Supply Chain Stability and Audit Fee in Emerging Markets: Analyst Attention as Moderator

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***Abstract*—This study investigates the impact of enterprise supply chain stability on audit fees in the context of China's capital market. Drawing on audit risk theory and resource dependence perspectives, the analysis argues that stable supply chain relationships reduce operational uncertainty and improve the credibility of financial reporting, thereby lowering auditors' assessment of engagement risk. Using data from Chinese listed firms between 2010 and 2024, the empirical results demonstrate that firms with more stable supply chains are associated with lower audit fees. The findings further reveal that analyst attention strengthens this negative relationship by enhancing information transparency and validating the credibility of operational signals in the capital market. These results enrich the literature on audit pricing by incorporating non-financial operational factors and external monitoring into the understanding of audit fee determinants. They also provide practical implications for auditors and regulators seeking to better evaluate how supply chain structures and market oversight shape audit outcomes.**

***Keywords*—supply chain stability, audit fee, analyst attention, audit pricing, emerging markets**

I. Introduction

In recent years, the stability of corporate supply chains has attracted growing attention from both capital markets and the auditing profession. Supply chain stability reflects the extent to which firms can maintain reliable supplier–customer relationships and ensure continuity of operations, especially under conditions of environmental uncertainty (Chowdhury, Lau, & Pittayachawan, 2019; BCI, 2023). In emerging markets, where institutional environments are less mature and firms face higher exposure to systemic shocks, supply chain stability becomes a critical determinant of business resilience (Liu, Wang, & Ren, 2024). The outbreak of COVID-19 and subsequent geopolitical disruptions further highlighted how supply chain instability amplifies corporate risk profiles, which are ultimately incorporated into auditors' risk assessments and fee structures (Bloomberg, 2022; Subramanian, 2023).

The auditing literature has long recognized that audit fees embed premiums for client-specific and environmental risk factors (Francis, 1984; Choi, Kim, Liu, & Simunic *et al*., 2008). Firms with greater operational uncertainty and weaker governance mechanisms tend to incur higher audit costs, reflecting auditors' increased effort and litigation risk (Simunic, 1980; Carson, Fargher, & Zhang, 2019). Within this framework, supply chain stability can be viewed as a novel yet underexplored determinant of audit pricing. Stable supply chains reduce the likelihood of production disruptions and reporting irregularities, thereby lowering auditors' risk perceptions and potentially constraining the audit fee premium (Liu, 2021). However, empirical evidence linking supply chain stability directly to audit pricing in emerging markets remains limited.

At the same time, the role of capital market intermediaries such as financial analysts deserves closer scrutiny. Analysts' forecasts and reports influence how information is disseminated and interpreted by investors and auditors alike (Healy & Palepu, 2001; Huang, Meschke, & Guthrie, 2017). Prior research shows that analyst attention can shape perceptions of firm risk and credibility, thus moderating the relation between corporate fundamentals and audit outcomes (Yu, 2008; Chang, Khanna, & Palepu, 2000). When analyst attention is high, information asymmetry is reduced, external monitoring is enhanced, and auditors may place less reliance on costly verification procedures, leading to lower audit fees (Lim, 2022). Conversely, in low-attention contexts, auditors may demand higher compensation for heightened information risk, amplifying the fee premium associated with unstable supply chains.

Despite its importance, the intersection between supply chain stability, analyst attention, and audit pricing has not been systematically explored. Existing studies on supply chains primarily focus on operational resilience and firm performance (Chowdhury *et al.*, 2019; Li *et al*., 2024), while the auditing literature has concentrated on governance, financial reporting quality, and market-based determinants of audit fees (Simunic, 1980; Choi *et al*., 2008). Integrating these perspectives can advance our understanding of how non-financial operational factors interact with capital market monitoring to shape audit outcomes in emerging economies.

Accordingly, this study investigates how supply chain stability affects audit fees in the context of China's A-share listed firms, with analyst attention as a moderating mechanism. By bridging the supply chain resilience and audit pricing literatures, this research contributes to identifying new determinants of audit costs and underscores the importance of information intermediaries in mitigating risk perceptions in emerging markets.

II. Literature Review

A. Enterprise Supply Chain Stability and Audit Fee

Audit pricing literature has consistently highlighted that audit fees encapsulate not only the direct costs of performing audit procedures but also the implicit premiums auditors charge for bearing engagement-specific risks (Simunic, 1980; Francis, 1984). Over time, the scope of these risk assessments has broadened to include both financial and non-financial dimensions, as auditors recognize that operational disruptions, reputational shocks, and institutional weaknesses

can amplify the likelihood of audit failures and subsequent litigation (Choi *et al.*, 2008; Carson *et al.*, 2019). This expanded framework underscores that audit fees serve as a forward-looking signal of risk, integrating auditors' evaluations of factors that shape firms' capacity to sustain reliable reporting and stable operations.

In emerging markets, the salience of these considerations is heightened. Weak investor protection, limited enforcement capacity, and incomplete disclosure regimes reduce the availability of reliable information, compelling auditors to rely more heavily on indirect indicators of resilience and governance quality (Liu *et al.*, 2024; Gao, Li, & Zhang, 2024). Under such conditions, the stability of firms' operational linkages becomes a central dimension of risk assessment. Research in operations and supply chain management shows that disruptions in input availability or demand continuity can transmit rapidly into financial volatility, creating cascading risks for external stakeholders (Ivanov & Dolgui, 2020; Chowdhury *et al.*, 2019). Auditors, tasked with forming reasonable assurance about firms' future viability, therefore cannot restrict their evaluations to static balance sheet data but must also consider whether firms' operational networks exhibit resilience against shocks.

Theoretically, this relationship can be illuminated through the economics of information and organizational interdependence. Firms embedded in stable transactional networks generate more transparent and predictable financial signals, thereby reducing auditors' costs of verifying assertions and mitigating the risk of material misstatements (Salukh & Soewarno, 2022). Furthermore, operational continuity lowers exposure to abrupt losses in revenue or liquidity, reducing the variance of future outcomes and diminishing the extent of substantive audit testing required to achieve reasonable assurance (Lennox, 2020). From a governance standpoint, robust relationships with key stakeholders also signal managerial competence and reduce the likelihood of opportunistic reporting, which in turn attenuates the reputational and litigation risks borne by auditors (DeFond & Zhang, 2014).

Recent empirical work further suggests that operational resilience interacts with institutional environments to influence auditors' pricing behavior. In contexts characterized by frequent exogenous shocks, such as the COVID-19 pandemic and heightened geopolitical frictions, firms with more reliable upstream and downstream relationships experienced fewer disruptions in cash flow predictability, thereby moderating auditors' perceptions of risk (Gong, Iqbal & Wang, 2021; Fan, 2024). This indicates that supply chain stability functions not only as an operational advantage but also as an informational safeguard that enhances the credibility of reported earnings, aligning with auditors' dual objectives of risk containment and efficiency in evidence collection.

Taken together, these arguments imply that supply chain stability systematically reduces multiple dimensions of audit fee. By lowering information asymmetry, mitigating exposure to operational shocks, and signaling credible governance, it provides auditors with greater confidence in the reliability of financial statements. Consequently, auditors rationally incorporate this lower risk profile into their pricing decisions.

H1: Enterprise supply chain stability is negatively associated with audit fees.

B. Enterprise Supply Chain Stability, Analyst Attention, and Audit Fee

The interaction between enterprise supply chain stability and analyst attention provides a critical lens for understanding variations in audit pricing. Prior studies have established that audit fees are jointly determined by expected audit effort and compensation for risk exposure (Simunic, 1980; Francis, 1984). While auditors traditionally assess financial indicators to determine risk, recent scholarship highlights that external monitoring mechanisms, such as analyst coverage, and operational resilience factors, such as supply chain stability, jointly shape auditors' perceptions of client risk (Choi *et al.*, 2008; Carson *et al.*, 2019).

Supply chain stability strengthens the reliability of financial reporting by reducing operational uncertainty and enhancing the predictability of firms' performance (Chowdhury *et al.*, 2019; Ivanov & Dolgui, 2020). Firms embedded in resilient operational networks are less vulnerable to disruptions in resource flows, thereby lowering auditors' expected costs of evidence collection and mitigating the risk of unexpected losses (Gong *et al.*, 2021; Fan, 2024). However, the impact of supply chain stability on audit fees does not operate in isolation. The presence of external monitors can amplify or reshape this relationship. Analyst attention plays a dual role in this process: it increases information transparency through greater dissemination of firm-specific knowledge, and it enhances pressure on managers to maintain credible disclosure practices (Subramanian, 2023; Li *et al.*, 2024).

From an auditor's perspective, analyst attention magnifies the visibility of a client's reporting outcomes. Higher analyst coverage reduces information asymmetry between auditors and investors, enabling auditors to rely more on external signals to validate financial statements (Lennox & Pittman, 2010). In contexts where supply chain stability is strong, analyst monitoring reinforces auditors' confidence that reported earnings reflect underlying operations, thus further lowering perceived engagement risk. By contrast, when supply chain stability is weak, analysts may highlight potential vulnerabilities, raising auditors' concerns about business continuity and litigation exposure, which in turn increases audit fees (Salukh & Soewarno, 2022; Gao & Zhang, 2024).

Therefore, the interaction between supply chain stability and analyst attention constitutes an important moderating mechanism in audit pricing. Supply chain stability reduces inherent and business risks at the firm level, while analyst attention magnifies these effects by shaping how operational resilience is perceived and priced in the capital market. From the auditor's standpoint, high analyst coverage reinforces the credibility of stable supply chains, thereby lowering engagement risk and audit fees; conversely, in the absence of stability, analyst scrutiny may elevate auditors' risk assessments and lead to higher pricing. Supply chain stability directly reduces operational risk, the level of analyst attention determines how effectively such stability is translated into reduced audit fees.

H2: Analyst attention positively moderates the negative

relationship between supply chain stability and audit fees.

Construct an analytical framework diagram for this article (Fig. 1).

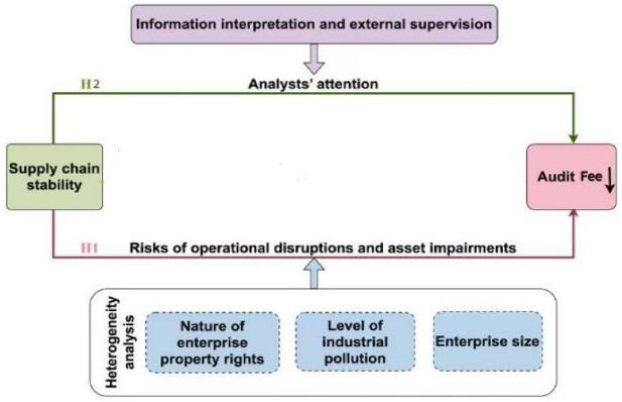

Fig. 1. Analytical framework.

III. Materials and Methods

A. Sample and Data Description

The paper's research sample encompasses Chinese A-share listed companies spanning from 2010 to 2024. The data collected was processed in the following manner:

1) Remove financial industry enterprises.
2) Remove listed companies with ST or *ST status during the sample period.
3) Exclude samples where key variables have missing data.
4) To mitigate the interference of extreme values on the research results, this study employed tail trimming for all continuous variables. Specifically, it performed "winsorize" trimming was applied to observations at the 1st and 99th percentiles.

Finally, 35,723 sample observations of unbalanced panel data were obtained. The CSMAR database in China and the East Finance Network were the sources for the data.

B. Variable Selection and Measurement

1) Supply Chain Stability (SCS): Drawing on the research conducted by Shi *et al*., (2024), this paper measures the stability of supplier and customer relationships by dividing the number of suppliers and customers that appeared in the previous year among the top five of the enterprise in the current year by 5. The value ranges from 0 to 1. The larger the value, the longer the suppliers and customers have continuously cooperated with the enterprise, and the greater the stickiness of the supplier and customer, indicating a more stable supplier and customer relationship. The entropy weight method is used to assign weights to the stability of suppliers and customers, facilitating the calculation of a comprehensive score for supply chain stability.

$$\mathrm{SCS} = \omega_{\mathrm{supplier}} \times s_{\mathrm{supplier}} + \omega_{\mathrm{customer}} \times s_{\mathrm{customer}} \quad (1)$$

$\omega_{\mathrm{supplier}}$ represents the weight of supplier stability, and $\omega_{\mathrm{customer}}$ represents the weight of customer stability. $\omega_{\mathrm{supplier}} + \omega_{\mathrm{customer}} = 1$, and $0 \leq \omega_{\mathrm{supplier}}, \omega_{\mathrm{customer}} \leq 1$.

2) Analyst Attention (AnaAttention): Referencing the research of Wang & Cao (2024). This study utilizes the natural logarithm of the number of enterprise analysts, incremented by one, as a proxy variable for analyst attention.
3) Audit Fee (AF). Referencing the research of Jha & Chen (2015), this paper selects natural logarithm of audit fees as the proxy variable for audit fee.

To ensure the integrity of the study, we will provide a detailed account of all variable types, names, codes, and measurement methods (Table A1).

C. Baseline Model Setup

To ensure the robustness of our empirical analysis, this study adopts a high-dimensional fixed effects model, controlling for firm, industry, and year heterogeneity. High-dimensional fixed effects techniques allow multiple layers of heterogeneity to be controlled simultaneously without introducing multicollinearity, improving the reliability of coefficient estimates (Guimarães & Portugal, 2010). This modeling approach provides a robust baseline for identifying the impact of supply chain stability on audit fee.

To examine H1, we construct the following regression Eq. (2):

$$AF_{i,t} = \alpha_0 + \alpha_1 SCS_{i,t} + \alpha_n \sum Controls_{i,t} + \sum Year = \sum Industry + \varepsilon_{i,t} \quad (2)$$

In the formula, the relationship between audit fee and the stability of an enterprise's supply chain over time was explored. We utilize a comprehensive dataset that includes Year and Industry as dummy variables to control for temporal and sector-specific effects. Additionally, we have incorporated a series of control variables with the objective of ascertaining the reliability of the findings. The random error term accounts for unobserved variations in our model. The aim of our analysis is to examine how changes in supply chain stability affect audit fee across industries and over time.

To test the moderating role of analyst attention, Eqs. (3) and (4) is built to test the hypothesis H2:

$$AF_{i,t} = \alpha_0 + \alpha_1 SCS_{i,t} + \alpha_2 AnaAttention_{i,t} + \alpha_n \sum Controls_{i,t} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (3)$$

$$AF_{i,t} = \alpha_0 + \alpha_1 SCS_{i,t} + \alpha_2 AnaAttention_{i,t} + \alpha_3 SCS_{i,t} \times AnaAttention_{i,t} + \alpha_n \sum Controls_{i,t} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (4)$$

Among them, AnaAttention represents analyst attention, and SCS×AnaAttention is the interaction term. When α_3 is significant, it indicates that analyst attention moderates the effect of supply chain stability on audit fee.

The t-statistics in all regression equations of this paper are calculated after adjusting for cluster-robust standard errors at the enterprise level.

IV. Result and Discussion

A. Descriptive Statistics

Table A2 presents the descriptive statistics of all variables. The average value of SCS is −0.19, with a standard deviation of 0.919, indicating that the sample enterprises have significant volatility in terms of supply chain stability. In

some cases, the supply chain may face greater risks or uncertainties (Hair, Black, Babin, & Anderson, 2019). The average value of analyst attention is 1.369, with a standard deviation of 1.19, indicating a large difference in analyst attention among enterprises (Da, Engelberg, & Gao, 2011). Moreover, from the correlation, there is no multicollinearity. The VIF value less than 5 is used as the cut-off value to verify this (O'Brien, 2007).

B. Multivariate Regression Results

1) Baseline regression results

Based on the analysis of the results of the F test and the Husman test, it is concluded that the high-dimensional fixed-effect regression model is the most suitable for estimation (Fernández-Val & Weidner, 2017; Greene, 2018). Table 1 presents the regression analysis results. Columns (1), (2) and (3) are the stepwise results of audit fee. In column (3), the coefficient of enterprise supply chain stability is -0.026, and the findings confirm a significant negative link between supply chain stability and audit fee ($p < 0.01$). The sixth column, after controlling for industry and year fixed effects, still shows a significant positive relationship between supply chain stability and audit fees (SCS = −0.023, $p < 0.01$). meaning that the higher the supply chain stability, the lower the audit fee, which verifies the research hypothesis H1.

Table 1. Supply chain stability, analyst attention, audit fee

	(1)	(2)	(3)	(4)
	AF	AF	AF	AF
SCS	−0.022***	-	−0.026***	−0.024***
	(−3.681)	-	(−4.301)	(−4.024)
AnaAttention	-	-	-	−0.014***
	-	-	-	(−3.217)
SCS×AnaAttention	-	-	-	-
	-	-	-	-
Constant	−0.243	−0.259*	−0.342**	−0.474***
	(−0.401)	(−1.865)	(−2.429)	(−3.157)
Controls	No	Yes	Yes	Yes
Industry&Year	Yes	Yes	Yes	Yes
Industry×Year	No	No	No	No
R2	0.650	0.632	0.637	0.436

Table 2. Supply chain stability, analyst attention, audit fee.

	(1)	(2)	(3)	(4)
	AF	AF	AF	AF
SCS	−0.015**	−0.023***	−0.020***	−0.012
	(−2.162)	(−3.668)	(−3.302)	(−1.597)
AnaAttention	−0.015***	-	−0.015***	−0.016***
	(−3.418)	-	(−3.235)	(−3.438)
SCS×AnaAttention	−0.007**	-	-	−0.007**
	(−2.122)	-	-	(−2.019)
Constant	−0.464***	−0.299**	−0.440***	−0.428***
	(−3.096)	(−2.399)	(−3.297)	(−3.204)
Controls	Yes	Yes	Yes	Yes
Industry&Year	Yes	No	No	No
Industry×Year	No	Yes	Yes	Yes
R2	0.437	0.633	0.416	0.403

2) Analyst attention on the moderating effect in terms of supply chain stability and audit fee

The columns (4) of Table 1 and the columns (1) of Table 2, report the estimation outcomes of Models (3) and (4), respectively. The coefficients of supply chain stability and analyst attention in column (4) are −0.024 and −0.014, respectively, both showing a significant negative impact at the 1% level. This indicates that the better the supply chain stability, the more analyst attention, and the lower the audit fee. In column (1), the interaction term of supply chain stability and analyst attention is added. The coefficient of the interaction term is -0.007, which is significant at the 1% level. These findings indicate that analyst attention enhances the inverse relationship between supply chain stability and audit fee. Overall amplification ratio = (0.007/0.026) × 100% ≈ 26.9%, which means that the average attention of analysts can approximately reduce the cost reduction effect of supply chain stability by 27%, and the total effect reaches 0.033 units. To further verify the differences in the scenarios of the regulatory effect, we divided the samples into high and low attention groups based on the median of analysts' attention (Table 3). We conducted group regression analysis: The amplification ratio of the group = (0.021/0.012) − 1 ≈ 75%, that is, in the high analyst attention scenario, the amplification ratio of the cost reduction effect is as high as 75%. Therefore, Hypothesis H2 is verified.

To address potential reverse causality, we re-estimate the models using a one-period lag of supply chain stability as the independent variable (Table 4). Across all tests, the moderate effects remain statistically significant, indicating that the findings are robust to both methodological variations and

temporal adjustments of the key independent variable. The current tests provide strong evidence that the estimated moderate effects are not artifacts of specific model specifications.

Table 3. Analysts focus on grouping

	Low Analyst Attention	High Analyst Attention
	AF	AF
SCS	−0.012*	−0.021**
	(−1.744)	(−2.407)
constant	6.579***	4.671***
	(34.350)	(21.706)
Controls	Yes	Yes
N	17772	18171
R^2	0.582	0.725

Table 4. Supply chain stability lagging by one period and moderating variables

	(1)	(2)	(3)
	AF	AF	AF
SCSt-1	−0.027***	−0.025***	−0.015*
	(−4.298)	(−3.970)	(−1.957)
AnaAttention	-	−0.015***	−0.016***
	-	(−3.196)	(−3.394)
SCSt-1×AnaAttention	-	-	−0.008**
	-	-	(−2.429)
Constant	−0.418***	−0.577***	−0.566***
	(−2.771)	(−3.585)	(−3.523)
Controls	Yes	Yes	Yes
N	30568	30568	30568
R2	0.637	0.639	0.239

C. Robustness Validation

1) Alternative measures of the independent variable

Based on the analysis of previous studies, for the measurement of supply chain stability, we adopt the Eq. (5) for supply chain stability proposed by Zhong (2022). We divide the supply chain stability into upstream supply chain (raw material suppliers) stability and downstream supply chain (customers) stability. The volatility of the upstream and downstream supply chains is represented by the ratio of the absolute value of the annual percentage change of the top five suppliers (customers) to the total proportion of the top five suppliers (customers) in the previous year. Finally, A revised measure of supply chain stability is derived using the entropy weight approach. After replacement, an empirical test is conducted, and the results are all the same as the ones, indicating that the research results of this paper are robust. (Table 5)

$$SCS_t = \omega_{\text{supplier2}} \times (1 - VU_t) + \omega_{\text{customer2}} \times (1 - VC_t) \quad (5)$$

VU_t represents the upstream supply chain volatility, VC_t and represents the weight of downstream supply chain volatility. $\omega_{supplier2} + \omega_{customer2} = 1$, and $0 \leq \omega_{supplier2}, \omega_{customer2} \leq 1$.

2) Model replacement test

This paper adopted the Ordinary Least Squares (OLS) method instead of the original model estimation method to re-verify this hypothesis (Wooldridge, 2013). Specifically, by controlling the original variables, the regression model was replaced with the regress model to address potential panel data structure issues. As shown in Table 5, the coefficient of supply chain stability was −0.017, and it was highly negatively correlated with this variable at a 1% significance level. This is the same as the sign and significance level of the benchmark model. This indicates that regardless of how the model is set, the inhibitory effect of supply chain stability on audit fee always exists significantly. The conclusion of this study has strong robustness (Cameron & Trivedi, 2005).

Table 5. Robustness check results

	Replacing Independent Variable	Model Replacement Test	PSM Test
	AF	AF	AF
SCS	−0.070***	−0.017***	−0.023**
	(−6.281)	(−2.933)	(−2.391)
$SCS_{(t-1)}$	-	-	-
	-	-	-
Constant	−0.159	−0.117	−0.331**
	(−1.142)	(−0.927)	(−2.544)
Controls	Yes	Yes	Yes
Industry&Year	Yes	Year	Yes
N	35720	35723	18307
R^2	0.639	0.533	0.537

3) PSM matching test

Given that factors such as enterprise size, profitability, and equity concentration may interfere with the stability of the supply chain, to effectively control the potential influence of the characteristic differences among the sample companies on the research conclusions, this study adopts the one-to-one nearest neighbor matching method to conduct Propensity Score Matching (PSM) tests (Rosenbaum & Rubin, 1983; Stuart, 2010). Specifically, the average value of supply chain stability was used to divide the samples into experimental groups and control groups. Key indicators such as enterprise size, return on assets, and equity concentration were selected as covariates. A 1:1 nearest neighbor matching algorithm was used for sample matching. After conducting a strict balance test to ensure the quality of the matching, a regression analysis was conducted again. The results showed that the directions and significance levels of each regression coefficient were aligned with those of the previous results, thus further testing the validity of the hypotheses of this study (Table 5).

4) Exclude the impact of the epidemic

The direct impact of the epidemic on the supply chain includes disruptions in logistics, production halts, and fluctuations in demand (Ivanov, 2020; Queiroz, Fosso, & Branski, 2022). The lockdown policies led to transportation delays and port congestion, resulting in lower stability of the supply chain compared to normal circumstances. To avoid errors in the regression results caused by the data from the epidemic years, the data from 2020 to 2022 were excluded from the sample, and a robustness test was conducted. The results showed that the stability of the supply chain was still significantly negatively correlated with audit fee, verifying the hypotheses of this paper (Table 6).

5) Instrumental variable method

To mitigate potential endogeneity concerns, we use lagged values of supply chain stability as explanatory variables. By measuring supply chain stability in the previous period, we reduce simultaneity bias, as past values are predetermined relative to current audit fee. This approach has been widely adopted in the supply chain and auditing literature as an effective robustness check (Hendricks & Singhal, 2005; Kim, Li, & Zhang, 2014). As shown in Table 6, Phase one indicates

that the lagged one-period instrumental variable has a very strong positive correlation with the endogenous variable SCS, meeting the correlation conditions for an instrumental variable, and the t-value is 107.728, which can rule out the problem of weak instrumental variables. Phase two shows that the negative impact of supply chain stability on audit fee is significant, indicating that the empirical results are robust.

Table 6. Robustness check results

	Exclude the Impact of the Epidemic	instrumental Variable Method	
		Phase One	Phase Two
	AF	AF	AF
SCS	−0.025***	-	−0.017***
	(−3.943)	-	(−6.280)
$SCS_{(t-1)}$	-	0.871***	-
	-	(107.728)	-
Constant	−0.399**	−1.895***	−0.202***
	(−2.478)	(−21.752)	(−4.081)
Controls	Yes	Yes	Yes
Industry&Year	Yes	Yes	Yes
N	25332	31151	30568
R^2	0.633	0.310	0.634

V. Extensibility Analysis

A. The Analysis of Heterogeneity

1) Property nature

Table 7 reveals a heterogeneous impact of property rights on the influence of supply chain stability on audit fee. State-Owned Enterprises (SOEs), due to their close ties with government, exhibit non-marketized supply chains characterized by high complexity, concentration, criticality, low transparency, and potential systemic consequences (Sun, Zhu, & Zhang 2023). As a result, auditors treat SCS as a highly fee-sensitive factor: a one-unit increase in SCS reduces AF for SOEs by 0.021 (SCS = −0.021, $p < 0.05$), compared with 0.014 for non-SOEs (SCS = −0.014, $p < 0.05$), indicating a 40% stronger effect. This difference reflects auditors' logic: SOEs' supply chain disruptions implicate policy and social stability, prompting conservative auditing and strict misstatement control; non-SOEs' marketized supply chains allow more flexibility, with fees largely perceived as operational.

Control variables further support this institutional context: economic growth (GDP = 0.662, $p < 0.01$) and firm size (Size = 0.030, $p < 0.01$) exacerbate risk management pressures for SOEs, highlighting governance paradoxes where institutional advantages in supply chain stability translate into increased audit scrutiny. Overall, property rights fundamentally shape supply chain risk attributes and directly influence auditors' pricing logic.

2) Degree of pollution

Table 7 provides empirical evidence on the moderating role of pollution levels in the relationship between supply chain stability and audit fee. The results show that for heavily polluting enterprises, SCS has a weaker inhibitory effect on AF (SCS = −0.018, $p < 0.1$) than for non-heavily polluting enterprises (SCS = −0.025, $p < 0.01$), highlighting a paradox between theoretical expectations and observed data. This discrepancy arises from the systematic reshaping of governance logic under environmental policies. Specifically, administrative interventions such as production limits reduce the risk-mitigation value of SCS, while the contagious risk of ESG violations in high-carbon links forces auditors to be cautious when assessing supply chain stability. In contrast, non-heavily polluting enterprises, with more isolated environmental risks, can fully leverage their supply chain stability, making SCS an effective governance mechanism for reducing audit fees (Li *et al*., 2024).

Additionally, the high profitability of heavily polluting firms (ROA = 0.376, $p < 0.01$) is positively associated with AF, suggesting that part of their profits may rely on environmental violation arbitrage. Together, these findings illustrate a key regulatory mechanism: environmental policy constraints alter the risk transmission path, decoupling supply chain governance indicators from audit fee for heavily polluting firms, while non-heavily polluting firms still follow market-based governance logic. This highlights a critical dilemma in environmental regulation: policies aimed at mitigating negative externalities may inadvertently weaken the micro-level effectiveness of supply chain governance (Sun *et al*., 2023).

Table 7. Results of enterprise heterogeneity analysis

	State-Owned	Non-State-Owned	Heavy Polluting	Non-Heavy Polluting
	(1) AF	(2) AF	(3) AF	(4) AF
SCS	−0.021**	−0.014**	−0.018*	-0.025***
	(−2.081)	(−2.524)	(−1.901)	(−4.126)
Constant	-0.663***	0.114	−0.700**	−0.231
	(−3.309)	(0.809)	(−2.516)	(−1.627)
Controls	Yes	Yes	Yes	Yes
N	13220	22503	8182	27541
R^2	0.615	0.611	0.718	0.610

3) Size of the enterprise

Enterprises differ in scale and supply chain complexity, leading to heterogeneous levels of supply chain stability, the sample is divided into large-scale and small-scale groups based on the median of the natural logarithm of total assets. Column (1) of Table 8 reports the results for large-scale enterprises, showing no significant relationship between SCS and audit fee. Column (2) presents results for small-scale enterprises, where SCS significantly reduces AF, indicating a scale-dependent governance effect.

This differentiation arises from differences in risk-resistance capabilities. Large-scale firms benefit from internal buffers such as redundant inventory, diversified supplier networks, and ample capital reserves. Short-term supply chain disruptions can be absorbed internally, preventing observable audit fee. In contrast, small-scale firms face resource constraints, making SCS directly linked to operational viability. Auditors are particularly sensitive to disruptions that threaten the continuity of small firms' operations, highlighting the importance of supply chain stability in pricing assessment (Li *et al*., 2024; Wang, 2023).

Supporting variables further confirm this pattern. Large-scale firms rely on mature internal control systems (IC = 0.012, $p < 0.05$) to decrease fee, whereas small-scale firms depend on property rights structures (FN = −0.028, $p < 0.01$) to alleviate financing constraints. During economic downturns, small enterprises are disproportionately affected (GDP = −0.456, $p < 0.01$), showing that supply chain vulnerability is closely tied to macroeconomic conditions.

These findings reveal a scale threshold effect: beyond a critical asset size, the significance of SCS for audit fee diminishes. Accordingly, audit strategies should differ by firm size: for large firms, focus on internal control effectiveness; for small firms, emphasize building supply chain resilience and integrating environmental protection investments into the risk mitigation framework.

Table 8. Results of enterprise heterogeneity analysis

	Large-Scale	Small-Scale
	(1)	(2)
	AF	AF
SCS	−0.013	−0.015***
	(−1.601)	(−2.804)
Constant	−0.663***	0.114
	(−3.309)	(0.809)
Controls	Yes	Yes
N	17862	17861
R2	0.507	0.612

VI. Conclusion

This study investigates the impact of supply chain stability on audit fees in emerging markets, with a particular focus on the moderating role of analyst attention. Using a sample of Chinese A-share listed firms from 2020 to 2024, the empirical analysis demonstrates that supply chain stability significantly reduces audit fees, suggesting that operational resilience mitigates auditors' perceived risk and thereby lowers the risk premium embedded in audit pricing. Furthermore, analyst attention is found to strengthen this relationship: the negative effect of supply chain stability on audit fees is more pronounced in firms with higher levels of analyst coverage, highlighting the amplifying role of external monitoring and information transparency in shaping auditors' risk assessment.

Theoretically, this study contributes in several ways. First, it extends audit pricing research by incorporating a non-financial operational factor supply chain stability into the assessment of audit risk, providing evidence that operational management is a key determinant of audit costs in emerging markets. Second, it identifies analyst attention as a significant moderating mechanism, linking external capital market monitoring to the supply chain–audit fee relationship and enriching the literature on information asymmetry, corporate governance, and audit economics. Third, by integrating supply chain management, external supervision, and audit outcomes, the study offers a comprehensive framework that enhances our understanding of how operational and market factors jointly influence audit pricing.

From a practical perspective, the findings suggest actionable implications for both corporate managers and auditors. Firms can reduce audit costs by investing in supply chain resilience and fostering transparency through effective disclosure, while auditors should incorporate assessments of supply chain stability and external information flows into their risk evaluation and pricing strategies. Regulators may also consider promoting disclosure standards and operational best practices to improve audit efficiency and resource allocation in capital markets.

Finally, this research opens avenues for future studies. Subsequent work could explore industry-specific, firm-size, or cross-country variations in the supply chain–audit fee relationship, as well as examine other external monitoring mechanisms, such as media coverage or institutional investor scrutiny. Such extensions would further clarify the boundary conditions and generalizability of the observed effects, enhancing the theoretical and practical relevance of integrating operational resilience, market monitoring, and audit risk management.

Appendix

Table A1. Variable definitions

Variable Category	Variable Label	Variable Symbol	Measure
Dependent variable	Audit fee	AF	Natural logarithm of audit fees
Independent variable	Supply chain stability	SCS	Measure the stability of supplier and customer relationships by dividing the number of the top five suppliers and customers of the enterprise in the previous year by 5. Entropy weight method assigns weights to the stability of suppliers and customers, and obtains the comprehensive value of supply chain stability
Moderating variable	Analyst attention	AnaAttention	Natural logarithm of the sum of the number of analysts plus 1
Control variable	Enterprise size	Size	Natural logarithm of total assets
	Internal control	IC	Dibo internal control index
	Return on assets	ROA	Net profit/total asset balance
	Ownership nature	FN	State-owned enterprises are 1, non-state-owned enterprises are 0
	Equity concentration	Top1	Shareholding ratio of the largest shareholder
	Auditing firm size	Big4	1 if the auditing firm is one of the "Big Four" internationally, 0 otherwise
	Listing years	Age	Natural logarithm of the number of years the automotive enterprise has been listed + 1
	Inventory turnover rate	Inventory	Operating cost/average inventory balance
	GDP growth rate	GDP	(Current year's GDP - Last year's GDP) / Last year's GDP

Table A2. Mean, standard deviation, VIF

	Average	Standard	VIF
SCS	-0.19	0.919	1.11
AnaAttention	1.369	1.190	1.58
IC	6.339	0.949	1.08
ROA	0.036	0.060	1.30
Size	22.293	1.288	1.93
Top1	34.45	14.734	1.13
FN	0.371	0.483	1.26
list	2.192	0.790	1.58
Inventory	14.346	54.22	1.01
Big4	0.063	0.243	1.14
GDP	0.062	0.021	1.14

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

HH and LL conceived this project and designed the model and conducted the analysis. HH and LL collected the sample data. HH participated in the statistical analysis of the sample data. HH organized the research results. HH wrote the initial

draft of the paper. LL revised the paper; all authors had approved the final version.

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