Does Supplier-base Concentration Influence Corporate Investment Efficiency?

Binfa Wang[a], Rui Ge[b]*

Shenzhen Audencia Financial Technology Institute, Shenzhen University, Shenzhen, China

[a] wlh981031@163.com, [b,*] rui.ge@audencia.com

Abstract. Although suppliers are important stakeholders of firms and intensively interact with the firms, there is limited research on whether and how suppliers influence their customers' investments. To fill the void in the literature, we examine the relation between supplier-base concentration and corporate investment efficiency. Analyzing a comprehensive sample of Chinese listed firms, we find that when a firm's supplier-base is more concentrated, its investment efficiency is generally lower. The results hold when we control for various factors that can influence corporate investment efficiency. Furthermore, we show that firms under-invest more when their supplier-base is more concentrated. However, we find no evidence that supplier-base concentration is significantly associated with firms' over-investments. Overall, our findings suggest that supplier-base concentration impairs firms' investment efficiency, which manifests in under-investments.

Keywords: Supplier-base Concentration; Investment Efficiency; Under-investments; Over-investments.

1. Introduction

China aims at transforming the economy development from high-speed growth to high-quality growth. Efficient investments play a critical role in growth quality of the economy. At micro-economy level, investment efficiency deeply influences firm values and profitability. Therefore, it is important to understand the factors affecting firms' investment efficiency.

In a frictionless capital market, a firm invests at the optimal level to maximize the firm value[1]. However, there are also factors distorting firms' investment decisions, which results in inefficiency investments[2, 3]. Recent studies examine how stakeholders in the supply chain affects the firm's investment efficiency. Specifically, several studies find that financial information disclosed by customers firms can facilitate their suppliers' prediction of the customers' demand and thus benefit their investment decisions [4, 5, 6]. These studies show that when the disclosure quality of customer firms' earnings and risks is higher, their suppliers' investments are more efficient. While prior studies show that firms' customers can influence firms' investment efficiency, the existing literature largely ignore the potential impact of their suppliers. The gap is surprising because suppliers are as important as customers in the supply chain of a firm. Therefore, suppliers may also affect the investment decisions of the firm. To address the gap in the literature, we investigate whether supplier-base concentration influences firms' investment efficiency.

Leveraging supplier information disclosed by Chinese listed firms, we find strong evidence that concentrated supplier-base impedes corporate investment efficiency. In addition, we find the negative effect of supplier-base concentration on firms' investment efficiency is mainly driven by under-investments but not over-investments. This study can enrich our understanding on the economic factors influencing firms' investment efficiency. In addition, it has implications for firms aiming at improving their investment efficiency.

2. Method

2.1 Hypothesis development

Concentrated supplier-base can have two opposite effects on firms' investment efficiency. On the one hand, concentrated supplier-base can impair firms' investment efficiency for two reasons. First, concentrated supplier-base can lead to excessive cash holding and thus firms may not have adequate financial resources to invest in profitable projects. Specifically, when a firm's supplier-base is highly concentrated, the firm relies heavily on its major suppliers. Once a major supplier goes bankrupt or reduce/stop its supply, the firm is difficult to find an alternative supplier to replace the supplier in a timely manner. Consequently, the firm can suffer poorer performance and high financial distress risk. Considering the high risk, the firm may have an incentive to hold more cash, which prevents it from investing in profitable projects. Second, when a firm's supplier-base is more concentrated, its major suppliers can have more bargaining power over the firm. Consequently, the suppliers may raise product prices and reduce product quality, which impairs the firm's profitability and operating cash flow[7]. Because a firm's operating cash flow is an important source of fund for its investments [8], when the firm's operating cash flow decreases, the firm has to abandon profitable projects.

On the other hand, concentrated supplier-base may benefit corporate investment efficiency. Due to agency conflicts between shareholders and managers, managers have incentives to over-invest in order to obtain financial and/or non-financial benefits for themselves [9]. However, over-investments impair shareholders' interests because they harm the firms' performance and increase their bankruptcy risk. If a firm goes bankrupt, the relationship-specific investments made by its major suppliers have little value[10]. Consequently, the major suppliers have incentives to prevent their customer firm from engaging in over-investments in order to reduce its bankruptcy risk. When a firm's supplier-base is more concentrated, its major suppliers have greater bargaining powerand thus can be more able to constrain its overinvestments[11].

As these arguments lead to opposite predictions, we provide two competing hypotheses:

H1a：When a firm's supplier-base is more concentrated, its investment efficiency is lower.

H1b：When a firm's supplier-base is more concentrated, its investment efficiency is higher.

2.2 Sample selection

Our sample consists of firms listed in Chinese stock markets and the sample period is from 2007 to 2020. Our sample period starts from 2007 because it is the first year when the new accounting standards are implemented. We obtain the financial data from CSMAR database. We exclude the firms in the financial industry and the observations without necessary data. Our final sample consists of 10,633 firm-year observations. We winsorize all continuous variables at the upper and lower 1% percentile to address the potential outlier problem.

2.3 Variable definition

We follow Richardson[8]to measure investment efficiency. Specifically, we regress the corporate investments on economic determinants of the investments with the following model.

$$Inv_{t+1} = \beta_0 + \beta_1\, Growth_t + \beta_2\, Lev_t + \beta_3\, Cash_t + \beta_4\, Size_t + \beta_5\, Ret_t + \beta_6\, Inv_t + \beta_7\, Age_t + \sum Year + \sum Industry + \varepsilon_t \tag{1}$$

where Inv_{t+1} is the capital investment in year t+1, and Inv_t is the capital investment in year t. Specifically, they are calculated as the value of cash paid to acquire fixed assets, intangible assets and other long-term assets minus cash received from the disposal of fixed assets, intangible assets and other long-term assets, which is divided by total assets at the beginning of the year. $Growth_t$ is the growth rate of operating income from year t-1 to year t. Lev_t is total liabilities in year t divided by total assets in year t. $Cash_t$ is cash holdings in year t, and it is calculated as the sum of cash and

trading financial assets divided by total assets. $Size_t$ is firm size in year t, which is calculated as the natural logarithm of the total assets of the firm at the end of year t. Ret_t is the stock return rate in year t. Age_t is the firm age in year t, which is measured as the natural logarithm of the number of the years that firm has gone public. In addition, year dummy variables (*Year*) and industry dummy variables (*Industry*) are included to control for the year and industry fixed effects.

Then we measure investment efficiency (*Ineff_Inv*) with the absolute values of the residual terms of the above regression. A greater value of *Ineff_Inv* indicates less efficient investments. We also divide the residual terms into two groups based on their signs to measure over-investment (*Over_Inv*) and under-investments (*Under_Inv*). Over-investments (*Over_Inv*) are measured with the positive residual terms and under-investments (*Under_Inv*) are measured with the negative residual terms multiplied by -1.

We use two alternative measures of supplier-base concentration. The first measure (*SC1*) is calculated as the proportion of the purchases from all the top five suppliers in the total purchases of the year. To further control for industry heterogeneity, we construct the second measure of supplier-base concentration (*SC2*), which equals one if *SC1* of the firm is greater than the sample median in the same industry, and zero otherwise.

To examine the effect of supplier-base concentration on firms' investment efficiency, we regress *Ineff_Inv* on *SC1* or *SC2*. Following Biddle et al.[3], we control for various variables influencing investment efficiency. The variables in this regression are defined in Table 1.

Table 1. Definition of variables

Variable	Description
Ineff_Inv	The absolute value of the residual in model (1).
Over_Inv	The value of the residual in model (1) when the residual positive. A greater value of this variable indicates more over-investments.
Under_Inv	The absolute value of the residual in model (1) when the residual is negative. A greater value of this variable indicates more under-investments.
SC1	The sum of the firm's purchases from its top five suppliers divided by its total purchases.
SC2	A dummy variable, which equals one if SC1 of the firm is greater than the sample median in the same industry, and zero otherwise.
CFO	Operating cash flow/total equity.
ROA	Net income/total assets.
Expt	Administrative expenses/total assets.
AT	Operating income/total assets.
Size	Natural logarithm of total assets.
Lev	Total liabilities/total assets.
CR	The sum of the ownership of the top five shareholders excluding the ownership of the largest shareholder/the ownership of the largest shareholder.
Indepratio	The number of independent directors/the number of board members.
Salary	Natural logarithm of the total compensation of the executives.
Mshare	The ownership of the executives.
Block	The ownership of the institutional investors.
Boardsize	The number of board members.
Tang	Fixed assets/total assets.
Slack	Cash and cash equivalents/fixed assets.
CC	The firm's sales to its top five customers divided by its total sales.
BM	Book value of equity/market value of equity.
Share10	The ownership of the top ten shareholders.
Dual	A dummy variable that equals one if the chairman and the CEO are the same person, and zero otherwise.
State	A dummy variable that equals one if the firm is state-owned, and zero otherwise.
Dividend	A dummy variable that equals one if the firm pays cash dividends in the year, and

	zero otherwise.
Loss	A dummy variable that equals one if the net income of the firm is negative, and zero otherwise.

2.4 Regression model

To test our hypotheses, we construct the following model with all the variables defined in Table 1:

$$\text{Ineff\_Inv}_{t+1}=\beta_0+\beta_1 SC1_t+\beta_2 CFO_t+\beta_3 ROA_t+\beta_4 Expt_t+\beta_5 AT_t+\beta_6 Size_t+\beta_7 Lev_t+\beta_8 State_t+\beta_9 CR_t+\beta_{10}Indepratio_t+\beta_{11}Salary_t+\beta_{12}Mshare_t+\beta_{13}Block_t+\beta_{14}Boardsize_t+\beta_{15}Tang_t+\beta_{16}Slack_t+\beta_{17}CC_t+\beta_{18}BM_t+\beta_{19}Share10_t+\beta_{20}Dual_t+\beta_{21}Dividend_t+\beta_{22}Loss_t+\sum Year+\sum Industry+\varepsilon_t \qquad (2)$$

Then, we classify investment efficiency into under-investments and over-investments to examine the effects of supplier-base concentration on under-investments and over-investments separately. In order to improve identification, we lag the independent variables by one year.

3. Empirical results

3.1 Descriptive statistics

Table 2 presents the descriptive statistics of the main variables in this study. In order to mitigate the influence of outliers, we winsorize all continuous variables at the 1% and 99% levels by year. The mean value of the variable of inefficient investment (*Ineff_Inv*) is 2.9%. The number of observations suffering under-investments is 6498, which is 61.1% of the total observations. In contrast, the number of observations involving over-investments is 4135, which is 38.9% of the total observations. The results suggest that under-investments occur more frequently than over-investments. In addition, the mean value of the variable over-investments (*Over_Inv*) is 3.8%, and the mean value of the variable of under-investments (*Under_Inv*) is 2.4%. Therefore, the average magnitude of over-investments is greater than that of under-investments.

Table 2. Descriptive statistics

Variable	Obs	Mean	Std	Median	Min	Max
Ineff_Inv	10633	0.029	0.035	0.019	0.000	0.302
Under_Inv	6498	0.024	0.023	0.018	0.000	0.253
Over_Inv	4135	0.038	0.046	0.021	0.000	0.302
SC1	10633	0.334	0.199	0.289	0.000	1.000
CFO	10633	0.504	1.269	0.349	-16.340	47.030
ROA	10633	0.039	0.076	0.038	-1.648	0.786
Expt	10633	0.086	0.152	0.069	-0.006	13.540
AT	10633	0.690	0.587	0.563	0.005	11.350
Size	10633	22.210	1.310	22.010	17.760	28.260
Lev	10633	0.432	0.204	0.426	0.008	1.957
CR	10633	0.690	0.597	0.519	0.005	3.914
Indepratio	10633	37.200	0.054	33.330	0.000	80.000
Salary	10633	14.860	0.872	14.850	10.470	18.420
Mshare	10633	12.370	0.192	0.327	0.000	89.180
Block	10633	45.010	0.244	47.400	0.000	101.100
Boardsize	10633	8.699	1.677	9.000	3.000	18.000
Tang	10633	0.217	0.155	0.188	0.000	0.876
Slack	10633	4.300	0.234	0.877	0.003	942.200
CC	10633	28.750	0.209	23.070	0.010	100.000
BM	10633	0.340	0.160	0.317	-0.353	1.064
Share10	10633	58.090	0.154	59.040	12.320	101.000

Dual	10633	0.262	0.439	0.000	0.000	1.000
State	10633	0.374	0.484	0.000	0.000	1.000
Dividend	10633	0.754	0.431	1.000	0.000	1.000
Loss	10633	0.088	0.283	0.000	0.000	1.000

3.2 Results of the regression analysis

Table 3 reports the regression results of model (2). Columns (1) and (2) presents the results of the analysis on the effect of supplier-base concentration on investment efficiency. The coefficients on *SC1* and *SC2* are both significantly positive at the 1% level, indicating that when supplier-bases are more concentrated, corporate investments are less efficient.

Columns (3) and (4) of Table 3 reports the results of the tests on the impact of supplier-base concentration on under-investments. Both coefficients on *SC1* and *SC2* are significantly positive, which suggest that more concentrated supplier-bases lead to more under-investments. Columns (5) and (6) presents the results of the analysis on the relation between supplier-base concentration and over-investments. Interestingly, neither of the coefficients on *SC1* and *SC2* is statistically significant. Therefore, we find no evidence that supplier-base concentration influences overinvestments.

Table 3. Supplier concentration and investment efficiency

	Ineff_Inv t+1		Under_Inv t+1		Over_Inv t+1	
	(1)	(2)	(3)	(4)	(5)	(6)
SC1 t	0.007***		0.007***		0.006	
	(4.20)		(4.72)		(1.57)	
SC2 t		0.002***		0.003***		0.001
		(3.58)		(5.03)		(0.80)
CFO t	0.001	0.001	-0.000	-0.000	0.002*	0.002*
	(1.29)	(1.29)	(-1.08)	(-1.04)	(1.87)	(1.86)
ROA t	0.043***	0.043***	0.028***	0.028***	0.041**	0.040**
	(5.02)	(5.00)	(3.65)	(3.67)	(2.16)	(2.14)
Expt t	-0.011	-0.011	-0.002	-0.002	-0.028*	-0.030*
	(-1.53)	(-1.63)	(-0.35)	(-0.34)	(-1.77)	(-1.90)
AT t	-0.006***	-0.006***	-0.005***	-0.005***	-0.011***	-0.011***
	(-7.14)	(-7.04)	(-6.42)	(-6.23)	(-5.57)	(-5.59)
Size t	-0.003***	-0.003***	-0.001***	-0.001***	-0.005***	-0.005***
	(-6.32)	(-6.47)	(-3.35)	(-3.41)	(-5.82)	(-5.97)
Lev t	0.001	0.001	0.002	0.002	-0.003	-0.003
	(0.51)	(0.44)	(0.88)	(0.91)	(-0.41)	(-0.51)
CR t	0.000	0.000	0.001	0.001	-0.000	-0.000
	(0.73)	(0.73)	(1.26)	(1.23)	(-0.09)	(-0.05)
Indepratio t	0.008	0.008	-0.001	-0.001	0.018	0.018
	(1.15)	(1.19)	(-0.19)	(-0.10)	(1.26)	(1.27)
Salary t	0.001	0.001	-0.000	-0.000	0.001	0.001
	(1.22)	(1.15)	(-0.59)	(-0.67)	(1.12)	(1.08)
Mshare t	0.011***	0.011***	0.006*	0.006*	0.012	0.012
	(3.23)	(3.17)	(1.91)	(1.85)	(1.56)	(1.53)
Block t	0.009***	0.009***	0.003	0.003	0.012*	0.012*
	(2.92)	(2.89)	(0.96)	(0.89)	(1.73)	(1.73)
Boardsize t	0.000	0.000	0.000	0.000	0.000	0.000
	(0.80)	(0.80)	(0.19)	(0.25)	(0.75)	(0.74)
Tang t	0.022***	0.022***	0.006**	0.006**	0.033***	0.033***
	(8.01)	(7.99)	(2.54)	(2.47)	(5.61)	(5.62)
Slack t	-0.008*	-0.007*	-0.003	-0.003	-0.012	-0.012
	(-1.89)	(-1.75)	(-0.87)	(-0.74)	(-1.22)	(-1.17)

CC t	0.007***	0.008***	0.005***	0.005***	0.011***	0.012***
	(4.33)	(4.69)	(3.11)	(3.32)	(3.09)	(3.33)
BM t	-0.008***	-0.008***	0.003	0.003	-0.028***	-0.028***
	(-2.59)	(-2.61)	(1.14)	(1.17)	(-4.29)	(-4.32)
Share10 t	0.003	0.003	0.009***	0.009***	0.003	0.003
	(0.75)	(0.75)	(2.75)	(2.77)	(0.34)	(0.34)
Dual t	0.003***	0.003***	0.002**	0.002**	0.003**	0.003**
	(3.86)	(3.84)	(2.52)	(2.50)	(2.27)	(2.28)
State t	-0.004***	-0.004***	-0.003***	-0.003***	-0.004**	-0.004**
	(-4.85)	(-4.90)	(-3.90)	(-3.92)	(-2.32)	(-2.31)
Dividend t	0.000	0.000	0.000	0.000	-0.000	-0.000
	(0.08)	(0.06)	(0.12)	(0.11)	(-0.05)	(-0.08)
Loss t	0.002	0.002	0.004***	0.004***	-0.002	-0.002
	(1.55)	(1.58)	(3.73)	(3.67)	(-0.28)	(-0.27)
Year	control	control	control	control	control	control
Ind	control	control	control	control	control	control
Constant	0.074***	0.077***	0.055***	0.056***	0.134***	0.139***
	(7.52)	(7.85)	(6.19)	(6.34)	(6.41)	(6.70)
Observations	10,633	10,633	6,593	6,593	4,040	4,040
Adjusted R2	0.114	0.113	0.136	0.137	0.121	0.121

***, **, and * indicate two-tailed significance at 1%, 5%, and 10% significance levels, respectively.

4. Conclusion

While suppliers are important stakeholders of firms and interact frequently with them, prior studies provide limited insights on whether and how suppliers influence corporate financial decisions. To address the research gap, we analyze the effect of supplier-base concentration on corporate investment efficiency. We find that firms with greater supplier-base concentration exhibit lower investment efficiency. In addition, concentrated supplier-bases mainly aggravate under-investments but have limited impact on over-investments.

This study advances both the literature on corporate investments and that on the role of stakeholders in corporate financial decisions. The findings of this study also have practice implications. Given the importance of efficient investments for firm value and growth, it is important to understand the factors influencing investment efficiency. Our findings suggest that firms suffering inefficient investments particularly those suffering under-investments should pay more attention to their supplier-bases.

5. Acknowledgement

References

[1] Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. The American Economic Review, 48(3), 261-297.

[2] Biddle, G. C., Hilary, G., & Verdi, R. S. (2009). How does financial reporting quality relate to investment efficiency?. Journal of Accounting and Economics, 48(2-3), 112-131.

[3] Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 3(4), 305-360.

[4] Chen, C., Kim, J. B., Wei, M., & Zhang, H. (2019). Linguistic information quality in customers' forward‐looking disclosures and suppliers' investment decisions. Contemporary Accounting Research, 36(3), 1751-1783.

[5] Chiu, T. T., Kim, J. B., & Wang, Z. (2019). Customers' risk factor disclosures and suppliers' investment efficiency. Contemporary Accounting Research, 36(2), 773-804.

[6] Chiu, P. C., Jiu, L., & Yu, P. H. (2022). How do suppliers benefit from customers' voluntary disclosure? the effect of customers' earnings guidance on upstream firms' investment efficiency. Journal of Accounting and Public Policy, 41(1), 106880.

[7] Porter, M. E. (1989). How competitive forces shape strategy (pp. 133-143). Macmillan Education U

[8] Richardson, S. (2006). Over-investment of free cash flow. Review of Accounting Studies, 11, 159-189.

[9] Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. The American Economic Review, 76(2), 323-329.

[10] Raman, K., & Shahrur, H. (2008). Relationship-specific investments and earnings management: Evidence on corporate suppliers and customers. The Accounting Review, 83(4), 1041-1081.

[11] Hui, K. W., Klasa, S., & Yeung, P. E. (2012). Corporate suppliers and customers and accounting conservatism. Journal of Accounting and Economics, 53(1-2), 115-135.