The Impact of Customer Concentration on the Financial Performance of Listed Pharmaceutical Enterprises

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Abstract. The pharmaceutical sector serves as a cornerstone for safeguarding public welfare and national security. Driven by intensifying market and customer network volatility, mitigating financing constraints and recalibrating strategic deployments to bolster financial performance have become top priorities for pharmaceutical firms. Utilizing panel data from Chinese A-share listed pharmaceutical enterprises spanning 2016 to 2023, this study scrutinizes the nexus between customer concentration and corporate financial performance, with particular emphasis on the mediating role of financing constraints. The empirical evidence reveals a pronounced, negative impact of customer concentration on financial performance. Specifically, customer concentration acts as a structural impediment that stifles firm performance by compounding existing financing constraints, thereby confirming a distinct mediating channel. These findings suggest that pharmaceutical firms should diversify customer portfolios and alleviate financing constraints to achieve sustainable performance growth.

Keywords: Customer concentration; Financial performance; Financing constraints

1 Introduction

China's pharmaceutical industry underpins public welfare, yet mounting volatility in product markets and customer networks presses firms to ease financing constraints and sustain financial performance. Customer concentration—the share of sales going to a few major buyers—sharpens this pressure: demand concentrates in hospitals, distributors and chain pharmacies, heightening dependence on key customers and forcing relationship-specific investments that raise capital occupation. Evidence from manufacturing and retail links concentrated customers to weaker performance and higher capital costs, but whether this holds in a regulated, innovation-intensive industry is unclear. Using 2016–2023 panel data on Chinese A-share listed pharmaceutical firms, this study tests customer concentration's effect on financial performance and financing constraints as a mediating mechanism. Results show it reduces financial performance and intensifies financing constraints, which partially mediate the effect.

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2 Theoretical Foundation and Research Hypotheses

2.1 Customer Concentration and Financial Performance

High customer concentration increases firms' dependence on major customers, exposing them to greater operational risks and bargaining pressure. Such dependence may constrain innovation and market responsiveness, thereby undermining firms' competitive advantages and operating performance (Chen, 2024).Existing literature suggests that high customer concentration may undermine earnings persistence (Cheng et al., 2019) and exert a significant negative effect on the operating performance of retail enterprises (He & Zhang, 2023).Therefore, we propose:

H1: Customer concentration is negatively associated with the operating performance of pharmaceutical firms.

2.2 Customer Concentration and Financing Constraints

Firms with high customer concentration often make relationship-specific investments to maintain key customer relationships, thereby increasing their vulnerability to customer loss and financial risks. Furthermore, customer concentration may exacerbate financing constraints by increasing information uncertainty and hindering external financing (Sun & Zhu, 2022).Therefore, we propose:

H2: Customer concentration is positively associated with financing constraints.

2.3 The Mediating Role of Financing Constraints

Higher customer concentration may exacerbate financing constraints by increasing firms' dependence on major customers and raising capital occupation and sunk costs(Balakrishnan et al., 1996). According to signaling theory, operational difficulties of major customers may transmit negative signals to the market, increasing information asymmetry and restricting firms' financing ability. Therefore, we propose the following hypothesis:

H3: Financing constraints mediate the relationship between customer concentration and operating performance.

3 Research Design

3.1 Sample Selection and Data Processing

This study examines A-share listed pharmaceutical firms from 2016 to 2023. After excluding ST, ST, and incomplete observations, a panel dataset of 176 firms was constructed, with continuous variables winsorized at the 1% level. Data were collected from CSMAR and CNINFO.

3.2 Variable Definition and Measurement

Operating performance is proxied by ROA (Gan et al., 2023). Customer concentration (Cus) is calculated as the sales proportion of the top five customers (Zhang, 2024). Financing constraints are measured by the KZ Index. Control variables include firm characteristics such as size, age, ownership concentration, intangible assets, board independence, leverage, liquidity, receivables, and growth(Dhaliwal et al., 2016). Detailed definitions are provided in Table 1.

Table 1. Variable Definitions.

Indiator Type	Variable Name	Symbol	Measurement
Dependent Variable	Financial Performance	ROA	EBIT / Total Assets
Independent Variable	Customer Concentration	Cus	Sales from top five customers / Total annual sales
Mediating Variable	Financing Constraints	Fin	SA index calculated following Ju et al. (2013)
Control Variables	Firm Size	Size	ln(Total Year-End Assets)
	Firm Age	Age	ln(Current year - Foundation year+ 1)
	Top Shareholder Own-ership	TOP1	Shares held by the largest shareholder / Total shares
	Intangible Asset Ratio	Intangible	Intangible Assets / Total Assets
	Independent Directors Proportion	Outr	Number of independent directors / Total board members
	Leverage Ratio	Lev	Total Liabilities / Total Assets
	Current Ratio	CR	Current Assets / Current Liabilities
	Accounts Receivable Ratio	AR	Accounts Receivable / Total Assets
	Growth	Growth	(Current year revenue - Previous year revenue) / Previous year revenue

3.3 Model Construction

To examine the impact of customer concentration on firm performance, the baseline model is specified as follows:

$$ROA_{i,t} = \alpha_0 + \alpha_1 \mathrm{Cus}_{i,t} + \sum \alpha n\ \mathrm{Controls}_{i,t} + \sum \mathrm{YEAR}_{i,t} + \varepsilon_{i,t} \quad (1)$$

where ROA represents operating performance, Cus denotes customer concentration, and Controls include firm-level control variables.

To investigate the mediating role of financing constraints, the following models are estimated:

$$Fin_{i,t} = \alpha_0 + \alpha_1 Cus_{i,t} + \sum \alpha_n\ Controls_{i,t} + \sum YEAR_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$ROA_{i,t} = \alpha_0 + \alpha_1 Cus_{i,t} + \alpha_2 Fin_{i,t} + \sum \alpha_n\ Controls_{i,t} + \sum YEAR_{i,t} + \varepsilon_{i,t} \quad (3)$$

4 Empirical Results and Discussion

4.1 Descriptive Statistics

Table 2 reports the descriptive statistics. ROA has a mean of 0.062 (SD = 0.030), while Cus averages 0.104 with considerable variation across firms. Fin also exhibits substantial dispersion, and control variables show no apparent outliers.

Table 2. Descriptive Statistics.

Variable	Sample Size	Mean	Standard Deviation	Minimum	Maximum
ROA	176	0.062	0.030	-0.081	0.119
Cus	176	0.104	0.074	0.001	0.359
Fin	176	3.977	0.646	3.195	5.753
Cash	176	0.161	0.072	0.042	0.390
Size	176	23.222	1.225	20.748	26.012
Age	176	2.538	0.794	0.041	3.401
TOP1	176	0.337	0.143	0.134	0.748
Intangible	176	0.016	0.012	0.006	0.050
Outr	176	0.365	0.040	0.312	0.454
Lev	176	0.598	0.127	0.300	0.831
CR	176	0.015	0.127	0.295	0.831
AR	176	0.955	1.988	0.004	12.855
Growth	176	0.133	0.187	-0.347	0.899

4.2 Correlation Analysis

(Note: In accordance with space limitations for 6-page conference requirements, the Pearson correlation matrix is omitted).

Pearson correlation analysis indicates a negative correlation between ROA and Cus ($r = -0.186$), supporting H1. Fin is negatively correlated with ROA and positively correlated with Cus, consistent with H2. Correlation coefficients below 0.5 and VIF values below 5 suggest no multicollinearity concerns.

4.3 Regression Analysis

Table 3 presents the baseline and step-by-step mediation estimations. Without controls, the coefficient of Cus on ROA is significantly negative, validating H1. With the full vector of controls included (Column 2), the coefficient stands at -0.119 ($p < 0.01$), corroborating that high buyer concentration severely reduces asset profitability.

Table 3. Baseline Regression and Mediation Effect Results.

Variable	(1)	(2)	(3)	(4)
	ROA	ROA	Fin	ROA
Cus	-0.107***	-0.119***	0260***	-0.114***
	(-3.60)	(-4.12)	(1.81)	(-3.92)

Fin				-0.018*
				(-1.74)
Size		0.004*	-0.099***	0.325
		(1.88)	(9.26)	(1.49)
Age		-0.010***	-0.394***	-0.824***
		(-4.11)	(-33.85)	(-3.34)
TOP1		0.046***	-0.514***	5.464***
		(3.51)	(-8.35)	(3.92)
Intangible		-0.744***	-1.731***	-80.707***
		(-4.89)	(-2.21)	(-5.09)
Indep		0.055	0.163	5.332
		(1.27)	(0.76)	(1.23)
Lev		-0.136***	-0.517***	-13.632***
		(-5.43)	(-4.18)	(-5.50)
CR		-1.633*	15.406***	-148.634*
		(-1.93)	(-3.67)	(-1.76)
Ar		0.002	0.017*	0.137
		(1.55)	(3.31)	(1.32)
Growth		0.062***	-0.069	6.314***
		(6.98)	(-1.56)	(7.12)
Constant	0.073***	0.077*	-4.309***	11.062**
	(19.39)	(1.68)	(-18.92)	(2.23)
Fixed Effects	Yes	Yes	Yes	Yes
Observations	176	176	176	176
R^2	0.069	0.579	0.919	0.586

Notes: Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

4.4 Mechanism Analysis

Column 3 of Table 3 tests the transmission mechanism and demonstrates that Cus significantly boosts financing frictions ($\beta_1 = 0.260$, $p < 0.01$), verifying H2. In the fully specified mediation model (Column 4), Fin exhibits a negative association with firm performance ($\gamma_2 = -0.018$, $p < 0.1$), while the direct dampening impact of Cus diminishes yet remains significant ($\gamma_1 = -0.114$, $p < 0.01$). This confirms that financing constraints act as a potent partial mediating mechanism, supporting H3.

4.5 Robustness Tests

We re-run regressions using ROA_1 as an alternative proxy for operating performance. Table 4 shows that the negative effect of customer concentration on listed pharmaceutical firms' financial performance remains significant when using ROA_1 as an alternative proxy, confirming the robustness of the results.

Table 4. Robustness Tests

	Replacing the explained variable		
Variable	ROA_1	ROA_1	ROA_1
Cus	-0.001***	-0.001***	-0.002***
	(-3.93)	(-4.48)	(-3.69)
C		-0.006**	
		(-2.13)	
Cash			-0.055
			(-1.26)
Cash×Cus			0.005*
			(1.95)
Size	0.003	0.002	0.003
	(1.45)	(0.99)	(1.53)
Age	-0.005**	-0.003	-0.005**
	(-2.08)	(-1.29)	(-2.38)
TOP1	0.047***	0.057***	0.049***
	(3.78)	(4.33)	(3.97)
Intangible	-0.527***	-0.566***	-0.533***
	(-3.50)	(-3.77)	(-3.56)
Indep	0.066	0.063	0.073*
	(1.59)	(1.55)	(1.76)
Lev	-0.164***	-0.165***	-0.164***
	(-6.91)	(-7.02)	(-6.70)
CR	-1.460*	-1.289	-1.527*
	(-1.81)	(-1.61)	(-1.90)
Ar	0.001	0.001	0.001
	(1.01)	(0.73)	(0.94)
Growth	0.048***	0.049***	0.043***
	(5.71)	(5.90)	(4.71)
Constant	0.076*	0.115**	0.082*
	(1.75)	(2.46)	(1.87)
Fixed Effects	Yes	Yes	Yes
Observations	176	176	176
R^2	0.562	0.574	0.573

Notes: Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

5 Limitations of the Study

This study has several limitations that point to directions for future research. First, potential endogeneity was not fully addressed. Although customer concentration was found to affect financial performance, reverse causality may exist, reverse causality, as high-performing pharmaceutical firms might naturally attract or select key customers. Future studies should employ robust endogeneity controls, such as instrumental variables or lagged explanatory models. Second, the selection of control

variables was not exhaustive. Key firm- and industry-level factors—most notably government subsidies and the intensity of market competition—were omitted, which could potentially bias the estimated effects. Incorporating a broader spectrum of context-specific control variables will help improve model specification.

6 Conclusions and Policy Recommendations

Using panel data from Chinese A-share listed pharmaceutical firms during 2016–2023, this study examines the impact of customer concentration on financial performance and its underlying mechanism. The results show that customer concentration significantly reduces firm performance, and financing constraints serve as a partial mediating channel. These findings suggest that pharmaceutical firms should reduce excessive dependence on major customers, diversify customer portfolios, and strengthen financing capabilities. Meanwhile, firms should improve information transparency and optimize supply chain relationships to mitigate the risks associated with customer concentration and achieve sustainable development.

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