



Clan culture against the shock of the COVID-19 pandemic: Evidence from Chinese listed firms

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ABSTRACT

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This paper examines whether clan culture, as an informal institution, enhanced the resilience of Chinese listed firms to the COVID-19 shock. It further investigates whether this effect operated through financing and labor channels and whether it became weaker in regions with more developed formal institutions. To address these questions, we construct a firm-level measure of clan culture by combining genealogy records from the General Catalogue of Chinese Genealogy with senior executives' clan-related characteristics. This measure is merged with financial data for Chinese A-share listed firms in 2020–2021, city-level macroeconomic data, and COVID-19 data from Johns Hopkins University. Using a two-way fixed-effects model, together with a series of robustness checks, mechanism tests, and heterogeneity analyses, we estimate the moderating effect of clan culture on firm performance during the pandemic. The results show that COVID-19 had a significant negative effect on firm performance, while stronger clan culture significantly weakened this adverse effect. Mechanism analysis indicates that clan culture helped firms cope with the shock by easing financing constraints and alleviating labor shortages. We further find that the buffering effect of clan culture is stronger in regions with less-developed formal institutions, suggesting that clan culture partly substitutes for formal institutional arrangements such as the legal system. These findings highlight the role of informal institutions in shaping firm resilience to major external shocks and suggest that policies aimed at strengthening resilience should take into account both formal institutional development and the supportive role of informal social structures.

Contribution/Originality: The paper's primary contribution is identifying how clan culture influences Chinese listed firms resilience during the COVID-19 shocks by linking a firm-level measure of clan culture. Unlike prior studies, it moves beyond macro-level discussions of clan culture to show, at the firm level, that clan culture buffers adverse shocks through easing financing constraints and labor shortages, and that its role is strongest where formal institutions are less developed.

1. INTRODUCTION

Over the past 45 years of reform and opening up, the Chinese economy has achieved not only rapid growth but also notable resilience to adverse shocks. The COVID-19 pandemic offers a clear example. Although the pandemic placed severe pressure on China's economy, its impact was relatively less pronounced than in other major economies. In 2020, China's GDP grew by 2.24%, while the United States, Japan, and Germany recorded growth rates of -2.27%, -4.28%, and -3.83%, respectively. In 2021, its GDP growth rate reached 8.45%, again exceeding those of the United States, Japan, and Germany. Similar resilience was also observed during earlier shocks, such as those in 1998 and

2008. Why has the Chinese economy been able to repeatedly withstand adverse shocks? Previous studies have mainly examined the sources of China's resilience from the national or macro-level perspective, with particular attention to institutions, policy support, and regional development (Gong, Hassink, Tan, & Huang, 2020; Ren, Xu, & He, 2023; Zeng & Tang, 2023). Yet firms are the micro-level actors most directly exposed to adverse shocks, and their capacity to absorb and respond to disruptions is an important foundation of broader economic resilience.

During the COVID-19 pandemic, many firms faced labor shortages, financial strain, and operational disruptions, which in turn weakened business performance (Cai, 2020; Shen, Fu, Pan, Yu, & Chen, 2020; Tian & Li, 2020). Although governments introduced various support policies, formal measures alone may be insufficient when resources are limited and formal institutions are incomplete (Cull, Li, Sun, & Xu, 2015). In this context, Wenzhou provides an illustrative case. Despite being hit by the pandemic, most listed firms in the city remained profitable in the first half of 2021. A possible reason is the area's strong clan culture, which may have supported firms through kin-based mutual assistance, resource sharing, and locally embedded social ties. This perspective is consistent with previous research on the economic implications of clan culture. Pan, Ning, Ji, and Dai (2019) document that clan culture relaxes private firms' financing constraints and reduces agency costs between shareholders and managers, while Huang, Ma, and Wang (2022) find that it reduces firm risk. By fostering trust, information sharing, and mutual support, clan ties can help firms secure financial and labor resources during adverse shocks, thereby mitigating their negative effects on firm operations.

Despite these insights, important gaps remain. Previous studies on China's resilience mainly emphasize macro-level factors such as institutions, policy support, and regional development, while the role of culture has received much less attention. Numerous studies have shown that clan culture has important effects on resource allocation, public goods provision, and private-sector development (Peng, 2004; C. Zhang, 2020). By contrast, its implications for firm-level behavior and decision-making have received much less attention (Pan et al., 2019). Moreover, limited evidence exists on whether such a role varies with the strength of formal institutions. To address these gaps, this paper investigates whether clan culture helped Chinese listed firms withstand the adverse shock of COVID-19 and whether this buffering effect became weaker in regions with more developed formal institutions. This study contributes to the literature in the following ways.

First, it extends research on clan culture from a cultural perspective and brings this literature into the study of resilience under adverse shocks. As Guiso, Sapienza, and Zingales (2015) argues, economics is increasingly paying attention to culture, and explaining the development of Chinese firms from a cultural perspective has attracted growing interest. Previous studies of clan culture were mainly conducted in sociology and cultural studies (Freedman, 1958; Manion, 1996; Su, Ran, Sun, & Liu, 2011). More recent economic research has examined clan culture largely from a macro perspective, focusing on resource allocation, public goods provision, and private-sector development (Peng, 2004; Zhang, 2020), while firm-level evidence remains relatively limited (Huang et al., 2022; Pan et al., 2019). At the same time, much of the existing discussion of cultural confidence remains qualitative (Cao, 2023; Liu, 2016; F. Zhao & Sun, 2016). By focusing on firm resilience to adverse shocks, this paper provides micro-level evidence on the economic role of clan culture and offers a cultural explanation for China's relatively strong resilience during the COVID-19 pandemic.

Second, this paper develops a more refined firm-level measure of clan culture. Existing studies typically proxy clan culture by the number of genealogies or ancestral halls in the city where a firm is located (Greif & Tabellini, 2017; Huang et al., 2022; Pan et al., 2019) or by using the surnames of the chairman and general manager (Pan et al., 2019) and the local surname structure (Guo & Yao, 2013). Although useful, these measures remain relatively coarse. In contrast, this paper combines regional genealogy records with executives' clan-related characteristics to construct a firm-level index of clan culture. This measure incorporates both the local clan-culture environment and firm-specific variation, and it can change over time as firm characteristics change.

Third, this paper provides evidence on both the mechanisms and the institutional conditions under which clan culture matters. In a world of persistent uncertainty, adverse shocks are likely to remain frequent (Huang & Li, 2024; Liu & Lu, 2023; Xue, Wang, & Xu, 2023; Ye, Huang, & Chen, 2023; Zuo, Li, Ge, & Chen, 2023). This paper shows not only that clan culture helps firms buffer the adverse effects of COVID-19, but also that it does so through easing financing constraints and alleviating labor shortages. In addition, by using a triple-interaction framework, the paper examines the substitutive relationship between clan culture and formal institutions such as the legal system. In this sense, the paper contributes to the broader literature on the interaction between informal and formal institutions, while also offering policy implications for helping firms cope with future shocks.

In the following sections, this article is structured as follows: Section 2 reviews the related literature and develops the theoretical hypotheses. Section 3 describes the empirical strategy, variable construction, and data sources. Section 4 presents the benchmark results and robustness checks. Section 5 examines the underlying mechanisms, and Section 6 presents further analysis. Section 7 concludes by summarizing the main findings, discussing the study's limitations, and outlining the policy implications.

2. LITERATURE REVIEW AND THEORETICAL HYPOTHESES

2.1. Firm Resilience Under Adverse Shocks: Existing Explanations and Remaining Gaps

A growing body of research has examined how firms respond to adverse shocks. Existing studies mainly attribute corporate resilience to digitalization, governance quality, organizational resources, social networks, and managerial characteristics. For example, digital technology innovation, digital finance, and software investment have been shown to strengthen resilience by improving information processing, reducing costs, and enhancing operational efficiency (Dehghan, Hajiha, & Salehi, 2026; Xia, Qiao, & Xie, 2022; Zhang, Zhang, & Chen, 2024). Other studies emphasize the roles of ESG performance, Party organizations in corporate governance, government subsidies, administrative penalties, and board structure (Feng & Xue, 2023; Huang, Luan, & Xie, 2025). Firm resilience has also been linked to intangible assets, managerial bank relationship networks, geographic dispersion, managerial overconfidence, and CEO education (Jiang, Kong, Lu, Ma, & Yi, 2023; Niu, Chen, Jin, Xie, & Zhao, 2024; Uddin, Hasan, & Abadi, 2022; Ximeng Zhang, Liu, & Chen, 2024). More broadly, studies on economic resilience have emphasized institutions, regional development conditions, industry characteristics, financial flexibility, ownership structure, innovation capacity, and macro-level policy arrangements (Bondonio & Greenbaum, 2018; Lu & Wang, 2023; Martin, 2012; Wan & Sun, 2010; Wan & Rao, 2013; Wei, Lian, & Wu, 2019; Wei & Zhang, 2021; Zeng, Zhang, & Wei, 2013; Zhang, 2014; Zhou, 2015). Yet firm behavior is also embedded in a broader social and cultural environment. In the Chinese context, clan culture is one of the most enduring and influential cultural forces, making it a particularly relevant lens through which to understand how firms respond to major external shocks.

2.2. Clan Culture and Economic Behavior

Clan culture is a long-standing social institution in China, rooted in kinship ties, shared ancestry, and common norms (Peng, 2009). Genealogies and ancestral halls serve as important carriers of clan identity and continuity (Peng, 2004). Over time, clan culture has evolved beyond a purely familial or lineage-based arrangement and has come to shape broader patterns of social and economic interaction. In this sense, clan networks constitute an important form of informal institution embedded in Chinese society. Prior studies show that clan culture has influenced a wide range of economic outcomes. Earlier research highlights its role in shelter, education, lending, and land sharing (Freedman, 1958; Hsu, 1965), while more recent works document its effects on public goods provision, farmer entrepreneurship, private lending, village elections, and family planning implementation (Ma & Yang, 2011; Manion, 1996; Su et al., 2011). Greif and Tabellini (2017) further show that clan-based organizations can support infrastructure provision and local cooperation. At the firm level, clan culture may be understood as a form of social capital that helps firms mobilize resources, strengthen trust, and facilitate cooperation (Zhou & Chen, 2004). Through dense kin-based ties and shared

norms, clan culture can shape information flows, resource allocation, and governance arrangements in ways that differ from impersonal market transactions. This suggests that clan culture may also matter for how firms cope with major external shocks.

2.3. Clan Culture, Financing Constraints, and Firm Resilience

A key challenge for firms during adverse shocks is financial pressure. Crises often reduce revenues, increase fixed-cost burdens, weaken investment, and tighten access to external finance (Cheng, Lin, & Qiu, 2022; Leiter, Oberhofer, & Raschky, 2009). During the COVID-19 pandemic, firms faced severe cash-flow pressure and rising financing constraints as economic activity slowed and investor sentiment deteriorated (Donadelli, Kizys, & Riedel, 2017; Tang et al., 2020; Xu & Zheng, 2023; Zhu, Zhang, Li, & Wang, 2020). Although relief policies were introduced, formal support was not always sufficient to fully offset urgent funding needs in the short run. The existing literature suggests that clan culture may help alleviate such constraints. Pan et al. (2019) show that stronger clan culture is associated with lower financing constraints among private firms, and that surname-based clan identity can reduce agency costs between shareholders and managers. Related studies find that firms can more easily obtain funds through clan-based relationship networks (Huang et al., 2022; Ma & Yang, 2011). Lin, Wu, and Li (2016) view clan culture as a credit or guarantee mechanism that facilitates private financing, while Rosenthal and Wong (2011) argue that close clan ties can create internal financial markets that substitute for external finance. Wang and Gao (2022) further show that clan culture helps ease financing constraints, reduce patent-enforcement risks, and strengthen trust mechanisms. Taken together, these studies suggest that clan culture may enhance firm resilience by relaxing financing constraints when adverse shocks disrupt normal market-based financing channels. Under crisis conditions, such informal financial support may help firms maintain liquidity and stabilize operations.

2.4. Clan Culture, Employment, and Firm Resilience

In addition to financial strain, adverse shocks often disrupt labor supply and recruitment. During the COVID-19 pandemic, transportation restrictions, lockdown measures, and interruptions to labor mobility created severe staffing problems for many firms (Paul & Chowdhury, 2021; Spieske & Birkel, 2021; Tian & Li, 2020; Xu, Elomri, Kerbach, & El Omri, 2020; Zhu et al., 2020). These disruptions increased the difficulty of returning to work, hiring employees, and sustaining production. Social networks are central to labor-market matching, especially under conditions of uncertainty. The employment relationship relies on a degree of mutual trust, and job seekers often use family and social networks to obtain information and reduce mismatch (Granovetter, 1990; Mortensen & Vishwanath, 1994). Firms are also more likely to recruit through trusted personal networks, particularly during economic downturns (Huang, 2012; Simon & Warner, 1992). In China, where interpersonal ties play an important role in labor-market behavior, clan networks may be especially relevant (Chen, 2005; Zhao, 2002). Because clan culture is rooted in kinship and repeated social interaction, it can strengthen trust and facilitate labor matching. Peng (2004) and Chen and Chen (2018) find that clan culture promotes firm employment. In this sense, clan networks may help firms mitigate labor shortages during crises by improving access to workers and supporting the resumption of production. If so, clan culture may enhance firm resilience not only through finance, but also through labor support.

2.5. The Alternative Role of Formal Institutions in Clan Culture

Clan culture is sustained by shared norms, obligations, and reputational sanctions. Members who violate clan rules may face social disapproval or exclusion, giving rise to an informal reputation mechanism that helps regulate behavior. Allen, Qian, and Qian (2005) argue that such reputation-based mechanisms play an important role in China's economic development and can partially substitute for formal legal protection. Zhang (2020) similarly shows that clan culture generates implicit behavioral norms that, to some extent, perform functions similar to those of formal institutions.

The role of clan culture is likely to be stronger where formal institutions are less developed. By fostering trust and mutual support, clan culture can ease financing constraints and improve access to labor resources, thereby supporting firm development (Greif & Tabellini, 2017; Karlan, Mobius, Rosenblat, & Szeidl, 2009; Pan et al., 2019; Zhang, 2020). By contrast, when formal institutions are stronger and market governance is more standardized, firms can rely more on formal channels and less on clan-based networks. This suggests that the buffering effect of clan culture should weaken as formal institutions improve. Based on this reasoning, we propose the following hypothesis.

Theoretical hypothesis 1: Higher clan culture mitigates the adverse effect of external shocks on firm operations.

Theoretical hypothesis 2: Clan culture mitigates the adverse effect of external shocks on firm operations by easing financing constraints and alleviating labor shortages.

Theoretical hypothesis 3: The mitigating effect of clan culture becomes weaker as formal institutions improve.

3. EMPIRICAL STRATEGIES AND DATA EXPLANATION

3.1. Empirical Strategy

3.1.1. Benchmark Regression Model

We combine annual data on Chinese listed firms with city-level macroeconomic data, clan culture measures, and COVID-19 data to examine the effects of the pandemic and clan culture on listed firms' performance. To test Hypothesis 1 empirically, we specify the following model.

$$\begin{aligned} Growth_{ijt} = & \beta_o + \beta_1 Covid_{it} \times Clan_{ijt-1} + \beta_2 Covid_{it} + \beta_3 Clan_{ijt-1} + X'\gamma \\ & + \kappa_i + \varphi_j + \eta_t + \varepsilon_{ijt} \end{aligned} \quad (1)$$

The subscript j represents the enterprise, i represents the city, and t represents the year. $Growth_{ijt}$ indicates the operating status indicator of enterprise j in city i in year t . $Covid_{it}$ denotes the severity of the COVID-19 outbreak, and $Clan$ is the proxy variable for clan culture in enterprise j . To alleviate endogeneity issues and emphasize causal relationships, this indicator lags behind by one period. X is the vector of control variables. κ_i , φ_j and η_t represents the fixed effects of cities, enterprises, and years¹, respectively, ε_{ijt} is a stochastic disturbance team.

β_1 and β_2 are the most concerned coefficients in this paper. The coefficient β_2 captures the effect of COVID-19 on firm performance and is expected to be negative (Liu & Wang, 2022). β_1 captures whether clan culture moderates the adverse effect of COVID-19 on firm operations. If β_1 is significantly positive, stronger clan culture mitigates the negative impact of COVID-19 on firm performance. If β_1 is significantly negative, stronger clan culture amplifies the adverse effect of COVID-19. If β_1 is not statistically different from zero, clan culture does not significantly alter the impact of COVID-19 on firms. Therefore, if the hypothesis of this paper is supported, $\beta_1 > 0$.

3.1.2. Mechanism Verification Model

To test Hypothesis 2 empirically, we specify the following model.

$$\begin{aligned} Growth_{ijt} = & \theta_o + \theta_1 Covid_{it} \times Clan_{ijt-1} \times Med_{ijt} + \theta_2 Covid_{it} \times Med_{ijt} + \theta_3 Covid_{it} \times Clan_{ijt-1} \\ & + \theta_4 Med_{ijt} + \theta_5 Covid_{it} + \theta_6 Clan_{ijt-1} + X'\gamma + \kappa_i + \varphi_j + \eta_t + \varepsilon_{ijt} \end{aligned} \quad (2)$$

Med denotes the mechanism variable, which captures either financing constraints or labor shortages. The coefficient of primary interest is θ_1 , which captures whether clan culture mitigates the adverse effect of COVID-19 on firm performance through these channels. If clan culture mitigates the negative impact of COVID-19 by easing financing constraints or alleviating labor shortages, θ_1 is expected to be significantly positive. By contrast, a

¹ Due to the absence of companies leaving their original cities in the sample, under the control of fixed effects of companies and years, the fixed effects of cities will be absorbed.

significantly negative θ_i would suggest that clan culture reinforces the adverse effect of COVID-19 through the corresponding channel.

3.1.3. Heterogeneity Testing Model

To examine Hypothesis 3, we augment a three-way interaction term among clan culture, formal institutions, and COVID-19 into the regression equation, as shown in Equation 3.

$$\begin{aligned} Growth_{ijt} = & \alpha_0 + \alpha_1 Covid_{it} \times Clan_{ijt-1} \times For_{ijt} + \alpha_2 Covid_{it} \times For_{ijt} + \alpha_3 Covid_{it} \times Clan_{ijt-1} \\ & + \alpha_4 For_{ijt} + \alpha_5 Covid_{it} + \alpha_6 Clan_{ijt-1} + X' \gamma + \kappa_i + \varphi_j + \eta_t + \varepsilon_{ijt} \end{aligned} \quad (3)$$

For denotes the variable measuring the degree of formal institutional development. When the formal-institutions variable is a positive indicator, the coefficient α_i captures whether stronger formal institutions affect the moderating role of clan culture in buffering the adverse impact of COVID-19 on firm performance. A significantly negative α_i indicates that the mitigating effect of clan culture becomes weaker as formal institutions improve. A significantly positive α_i indicates the opposite, namely that the mitigating effect of clan culture becomes stronger as formal institutions improve. If α_i is statistically insignificant, formal institutions do not significantly affect the role of clan culture in shaping firms' responses to the COVID-19 shock.

3.2. Data Description

Our initial sample consists of all A-share listed firms from 2020 to 2021. Because most firms in the medical industry experienced unusually high operating revenues during the COVID-19 period, we exclude listed firms in this industry as well as observations with incomplete data. The final sample contains 8996 observations from 4498 enterprises from 263 cities.

The genealogy data are obtained from the Chinese Genealogy Knowledge Service Platform, and the COVID-19 data are collected from Johns Hopkins University (JHU). Firm-level data come from the China Stock Market & Accounting Research (CSMAR) database, while city-level data are drawn from the China Statistical Yearbook. All continuous variables are winsorized at the 1st and 99th percentiles to limit the influence of outliers.

3.2.1. Explained Variable

Growth reflects firms' operating performance and is measured by the revenue growth rate from 2020 to 2021 (Yin, Sheng, & Li, 2018; Zhong & Lu, 2018).

3.2.2. Core Explanatory Variables

(1) Clan is the key explanatory variable and captures the intensity of clan culture at the firm level. Following Lei and Huang (2026) and Huang et al. (2022) we first measure local clan culture by the number of clan genealogies compiled between the Ming Dynasty and 1990, scaled by the local population in 1990. Using the 1990 population as the denominator helps reduce reverse-causality concerns, because large-scale migration and rapid economic transformation in China did not intensify until the early 1990s.

Although this city-level genealogy density is widely used in the literature, it is time-invariant and identical for all firms located in the same city. It therefore captures the local clan-culture environment, but not firm-specific exposure to clan culture. To address this limitation, this paper develops a more refined firm-level measure by combining city-level genealogy density with senior executive' clan-related characteristics. This measure varies across firms and over time.

Specifically, we first construct the city-level component as the ratio of the number of genealogies to the local population in 1990. We then assign each senior executive a clan-related score along three dimensions. The first dimension is position, which captures the executive's formal authority within the firm. Executive directors,

chairpersons, and general managers, who are typically able to represent the firm in major contracting decisions, are assigned 2 points, while other senior executives are assigned 1 point. The second dimension is surname, which captures the potential breadth of the executive's local clan network. If an executive's surname is the most common surname in the city where the firm is located, the executive receives 3 points; if it is the second most common, 2 points; and if it is the third most common, 1 point.

The third dimension is local origin, which captures the potential depth of the executive's embeddedness in local clan networks. An executive whose place of origin matches the firm's location is assigned 1 point; otherwise, the score is 0.

We sum these three components to obtain an executive-level clan score, and then combine this score with the city-level genealogy density to construct the firm-level measure of clan culture. Specifically, the firm-level clan-culture index is defined as the natural logarithm of the product of city-level genealogy density and the executive clan score. In this way, the measure incorporates both the local intensity of clan culture and the degree to which firm decision-makers are embedded in local clan networks.

It should be noted that the executive scoring scheme is intended to rank relative exposure to clan culture rather than to assign a literal economic meaning to each point value.

Combining the city-level genealogy measure with executives' clan-related characteristics, we construct the following firm-level clan culture index.

$$Clan_{ijt} = \frac{gene_i}{pop90_i} \times \sum_{r=1}^6 (position_{rjt} + surname_{rjt} + native_{rjt}) \quad (4)$$

$Gene_i$ denotes the number of genealogies in city i , and $pop90_i$ denotes the population of city i in 1990. $Position_{rjt}$ denotes the position-based score of executive r in firm j in year t , while $surname_{rjt}$ denotes the surname-based score, and $native_{rjt}$ is an indicator for whether the executive is local to the firm's city. In this paper, executives include the chairperson, vice chairperson, general manager, deputy general manager, board secretary, and chief financial officer.

(2) *Covid* measures the severity of the COVID-19 outbreak at the city level and is proxied by the infection rate, defined as the number of confirmed cases per 10,000 people in each city. In the robustness tests, we replace this measure with the severe-case rate per 10,000 people.

3.3. Control Variables

Following the existing literature, the vector of control variables X includes both firm-level and regional characteristics. At the firm level, we control for firm size (*Size*), measured as the logarithm of total assets; firm age (*Firmage*), measured as the number of years since the firm was listed; the equity multiplier (*Em*), measured as total assets divided by shareholders' equity; net profit margin (*Npr*), measured as net profit divided by operating revenue; return on equity (*ROE*), measured as net profit divided by shareholders' equity; leverage (*Leverage*), defined as total liabilities divided by total assets; solvency (*Solvency*), measured as earnings before interest and taxes (*EBIT*) divided by total liabilities; and the cash ratio (*Cr*), defined as cash holdings divided by current liabilities. At the regional level, we control for the logarithm of real GDP per capita (*Lpgdp*); industrial structure (*Stru*), defined as the ratio of primary-sector value added to GDP; the share of total social consumption in GDP (*Ct*). We include *Stru* because traditional agricultural production may be associated with the local strength of clan culture. In all regressions, we also include firm fixed effects and year fixed effects.

Detailed definitions for all variables are presented in Table 1.

Table 1. Variable symbols and definitions.

Symbol	Variable Name	Definition
Dependent variable		
Growth	Growth rate of sales revenue	The growth rate of operating revenue
Explanatory variables		
Covid	The severity of the epidemic	Measured by the number of confirmed COVID-19 cases per 10,000 people
Clan	Clan cultural atmosphere	We construct a firm-level measure of clan culture by multiplying city-level genealogy density by the executive clan score and then taking the logarithm. The intensity of city-level clan culture is measured by the logarithm of the number of genealogies per ten million people in the city. The executive clan score is constructed by summing the scores for position, surname, and local origin
Control variables		
Size	Firm size	We measure it by taking the log of total assets
Firmage	Firm age	Years from company establishment to year t
Em	Equity multiplier	Measured by ratio of total assets to shareholders' equity
Npr	Net profit margin	Measured by net profit divided to operating income
ROE	Company's profitability	Measured by dividing the net profit by the total assets
Leverage	Company's debt ratio	Measured by the proportion of the total liabilities to assets at the end of the period
Solvency	Company's solvency	Measured by the ratio of earnings before interest and tax (EBIT) to total liability
Cr	Cash ratio	Measured by ratio of cash assets to current liabilities
Lpgdp	Log of GRP per capita	Measured by regional GDP per capita
Ct	The proportion of social consumption	Measured by ratio of total social consumption divided by GDP
Stru	Proportion of primary production	Measured by the ratio of primary-sector value added to GDP

Table 2 presents descriptive statistics of the key variables. *Growth* is the operating-revenue growth rate of listed firms, with a minimum of -33.1652, a maximum of 76.9556, and a standard deviation of 27.1283. *Clan* is the firm-level clan culture index, ranging from 0 to 3.4030.

Table 2. Descriptive Statistics.

Variables	Observations	Mean	Std. Dev.	Min.	Max.
Growth	8996	15.2449	26.9629	-33.3616	75.9015
Covid	8996	0.3390	0.3461	0.0370	1.2467
Clan	8996	1.0434	1.0693	0.0000	3.4030
Covid×Clan	8996	0.3185	0.4869	0.0000	3.6539
Size	8989	22.1512	1.3765	20.1054	25.2085
Firmage	8996	19.2858	5.6730	9.0000	29.0000
Em	8956	2.0605	1.0089	1.1254	5.0686
Npr	8996	0.0813	0.1403	-0.3074	0.3257
ROE	8984	4.9928	6.4198	-9.7383	17.4112
Leverage	8996	42.9214	20.0185	11.1539	81.3074
Solvency	8992	0.4293	0.2003	0.1115	0.8140
Cr	8805	1.1408	1.2347	0.1231	4.7522
Lpgdp	8996	11.6638	0.3896	10.8337	12.1226
Ct	8930	0.2543	0.1451	0.0000	0.4445
Stru	8996	3.4915	3.7715	0.0932	13.1000

4. EMPIRICAL RESULTS

4.1. Benchmark Regression

Table 3 presents the results of the benchmark regression. In all three columns, the coefficient of Covid is significantly negative, indicating that a higher local infection rate is associated with a lower growth rate of operating

revenue. This finding is consistent with Zheng and Liu (2021) and Zhang and Zhang (2023). At the same time, the coefficient on Covid×Clan is positive and significant at the 1% level, implying that stronger clan culture buffers firms against the adverse effect of COVID-19 on operating-revenue growth.

Specifically, Column (1), which controls only for fixed effects, yields a coefficient of 5.9745 on Covid×Clan, significant at the 1% level. After adding firm-level control variables in Column (2), the coefficient declines to 3.6014 but remains significantly positive at the 1% level. In Column (3), after further controlling for city-level characteristics, the coefficient on Covid×Clan is 3.6377 and remains significant at the 1% level. This implies that a 1% increase in clan culture weakens the adverse effect of COVID-19 on firms' operating-revenue growth by 0.0364 units (3.6377×0.01), which corresponds to a reduction of about 0.75% ($3.6377 \times 0.01 / 4.85$) in the pandemic's negative impact.

Table 3. Benchmark regression.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid×Clan	5.9745*** (1.0333)	3.6014*** (0.8900)	3.6377*** (0.9209)
Covid	-7.9498*** (2.0318)	-5.1697** (2.3581)	-4.8546** (2.1633)
Clan	0.4689 (0.9407)	2.6422*** (0.8810)	2.6474*** (0.8867)
Control variables			
Size		20.1833*** (2.4030)	20.8071*** (2.4329)
Firmage		4.1449*** (1.3644)	4.1873*** (1.3459)
Em		-0.1863 (2.3535)	-0.2597 (2.3490)
Npr		-45.4377*** (11.8660)	-47.0383*** (11.9941)
ROE		3.5918*** (0.2088)	3.6094*** (0.2103)
Leverage		-0.9043 (1.0242)	-1.0008 (1.0383)
Solvency		150.5257 (101.0571)	159.5026 (102.7523)
Cr		-1.4944 (1.0266)	-1.6955* (1.0236)
Lpgdp			-20.1263 (12.8216)
Ct			-71.7883* (41.4485)
Stru			-2.0087 (2.0223)
Constant	15.5476*** (1.1935)	-550.0613*** (58.3232)	-304.1004* (156.2667)
Model statistics			
Observations	8996	8704	8618
R ²	0.6037	0.6818	0.6813

Note: (1) The robust standard error is indicated in parentheses; (2) *** **, * respectively represent significant values at 1%, 5%, and 10%; (3) N refers to the sample size, R² refers to the goodness of fit. The same as the following tables.

4.2. Robustness Check

The benchmark regression results reported in Table 3 indicate that the COVID-19 pandemic significantly reduced firms' operating-revenue growth, while clan culture played a significant buffering role by mitigating the adverse effect of the pandemic. To assess the robustness of this result more thoroughly, we perform six additional

tests: (1) replace the dependent variable with an alternative measure; (2) use alternative measures of the firm-level clan culture index; (3) replace the COVID-19 variable with an alternative indicator of pandemic severity; (4) rule out potential regional confounding factors: (i) excluding firms listed in Beijing, Shanghai, and Shenzhen; (ii) excluding treaty-port cities; and (iii) excluding firms located in Hubei Province; (5) control for the Confucian culture; (6) conduct a placebo test.

4.2.1. Replace the Dependent Variable

Table 4 replaces operating-revenue growth rate with operating-profit growth rate as the dependent variable. The coefficient of Covid is significantly negative, while the coefficient on Covid×Clan is significantly positive at the 10% level. The conclusion is robust.

Table 4. Robustness test: Replacing the dependent variable.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid×Clan	9.2885*** (2.8953)	3.7305* (2.0399)	4.4269** (2.1446)
Covid	-13.8754*** (4.3720)	-6.7492** (3.4127)	-7.3680** (2.9598)
Clan	-4.8626*** (1.3937)	4.1908*** (1.2206)	4.0663*** (1.2233)
Control variables			
Size		-6.6519** (3.1862)	-5.9456* (3.1290)
Firmage		1.0282 (3.1817)	0.8553 (3.1977)
Em		8.4669** (3.2780)	8.2287** (3.2687)
Npr		43.0824*** (12.7891)	41.7603*** (12.8567)
ROE		7.2545*** (0.2635)	7.2494*** (0.2656)
Leverage		1.4631 (1.8268)	1.9658 (1.8381)
Solvency		-117.6160 (172.7757)	-168.6945 (172.6957)
Cr		1.6290 (1.1006)	1.3806 (1.0928)
Lpgdp			-26.9054 (24.6365)
Ct			-91.1051 (68.9250)
Stru			-3.8316 (2.5302)
Constant	22.9186*** (1.9249)	68.4566 (91.3564)	407.4815 (313.6095)
Model statistics			
Observations	8996	8704	8618
R ²	0.4553	0.6841	0.6840

Note: The robust standard error is indicated in parentheses; ***, **, * respectively represent significant values at 1%, 5%, and 10%; N refers to the sample size, R² refers to the goodness of fit.

4.2.2. Replace Core Explanatory Variables - Clan Culture

4.2.2.1. Changing the Executive Scoring Scheme

In the baseline specification, the executive scoring scheme assigns 2 points to executives with legal representative authority and 1 point to other senior executives. As a robustness check, Table 5 adopts an alternative scoring scheme

that assigns 7 points to executives with legal representative authority and 6 points to other senior executives. The coefficient on Covid is significantly negative, whereas interaction term Covid×Clan is significantly positive, indicating that clan culture buffers firms against the adverse effect of COVID-19. This robustness check suggests that the specific scoring values assigned to executives do not drive the results. Rather, the executive score functions as a ranking device, and the baseline conclusion remains robust.

Table 5. Robustness test: Scoring for replacement of senior management.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid×Clan	4.0156*** (0.7047)	2.4802*** (0.5730)	2.4850*** (0.5595)
Covid	-9.8711*** (2.3280)	-6.4772** (2.5179)	-6.1417*** (2.3022)
Clana	0.0656 (0.5898)	1.5201*** (0.5484)	1.5256*** (0.5509)
Control variables			
Size		20.1698*** (2.4054)	20.7946*** (2.4338)
Firmage		4.1257*** (1.3659)	4.1652*** (1.3466)
Em		-0.1696 (2.3543)	-0.2451 (2.3497)
Npr		-45.5041*** (11.9055)	-47.0799*** (12.0327)
ROE		3.5952*** (0.2102)	3.6121*** (0.2116)
Leverage		-0.8981 (1.0293)	-0.9919 (1.0456)
Solvency		149.8650 (101.6072)	158.5801 (103.5226)
Cr		-1.4529 (1.0316)	-1.6553 (1.0286)
Lpgdp			-20.1499 (12.7503)
Ct			-72.7972* (41.4482)
Stru			-2.0909 (2.0247)
Constant	16.0777*** (1.3305)	-549.4126*** (58.3939)	-302.6111* (155.4554)
Model statistics			
Observations	8996	8704	8618
R ²	0.6037	0.6818	0.6813

Note: The robust standard error is indicated in parentheses; ***, **, * respectively represent significant values at 1%, 5%, and 10%; N refers to the sample size, R² refers to the goodness of fit.

4.2.2.2. Changing the Time Window for Genealogy Measurement

In Table 3, city-level clan culture is proxied by the number of genealogies compiled between the Ming Dynasty (1368) and 1990. As a robustness check, Column (1) of Table 6 extends the genealogy window back to the Song Dynasty (960), using genealogies compiled over the 960-1990 period. the number of genealogies compiled between 960 and 1990. The results remain consistent with the baseline specification. Column (2) further uses the number of genealogies compiled between 1368 and 1911 as an alternative proxy for city-level clan culture. This alternative window is motivated by the fact that China experienced major wars, political upheavals, and substantial population displacement after the late Qing period, which may reduce the representativeness of genealogy-based measures constructed over a longer historical period. The coefficient of Covid×Clanc remains significantly positive at the 1%

level. In addition to genealogy-based measures, the existing literature also uses ancestral halls to capture local clan culture (Guo & Yao, 2013). As an important material carrier of clan culture, the construction and maintenance of ancestral halls require substantial collective resources. A larger number of ancestral halls in a city therefore suggests stronger local clan influence. We collect data on the number of ancestral halls in each prefecture-level city from Baidu Maps and use this measure as an alternative proxy for city-level clan culture. The results show that the coefficient of the interaction term Covid×Cland remains significantly positive at the 1% level.

Taken together, the three specifications in Table 6 show that the main results in Table 3 are robust to alternative measures of clan culture.

Table 6. Robustness test: Replacing explanatory variables.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid×Clanb	3.1892*** (0.9054)		
Clanb	2.6154*** (0.8721)		
Covid×Clanc		2.9330*** (0.9613)	
Clanc		3.6043*** (1.1240)	
Covid×Cland			1.7713*** (0.4564)
Cland			0.9779** (0.4417)
Covid	-4.5355** (2.1475)	-3.2968 (2.1852)	-6.0235** (2.3583)
Control variables			
Size	20.7992*** (2.4327)	20.8655*** (2.4341)	20.9571*** (2.4134)
Firmage	4.1987*** (1.3477)	4.2416*** (1.3551)	4.1616*** (1.3410)
Em	-0.2434 (2.3499)	-0.2335 (2.3485)	-0.2898 (2.3419)
Npr	-46.9060*** (11.9929)	-46.5502*** (11.9727)	-46.7280*** (12.0771)
ROE	3.6060*** (0.2104)	3.5925*** (0.2096)	3.6106*** (0.2135)
Leverage	-0.9950 (1.0394)	-0.9746 (1.0436)	-0.9801 (1.0390)
Solvency	158.9604 (102.8515)	156.9050 (103.3030)	157.7500 (102.7905)
Cr	-1.7046* (1.0235)	-1.7603* (1.0214)	-1.6757* (1.0122)
Lpgdp	-19.8910 (12.7914)	-19.6568 (12.7969)	-19.8666 (12.6429)
Ct	-70.7191* (41.2590)	-69.2213* (41.0563)	-54.6833 (40.3740)
Stru	-1.9389 (2.0194)	-1.7667 (2.0011)	-2.5510 (2.0437)
Constant	-307.4363** (155.9356)	-313.1084** (156.6963)	-312.6959** (154.5443)
Model statistics			
Observations	8618	8618	8618
R ²	0.6813	0.6811	0.6811

Note: The robust standard error is indicated in parentheses; ***, **, * respectively represent significant values at 1%, 5%, and 10%; N refers to the sample size, R² refers to the goodness of fit.

4.2.2.3. Using Urban Level Genealogical Data

Table 3 uses the firm-level clan culture index as the key explanatory variable, which varies across firms and over time. As an additional robustness check, Table 7 replaces this firm-level measure with the city-level genealogy-based proxy used by Huang et al. (2022) namely $\ln(1368-1990 \text{ genealogy}/1990 \text{ population}+1)$. Unlike the firm-level index, this city-level measure is time-invariant and common to all firms within the same city. The results in Table 7 remain consistent with the baseline findings. The coefficient on Covid×Clane is positive and significant at the 1% level. This result suggests that the main finding continues to hold even when clan culture is measured at the city level.

Table 7. Robustness test: Using urban-level genealogy data.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid×Clane	10.9047*** (2.5465)	6.6113*** (2.3874)	6.5388*** (2.4325)
Covid	-4.7463*** (1.5317)	-3.2111 (1.9762)	-2.8491 (1.8012)
Clane	3.4924 (2.7029)	7.6899*** (2.6400)	7.7311*** (2.6458)
Control variables			
Size		20.2683*** (2.4118)	20.8790*** (2.4431)
Firmage		4.1665*** (1.3748)	4.2250*** (1.3589)
Em		-0.2022 (2.3542)	-0.2668 (2.3506)
Npr		-44.8922*** (11.8787)	-46.5276*** (12.0204)
ROE		3.5717*** (0.2077)	3.5906*** (0.2094)
Leverage		-0.8220 (1.0330)	-0.9191 (1.0449)
Solvency		142.6062 (101.9045)	151.6635 (103.3510)
Cr		-1.5865 (1.0276)	-1.7842* (1.0246)
Lpgdp			-19.2070 (12.8020)
Ct			-66.9989 (40.7634)
Stru			-1.5768 (2.0211)
Constant	14.9107*** (0.9686)	-551.9180*** (58.3560)	-319.4201** (156.6055)
Model statistics			
Observations	8996	8704	8618
R ²	0.6037	0.6818	0.6813

Note: The robust standard error is indicated in parentheses; ***, **, * respectively represent significant values at 1%, 5%, and 10%; N refers to the sample size, R² refers to the goodness of fit.

4.2.3. Change the Core Explanatory Variable: COVID-19 Severity

In Table 3, COVID-19 severity is defined as the confirmed-case rate per 10,000 people in each prefecture-level city. As a robustness check, Table 8 replaces this measure with the severe-case rate, defined as the number of severe COVID-19 cases per 10,000 people in each prefecture-level city (Covidb). After controlling for firm-level and prefecture-level characteristics, the coefficient of Covidb is significantly negative at the 5% level, indicating that more severe local outbreaks continue to be associated with lower firm growth. The coefficient on Covidb×Clan is significantly positive. The result suggests that even when pandemic severity is measured using the severe-case rate,

stronger clan culture continues to mitigate the adverse effect of COVID-19 on firms' revenue growth. The baseline conclusion therefore remains unchanged and continues to support Hypothesis 1.

Table 8. Robustness test: Replacement of core explanatory variables.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covidb×Clan	3.3296 (2.1878)	6.9462*** (1.8804)	7.1151*** (1.8003)
Covidb	-9.4673 (6.5401)	-12.5279** (5.5023)	-12.3833** (5.4181)
Clan	1.5381* (0.8968)	2.9027*** (0.7991)	2.8818*** (0.7869)
Control variables			
Size		19.5535*** (2.3664)	20.1549*** (2.3872)
Firmage		4.5697*** (1.3439)	4.6275*** (1.3314)
Em		-0.1090 (2.3922)	-0.1941 (2.3899)
Npr		-45.6326*** (11.8788)	-47.2995*** (12.0089)
ROE		3.6159*** (0.2100)	3.6344*** (0.2115)
Leverage		-0.9370 (1.0063)	-1.0415 (1.0152)
Solvency		155.4533 (99.0338)	165.3852 (100.2352)
Cr		-1.4713 (1.0216)	-1.6714 (1.0183)
Lpgdp			-19.0513 (12.8899)
Ct			-60.7344 (42.1816)
Stru			-2.6400 (2.0622)
Constant	13.8752*** (0.9798)	-546.0074*** (58.2524)	-312.9347*** (157.1363)
Model statistics			
Observations	8996	8704	8618
R ²	0.6029	0.6821	0.6817

Note: The robust standard error is indicated in parentheses; ***, **, * respectively represent significant values at 1%, 5%, and 10%; N refers to the sample size, R² refers to the goodness of fit.

4.2.4. Exclude the Regional Effect Reasons

4.2.4.1. Excluding Firms Listed in Beijing, Shanghai, and Shenzhen

This paper focuses on the effect of clan culture on firms' resilience to the COVID-19 shock. However, an alternative concern is that the city-level genealogy measure of clan culture is time-invariant and varies only across cities, so its estimated effect may partly capture regional characteristics rather than clan culture itself. In other words, the mitigating effect attributed to clan culture may reflect location-specific factors correlated with both firm performance and the city-level clan measure. This concern is particularly relevant because listed firms in China are heavily concentrated in a few large cities. In our sample, roughly one-quarter of all listed firms are located in Beijing, Shanghai, and Shenzhen. To rule out the possibility that the baseline results are driven by the overrepresentation of firms in these economically developed cities, Table 9 re-estimates the baseline specification after excluding all firms located in Beijing, Shanghai, and Shenzhen. The coefficient on Covid×Clan remains positive and significant at the 1%

level. Therefore, after accounting for the geographic concentration of listed firms in these three major cities, the main conclusion remains unchanged.

Table 9. Robustness test: Samples from Beijing, Shanghai and Shenzhen were excluded.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid×Clan	5.7441*** (0.9395)	3.6810*** (1.2901)	3.6662*** (1.2217)
Covid	-7.9854*** (2.0530)	-3.3208 (2.1094)	-3.5127 (2.2217)
Clan	0.8734 (1.0141)	2.9173*** (1.0178)	2.9193*** (1.0070)
Control variables			
Size		22.5012*** (3.0511)	23.3175*** (3.0619)
Firmage		3.1014* (1.7272)	3.2074* (1.7158)
Em		-0.6801 (3.1081)	-0.7929 (3.1121)
Npr		-54.6035*** (14.9928)	-57.0539*** (15.1255)
ROE		3.7613*** (0.2598)	3.7865*** (0.2624)
Leverage		1.6501 (2.2819)	1.3650 (2.5322)
Solvency		-101.6856 (230.2012)	-73.9606 (255.2156)
Cr		-1.7719* (1.0518)	-2.0424** (1.0324)
Lpgdp			-19.9194 (13.2212)
Ct			-63.3726 (46.5956)
Stru			-1.3325 (2.0364)
Constant	15.2507*** (1.2817)	-582.6947*** (78.5990)	-352.1702** (163.9936)
Model statistics			
Observations	6698	6498	6412
R ²	0.5969	0.6790	0.6783

Note: The robust standard error is indicated in parentheses; ***, **, * respectively represent significant values at 1%, 5%, and 10%; N refers to the sample size, R² refers to the goodness of fit.

4.2.4.2. Excluding Port City Samples

Jia (2014) shows that, following China's reform and opening-up, treaty-port cities experienced significantly faster economic growth than non-treaty-port cities, largely because of the rapid expansion of the commerce and service sectors. If this historical openness also reshaped local social norms and weakened traditional clan culture, then the estimated effect of clan culture may partly capture the long-run influence of treaty-port exposure rather than clan culture itself. To account for this concern, we re-estimate the baseline specification after excluding firms located in treaty-port cities listed in Jia (2014). The results are reported in Table 10. After excluding treaty-port cities, the coefficient on Covid×Clan remains significantly positive. This result suggests that the baseline finding is not driven by the historical openness of treaty-port cities.

Table 10. Robustness test: Excluding port city samples.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid×Clan	4.6507*** (1.0356)	2.6989*** (0.8556)	2.5467*** (0.8362)
Covid	-7.6947*** (2.4092)	-3.1727 (2.4222)	-2.9612 (2.5514)
Clan	-0.0097 (1.2638)	2.4733* (1.3965)	2.4725* (1.3785)
Control variables			
Size		20.3871*** (2.7883)	21.2377*** (2.8479)
Firmage		4.2378*** (1.5067)	4.3039*** (1.4929)
Em		-1.8666 (3.0993)	-1.9597 (3.0967)
Npr		-46.6183*** (16.0376)	-48.9093*** (16.3888)
ROE		3.7755*** (0.2952)	3.8005*** (0.3005)
Leverage		-1.4777 (1.4831)	-1.7636 (1.3846)
Solvency		220.0805 (143.5907)	247.6458* (133.8362)
Cr		-1.0941 (1.3375)	-1.3859 (1.3425)
Lpgdp			-15.4963 (14.7229)
Ct			-74.0713 (51.6114)
Stru			-1.5543 (2.1025)
Constant	16.1511*** (1.4397)	-560.1444*** (69.5682)	-373.9063** (182.9511)
Model statistics			
Observations	5840	5648	5562
R ²	0.5909	0.6792	0.6783

Note: Robust standard error in parentheses; ***, ** and * indicate significance at 1%, 5% and 10% respectively; N refers to sample size, R² refers to goodness of fit.

4.2.4.3. Excluding Samples from Hubei Province

Hubei Province was the initial epicenter of the COVID-19 outbreak in China, and firms there were exposed to an exceptionally severe shock at the beginning of the pandemic. To ensure that the baseline results are not driven by this extreme case, we exclude firms located in Hubei Province. Table 11 shows that the coefficient on Covid×Clan remains significantly positive. The main conclusion therefore remains unchanged: stronger clan culture continues to attenuate the adverse effect of COVID-19 on firms' operating-revenue growth.

Table 11. Robustness test: Samples from Hubei Province were excluded.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid×Clan	5.8519*** (1.0399)	3.3060*** (0.8323)	3.4202*** (0.8907)
Covid	-7.6928*** (2.0712)	-4.7207** (2.3637)	-4.4789** (2.1515)
Clan	0.4961 (0.9347)	2.6894*** (0.8690)	2.6847*** (0.8773)
Control variables			

Variables	(1) Growth	(2) Growth	(3) Growth
Size		20.0710***	20.7552***
		(2.4442)	(2.4753)
Firmage		4.3936***	4.3736***
		(1.3536)	(1.3438)
Em		-0.0912	-0.1968
		(2.3943)	(2.3867)
Npr		-42.8616***	-44.4290***
		(11.9482)	(12.0635)
ROE		3.5685***	3.5848***
		(0.2135)	(0.2146)
Leverage		-0.8718	-0.9631
		(1.0329)	(1.0481)
Solvency		148.4780	156.9934
		(101.8551)	(103.6915)
Cr		-1.5118	-1.7234*
		(1.0309)	(1.0271)
Lpgdp			-24.7079*
			(13.9126)
Ct			-89.4946**
			(44.1793)
Stru			-2.3485
			(2.0426)
Constant	15.5241***	-552.9754***	-248.1853
	(1.1818)	(58.7059)	(169.5492)
Model statistics			
Observations	8802	8522	8436
R ²	0.6033	0.6830	0.6826

Note: The robust standard error is indicated in parentheses; ***, **, * respectively represent significant values at 1%, 5%, and 10%; N refers to the sample size, R² refers to the goodness of fit.

4.2.5. Eliminating the Influence of Confucian Culture

Besides clan culture, other traditional cultural forces may also shape firm behavior. Existing studies show that Confucian culture can reduce agency costs and improve firms' internal control quality (Pan, Yi, & Bai, 2022) while stronger internal control helps firms better cope with the COVID-19 shock (Zheng & Liu, 2021). To ensure that the estimated effect of clan culture is not confounded by Confucian culture, Table 12 includes the number of Confucian temples within a 200-kilometer radius of each listed firm as an additional control. The coefficient on Covid×Clan remains significantly positive at the 1% level, suggesting that the baseline finding continues to hold after controlling for Confucian culture.

Table 12. Robustness test: Controlling Confucian culture.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid×Clan	4.0649***	2.2458**	2.3458***
	(0.9206)	(0.8860)	(0.7600)
Covid	-5.9046***	-3.1545	-2.9110*
	(1.9799)	(1.9565)	(1.7564)
Clan	1.7432	5.6348**	5.4505**
	(2.4356)	(2.2215)	(2.2026)
Covid×Confucian	-0.0606	-0.1307	-0.1211
	(0.1153)	(0.1090)	(0.1072)
Confucian	1.0040	0.8103	0.7390
	(0.6782)	(0.6729)	(0.6701)
Control variables			
Size		15.5114***	16.2085***
		(2.7070)	(2.7048)
Firmage		3.4843*	3.4990*

Variables	(1) Growth	(2) Growth	(3) Growth
		(1.9580)	(1.9368)
Em		-0.8916	-0.9395
		(2.4827)	(2.4764)
Npr		-39.9788***	-41.5381***
		(12.1017)	(12.2044)
ROE		3.5792***	3.5961***
		(0.2459)	(0.2471)
Leverage		-0.9060	-1.0010
		(0.9748)	(0.9889)
Solvency		160.8314*	169.1950*
		(95.1041)	(96.6884)
Cr		-2.4228**	-2.7190**
		(1.1909)	(1.1790)
Lpgdp			-20.3348
			(13.1141)
Ct			-95.0112**
			(45.9089)
Stru			-1.4240
			(2.0885)
Constant	-3.7961	-455.7785***	-203.3194
	(11.7046)	(74.6208)	(171.2888)
Model statistics			
Observations	7820	7550	7468
R ²	0.5954	0.6758	0.6752

Note: The robust standard error is indicated in parentheses; ***, **, * respectively represent significant values at 1%, 5%, and 10%; N refers to the sample size, R² refers to the goodness of fit.

4.2.6. Placebo Test

To rule out the possibility that the baseline results are driven by unobserved factors, we perform a placebo test by randomly assigning the firm-level clan culture index. If clan culture truly operates as the underlying mechanism, the coefficient on Covid×Clan under random assignment should be close to zero and statistically insignificant. We repeat this procedure 500, 1000, and 2000 times. Figure 1 reports the distribution of the resulting placebo coefficients. In all cases, the estimated coefficients are centered around zero and approximately normally distributed. The actual estimated coefficient in Table 3, 3.6377, lies well outside the 90th percentile of the placebo distribution. This provides further support that the main result is not driven by unobserved factors.

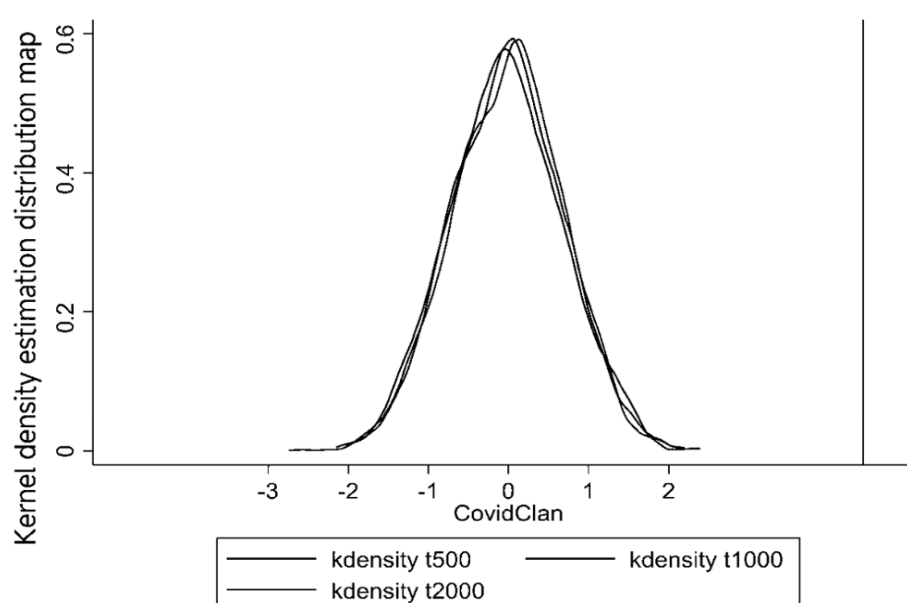


Figure 1. Distribution of regression coefficients for 500, 1000 and 2000 random samples.

5. MECHANISM TEST

The empirical results above show that COVID-19 significantly reduced firm performance, whereas the adverse effect was weaker for firms with stronger clan culture. In this section, we further investigate the mechanisms through which clan culture buffers firms against the pandemic shock. We argue that clan culture operates through two main channels. First, it may ease financing constraints. During the pandemic, firms were exposed to revenue losses, liquidity pressure, and tighter financing conditions. Although governments introduced supportive policies, these measures may not have been immediately effective in meeting firms' short-term funding needs. Under such circumstances, firms with stronger clan culture may obtain informal financial support more easily. Second, clan culture may alleviate labor shortages. Because the pandemic disrupted labor mobility and workplace attendance, firms often faced staffing difficulties and production interruptions. Through kin-based trust and social ties, clan culture may help firms mobilize labor resources more effectively. Accordingly, firms with stronger clan culture are expected to face fewer financing constraints and labor shortages during the pandemic. We test these channels by incorporating three-way interaction terms among COVID-19 severity, clan culture, and the corresponding mechanism variables into the baseline regression.

5.1. Reduce the Financing Constraint Mechanism

We first test the financing-constraint mechanism. Following Hadlock and Pierce (2010) and Ju, Lu, and Yu (2013) we use the SA index to measure firms' financing constraints. The use of firm characteristics to quantify financing constraints originates from Kaplan and Zingales (1997) and the SA index has since become a widely used proxy in the literature. In this paper, a higher SA index indicates tighter financing constraints. The index is constructed as follows:

$$SA = -0.737 \times Size + 0.043 \times Size^2 - 0.04 \times Age \quad (5)$$

In this specification, Size is the natural logarithm of total assets, and Age denotes firm age. The SA index is used as a proxy for firms' financing constraints. Based on Equation 2, we further introduce the three-way interaction term Covid×Clan×SA, and the results are reported in Table 13.

Table 13. Mechanism test: Reducing financing constraints.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid×Clan×SA	9.1050** (4.6128)	17.0196** (7.2522)	17.7353** (7.2775)
Covid×SA	-13.7428* (7.1373)	-21.0173** (9.7819)	-22.6116** (9.6652)
Covid×Clan	39.6447** (17.7343)	69.1318** (28.1350)	71.9765** (28.2570)
SA	-62.6116*** (19.6160)	-40.6245* (23.9224)	-41.1328* (24.0222)
Covid	-59.5022** (27.5121)	-85.4544** (37.7497)	-91.3276** (37.4479)
Clan	-0.3716 (0.9292)	2.2542** (0.9651)	2.2607** (0.9612)
Control variables			
Size		14.7605*** (2.7041)	15.4498*** (2.7097)
Firmage		3.1643 (2.0036)	3.1773 (1.9792)
Em		-0.8467 (2.5761)	-0.8912 (2.5733)
Npr		-40.8195*** (12.0960)	-42.5438*** (12.1833)

Variables	(1) Growth	(2) Growth	(3) Growth
ROE		3.6094***	3.6313***
		(0.2469)	(0.2478)
Leverage		-0.8498	-0.9515
		(1.0234)	(1.0436)
Solvency		156.3556	165.4382
		(99.9209)	(102.1888)
Cr		-2.4489*	-2.7593**
		(1.2454)	(1.2313)
Lpgdp			-21.2808
			(13.9916)
Ct			-100.2232**
			(47.5577)
Stru			-1.6403
			(2.1513)
Constant	-228.8366***	-577.4625***	-314.8446
	(75.9975)	(115.8659)	(191.8749)
Model statistics			
Observations	7642	7372	7290
R ²	0.5975	0.6757	0.6753
Note: The robust standard error is indicated in parentheses; ***, **, * respectively represent significant values at 1%, 5%, and 10%; N refers to the sample size, R ² refers to the goodness of fit.			

The results in Table 13 provide evidence for the financing-constraint channel. The three-way interaction term Covid×Clan×SA enters positively and is statistically significant at the 5% level, indicating that clan culture mitigates the adverse effect of COVID-19 on firm performance by easing financing constraints. The coefficient of SA is negative and significant at least at the 10% level, suggesting that tighter financing constraints are associated with worse firm performance. In addition, the coefficient on the interaction term between Covid and SA is significantly negative, implying that the pandemic amplified the adverse effect of financing constraints on firm operations. These results suggest that clan culture helped firms ease financing pressure during the pandemic, thereby reducing the negative impact of COVID-19 on firm operations. Overall, the evidence supports the financing-constraint mechanism.

5.2. Mechanism to Alleviate Staff Shortage

In addition to financial resources, labor availability is another key condition for firms to maintain normal operations during the COVID-19 pandemic. Existing studies show that many firms faced severe recruitment difficulties, labor shortages, and rising hiring costs during this period. When firms are unable to recruit the workers they need, production may be disrupted or even suspended (Cai, Zhang, & Liu, 2021; Gao, 2020; Zhang & Wu, 2020). Clan culture may help firms alleviate these labor-market frictions. Through kin-based trust and social ties, firms embedded in stronger clan-culture environments may be able to recruit workers more quickly and cope more effectively with labor shortages. Chen and Chen (2018) show that clan culture significantly improves the employment prospects of migrants and that migrants from places with stronger clan culture are more likely to be employed. In addition, because clan culture fosters trust, cooperation, and mutual support, firms may be more willing to recruit workers who are socially connected or otherwise more familiar to them.

Therefore, we draw on Liu, Zhang, Wang, and Wu (2010) to build an employee shortage index, and use ordinary least square method to regression Equation 6.

$$Employee_{jt} = \delta_1 + \delta_2 Size_{jt} + \delta_3 Lev_{jt} + \delta_4 ROA_{jt} + \delta_5 Growth_{jt} + \delta_6 PPE_{jt} + \xi_j + \eta_t + \omega_{jt} \quad (6)$$

In this specification, Employee measures labor intensity and is defined as the number of employees divided by total assets at year-end, multiplied by 10,000. Size is the natural logarithm of total assets at year-end. Lev is measured as total liabilities divided by total assets. ROA captures firm profitability and is defined as net profit divided by total assets at year-end. Growth is the annual growth rate of firm revenue. PPE measures asset intensity and is defined as

fixed assets divided by total assets at year-end. The residual from Eq.6 is used to construct the labor-shortage index, denoted by EMP. A larger residual indicates that the firm does not face a labor shortage, whereas a residual below zero suggests that the firm is experiencing labor shortages.

Table 14. Mechanism test: Alleviating staff shortages.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid×Clan×EMP	6.8810* (3.7944)	10.3912*** (3.8073)	10.5394*** (3.8007)
Covid×EMP	-11.5964* (6.8947)	-10.5006* (5.8681)	-10.9932* (5.8593)
Covid×Clan	5.0892*** (1.0904)	2.9520*** (0.9016)	2.9535*** (0.9080)
EMP	9.3103*** (3.4466)	5.2106* (2.8653)	5.1887* (2.9111)
Covid	-6.5526*** (2.0916)	-3.9777* (2.2564)	-3.7223* (2.1318)
Clan	0.3503 (0.9594)	2.6082*** (0.8473)	2.6170*** (0.8500)
Control variables			
Size		20.6111*** (2.5241)	21.2186*** (2.5302)
Firmage		2.7925 (1.7029)	2.7970* (1.6873)
Em		-0.2101 (2.4654)	-0.3220 (2.4690)
Npr		-46.6778*** (11.8115)	-48.5188*** (11.9363)
ROE		3.6446*** (0.2185)	3.6655*** (0.2205)
Leverage		-0.9243 (0.9759)	-1.0254 (0.9905)
Solvency		149.4331 (95.3808)	158.9967 (97.1467)
Cr		-1.6381* (0.9200)	-1.8615** (0.9039)
Lpgdp			-12.9839 (12.9528)
Ct			-90.3159** (42.1650)
Stru			-1.3427 (2.1034)
Constant	14.9397*** (1.2834)	-533.9754*** (64.5672)	-367.8744** (160.7821)
Model statistics			
Observations	8354	8292	8208
R ²	0.5984	0.6800	0.6795

Note: The robust standard error is indicated in parentheses; ***, **, * respectively represent significant values at 1%, 5%, and 10%; N refers to the sample size, R² refers to the goodness of fit.

Table 14 examine the labor-shortage channel by including the employee-shortage index (EMP). Across all three specifications, the interaction term Covid×Clan remains positive and significant at the 1% level, confirming the robustness of the baseline result. The coefficient of EMP is positive and significant at least at the 10% level, suggesting that firms with fewer labor shortages perform better. In addition, a significantly negative coefficient is obtained for Covid×EMP, suggesting that pandemic exacerbated labor shortages and that more severe outbreaks were associated with greater staffing pressure on firms. The coefficient of the three-way interaction term Covid×Clan×EMP is positive and statistically significant at the 1% level. This indicates that clan culture helped alleviate labor shortages

during the pandemic, thereby mitigating the adverse effect of COVID-19 on firm performance. Overall, the evidence supports the labor-shortage mechanism.

6. FURTHER ANALYSIS

The preceding analysis shows that clan culture mitigated the adverse effect of COVID-19 on firms by easing financing constraints and alleviating labor shortages. Meanwhile, China's formal institutions have improved substantially since the reform and opening up, increasing firms' access to formal channels for solving operational problems. Does clan culture substitute for formal institutions, or does it complement them in buffering firms against the pandemic shock? We explore this issue in the following heterogeneity analysis. Specifically, we proxy the strength of formal institutions using two measures. The first is the legal-environment subindex from the Fan Gang Marketization Index, which captures the development of intermediary organizations and the legal environment. A higher value of this index indicates a more developed formal institutional environment. The second measure is real GDP per capita. Since formal institutional development is closely associated with local economic development, a higher level of GDP per capita may also reflect better-developed formal institutions. We then incorporate these proxy variables, together with their interaction terms with clan culture and COVID-19 severity, into the regression model.

Table 15. Formal institutional interaction: Legal Index.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid × Clan × Law	-0.7698 (0.7801)	-1.8004** (0.8988)	-1.7292** (0.7731)
Covid × Clan	16.7461 (12.4855)	31.6572** (14.4691)	30.5458** (12.4688)
Covid	-6.4046*** (2.0338)	-4.1982** (1.7350)	-3.8805** (1.7517)
Clan	0.2920 (0.9025)	2.4724*** (0.8995)	2.5013*** (0.8894)
Control variables			
Size		15.6029*** (2.7259)	16.2806*** (2.7219)
Firmage		3.4736* (1.9947)	3.4920* (1.9740)
Em		-0.9199 (2.4920)	-0.9666 (2.4883)
Npr		-39.8633*** (12.1098)	-41.4401*** (12.2277)
ROE		3.5821*** (0.2445)	3.5992*** (0.2462)
Leverage		-0.9066 (0.9787)	-1.0029 (0.9927)
Solvency		161.3472* (95.5388)	169.8605* (97.1001)
Cr		-2.4211** (1.1828)	-2.7136** (1.1709)
lpgdp			-18.5954 (13.4661)
ct			-91.0067** (45.6957)
Stru			-1.4218 (2.0812)
Constant	13.5460*** (1.2870)	-443.6491*** (75.5117)	-213.3200 (174.3938)
Model statistics			
Observations	7814	7544	7462
R ²	0.5948	0.6758	0.6752

Note: The robust standard error is indicated in parentheses; ***, **, * respectively represent significant values at 1%, 5%, and 10%; N refers to the sample size, R² refers to the goodness of fit.

Table 15 reports the results after introducing the legal-system measure into the baseline specification. After adding the relevant controls, the coefficient on Covid×Clan turns negative and remains statistically significant at the 5% level. More importantly, once the legal-system variable (Law) is incorporated to form the three-way interaction term Covid×Clan×Law, the coefficient of this three-way interaction is consistently negative and statistically significant at the 5% level. These findings suggest that the mitigating effect of clan culture diminishes as the legal environment becomes more developed. In other words, stronger formal institutions reduce firms' reliance on clan culture in coping with the pandemic shock. This finding supports a substitutive relationship between clan culture and formal institutions.

Table 16. Formal institutional interaction: Per capita GDP.

Variables	(1) Growth	(2) Growth	(3) Growth
Key variables			
Covid ×Clan ×lpgdp	-2.9038 (4.0089)	-8.4770*** (3.1044)	-6.9708** (3.3815)
Covid ×Clan	40.3969 (46.9452)	104.0430*** (36.6253)	86.1913** (39.8124)
Covid	-7.7483*** (2.0934)	-4.5408** (2.2950)	-4.3266* (2.2340)
Clan	0.3984 (0.9729)	2.4442** (0.9591)	2.4870*** (0.9506)
Control variables			
Size		20.1491*** (2.4055)	20.7551*** (2.4374)
Firmage		4.1927*** (1.3585)	4.2378*** (1.3401)
Em		-0.1920 (2.3541)	-0.2605 (2.3528)
Npr		-45.4813*** (11.8598)	-47.1051*** (11.9981)
ROE		3.5952*** (0.2091)	3.6131*** (0.2108)
Leverage		-0.8793 (1.0322)	-0.9807 (1.0421)
Solvency		148.7523 (101.9134)	158.1469 (103.1972)
Cr		-1.5022 (1.0259)	-1.6965* (1.0223)
Lpgdp			-17.2230 (12.8419)
Ct			-65.2945 (41.3127)
Stru			-1.6452 (2.0389)
Constant	15.5233*** (1.1892)	-550.5964*** (58.2622)	-341.0226** (156.2786)
Model statistics			
Observations	8996	8704	8618
R ²	0.6037	0.6820	0.6815

Note: The robust standard error is indicated in parentheses; ***, **, * respectively represent significant values at 1%, 5%, and 10%; N refers to the sample size, R² refers to the goodness of fit.

Table 16 presents the results using GDP per capita as a proxy for formal institutional development. After controlling for the relevant covariates, the coefficient on Covid×Clan is significantly positive. More importantly, the coefficients of the three-way interaction term Covid×Clan×Lpgdp are negative and statistically significant at least at the 5% level in Columns (2) and (3). These results suggest that the mitigating effect of clan culture becomes weaker as local economic and institutional development improves. In other words, better-developed formal institutions

reduce firms' reliance on clan culture in coping with the COVID-19 shock. Clan culture is sustained by a system of shared norms, obligations, and reputational incentives.

Clan members are expected to follow established rules of conduct, and violations may trigger social sanctions or exclusion from the group. In this sense, clan culture creates an informal reputation mechanism that disciplines individual behavior. Allen et al. (2005) argue that reputation-based mechanisms play an important role in China's economic development and can partially substitute for formal legal protection. Similarly, Zhang (2020) shows that clan culture generates a set of implicit social and behavioral norms that regulate members' actions and, to some extent, substitute for formal institutions.

This substitutive relationship implies that the positive role of clan culture should become weaker where formal institutions are better developed. In regions with stronger legal and market-supporting institutions, firms are less dependent on clan-based norms and networks in managing operations and coping with adverse shocks. When the Fan Gang legal-environment index and GDP per capita are used to proxy for formal institutional development, the coefficients on the three-way interaction terms $Covid \times Clan \times Law$ and $Covid \times Clan \times Lpgdp$ are both significantly negative. This suggests that formal institutions substitute for clan culture in buffering firms against the adverse effect of the COVID-19 shock.

7. IMPLICATIONS AND CONCLUSIONS

7.1. Conclusions

This paper examines whether clan culture helped Chinese firms withstand the adverse shock of the COVID-19 pandemic. To construct a firm-level measure of clan culture, we combine genealogy data from the General Catalogue of Chinese Genealogy with senior executives' personal information. We then merge this measure with the financial data of Chinese A-share listed firms for 2020–2021, city-level macroeconomic data, and COVID-19 data from Johns Hopkins University. Using a two-way fixed-effects model, we test whether clan culture mitigated the adverse effect of COVID-19 on the operations of listed firms.

The results show that COVID-19 had a significant negative effect on firm performance. At the same time, stronger clan culture substantially weakened this adverse effect, indicating that clan culture played a meaningful buffering role during the pandemic. The findings remain robust when we use alternative measures of firm performance, COVID-19 severity, and clan culture, and when we address potential regional confounding factors. Mechanism analysis further shows that clan culture helped firms cope with the pandemic by easing financing constraints and alleviating labor shortages. In addition, the buffering effect of clan culture is stronger in regions with less-developed formal institutions, suggesting that clan culture and formal institutions are substitutes to some extent.

7.2. Implications and Discussions

First, in an increasingly uncertain external environment, traditional social institutions may still provide firms with valuable support in times of crisis. Clan culture appears to facilitate the mobilization of human, financial, and relational resources, thereby helping firms absorb adverse shocks. This suggests that policymakers should better understand the role of informal institutions in economic resilience rather than treating them solely as historical legacies.

Second, the government should improve the interaction between informal and formal financing channels. Because clan-based financing relies on trust, moral obligations, and relational enforcement rather than formal contracts alone, its effectiveness depends on a broader social environment that supports credibility and cooperation. Through education, cultural guidance, and appropriate institutional design, policymakers can help channel these informal resources in ways that complement formal financial development and ease firms' short-term financing pressure during major shocks.

Third, the pandemic has highlighted persistent frictions in the labor market. Firms may face worker shortages even when job seekers remain abundant, partly because labor-market information is often incomplete and matching is inefficient. In this context, clan-based social networks may help firms recruit more suitable and trusted workers. Policymakers may therefore consider ways to improve local labor-market matching by drawing on trusted community-based networks while preserving openness and fairness in recruitment.

Finally, although informal institutions can provide short-term support during crises, long-run resilience still depends on the continued improvement of formal institutions. Governments should therefore place greater emphasis on strengthening legal protection, improving regulatory capacity, enhancing financial services, and deepening market-oriented reforms. In this sense, the policy goal should not be to rely on clan culture in place of formal institutions, but to recognize its transitional value while continuing to build a stronger formal institutional environment.

7.3. Limitations and Future Research Directions

Despite providing robust evidence that clan culture helped Chinese listed firms buffer the adverse shock of the COVID-19 pandemic, this study has several limitations. First, the analysis focuses on Chinese A-share listed firms, and the findings may therefore not generalize directly to non-listed firms, smaller private firms, or firms operating in other cultural and institutional contexts beyond China. Since clan culture is deeply rooted in China's historical and social structure, its economic effects may differ across countries and regions with different informal institutions.

Second, although this paper makes considerable efforts to address endogeneity concerns through alternative measures, sample restrictions, placebo tests, and other robustness checks, potential endogeneity cannot be fully ruled out. In particular, unobserved local characteristics or omitted firm-level factors may still be correlated with both clan culture and firm resilience. The results should therefore be interpreted with appropriate caution.

Third, the empirical analysis is based on the specific period of 2020–2021, which captures the firm response to the COVID-19 shock in a relatively short time window. While this setting is well suited to identifying the buffering role of clan culture during a major public-health crisis, it does not allow us to assess whether the effects documented in this paper persist over a longer horizon or extend to other types of adverse shocks.

These limitations point to several directions for future research. First, future studies could examine whether similar mechanisms operate in other countries or in other settings where kinship-based informal institutions remain important. Second, richer micro-level data could help further identify the causal effects of clan culture and distinguish more clearly between alternative channels. Third, future research could explore whether the role of clan culture differs across other types of shocks, such as financial crises, supply-chain disruptions, or climate-related disasters. Finally, longer panel data would make it possible to study the long-run consequences of clan culture for firm resilience and post-shock recovery.

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