



Network-based state ownership and corporate resilience: Evidence from China[☆]

Weigang Fu^a, Fangrui Liu^b, Yan Liu^{c,*}

^a School of Information Management, Wuhan University, PR China

^b Institute of New Structural Economics, Peking University, PR China

^c Big Data Institute and Economics and Management School, Wuhan University, 430072, PR China

ARTICLE INFO

JEL classification:

G31

G32

G38

Keywords:

Corporate resilience

State ownership

Ownership network

Ultimate shareholder

ABSTRACT

Better financial support from state shareholders may enhance corporate resilience when facing large negative shocks. We empirically test this hypothesis based on data of listed firms from Chinese, an institutional environment featuring wide state ownership, and exploit a negative macro shock for identification. We employ a new measure of state ownership, which is constructed for each firm by identifying its ultimate shareholders through its entire ownership network. The findings robustly support that state ownership contributes to firm resilience, and one channel is the better financial flexibility provided by higher state ownership.

1. Introduction

Resilience is the capacity of a company to maintain stable operations, investments, and employment in the face of negative shocks or adverse events. More recently, there emerges a strong appreciation of firm resilience in the COVID-19 pandemic (Cheema-Fox et al., 2021), and correspondingly there is a resurgence of interest in examining factors affecting resilience. A number of studies have underscored the critical role of finance. Fahlenbrach et al. (2020) stresses that companies with greater financial flexibility are better equipped to mitigate revenue shortfalls resulting from negative shocks. Balduzzi et al. (2024) and Forbes et al. (2023) confirm that credit constraints and funding structures do affect corporate resilience. Additional firm characteristics have also been identified to affect firm resilience during the pandemic.¹ Nonetheless, few studies have investigated the influence of corporate ownership structure, and in particular the state ownership, on firm resilience. This paper aims at filling this gap in the literature.

Despite a common view backed by the literature in the 1990s about low efficiency of state-owned enterprises (SOEs) (Meggison and Netter, 2001; Shleifer, 1998), the recent studies cast doubts on this claim (Lazzarini and Musacchio, 2018) and stress on the positive sides of state ownership for a more balanced view (Bruton et al., 2015; Jaslowitzer et al., 2018; Lin et al., 2020; Meggison et al., 2021; Panizza, 2024). In particular, the recent literature highlights the stabilizing role featured by state ownership, both for non-financial firms and financial intermediaries. The multitask theory of SOEs (Lin et al., 1998; Bai et al., 2000) emphasizes that

[☆] We are grateful to the financial support provided by National Natural Science Foundation of China (grant number: 72173091), and the computational facility provided by Big Data Institute of Wuhan University. We thank two anonymous reviewers, Zhigang Cao, Xu Feng, Feng He, Bin Ke, Deming Luo, Fu Xin, Tao Yuan, Anru Zhang, and participants of numerous seminars for helpful comments. Yunzhu Huang provided excellent research assistance in data work. All remaining errors are ours.

* Corresponding author.

E-mail addresses: fuweigang@whu.edu.cn (W. Fu), liufangrui@nsd.pku.edu.cn (F. Liu), yanliu.ems@whu.edu.cn (Y. Liu).

¹ A partial list of the related literature includes: Chen et al. (2023) for exporters, Kuhn et al. (2023) for internal coordination, Li et al. (2021) for corporate culture, Liu and Zhao (2023) for political connections, Shan and Tang (2023) for employee morale, and Xia et al. (2022) for digital finance.

<https://doi.org/10.1016/j.frl.2024.106199>

Received 25 July 2024; Received in revised form 1 September 2024; Accepted 26 September 2024

Available online 1 October 2024

1544-6123/© 2024 Elsevier Inc. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

SOEs effectively balance between profit efficiency and social responsibility by providing non-governmental public insurance when the economy faces adverse scenarios.² One implication of this theory is that SOEs are likely to be more resilient to negative shocks in terms of maintaining more stable operations, investment, and employment. Furthermore, according to the hybrid organization perspective of Bruton et al. (2015), the resilience effect should not be confined to the SOEs only.³

Considering the more realistic situation of a hybrid ownership with both state and private shareholders, then the decision-making of the firm is most likely to account for both the economic efficiency and social responsibility, and the final outcome is determined through certain bargaining process.⁴ While the precise outcome must depend on details of firm characteristics, it is reasonable to conjecture that firm decision will weigh more on social responsibility, thus enhance resilience, given a higher state ownership. This is the main hypothesis that we test in this paper. In addition, we also investigate one possible underlying mechanism for this hypothesis: we argue that higher state ownership in a firm brings about better financial flexibility, through both an internal capital market channel and an external financing channel. The latter channel is particularly relevant for China, given the markedly advantageous access to external finance through state shareholders (cf. Zhu, 2021), while the former channel may also be operative around the world given the common practice of business groups formed by ownership linkages (cf. Khanna and Yafeh, 2005).

It is worth noting that existing literature often categorizes companies into SOEs and non-SOEs when analyzing the role of state ownership, rather than utilizing continuous variables to investigate state ownership in more detail. This approach limits the scope of the research to some extent. In contrast, this study adopts a network methodology inspired by Brioschi et al. (1989) to calculate the ultimate state ownership of a firm and then use this indicator to examine the role of state ownership in companies' responses to negative shocks.⁵

Based on the sample of A-share listed firms in China over 2018–2021, the empirical results demonstrate that when facing negative shocks, companies with higher state ownership show better performance in operations, investments and employment. In addition, the results are not driven by corporate political connections. Indeed, in a horse-race of state ownership and political connections, the former stands out by higher statistical and economic significance. Mechanism analysis suggests that state ownership primarily enhances firm resilience by improving firms' financial flexibility, consistent with the results of Fahlenbrach et al. (2020). Lastly, we demonstrate that the overall positive effect of state ownership on firm financial flexibility is subject to a caveat: there is an inverted U relationship between state ownership and financial flexibility, so that excessively high state ownership is likely to be counterproductive. This underscores the advantage of hybrid ownership (Bruton et al., 2015) and echoes the complexity of state ownership in the real world (Megginson and Liu, 2022).

Our paper makes two contributions to the existing literature. First, this paper examines the role of (ultimate) state ownership when companies confront negative shocks, thereby complementing the existing literature on firm characteristics influencing firm resilience. Second, unlike previous studies that dichotomize state ownership into SOEs and non-SOEs, this paper employs a continuous measure of (ultimate) state ownership. This approach helps to reduce measurement errors and facilitates the assessment of the marginal effects of state ownership.

The rest of paper is organized as follows. Section 2 presents the empirical model and data, and in particular, the network-based measure of state ownership. Section 3 reports the baseline results and robustness checks. Section 4 inspects one particular mechanism, namely financial flexibility, underlying the resilience effect of the state ownership. Section 5 concludes.

2. Model and data

2.1. Empirical specification

This paper exploits the COVID-19 pandemic as a large scale negative macro shock to facilitate identification with a (generalized) difference-in-differences (DID) model specification. The aim is to examine whether companies with a higher ultimate state ownership demonstrate greater operational resilience in the face of these negative shocks.

$$y_{ijt} = \beta \text{State}_i \times \text{Post}_t + \mathbf{Z}'_{ijt} \boldsymbol{\phi} + \mu_i + \mu_t + \epsilon_{it}, \quad (1)$$

where i, j, t index for firm, industry and year, respectively; y denotes one of an array of outcome variables, covering firm level operations, investment and employment; State_i denotes the network-based measure of the state ownership of firm i before the COVID-19 pandemic, while Post_t is the shock variable which equals to 1 for years starting from 2020; \mathbf{Z} is a vector of control variables at the firm levels; and μ_i and μ_t are firm and year fixed effects, which also absorb State_i and Post_t respectively. The

² This is not to deny the existence of perverse incentives in SOEs, as analyzed in Shleifer and Vishny (1994), but to complement the existing literature by offering a more impartial perspective on state ownership in firms, especially given the fact that around the world more firms now have a hybrid ownership structure blending state and non-state ownership as documented by Bruton et al. (2015).

³ The status of SOE for a company is almost exclusively related to the fact that the control power of the company falls in the hand of the state. However, given that hybrid ownership of both state and private shareholders is now the prevailing ownership structure in the aftermath of the privatization wave post the Cold War (Megginson, 2017), it is necessary to have a broader conceptual framework to encompass companies with state ownership but without state control. See Megginson and Liu (2022) and the related chapters in the same volume for extensive surveys on the latest development of many aspects of state ownership and state capitalism.

⁴ Shleifer and Vishny (1994) offers a particular model of Nash bargaining for the decision making of a public firm. Although the model focuses on the case of bargaining between the politician and the manager, the conceptual framework can be applied to different types of shareholders as well.

⁵ Bai et al. (2021) and Allen et al. (2024) are two recent examples of the emerging literature of inspecting the enterprise ownership network in China.

coefficient of interest is β , which captures the differential responses of high state ownership versus low state ownership firms before and after the COVID-19 pandemic shock.

We use a panel data sample comprising all A-share listed companies in China. For the baseline results, we restrict the sample period to be 2018–2021. Prior to 2018, China experienced a series of internal and external shocks,⁶ which likely to contaminate the results. Furthermore, China officially abandoned the pandemic policy at the end of 2022, and there were a lot of policy uncertainties in the whole year, which may also interfere the inference of the baseline specification.⁷

2.2. Data sources and measurement

As resilience encompasses the ability of a company to maintain stable operations, investments, and employment when facing negative shocks, we examine a host of outcome variables. These include the net profit, total operating income, cash investment, and number of staff, all normalized by total assets (Liu and Zhao, 2023). To test the potential mechanism of financial flexibility, we employ the current ratio, quick ratio, cash ratio, and (total) asset growth rate as additional outcome variables (Fahlenbrach et al., 2020).

The core variable of interest is the network-based measure of the state ownership for each firm. We adopt the methodology proposed by Brioschi et al. (1989) to construct our main explanatory variable, $State_i$, for each listed firm i in the year of 2018, using the full sample of enterprise registration data with comprehensive ownership records for each enterprise in China.⁸ In particular, we start by constructing the entire ownership network for each listed firm in our sample, by searching the direct shareholders and all the indirect shareholders of the firm. In other words, we exhaust the shareholders of firm i until we identify all the ultimate shareholders, i.e., shareholders without further shareholders. We classify the ultimate shareholders into four categories following La Porta et al. (1999): state shareholders, individual shareholders, widely held shareholders, and foreign shareholders.⁹ Once we identify the ultimate state owners of firm i , we then use the algorithm of Brioschi et al. (1989) to calculate the ultimate ownership share s_{ik} of any ultimate state shareholder k to firm i .¹⁰ Finally, we sum up the ultimate ownership of all ultimate state shareholders of firm i to arrive at our network-based measure of state ownership, $State_i = \sum_{k \in U_i} s_{ik}$, where U_i denotes the set of ultimate state owners of firm i .¹¹ Fig. 1 reports the histograms of the ultimate state ownership of our sample firms conditional on firm's SOE status, which we retrieve from CSMAR. Evidently, the ultimate state ownership concentrates on values close to 0 for firms classified as non-SOE, whereas it is more dispersed with a significantly higher mean for firms classified as SOE. However, the dispersion per se indicates that the ultimate state ownership measure is informative, and there exists considerable heterogeneity of state ownership even for the SOE sample firms.

We adopt a set of standard firm-level control variables, including the size as measured by log total assets (Balduzzi et al., 2024; Igan et al., 2023), fixed asset ratio (Zhang et al., 2022), intangible asset ratio (Shan and Tang, 2023), and debt ratio (Lins et al., 2017).

All data, except for $State$, are sourced from CSMAR, a standard database for Chinese listed companies. To mitigate the impact of outliers, we winsorize all continuous indicators at the 0.5% and 99.5% percentiles. Table 1 reports summary statistics of all variables.

3. Results

3.1. Baseline results

Tables 2 and 3 present the estimation results of the baseline specification of Eq. (1). In the odd-numbered columns, no control variables are included, while in the even-numbered columns, firm-level control variables are incorporated.

Table 2 examines the impact of state ownership on firms' operations. All the coefficients of the interaction term are positive and significant at the 1% level. This suggests that when firms face adverse shocks, firms with higher ultimate state ownership exhibit

⁶ The main shocks are as follows: (i) the supply-side structural reform starting from 2015; (ii) the shadow banking regulatory reform in 2017; and (iii) the trade war with the US starting from 2018.

⁷ Nonetheless, the baseline results are robust to longer sample periods, as briefly discussed in Section 3.2.

⁸ The choice of 2018 is partly due to data availability. We have obtained the full sample of enterprise registration data only for 2017 and 2018, which also explains why we choose to focus COVID-19 as the negative shock in this paper. Our version of the enterprise registration data is sourced from Shenzhen Securities Information Co., Ltd through an NSFC collaboration project (grant number: 91646206).

⁹ Ultimate state shareholders in China are government entities and public entities, where the latter include public universities, hospitals, etc. Individual shareholders are large owners typically with a ownership greater than 5%. Widely held shareholders are small shareholders, e.g., retail investors of listed firms. Lastly, for foreign shareholders, we lack the ownership registration data for foreign firms operating in China or being shareholders of firms in China. As a result, we group all foreign shareholders together and do not further distinguish their types. Foreign shareholders account for a tiny portion of numbers of shareholders for firm ownership networks in China.

¹⁰ The algorithm is designed to deal with possible loops in the ownership network, i.e., two firms owning shares with each other, by modeling the direct and indirect shareholdings of a shareholder in a firm.

¹¹ In the recent literature exploiting enterprise registration data, i.e., Bai et al. (2021) and Allen et al. (2024), similar firm ownership networks are also constructed from the full sample of firm ownership records. However, to our knowledge, no other work has utilized the method of Brioschi et al. (1989) to calculate the ultimate ownership of a certain firm for a given shareholder. In addition, Allen et al. (2024) define the state ownership of a firm by searching its ownership network for shareholders within a given number of layers, and identifying state shareholders according a separate list sourcing from central and local state-owned assets supervision and administration commissions etc.

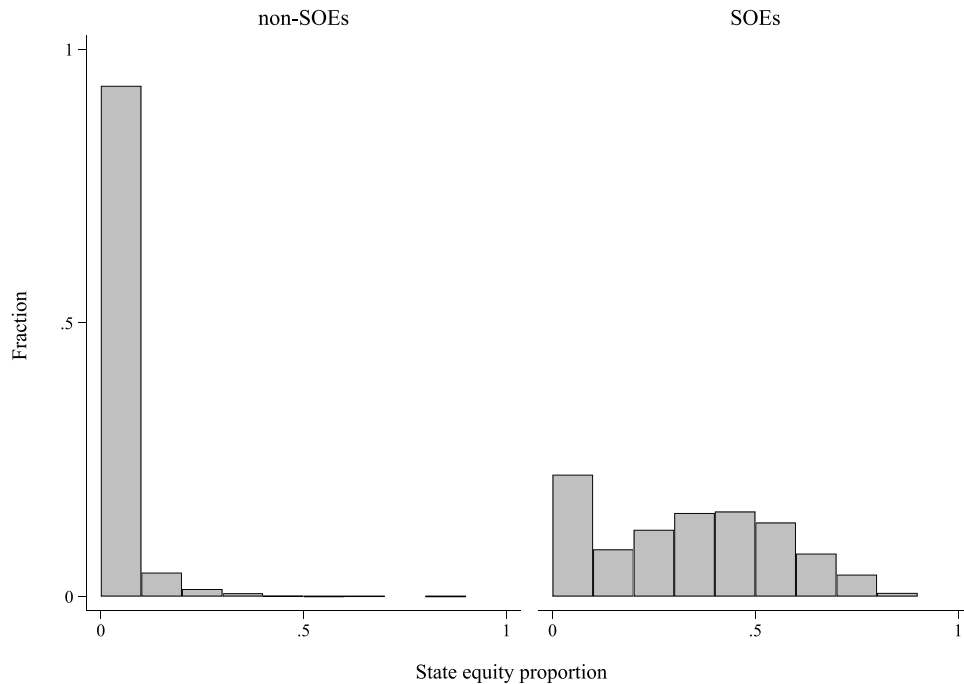


Fig. 1. Histograms of the ultimate state ownership conditional on SOE status.

Table 1
Summary statistics.

Variables	Obs.	Mean	Std.	Min	Median	Max
State	13,535	0.122	0.194	0.000	0.020	0.850
Net profit	13,535	0.029	0.104	-2.817	0.023	4.766
Total operating income	13,530	0.376	0.585	-0.019	0.273	35.127
Cash investment	10,499	0.237	0.436	0.000	0.054	3.585
Staff	13,533	57.452	49.956	1.054	45.633	350.726
Current ratio	13,237	11.915	24.503	0.014	4.036	226.630
Quick ratio	13,237	9.835	21.588	0.009	3.013	203.313
Cash ratio	13,237	3.668	9.522	0.002	0.787	98.332
Asset growth rate	13,535	0.528	2.102	-4.319	0.094	33.373
Political connection	13,535	0.256	0.437	0.000	0.000	1.000
Size	13,535	4.084	1.491	0.802	3.843	10.081
Fixed asset ratio	13,535	0.707	1.048	0.000	0.334	8.234
Int. asset ratio	13,535	0.163	0.278	0.000	0.069	2.776
Debt ratio	13,535	1.392	1.963	0.003	0.825	28.181

superior profitability and revenue levels. This indicates that state ownership helps enhance the operational stability of companies when facing shocks, thereby mitigating the adverse impacts.

Table 3 examines the impact of ultimate state ownership on firms' investments and employment. All the coefficients of the interaction term are also positive and significant, which indicate that when facing adverse shocks, companies with higher proportions of state ownership tend to engage in more cash investments and employ more staff. This is related to its function in maintaining social stability. On one hand, companies with higher proportions of state ownership are more susceptible to government intervention, which encourages increased investment and more jobs during adverse periods to mitigate the negative impact of shocks on the macroeconomy. On the other hand, the government is also more likely to provide assistance, in particular the financial ones, to these firms.

To save space, we report the parallel trend tests for the baseline regressions in Table 4 instead of drawing separate figures for all 4 main dependent variables. Following the standard practice, we choose 2019 to be the base year. We report the 95% confidence interval (CI) under each estimate of the interaction terms. To summarize, all CIs for State \times 2018 contain 0, whereas all but 2 CIs

Table 2
The impact of state ownership on operations.

	(1)	(2)	(3)	(4)
	Net profit	Net profit	Tot. ope. income	Tot. ope. income
State × Post	0.0176** (0.0071)	0.0170** (0.0071)	0.1103*** (0.0413)	0.1081*** (0.0405)
Size		0.0423*** (0.0070)		0.1663*** (0.0611)
Fixed asset ratio		0.0047 (0.0034)		0.0399** (0.0166)
Int. asset ratio		0.0016 (0.0075)		0.0108 (0.0345)
Debt ratio		0.0041 (0.0025)		0.0700*** (0.0132)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R ²	0.4647	0.4714	0.4945	0.5038
Obs.	13,455	13,455	13,449	13,449

Notes: Standard errors are clustered at the firm level, *t*-value in the parenthesis, and ***, **, * indicate significance levels at 1%, 5%, and 10% respectively.

Table 3
The impact of state ownership on investment and employment.

	(1)	(2)	(3)	(4)
	Cash investment	Cash investment	Staff	Staff
State × Post	0.1011*** (0.0266)	0.0975*** (0.0261)	4.0859*** (1.2868)	3.8237*** (1.1749)
Size		0.0826*** (0.0226)		-19.4647*** (1.4921)
Fixed asset ratio		0.0229 (0.0197)		3.1422*** (0.7921)
Int. asset ratio		0.0672 (0.0515)		1.3499 (2.6250)
Debt ratio		0.0191 (0.0127)		-0.0987 (0.3717)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R ²	0.7743	0.7764	0.9390	0.9469
Obs.	10,101	10,101	13,453	13,453

Notes: Standard errors are clustered at the firm level, *t*-value in the parenthesis, and ***, **, * indicate significance levels at 1%, 5%, and 10% respectively.

for State × 2019 and State × 2020 are above 0, and for each outcome variable at least one post-shock CI is above 0. As a result, we conclude that pre-trend requirements are satisfied for all the dependent variables.

3.2. Robustness checks

We further conduct a series of tests to ensure the robustness of our empirical findings.¹² Firstly, we control for industry and time fixed effects while excluding individual fixed effects and introduce the variable State as a control variable. This strategy allows us to assess the first order impact of State in the cross section. Following the inclusion of industry fixed effects, the coefficients of the interaction term remain consistent in direction with the baseline and attain statistical significance. Moreover, we augment the model by including a binary variable indicating whether a firm is state-owned, and find that our empirical results remain unchanged.

Secondly, considering that the China-US trade war in 2019 led to deteriorating trade conditions for China and disruptions in international supply chains, potentially causing adverse impacts on business operations, we adjust the starting year of the negative shock from 2020 to 2019. Our empirical results remain unchanged.¹³

¹² Due to space limit, we do not report the robustness test results in the main text, except for the last one about political connection. All results are available upon request.

¹³ For this case, we choose a longer sample period of 2017–2021, so that we have enough sample in the pre-shock periods.

Table 4
Parallel trend tests.

	(1) Net profit	(2) Tot. ope. income	(3) Cash investment	(4) Staff
State × 2018	0.0010 [−0.0121, 0.0141]	−0.0048 [−0.1053, 0.0958]	−0.0474 [−0.1026, 0.0077]	−1.8618 [−3.9860, 0.2623]
State × 2020	0.0090 [−0.0051, 0.0230]	0.1460 [0.0241, 0.2679]	0.0531 [0.0059, 0.1002]	1.8032 [0.1653, 3.4410]
State × 2021	0.0261 [0.0022, 0.0500]	0.0654 [−0.0112, 0.1420]	0.0951 [0.0365, 0.1538]	3.9808 [1.3771, 6.5844]
Control Var.	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R ²	0.4716	0.5039	0.7765	0.9469
Obs.	13,455	13,449	10,101	13,453

Notes: Brackets under point estimates indicate the 95% confidence intervals. 2019 is the base period.

Table 5
Robustness tests controlling for political connection.

	(1) Net profit	(2) Tot. ope. income	(3) Cash investment	(4) Staff
State × Post	0.0170** (0.0071)	0.1095*** (0.0407)	0.0975*** (0.0263)	3.7737*** (1.1817)
PC × Post	0.0022 (0.0031)	0.0251* (0.0145)	0.0240* (0.0128)	0.8431 (0.6602)
PC	−0.0004 (0.0035)	0.0094 (0.0179)	0.0044 (0.0123)	−0.8114 (1.0299)
Size	0.0423*** (0.0070)	0.1662*** (0.0611)	0.0828*** (0.0226)	−19.4368*** (1.4954)
Fixed asset ratio	0.0047 (0.0035)	0.0398** (0.0166)	0.0225 (0.0197)	3.1421*** (0.7903)
Int. asset ratio	0.0016 (0.0075)	0.0110 (0.0345)	0.0674 (0.0517)	1.3435 (2.6226)
Debt ratio	0.0041 (0.0025)	0.0702*** (0.0132)	0.0193 (0.0128)	−0.0985 (0.3707)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R ²	0.4715	0.5039	0.7765	0.9469
Obs.	13,455	13,449	10,101	13,453

Notes: Standard errors are clustered at the firm level, *t*-value in the parenthesis, and ***, **, * indicate significance levels at 1%, 5%, and 10% respectively.

Thirdly, we employ other commonly used financial performance indicators such as operating profit margin, return on equity, total asset turnover, and cash ratio as dependent variables to measure corporate operational resilience, and the coefficients of the interaction terms remain significant.

Finally, we report an important robustness test in [Table 5](#) to control for the potential confounding effects from firm political connections, as stressed by [Liu and Zhao \(2023\)](#). Specifically, we use the same measure of political connections as in [Liu and Zhao \(2023\)](#), and conduct a horse race by adding an interaction term of political connection (PC) with COVID-19 shock (Post). The results show that our baseline results on state ownership survive in all cases, with no change in the signs of the coefficient estimates, and very small changes in the magnitudes.¹⁴ As a result, we conclude that our findings are not driven by the political connection channel.

4. Inspecting the mechanisms

The preceding results have demonstrated that a higher level of ultimate state ownership enhances firms' operational resilience when facing negative shocks. In this section, we delve into the mechanisms underlying this impact.

[Fahlenbrach et al. \(2020\)](#) stresses that firms with greater financial flexibility are better equipped to withstand revenue shortfalls resulting from the COVID-19 shock. In their study, financial flexibility is defined as the ease with which a firm can fund a cash flow shortfall. Inspired by this literature, our study examines whether the presence of ultimate state ownership improves firms' operational performance when facing negative shocks by enhancing their financial resilience.

¹⁴ The correlation between PC and State is 0.0179, positive yet small in magnitude, which explains why our results are robust to controlling the political connection.

Table 6
Mechanism inspection of financial flexibility.

	(1)	(2)	(3)	(4)
	Current ratio	Quick ratio	Cash ratio	Total asset growth rate
State × Post	5.2302*** (0.7378)	4.7658*** (0.6508)	1.2197*** (0.3379)	0.2987*** (0.1147)
Size	-8.2232*** (1.3878)	-6.7206*** (1.2633)	-2.2762*** (0.3698)	2.2320*** (0.2927)
Fixed asset ratio	4.0757*** (1.0219)	3.5443*** (0.8052)	1.0613*** (0.3858)	0.2426 (0.2158)
Int. asset ratio	6.3670** (2.6544)	4.8176** (2.2926)	1.7234* (0.9176)	2.4821*** (0.7037)
Debt ratio	-2.4325*** (0.5167)	-2.2423*** (0.4676)	-0.9599*** (0.2078)	0.9824*** (0.1200)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R ²	0.8894	0.8819	0.8396	0.5094
Obs.	13,155	13,155	13,155	13,455

Notes: Standard errors are clustered at the firm level, *t*-value in the parenthesis, and ***, **, * indicate significance levels at 1%, 5%, and 10% respectively.

Table 7
Mechanism analysis: Existence of the optimal level of state ownership.

	(1)	(2)	(3)	(4)
	Current ratio	Quick ratio	Cash ratio	Total asset growth rate
State × Post	14.7716*** (2.4563)	12.9809*** (2.2104)	3.7472*** (1.1154)	1.2828*** (0.4248)
State ² × Post	-16.6339*** (3.6456)	-14.3216*** (3.2487)	-4.4062 ** (1.7419)	-1.7191*** (0.6295)
Size	-8.1972*** (1.3873)	-6.6982*** (1.2631)	-2.2693*** (0.3697)	2.2343*** (0.2927)
Fixed asset ratio	4.0740*** (1.0205)	3.5427*** (0.8044)	1.0608*** (0.3854)	0.2420 (0.2159)
Int. asset ratio	6.2910** (2.6515)	4.7521** (2.2901)	1.7032* (0.9176)	2.4738*** (0.7043)
Debt ratio	-2.4256*** (0.5161)	-2.2363*** (0.4671)	-0.9580*** (0.2076)	0.9832*** (0.1200)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R ²	0.8895	0.8820	0.8397	0.5096
Obs.	13,155	13,155	13,155	13,455

Notes: Standard errors are clustered at the firm level, *t*-value in the parenthesis, and ***, **, * indicate significance levels at 1%, 5%, and 10% respectively.

We employ four indicators, namely current ratio, quick ratio, cash ratio, and total asset growth rate, to capture firm's financial resilience. The results are presented in Table 6. All four indicators show statistically significant positive coefficients, indicating that when facing negative shocks, companies with higher proportions of ultimate state ownership demonstrate stronger abilities to generate cash flows and sustain growth, thereby exhibiting higher financial resilience.

However, is it preferable for the ultimate state ownership to be as high as possible? The answer is negative. We introduce an interaction term between State² and Post into our model, and the results are presented in Table 7. Both the squared interaction terms and the linear interaction terms for all four indicators are statistically significant, with the coefficients of the squared interaction terms being negative. This suggests that there exists an optimal proportion of state ownership that maximizes firms' financial resilience. The optimal range for the ultimate state ownership, ensuring the highest level of financial resilience, lies around 40%.¹⁵ This indicates that a certain proportion of state ownership in a mixed ownership reform is more conducive to enhancing firms' financial and operational resilience.¹⁶

¹⁵ Across the four regressions reported in Table 7, the maxima are achieved in the range of 37% to 45% for the ultimate state ownership. Note that the ultimate state ownership used in this paper describes the cumulative state ownership across all direct and indirect ultimate state shareholders, therefore it is typically higher than the simple measure of direct state ownership that is conventional in the previous literature.

¹⁶ We have also experimented with another approach to assess the nonlinearity relationship. We divide the sample into 3 groups according to tertiles of State variable, and the results confirm the inverted U patterns as reported here.

5. Conclusion

In this paper, we examine the impact of state ownership on firm resilience. In particular, we use a network-based measure of state ownership of a firm by tracing all its ultimate state shareholders and calculating the sum of the corresponding ultimate state ownership. Being continuous, this measure admits less measurement error than the conventional 0–1 categorical variable for state-owned enterprises. Our empirical findings indicate that companies with higher state ownership exhibit better resilience in profitability, investment, and employment stability. The results pass a host of robustness tests, and we show that the results are not driven by corporate political connections. Lastly, we provide one mechanism test by demonstrating that higher state ownership enhances resilience via better financial flexibility for a firm, resonating the finding of [Fahlenbrach et al. \(2020\)](#). Yet this positive effect is subject to a limit: there is an overall inverted U relationship between state ownership and firm financial flexibility, with a maximum effect reached around 40% of ultimate state ownership. An important implication of this study is to acknowledge the advantage inherent to mixed ownership in promoting firm resilience, hence the resilience of the economy at large. State ownership may have various incentive drawbacks as identified in the literature of transition economies, however at least in terms of resilience, state ownership in firms does provide a cushion against negative shocks and contribute to the overall risk-sharing capacity of an economy.

It is worth to make a final remark about our network based measure of state ownership, i.e., the ultimate state ownership. A continuous measure of state ownership is indispensable for any test of non-linear effect of a firm's state ownership, for a binary state ownership indicator (e.g., SOE status) would render any such test impossible. As a result, we expect that the ultimate state ownership measure would be useful for other empirical studies.

CRedit authorship contribution statement

Weigang Fu: Writing – original draft, Software, Methodology, Data curation. **Fangrui Liu:** Writing – original draft, Investigation, Formal analysis. **Yan Liu:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

References

- Allen, F., Cai, J., Gu, X., Qian, J.Q., Zhao, L., Zhu, W., 2024. Centralization or decentralization? The evolution of state-ownership in China. Working Paper, SSRN.
- Bai, C.-E., Hsieh, C.-T., Song, Z., 2021. The rise of state-connected private owners in China. Working Paper 28170, NBER.
- Bai, C.-E., Li, D.D., Tao, Z., Wang, Y., 2000. A multitask theory of state enterprise reform. *J. Comp. Econ.* 28 (4), 716–738.
- Balduzzi, P., Brancati, E., Brianti, M., Schiantarelli, F., 2024. Credit constraints and firms' decisions: Lessons from the COVID-19 outbreak. *J. Monetary Econ.* 142, 103519.
- Brioschi, F., Buzzacchi, L., Colombo, M.G., 1989. Risk capital financing and the separation of ownership and control in business groups. *J. Bank. Financ.* 13 (4), 747–772.
- Bruton, G.D., Peng, M.W., Ahlstrom, D., Stan, C., Xu, K., 2015. State-owned enterprises around the world as hybrid organizations. *Acad. Manage. Perspect.* 29 (1), 92–114.
- Cheema-Fox, A., LaPerla, B.R., Wang, H.S., Serafeim, G., 2021. Corporate resilience and response to COVID-19. *J. Appl. Corp. Finance* 33 (2), 24–40.
- Chen, Y., Debnath, S., Sekhri, S., Sekhri, V., 2023. The impact of Covid-19 containment lockdowns on MSMEs in India and resilience of exporting firms. *J. Econ. Behav. Organ.* 210, 320–341.
- Fahlenbrach, R., Rageth, K., Stulz, R.M., 2020. How valuable is financial flexibility when revenue stops? Evidence from the COVID-19 crisis. *Rev. Financ. Stud.* 34 (11), 5474–5521.
- Forbes, K., Friedrich, C., Reinhardt, D., 2023. Stress relief? Funding structures and resilience to the covid shock. *J. Monetary Econ.* 137, 47–81.
- Igan, D., Mirzaei, A., Moore, T., 2023. Does macroprudential policy alleviate the adverse impact of Covid-19 on the resilience of banks? *J. Bank. Financ.* 147, 106419.
- Jaslowitz, P., Megginson, W.L., Rapp, M.S., 2018. State ownership and corporate investment. Working Paper, SSRN.
- Khanna, T., Yafeh, Y., 2005. Business groups and risk sharing around the world. *J. Bus.* 78 (1), 301–340.
- Kuhn, M., Luo, J., Manovskii, I., Qiu, X., 2023. Coordinated firm-level work processes and macroeconomic resilience. *J. Monetary Econ.* 137, 107–127.
- La Porta, R., Lopez-De-Silanes, F., Shleifer, A., 1999. Corporate ownership around the world. *J. Finance* 54 (2), 471–517.
- Lazzarini, S.G., Musacchio, A., 2018. State ownership reinvented? Explaining performance differences between state-owned and private firms. *Corp. Gov.: Int. Rev.* 26 (4), 255–272.
- Li, K., Liu, X., Mai, F., Zhang, T., 2021. The role of corporate culture in bad times: Evidence from the COVID-19 pandemic. *J. Financ. Quant. Anal.* 56 (7), 2545–2583.
- Lin, J.Y., Cai, F., Li, Z., 1998. Competition, policy burdens, and state-owned enterprise reform. *Amer. Econ. Rev.* 88 (2), 422–427.
- Lin, K.J., Lu, X., Zhang, J., Zheng, Y., 2020. State-owned enterprises in China: A review of 40 years of research and practice. *China J. Account. Res.* 13 (1), 31–55.
- Lins, K.V., Servaes, H., Tamayo, A., 2017. Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis. *J. Finance* 72 (4), 1785–1824.

- Liu, H., Zhao, W., 2023. The role of political connections in bad times: Evidence from the Covid-19 pandemic. *Econom. Lett.* 224, 110999.
- Meggison, W.L., 2017. Privatization, state capitalism, and state ownership of business in the 21st century. *Found. Trends® Financ.* 11 (1–2), 1–153.
- Meggison, W.L., Liu, X.S., 2022. State ownership and corporate governance. In: Wright, M., Wood, G.T., Cuervo-Cazurra, A., Sun, P., Okhmatovskiy, I., Grosman, A. (Eds.), *The Oxford Handbook of State Capitalism and the Firm*. Oxford University Press, Oxford, pp. 131–165.
- Meggison, W.L., Lopez, D., Malik, A.I., 2021. The rise of state-owned investors: Sovereign wealth funds and public pension funds. *Annu. Rev. Finan. Econ.* 13 (1), 247–270.
- Meggison, W.L., Netter, J.M., 2001. From state to market: A survey of empirical studies on privatization. *J. Econ. Lit.* 39 (2), 321–389.
- Panizza, U., 2024. Bank ownership around the world. *J. Bank. Financ.* 166, 107255.
- Shan, C., Tang, D.Y., 2023. The value of employee satisfaction in disastrous times: Evidence from COVID-19. *Rev. Financ.* 27 (3), 1027–1076.
- Shleifer, A., 1998. State versus private ownership. *J. Econ. Perspect.* 12 (4), 133–150.
- Shleifer, A., Vishny, R.W., 1994. Politicians and firms. *Q. J. Econ.* 109 (4), 995–1025.
- Xia, Y., Qiao, Z., Xie, G., 2022. Corporate resilience to the COVID-19 pandemic: The role of digital finance. *Pac.-Basin Finance J.* 74, 101791.
- Zhang, J., Zhang, Y., Sun, Y., 2022. Restart economy in a resilient way: The value of corporate social responsibility to firms in Covid-19. *Finance Res. Lett.* 47, 102683.
- Zhu, X., 2021. The varying shadow of China's banking system. *J. Comp. Econ.* 49 (1), 135–146.