

Research on the Relationship Between Big Customer Dependence and Capital Allocation Efficiency

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Abstract. This paper explores the relationship between big customer dependence and capital allocation efficiency by taking the data of China's A-share listed companies from 2008 to 2020 as samples. The increasing dependence on big customers leads to lower the efficiency of capital allocation, which is manifested by an increased probability of underinvestment. Further research shows that heavy reliance on customers only has a significant adverse effect on the capital allocation efficiency of non-soes; Moreover, the impact of big customer dependence on capital allocation efficiency is not related to the investment opportunities, but to the business risk. The higher the business risk, the more significant the influence is. This paper enriches the literature on big customer dependence and firm capital allocation efficiency at the theoretical level. In addition, based on the research conclusions, this paper makes relevant suggestions for stakeholders and policy makers, and provides relevant enlightenment for systematically understanding the impact of big customer dependence on corporate capital allocation efficiency, which has practical significance.

Keywords: Big customer dependence, Customer concentration, Enterprise capital allocation efficiency.

1. Introduction

Under the background of increasingly fierce market competition, the big customer resource, as the core competitiveness of an enterprise, can affect the business activities of the enterprise to a great extent. Relying on the support of big customers, enterprises will bind themselves to big customers, and can enjoy the economic benefits brought by the synergy of supply chains, so as to achieve rapid development. But on the other hand, the turmoil of major customers can also bring huge negative effects on supplier enterprises (Tian Tileng, 2023). For example, in 2023, a rumor that Apple asked suppliers to reduce production made a "Apple chain" company's stock price fluctuate sharply, and its stock price fluctuated because the market was worried that the reduction in demand from big customers would lead to a decline in the company's performance. And in the global smart phone market continues to downturn stage, with Apple as a major customer of the "fruit chain" business performance will be heavy and sustained blow. Therefore, big customers can affect the market performance of enterprises and their business activities in all aspects. While enjoying the stable sales performance brought by big customer, enterprises have to bear the operating risks caused by excessive dependence on big customer. If big customer fall into debt crisis, the accounts receivable turnover rate of supplier enterprises will inevitably be affected, which will lead to a sharp deterioration of their assets and liabilities.

For enterprises, the efficiency of capital allocation is also a big factor of competitiveness, which is related to the survival and development of enterprises. The higher the efficiency of capital allocation, the stronger the profitability and competitiveness of the enterprise. The improvement of capital allocation efficiency requires enterprises to carry out fine management in production, sales, investment and other aspects, and at the same time to control the dependence of big customers. Dependence on big customers will make the production and sales of enterprises over-rely on a few big customers. Once the operation risk of big customers occurs, the business performance of enterprises will be affected, which may lead to the decline of capital allocation efficiency. At present, the academic community generally pays attention to various factors affecting the capital allocation

efficiency of enterprises. The existing literature mainly studies the external and internal aspects of enterprises, including the external factors such as regional economic development level and regional infrastructure level, and the internal factors such as the characteristics of senior executives and the quality of accounting information, and rarely discusses how the dependence of major customers affects the capital allocation efficiency of enterprises from the perspective of supply chain.

On the basis of the above analysis, it can be seen that the influence mechanism of major customer dependence on the capital allocation efficiency of enterprises is related to the core competitiveness of enterprises. Therefore, on the basis of the data of the top five major customers disclosed by China's A-share listed companies, this paper attempts to study the relationship between major customer dependence and the capital allocation efficiency of enterprises, and conducts further research based on the nature of property rights and investment opportunities.

The research of this paper has both theoretical and practical significance. Theoretically, this paper takes the data of all A-share listed companies in China from 2008 to 2020 as A sample to study the relationship between big customer dependence and capital allocation efficiency of enterprises, enriching the literature on big customer dependence and capital allocation efficiency of enterprises. Existing literature mainly discusses big customer dependence and accounting rate of return (Panos et al., 2012), corporate financial performance (Chen Zhenglin and Wang Yu, 2014), cost of equity capital (Chen Jun et al., 2015), earnings management (Kartik Raman et al., 2008) and other related issues. However, from the perspective of supply chain, there are few studies on the influence of big customer dependence on the efficiency of capital allocation. However, in the research literature on the efficiency of capital allocation of enterprises, most studies are conducted from the perspectives of characteristics of senior executives (Dai Yunhao and Kong Dongmin, 2017), quality of accounting information (McNichol and Stubben, 2008), and corporate governance (Li Yunhe et al., 2011), and less consider the influence of dependence on major customers. This paper supplements the research on the influence of big customer dependence and the influencing factors of capital allocation efficiency of enterprises, and helps to clarify the influence relationship between big customer dependence and capital allocation efficiency of enterprises. From a practical point of view, China's listed companies generally have the problem of under-investment. This paper reveals the research conclusion that dependence on big customer mainly leads to under-investment of enterprises and thus reduces the efficiency of capital allocation, which is helpful for investors and operators to understand the risks brought by dependence on big customer from the perspective of long-term development of enterprises, and brings certain reference significance for the operation of enterprises. At the same time, the conclusions of this paper provide a reminder to relevant policy making departments, suggesting that they should pay close attention to the positive and negative impacts of dependence on major customers on the capital allocation efficiency of enterprises, so that when formulating relevant policies, they can take into account how to guide supplier enterprises that rely on major customers to pay attention to their own long-term development, so that enterprises can maintain vitality and improve investment efficiency.

The rest of this paper is arranged as follows: The second part is a literature review and puts forward the research hypothesis of this paper; The third part is the research design; The fourth part is empirical analysis; The last part is conclusion and suggestion.

2. Literature review and research hypothesis

2.1. Research on the consequences of big customer dependence

Big customer dependence refers to the phenomenon that supplier enterprises depend on big customers. The China Securities Regulatory Commission requires listed companies to disclose the proportion of their top five customers' sales to total annual sales in an aggregated and disaggregated manner. Therefore, the big customers referred to in this study refer to the top five customers. If the enterprise's sales channels are concentrated in the hands of a few big customers, it will form a

dependence on big customers. Previous literature studies show that the dependence on big customers can not only improve the level of enterprise operation, but also lead to some risks.

On the one hand, big customer dependence is conducive to improving the level of enterprise operation. The traditional customer relationship believes that "relational resources" and stable supply and marketing network can promote the collaborative design and research and development of products, and combine the "value enhancement effect" in the supply chain, which helps the supplier enterprises to reduce costs, improve financial flexibility and operational efficiency, and thus create greater profit space (Tian Gengyun, 2023). Patatoukas (2012) research shows that there is a positive correlation between big customer dependence and accounting rate of return, and suppliers with concentrated customer base will improve efficiency, which is contrary to the traditional view that concentrated customer base impedes supplier company performance. According to the research of Chen Zhenglin and Wang Yu (2014), supply chain integration can reduce operating costs and improve asset utilization efficiency, and profit distribution activities in the supply chain can promote the improvement of corporate financial performance. Chen Jun et al. (2015) found a significant negative correlation between customer concentration and cost of equity capital. This shows that the existence of big customers is conducive to promoting supply chain integration, improving enterprise operation level, reducing enterprise risks, and sending positive signals to the market, thus reducing the cost of equity capital of enterprises. Irvine et al. (2016) showed that in the early stage of the relationship, big customer dependence and profitability were significantly negatively correlated, but with the maturity of the relationship, the relationship became positively correlated, and the market's response to the increase in the degree of big customer dependence was similar to the results of Patatoukas's (2012) paper. Korcan et al. (2016) found that manufacturers with a more concentrated customer base hold less inventory, for a shorter period of time, and are less likely to end up with an inventory glut, as shown by the lower likelihood and magnitude of inventory writedowns and reversals.

On the other hand, too much dependence on big customers may also cause enterprises to face some risks. Chen Zhenglin (2016) found that over-dependence on big customers would weaken the bargaining power of enterprises, thus increasing the possibility of risks faced by companies. In the face of big customers, companies will make concessions in terms of sales price and receivables recovery credit, and big customers are subject to strong market control, adjust the size of orders, unilaterally change suppliers, and so on, it is easy to transfer operational risks to the company. In unexpected circumstances, the contractual relationship between the major customer and the enterprise suddenly ends, then the enterprise will lose the guarantee of sales income and have to face the rise of equity capital cost and debt cost. In the short term, the stock price will fluctuate abnormally, and there is a great possibility of capital chain break. Raman et al. (2008) believe that enterprises with a higher degree of dependence on big customers have stronger motivation to implement earnings management, which may lead to short-sighted behavior of enterprise management. Paying more attention to short-term benefits will affect the long-term development of enterprises. By shaping the financial report through earnings management, the management may lose the correct judgment of the company's operating status, thus increasing the risk of the company's operating activities. Meng Qingxi et al. (2018) found that dependence on big customers would affect their business independence. The higher the degree of dependence on big customers, the more serious the limitation of technological innovation. Because when the degree of dependence on big customers increases, the more serious the financing constraints of enterprises, the business risk will also rise.

To sum up, scholars have conducted in-depth research on big customer dependence from multiple perspectives, and found that big customer dependence can bring positive and negative impacts on enterprise development. As an important resource of enterprises, big customers can guarantee the sales channels of enterprises, help enterprises achieve big-scale production and reduce costs, so that they can better control the inventory flow and capital. However, over-reliance on big customers will damage the independence of the enterprise and make it face a series of business risks.

2.2. Research on the factors affecting the efficiency of capital allocation in enterprises

Capital allocation efficiency refers to the efficiency of allocating scarce capital to the sector with the highest marginal efficiency (Shao Jun and Liu Zhiyuan, 2011). Capital allocation efficiency can be divided into macro and micro levels, and this paper studies it from the micro level. The efficiency of capital allocation is an important index of the capital operation of the company, which is affected by many factors, including the macro external environment factors and the internal factors.

Some scholars analyze the factors affecting the efficiency of capital allocation from the perspective of macro external environment. It mainly includes factors such as business environment, economic policy uncertainty, regional economic development level, regional infrastructure level, local fiscal decentralization, and the degree of stock market openness. Liu Juan et al. (2022) found that improving the quality of the business environment is conducive to improving the investment efficiency of enterprises, thus improving the capital allocation efficiency of enterprises, while reducing the pressure in the investment load and improving the support and adjustment force in the investment load will make the improvement effect more obvious. Shi Huajun et al. (2021) found that economic policy uncertainty would generally improve the efficiency of capital allocation. Zhang Guofu and Wang Qingshi (2010) found that the improvement of regional economic development level, infrastructure, human capital and opening level can significantly improve the efficiency of capital allocation, while the increase of the proportion of state-owned bank credit funds in GDP will reduce the efficiency of capital allocation. Chen Gong and Chen Mingli (2016) found that, on the whole, the degree of fiscal decentralization in the location of listed companies will have a positive impact on the efficiency of capital allocation of enterprises, and the impact is more significant in local state-owned enterprises. Chen Yunsen and Huang Jianqiao (2019) believe that the higher the degree of stock market opening, the more conducive it is to improve the investment efficiency of the company and improve the service ability for the real economy.

Other scholars study the factors that affect the efficiency of capital allocation from inside enterprises. It mainly includes the characteristics of senior executives, the quality of accounting information, the situation of corporate governance, and the degree of financial mismatch. Dai Yunhao and Kong Dongmin (2017) found that company executives with "overseas returnees" tend to reduce excessive investment so as to improve the company's investment efficiency. McNichol and Stubben (2008) found that during the period of misstatement of accounting information, enterprises would significantly over-invest, while after the period of misstatement, enterprises would no longer over-invest. It can be seen that earnings management will have a great impact on the investment decision-making behavior of the company, and then affect the efficiency of the company's capital allocation. However, the quality of accounting information of small and medium-sized enterprises in China is generally low, which brings some negative effects on the efficiency of capital allocation. Li Qingyuan (2009) believes that high-quality accounting information can indeed improve the capital allocation efficiency of a company, and there is a significant negative relationship between "under-investment" and "over-investment". In addition, corporate governance will also have an impact on the efficiency of capital allocation. Li Yunhe et al. (2011) found that in the growth stage, the combination of chairman and general manager will inhibit over-investment, and management shareholding can effectively alleviate the company's under-investment. Cheng Xinsheng et al. (2020) found that equity incentives for management could restrain over-investment. Fang Mingyue and Zhang Yuxiao (2023) found that "zombie enterprises" that rely on bank loans to survive tend to reduce the efficiency of capital allocation through risk taking. Wang Qiqin (2022) found that the capital allocation efficiency of financial mismatched enterprises has a significant inhibitory effect, and it is more significant in enterprises with low profitability.

To sum up, domestic and foreign scholars have explored the factors affecting the efficiency of capital allocation of companies from two aspects: external macro environment and enterprises themselves. It mainly includes external macro-environmental factors such as business environment, economic policy uncertainty, regional economic development level, regional infrastructure level, local fiscal decentralization, and stock market openness. The characteristics of senior executives, the

quality of accounting information, corporate governance and the degree of financial mismatch are the internal factors of the enterprise itself.

2.3. The influence of big customer dependence on the efficiency of capital allocation

On the one hand, dependence on big customers may make investment decisions more efficient, thus making capital allocation more efficient. First, there is an obvious negative correlation between the dependence of enterprises on major customers and their shareholders' capital cost. In other words, the higher the degree of dependence on big customers, the lower the cost stickiness of enterprises. This mechanism is cooperation between enterprises. This mechanism is more significant in samples with higher demand uncertainty or more intense competition (Wang Xiongyuan and Gao Kaijuan, 2017). Due to the reduction of cost viscosity due to big customers, the managers of the company can spend more time to study the investment market, so that the efficiency of investment decisions is higher, so that the enterprise capital allocation efficiency is higher. Second, big customers can not only provide income security for enterprises, but also bring strength certification. This will lead to the bigger scale and longer term of bank loans for companies with a higher degree of dependence on major customers, which are more obvious in samples with a higher proportion of high-quality customers (Li Huan et al., 2018). This shows that major customer resources can help enterprises alleviate financing constraints, and major customers will also implement external supervision on their main suppliers, play a supervisory and governance role, and affect their corporate governance level (Hui et al., 2011), which will lead enterprises to be more inclined to prudently select investment projects, improve investment efficiency, and thus improve the efficiency of capital allocation.

On the other hand, dependence on big customers may affect the company's over-investment or under-investment behavior, and thus reduce the efficiency of capital allocation. Specifically, dependence on big customers may aggravate excessive investment behavior, deepen the degree of inefficient investment, and then reduce the efficiency of capital allocation. The increase in the proportion of big customers can help ease the financing constraints of enterprises and guarantee their business income (Li Huan et al., 2018). In the presence of stable sales channels, business management tends to engage in "empire building" activities, i.e. over-investment (Aggarwal et al., 2006). In addition, the increase of dependence on big customers may also deepen the degree of underinvestment of enterprises, thus reducing the efficiency of capital allocation of enterprises. The high degree of dependence on major customers will increase the financial pressure of enterprises, so that enterprises tend to reserve more cash, resulting in the deepening of underinvestment. Wang Junqiu and Bi Jingwei (2015) believe that enterprises with high customer dependence will increase cash holdings to resist customer risks, and the lock-in effect of customer relationship-specific investment will significantly increase the positive correlation between major customer dependence and cash holdings. The higher the cash holdings, the lower the degree of foreign investment, that is, the deeper the degree of underinvestment. In addition, with a high degree of dependence on big customers, customers have strong bargaining power with suppliers, and suppliers will face the risk of default of accounts receivable from customers, which will reduce the turnover rate of accounts receivable of enterprises and thus reduce the discretionary funds of enterprises. Richardson (2006) found that a firm's investment behavior is significantly affected by free cash flow. When the free cash flow is restricted, the activities of enterprises to make foreign investment will be inhibited, and they have to give up the projects with positive NPV, resulting in insufficient investment. Therefore, no matter the dependence of big customers leads to over-investment or under-investment, it is shown that the degree of inefficient investment of enterprises is deepened, and the efficiency of capital allocation is reduced.

To sum up, major customer dependence has two impacts on the capital allocation efficiency of enterprises, including positive and negative impacts, and the specific impact relationship needs empirical research. Therefore, this paper proposes the following two competing master hypotheses:

H1a: The stronger the dependence of major customers, the higher the degree of inefficient investment of the company, and the lower the efficiency of capital allocation of the enterprise.

H1b: The stronger the dependence of major customers, the lower the degree of inefficient investment of the company, and the higher the efficiency of capital allocation of the enterprise.

3. Research design

3.1. Sample selection and data source

In order to exclude the impact of changes in the old and new accounting systems around 2007 on the financial indicators of enterprises, this paper selects the data of all A-share listed companies from 2008 to 2020 as the research object. According to the past research habits, the data of financial industry companies, ST or *ST share enterprises, companies listed less than one year, have been delisted or suspended from listing, and data samples with missing relevant variables are excluded. Finally, all continuous variables are winsorized by 1% up and 1% down. Finally, a total of 14,688 companies of 2384 listed companies were obtained - annual observation data. All data are from the CSMAR database.

3.2. Definition of variables

3.2.1 Dependent variable

Enterprise capital allocation efficiency. Based on previous studies, investment efficiency is mostly used as an index to measure capital allocation efficiency at the firm level. Therefore, this paper will refer to Richardson's (2006) investment response model and the research experience of Xiong Jiakai et al. (2016), Xin Qingquan et al. (2007) and Wang Dan et al. (2020). The anticipated investment model (1) is used to calculate the degree of inefficient investment and measure the efficiency of capital allocation of enterprises. In other words, the higher the degree of inefficient investment, the lower the efficiency of capital allocation of enterprises.

$$Invest_t = \alpha_0 + \alpha_1 Growth_{t-1} + \alpha_2 Lev_{t-1} + \alpha_3 Cash_{t-1} + \alpha_4 Age_{t-1} + \alpha_5 Size_{t-1} + \alpha_6 Ret_{t-1} + \alpha_7 Invest_{t-1} + \sum Industry + \sum Year + \varepsilon \quad (1)$$

In model (1), $Invest_t$ represents the company's actual new investment expenditure in year t. Actual new investment expenditure = total investment - maintenance investment = [purchase and construction of fixed assets, intangible capital Cash paid for property and other long-term assets + Net cash paid for acquired subsidiaries and other operating units - Net cash recovered from disposal of fixed assets, intangible assets and other long-term assets - Net cash received from disposal of subsidiaries and other operating units - (Depreciation of fixed assets + amortization of intangible assets + amortization of long-term unamortized expenses)] / Total assets at the beginning of the year; $Growth_{t-1}$ represents the growth opportunity of the company in t-1 year, represented by Tobin Q; Lev_{t-1} represents the financial leverage ratio of the company in t-1 year, expressed by the asset-liability ratio; $Cash_{t-1}$ represents the cash flow position of t-1 year, which is equal to the net cash flow from operating activities/total assets at the beginning of the year; Age_{t-1} indicates the age of the company at t-1, minus the IPO year income from the year of observation; $Size_{t-1}$ represents the size of the company's assets in t-1 year, expressed by the natural logarithm of the total assets; Ret_{t-1} represents the stock yield of the company in year t-1, including the reinvestment of cash dividends; $Invest_{t-1}$ represents the new investment expenditure in t-1 year; $\sum Industry, \sum Year$ represent industry and year dummy variables respectively.

After excluding the financial industry and sample data with missing data, the continuous variables in model (1) are identified at 1% and 99% quartiles. We can find the estimated investment amount of each firm in year t, and then subtract the expected investment amount of each firm in year t from the actual investment amount of each firm in year t to find the remaining investment amount of each firm in year t. The residual of model (1) represents inefficient investment, and the absolute value of this residual is the degree of inefficient investment Inv .

3.2.2 Independent variable

Major customer dependence degree. To measure the degree of dependence on major customers, the selected index is the proportion of sales revenue of the top five customers in the total sales of the year, which is defined as *CC1*. In order to further eliminate the interference of industry heterogeneity, the dummy variable *CC2* is set in this paper. When *CC1* is greater than the median of listed companies in the same industry in the current year, the value of *CC2* is 1, otherwise it is 0.

3.2.3 Control variables

Many literature studies have shown that factors such as corporate governance and financial performance will significantly affect the degree of inefficient investment of enterprises (Cheng Xinsheng et al., 2012). Therefore, this paper takes the factors that may affect the degree of inefficient investment of enterprises as the control variables for reference to previous studies. With reference to the research of Wang Dan et al. (2020), this paper introduces *Expt* (management expense ratio), *AT* (total asset turnover), *Lev* (asset-liability ratio), *CR* (equity balance), *Dboard* (proportion of independent directors), *Size* (asset size) and *Mino* (minority shareholders' equity) as control variables. In addition, this paper sets industry and year dummy variables. The above variables and their descriptions are shown in Table 1.

Table 1. Variables and variable definitions

Property of variable	Variable name	Symbol	Description
Dependent variable	Degree of inefficient investment	<i>Inv</i>	Absolute value of the residual in model (1)
		<i>CC1</i>	Ratio of sales of top five customers to total annual sales
Independent variable	Major customer dependence degree	<i>CC2</i>	Virtual variable, when <i>CC1</i> is greater than the median value of listed companies in the same industry in the current year, take 1, otherwise take 0
Control variables	Overhead rate	<i>Expt</i>	Management expenses/total assets
	Turnover of total assets	<i>AT</i>	Operating income/ending total assets
	Asset-liability ratio	<i>Lev</i>	Ending total liabilities/ending total assets
	Equity balance	<i>CR</i>	Second - to fifth-bigst shareholder share/Bigst shareholder share
	Proportion of independent directors	<i>Dboard</i>	Number of independent directors/Total number of board members
	Minority interest	<i>Mino</i>	Minority equity/owner equity
	Asset size	<i>Size</i>	Natural log of ending total assets
	Annual dummy variable	<i>Year</i>	If the company is in the current year, take 1, otherwise take 0
Industry dummy variable	<i>Industry</i>	If the company is in the industry, take 1, otherwise take 0	

3.3. Model construction

In order to study the relationship between big customer dependence and capital allocation efficiency of enterprises, this paper intends to construct a multiple linear regression model (2) to test the relationship between big customer dependence and the overall inefficiency of enterprises. In order to avoid the homogeneity bias between the explained variable and the explanatory variable, this paper

selects the degree of inefficient investment of enterprises in t+1 period as the explained variable to investigate the influence of the degree of dependence of major customers in the current period on the investment behavior in the next period.

$$Inv_{t+1} = \beta_0 + \beta_1 CC1_t + \beta_2 Expt_t + \beta_3 AT_t + \beta_4 Lev_t + \beta_5 CR_t + \beta_6 Dboard_t + \beta_7 Mino_t + \beta_8 Size_t + \sum Industry + \sum Year + \varepsilon_t \quad (2)$$

Through the Hausman test, the result shows that P=0.000, so this paper selects the fixed effect model for regression analysis.

4. Empirical analysis

4.1. Descriptive statistics

This paper conducted descriptive statistics on the main variables, and the results are shown in Table 2.

Table 2. Descriptive statistical results of the main variables

Variable symbol	Sample size	Mean	Median value	Standard deviation	Minimum value	Maximum value
<i>Inv</i>	14688	0.042	0.026	0.050	0.001	0.316
<i>OverInv</i>	5876	0.026	0.022	0.020	0.001	0.053
<i>UnderInv</i>	5874	0.039	0.037	0.014	0.018	0.057
<i>CCI</i>	14688	0.286	0.234	0.197	0.037	0.737
<i>Expt</i>	14688	0.042	0.037	0.026	0.004	0.142
<i>AT</i>	14688	0.617	0.519	0.425	0.069	2.584
<i>Lev</i>	14688	0.441	0.439	0.200	0.063	0.910
<i>CR</i>	14688	0.682	0.519	0.578	0.024	2.638
<i>Dboard</i>	14688	0.378	0.364	0.064	0.350	0.600
<i>Mino</i>	14688	0.064	0.027	0.091	0.000	0.479
<i>Size</i>	14688	22.239	22.080	1.203	19.790	26.160

It can be seen from Table 2 that the average *Inv* of the sample companies is 0.042, indicating that the average degree of deviation from the optimal capital allocation efficiency of the sample companies is 4.2%, which is basically consistent with the findings of Wang Dan et al. (2020). The average level of *UnderInv* in sample companies is 3.9%, and the average level of *OverInv* is 2.6%, indicating that the situation of underinvestment in sample companies is more serious. *CCI*, a measure of the degree of dependence of big customers, has a mean value of 0.286 and a median value of 0.234, showing a thick tail distribution. In terms of control variables, the average level of overhead rate *Expt* is 0.042, the range is 0.138, and the standard deviation is 0.026, which indicates that there are big differences in the overhead rate of sample companies, but the data are relatively concentrated. The average value of total asset turnover *AT* is 0.617, the maximum value is higher than 1, and the standard deviation is 0.425, which indicates that the distribution of total asset turnover of the sample companies is relatively dispersed. The minimum value of equity balance index *CR* is 0.024, and the maximum value is 2.638, and the high and low balance ratio exist simultaneously. The average *Dboard* ratio of independent directors is 0.378, and the minimum is 0.35, which meets the statutory requirements of listed companies on the number of independent directors. The minimum *Mino* value of minority shareholders' equity is 0, indicating that there are companies with excess losses in the sample. The mean value of asset *Size* is 22.24, the maximum value is 26.16, the minimum value is 19.79, and the standard deviation is 1.203, which indicates that the selected sample covers a wide range and includes both big and small enterprises.

4.2. Correlation analysis

The result of Person correlation analysis is shown in Table 3.

Table 3. Descriptive statistical results of the main variables

	Inv_{t+1}	$CC1_t$	$CC2_t$	$Expt_t$	AT_t	Lev_t	CR_t	$Dboard_t$	$Size_t$	$Mino_t$
Inv_{t+1}	1									
$CC1_t$	0.052***	1								
$CC2_t$	0.050***	0.692***	1							
$Expt_t$	0.113***	-0.079***	-0.076***	1						
AT_t	-0.045***	-0.132***	-0.094***	0.249***	1					
Lev_t	-0.100***	-0.061***	-0.053***	-0.261***	0.126***	1				
CR_t	0.026***	0.016**	0.008	0.024***	-0.082***	-0.115***	1			
$Dboard_t$	0.022***	-0.019**	-0.012	0.032***	-0.036***	-0.044***	-0.003	1		
$Size_t$	-0.164***	-0.138***	-0.142***	-0.411***	0.020**	0.487***	-0.049***	-0.039***	1	
$Mino_t$	-0.050***	-0.033***	-0.038***	-0.090***	0.054***	0.342***	-0.072***	-0.060***	0.271***	1
VIF		1.95	1.94	1.35	1.13	1.45	1.02	1.01	1.56	1.16

Note: ***, ** and * are significant at the significance level of 1%, 5% and 10%, respectively.

As can be seen from Table 3, both $CC1$ and $CC2$ are positively correlated with the degree of inefficiency investment Inv_{t+1} at the significance level of 1%, which preliminarily verifies the hypothesis. The degree of inefficiency investment Inv_{t+1} has a relatively high significant relationship with each control variable, and the significance level is 1%, indicating that it is reasonable to include the above control variables in the regression model. The collinearity diagnosis results showed that the VIF value between the variables did not exceed 10, so there was no collinearity problem.

4.3. Regression result analysis

In this paper, Stata17 was used for regression analysis of model (2). The regression results are shown in Table 4.

Table 4. Regression result table

Variables	Inv_{t+1}	
	(1)	(2)
$CC1$	0.00960*** (4.30)	
$CC2$		0.00269*** (3.76)
$Expt$	0.07402*** (3.40)	0.07089*** (3.27)
AT	-0.00697*** (-6.15)	-0.00702*** (-6.24)
Lev	0.00021 (0.08)	0.00024 (0.10)
CR	0.00199*** (3.03)	0.00198*** (2.99)
$Dboard$	0.00518 (0.96)	0.00516 (0.96)
$Size$	-0.00386*** (-7.34)	-0.00398*** (-7.71)
$Mino$	0.00009 (0.02)	0.00029 (0.05)
Constant	0.10923*** (9.58)	0.11274*** (10.07)
Samples	14,688	14,688
Year	YES	YES
Industry	YES	YES
R^2	0.095	0.094
Adjust R^2	0.089	0.088

Note: ***, **, and * are significant at the significance level of 1%, 5%, and 10%, respectively, with t values in parentheses.

The results in Table 4 show that the regression coefficients of CCI and $CC2$, the variables of dependence degree of major customers, are both positive and significant at 1% level. This shows that

the stronger the dependence of big customers, the higher the degree of inefficient investment, and the lower the efficiency of capital allocation. Let's say H1a turns out to be correct.

In the control variables used in regression model (2), the degree of inefficient investment has a negative relationship with total asset turnover and firm size, and has a positive impact on other control variables. The regression coefficients of other control variables except asset-liability ratio, proportion of independent directors and minority shareholders' equity are all significant at the significance level of 1%.

4.4. Robustness test

Through the above analysis, it is found that the increase in the degree of dependence on major customers will lead to the increase in the degree of inefficient investment, which will reduce the efficiency of capital allocation. On this basis, this paper will pass a series of robustness tests to ensure the accuracy of the regression results.

4.4.1 The influence of big customer dependence on the degree of inefficient investment in the current period

As mentioned above, in order to avoid the homogeneity bias, this paper selects the degree of inefficient investment of enterprises in t+1 period as the explained variable to investigate the influence of the degree of dependence of major customers in the current period on the investment behavior in the next period. In order to return the robustness of the results, we tested the relationship between the degree of dependence on major customers and the degree of inefficient investment in the current period, and the results were shown in Table 5.

Table 5. Regression result table for the degree of inefficient investment in the current period

Variables	Inv _t	
	(1)	(2)
CC1	0.01350*** (5.19)	
CC2		0.00421*** (4.87)
Expt	0.01236 (0.43)	0.00911 (0.32)
AT	-0.01226*** (-7.95)	-0.01229*** (-8.14)
Lev	0.00431 (1.23)	0.00432 (1.24)
CR	0.00436*** (5.05)	0.00435*** (4.96)
Dboard	0.00940 (1.29)	0.00943 (1.30)
Size	-0.00301*** (-4.09)	-0.00314*** (-4.37)
Mino	0.00766 (1.11)	0.00790 (1.14)
Constant	0.09363*** (5.45)	0.09738*** (5.84)
Samples	14,688	14,688
Year	YES	YES
Industry	YES	YES
R ²	0.086	0.085
Adjust R ²	0.080	0.079

Note: ***, **, and * are significant at the significance level of 1%, 5%, and 10%, respectively, with t values in parentheses.

The results in Table 5 show that after controlling relevant variables, the regression coefficients of big customer dependence degree CC1 and CC2 on inefficiency investment degree Inv_t are both

positive, and the significance level is 1%. This shows that the higher the degree of dependence on major customers, the higher the degree of inefficient investment of enterprises, and the lower the efficiency of capital allocation of enterprises, which is consistent with the original conclusion.

4.4.2 Replace Independent variable

The previous article used the proportion of sales from the top five customers to total sales to measure the degree of major customer dependence, in addition to the Herfindahl index of customer concentration and the ratio of sales from the biggest customer to total sales to measure the degree of major customer dependence. The customer concentration Herfindahl index is calculated as the sum of the square of the ratio of sales of the top five customers to total sales. Therefore, this paper replaced explanatory variables with the above two indicators, represented by CC3 and CC4 respectively, and carried them into model (2) for regression respectively. The results are shown in Table 6.

Table 6. Regression results table after replacing independent variable

Variables	Inv _{t+1}	
	(1)	(2)
CC3	0.01528** (2.50)	
CC4		0.01204*** (3.51)
Expt	0.06795*** (3.12)	0.06982*** (3.20)
AT	-0.00721*** (-6.45)	-0.00717*** (-6.40)
Lev	0.00051 (0.21)	0.00041 (0.17)
CR	0.00198*** (3.00)	0.00195*** (2.99)
Dboard	0.00502 (0.94)	0.00525 (0.98)
Size	-0.00415*** (-7.73)	-0.00407*** (-7.58)
Mino	0.00008 (0.01)	0.00017 (0.03)
Constant	0.11808*** (10.12)	0.11640*** (9.98)
Samples	14,688	14,688
Year	YES	YES
Industry	YES	YES
R ²	0.094	0.095
Adjust R ²	0.088	0.089

Note: ***, **, and * are significant at the significance level of 1%, 5%, and 10%, respectively, with t values in parentheses.

The results in Table 6 show that the regression coefficients of the replaced explanatory variables, big customer dependence degree CC3 and CC4, on the inefficiency investment degree Inv_{t+1} are both positive, and the significance levels are 5% and 1% respectively. This shows that the higher the dependence of big customers, the higher the degree of inefficient investment of enterprises, and the lower the efficiency of capital allocation of enterprises, which is consistent with the original conclusion.

4.4.3 Tobit model testing

Since the variables measuring the degree of inefficient investment are treated in absolute value in this paper, Inv_{t+1} is distributed in $(0, +\infty)$, and the Tobit model can solve the case of "fault (deleted)", so as to better reflect the distribution of the original data. Therefore, this paper further uses the Tobit model for robustness test, and the results are shown in Table 7.

Table 7. Regression results table using Tobit model

Variables	Inv_{t+1}	
	(1)	(2)
CC1	0.00960*** (4.32)	
CC2		0.00269*** (3.77)
Expt	0.07402*** (3.42)	0.07089*** (3.28)
AT	-0.00697*** (-6.17)	-0.00702*** (-6.26)
Lev	0.00021 (0.08)	0.00024 (0.10)
CR	0.00199*** (3.04)	0.00198*** (3.00)
Dboard	0.00518 (0.97)	0.00516 (0.96)
Size	-0.00386*** (-7.37)	-0.00398*** (-7.73)
Mino	0.00009 (0.02)	0.00029 (0.05)
Constant	0.10923*** (9.61)	0.11274*** (10.10)
Samples	14,688	14,688
Year	YES	YES
Industry	YES	YES
Pseudo R2	-0.028	-0.028

Note: ***, **, and * are significant at the significance level of 1%, 5%, and 10%, respectively, with t values in parentheses.

The results in column (1) and (2) of Table 7 show that the regression coefficients of big customer dependence degree CC1 and CC2 on inefficient investment degree Inv_{t+1} are both positive, and the significance level is 1%. The above results verify the regression conclusion mentioned above, that is, the higher the degree of dependence on big customers, the higher the degree of inefficient investment of enterprises, and the lower the efficiency of capital allocation of enterprises.

4.5. Further analysis

4.5.1 The impact of big customer dependence on overinvestment and underinvestment

Further, this paper divides Inv into two categories: overinvested and underinvested. However, it is easy to have systematic bias when using model (1) to measure this. This is due to a hidden assumption in Richardson's (2006) model that listed companies do not systematically invest inefficiently. Therefore, in order to overcome this problem, this paper draws on the research of Xin Qingquan et al. (2007), divides the residual error of model (1) into five groups and removes the middle group. The two groups with big residual error are represented by OverInv. The two groups with the smaller residual difference are the underinvested group and are represented by UnderInv. This article takes

absolute values of both groups for understanding. The higher the value of OverInv and UnderInv, the lower the efficiency of capital allocation.

Regression models (3) and (4) are constructed to further examine whether big customer dependence leads to overinvestment or underinvestment.

$$OverInv_{t+1} = \gamma_0 + \gamma_1 CC1_t + \gamma_2 Expt_t + \gamma_3 AT_t + \gamma_4 Lev_t + \gamma_5 CR_t + \gamma_6 Dboard_t + \gamma_7 Mino_t + \gamma_8 Size_t + \sum Industry + \sum Year + \varepsilon_t \quad (3)$$

$$UnderInv_{t+1} = \delta_0 + \delta_1 CC1_t + \delta_2 Expt_t + \delta_3 AT_t + \delta_4 Lev_t + \delta_5 CR_t + \delta_6 Dboard_t + \delta_7 Mino_t + \delta_8 Size_t + \sum Industry + \sum Year + \varepsilon_t \quad (4)$$

Models (3) and (4) were regressed, and the results were shown in Table 8.

Table 8. Regression results table for overinvestment and underinvestment

Variables	OverInv _{t+1}		UnderInv _{t+1}	
	(1)	(2)	(3)	(4)
CC1	0.00204 (1.31)		0.00282** (2.56)	
CC2		0.00043 (0.69)		0.00083** (2.31)
Expt	0.01516 (1.33)	0.01415 (1.24)	0.03139*** (2.68)	0.03044** (2.56)
AT	-0.00160** (-2.23)	-0.00163** (-2.28)	-0.00244*** (-4.65)	-0.00247*** (-4.78)
Lev	-0.00554*** (-3.26)	-0.00552*** (-3.25)	0.00420*** (4.08)	0.00421*** (4.06)
CR	0.00102* (1.81)	0.00101* (1.81)	0.00059* (1.90)	0.00059* (1.89)
Dboard	0.00308 (1.03)	0.00308 (1.02)	0.00191 (0.75)	0.00191 (0.75)
Size	-0.00116*** (-3.22)	-0.00121*** (-3.35)	-0.00154*** (-5.63)	-0.00158*** (-5.79)
Mino	-0.00216 (-0.45)	-0.00213 (-0.45)	0.00034 (0.15)	0.00039 (0.18)
Constant	0.05425*** (7.07)	0.05546*** (7.26)	0.06515*** (10.00)	0.06613*** (10.28)
Samples	5,876	5,876	5,874	5,874
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
R ²	0.089	0.089	0.107	0.107
Adjust R ²	0.075	0.074	0.093	0.092

Note: ***, **, and * are significant at the significance level of 1%, 5%, and 10%, respectively, with t values in parentheses.

In Table 8, the results of columns (1) and (2) show that the regression coefficients of CC1 and CC2 on OverInv_{t+1} are not significant, while the results of columns (3) and (4) show that the regression coefficients of CC1 and CC2 on UnderInv_{t+1} are positive. The significance level is 5%, which indicates that the higher the dependence of major customers, the higher the possibility of underinvestment, and thus the lower the efficiency of capital allocation.

4.5.2 The impact of enterprises face investment opportunities

The above analysis shows that the dependence of big customers affects the efficiency of capital allocation mainly through the behavior that leads to the underinvestment of enterprises. The reason for the lack of investment may be that enterprises face financing constraints, or enterprises lack good

investment opportunities. Li Huan et al. (2018) took the data of listed companies in China as a sample to test whether customer resources affect the lending capacity of enterprises. The study found that the acquisition of big customers means that enterprises have been recognized by the market, especially the high quality big customers can guarantee their reputation and strength certification, so it is easier to obtain bank loans, thereby easing the external financing constraints. Therefore, enterprises with a high degree of dependence on major customers do not face external financing constraints, so whether investment opportunities will affect the relationship between the degree of dependence on major customers and the efficiency of capital allocation of enterprises needs to be further tested.

On the basis of previous studies, this paper uses TobinQ index to measure the investment opportunities of a company, and holds that the higher the TobinQ value, the more investment opportunities the company has. If the TobinQ value of a company is higher than the median value of all listed companies in the current year, then the sample is the high investment opportunity group (TobinQ=1); If the TobinQ value of the company is lower than the median value of all listed companies in the current year, the sample is classified as a low investment opportunity group (TobinQ= 0). Table 9 shows the results of regression for the TobinQ=1 and TobinQ=0 groups.

Table 9. Grouping regression results based on firm investment opportunities

Variables	Inv _{t+1}			
	TobinQ=0 (1)	TobinQ=0 (2)	TobinQ=1 (3)	TobinQ=1 (4)
CC1	0.00567* (1.75)		0.01028*** (2.74)	
CC2		0.00141 (1.38)		0.00305*** (2.64)
Expt	-0.01496 (-0.57)	-0.01764 (-0.66)	0.06966** (2.49)	0.06676** (2.41)
AT	-0.00552*** (-5.18)	-0.00558*** (-5.23)	-0.00774*** (-4.56)	-0.00775*** (-4.50)
Lev	0.00018 (0.06)	0.00011 (0.04)	0.00664* (1.78)	0.00683* (1.85)
CR	0.00247*** (2.93)	0.00246*** (2.93)	0.00147 (1.45)	0.00147 (1.44)
Dboard	-0.01068* (-1.75)	-0.01074* (-1.76)	0.02011** (2.43)	0.02016** (2.43)
Size	-0.00182*** (-3.60)	-0.00190*** (-3.86)	-0.00359*** (-5.00)	-0.00370*** (-5.26)
Mino	0.00583 (0.93)	0.00606 (0.97)	-0.01220* (-1.70)	-0.01238* (-1.73)
Constant	0.07208*** (6.12)	0.07482*** (6.67)	0.09734*** (6.39)	0.10034*** (6.66)
Samples	7,345	7,345	7,343	7,343
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
R ²	0.068	0.068	0.130	0.129
Adjust R ²	0.056	0.056	0.119	0.118

Note: ***, **, and * are significant at the significance level of 1%, 5%, and 10%, respectively, with t values in parentheses.

The results in columns (1) and (2) of Table 9 show that in the group of low investment opportunities, the regression coefficient of CC1 on the degree of dependence on major customers and Inv_{t+1} on the degree of inefficient investment is 0.00567, which is significant at the significance level of 10%; the regression coefficient of CC2 on Inv_{t+1} is relatively significant, with a confidence level of 83%, but it is also somewhat illustrative. The results in columns (3) and (4) show that in the group

of high investment opportunities, the regression coefficients of CC1 and CC2 on Inv_{t+1} of inefficient investment degree are positive, and both are significant at 1% significance level. To sum up, whether in the group of low investment opportunities or high investment opportunities, the degree of dependence on big customers is positively correlated with the degree of inefficient investment, indicating that the dependence on big customers leads to the decline in the efficiency of capital allocation, which is unrelated to the investment opportunities faced by the company.

4.5.3 The impact of the nature of property rights

This paper argues that the influence of major customer dependence on the degree of inefficient investment is different under different property rights. First of all, compared with non-state-owned enterprises, state-owned enterprises operate with two goals, one is profit goal and the other is policy goal. This allows state-owned enterprises to have favorable political resources and policy support, and the dependence of big customers to bring them less influence. At the same time, state-owned enterprises need to assume more social responsibilities rather than just consider the company value (Luo Danglun et al., 2013). Moreover, executives of state-owned enterprises are less sensitive to the negative impact caused by inefficient investment, so the influence of big customer dependence in state-owned enterprises on the degree of inefficient investment may not be significant (Cao Yue et al., 2020). Secondly, there is no natural equity relationship between non-state-owned enterprises and the government, their interests are relatively independent, they do not enjoy special policy resources, and the dependence of big customers has a greater impact on them. In addition, the negative impact of non-state-owned enterprises' inefficient investment will have a significant impact on corporate executives, so the influence of big customer dependence on the degree of inefficient investment in non-state-owned enterprises may be significant.

Table 10. Grouping regression results based on property rights

Variables	Inv_{t+1}			
	Non state-owned (1)	(2)	state-owned (3)	(4)
CC1	0.01484*** (4.97)		0.00106 (0.34)	
CC2		0.00369*** (4.37)		0.00106 (0.91)
Expt	0.10281*** (3.93)	0.09848*** (3.78)	0.03388 (1.57)	0.03586* (1.69)
AT	-0.00650*** (-4.47)	-0.00664*** (-4.57)	-0.00571*** (-4.48)	-0.00568*** (-4.41)
Lev	0.00448 (1.17)	0.00467 (1.21)	-0.00254 (-0.70)	-0.00255 (-0.70)
CR	0.00024 (0.33)	0.00027 (0.37)	0.00232 (1.66)	0.00230 (1.65)
Dboard	0.00506 (0.71)	0.00543 (0.76)	-0.00969 (-1.12)	-0.00954 (-1.10)
Size	-0.00427*** (-5.03)	-0.00450*** (-5.30)	-0.00232*** (-4.07)	-0.00225*** (-3.99)
Mino	0.00498 (0.65)	0.00515 (0.68)	-0.00182 (-0.27)	-0.00193 (-0.28)
Constant	0.11147*** (6.21)	0.11718*** (6.48)	0.08910*** (7.12)	0.08715*** (7.08)
Samples	9,050	9,050	5,638	5,638
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
R ²	0.104	0.103	0.106	0.106
Adjust R ²	0.095	0.093	0.091	0.091

Note: ***, **, and * are significant at the significance level of 1%, 5%, and 10%, respectively, with t values in parentheses.

Therefore, in order to test whether the influence of big customer dependence on the degree of inefficient investment varies due to the different nature of corporate property rights, this paper conducts a grouping regression analysis on state-owned enterprises and non-state-owned enterprises, and the results are shown in Table 10.

The results in columns (1) and (2) of Table 10 show that in non-state-owned enterprises, the regression coefficients of big customer dependence degree CC1 and CC2 on inefficient investment degree Inv_{t+1} are both positive, and the significance level is 1%. The results in columns (3) and (4) show that the regression coefficients of big customer dependence degree CC1 and CC2 on inefficient investment degree Inv_{t+1} in state-owned enterprises are not significant. This shows that the degree of major customer dependence has different impacts on the degree of inefficient investment of enterprises with different property rights, and only in non-state-owned enterprises, there is a significant positive correlation.

4.5.4 The impact of business risk

The level of operational risk has an important impact on the capital allocation behavior of enterprises. According to the above analysis, because the big customers have strong bargaining power in the company, the higher the company's dependence on the big customers, the greater the company's operational risk. In the case of companies relying on big customers, companies with higher operational risks tend to retain more cash and adopt conservative investment strategies, thus reducing the efficiency of capital allocation. In addition, supplier enterprises with higher operating risks are more inclined to take some inefficient investment behaviors to improve customer trust. However, these behaviors will waste the resources of enterprises, increase the cost but do not bring the corresponding benefits, which will reduce the efficiency of capital allocation.

Table 11. Grouping regression results based on business risk

Variables	Inv_{t+1}			
	DSROA=0		DSROA=4	
	(1)	(2)	(3)	(4)
CC1	0.00443 (0.97)		0.01391*** (2.87)	
CC2		0.00149 (0.99)		0.00302** (2.27)
Expt	0.01638 (0.36)	0.01570 (0.34)	0.11510*** (3.43)	0.10810*** (3.18)
AT	-0.00753*** (-3.97)	-0.00756*** (-3.99)	-0.00627*** (-2.78)	-0.00650*** (-2.98)
Lev	0.00399 (0.63)	0.00414 (0.66)	0.00221 (0.44)	0.00220 (0.44)
CR	0.00171 (1.21)	0.00170 (1.21)	0.00240* (1.91)	0.00250* (1.96)
Dboard	-0.00489 (-0.46)	-0.00488 (-0.45)	0.02089* (1.98)	0.02056* (1.96)
Size	-0.00497*** (-5.58)	-0.00501*** (-5.82)	-0.00331*** (-3.66)	-0.00358*** (-4.01)
Mino	0.01337 (1.20)	0.01334 (1.19)	0.00271 (0.31)	0.00253 (0.29)
Constant	0.13294*** (7.57)	0.13406*** (7.89)	0.09362*** (5.49)	0.10181*** (6.00)
Samples	2,935	2,935	2,935	2,935
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
R ²	0.121	0.121	0.115	0.113
Adjust R ²	0.092	0.092	0.086	0.083

Note: ***, **, and * are significant at the significance level of 1%, 5%, and 10%, respectively, with t values in parentheses.

Based on this, this paper, referring to the research experience of Xiong Jiakai et al. (2016), uses the standard deviation SROA of the return on total assets from T-2 to t to measure the company's business risk, divides it into five groups after decentralization, and defines it as the category variable DSROA, with the value ranging from 0 to 4. DSROA=4 indicates high business risk. DSROA=0 indicates low operating risk. Table 11 shows two sets of regression results DSROA=4 and DSROA=0.

The results in columns (1) and (2) of Table 11 show that in the low operational risk group, the regression coefficients of big customer dependence degree CC1 and CC2 on inefficient investment degree Inv_{t+1} are not significant. The results in column (3) and (4) show that in the high operational risk group, the regression coefficients of CC1 and CC2 on Inv_{t+1} are 0.01391 and 0.00302, respectively, and are significant at the significance level of 1% and 5%. In conclusion, the positive relationship between the degree of major customer dependence and the degree of inefficient investment is significant in enterprises with high operational risk, but not significant in enterprises with low operational risk. Therefore, the impact of big customer dependence on capital allocation efficiency is more significant in enterprises with high operational risk.

5. Conclusion and suggestion

Based on previous studies, this paper adopts the literature analysis method and empirical research method, takes the panel data of China's A-share listed companies from 2008 to 2020 as research samples, establishes A multiple linear regression model, and makes an empirical analysis of the correlation between major customer dependence and the capital allocation efficiency of enterprises. Meanwhile, cross-sectional analysis and robustness test are also carried out. Finally, the research conclusion is drawn.

It is found that the higher the degree of dependence on big customers, the higher the degree of inefficient investment, and the lower the efficiency of capital allocation. Then it is found that the higher the degree of dependence on big customers, the higher the probability of under-investment, and the lower the efficiency of capital allocation. After further analysis, it is found that: First, there is no significant difference between the sample groups of high investment opportunities and low investment opportunities in the inefficient investment induced by big customer dependence, that is, the decrease in capital allocation efficiency caused by big customer dependence has nothing to do with the investment opportunities faced by enterprises. Second, the influence of major customer dependence on the degree of inefficient investment of enterprises with different property rights is not the same, only in non-state-owned enterprises has a significant positive impact. Third, the positive effect of major customer dependence on the degree of inefficient investment is significant only in firms with high operational risk.

On the basis of the above research results, this paper puts forward corresponding suggestions: First of all, enterprise managers should pay attention to the management of enterprises' big customers, and need to reduce the negative impact of high dependence on big customers on the efficiency of capital allocation of enterprises by reducing customer concentration, reducing dependence on big customers, and reducing business risks. Second, in the context of deepening supply-side reform and industrial upgrading, relevant policy makers should pay close attention to the risks of supply-side risks on enterprise operations, especially to guide non-state-owned enterprises with private enterprises as the main body to identify high-quality and big customers when integrating the supply chain, ensure that customer business risks are within a controllable range, and ensure the stable supply-demand relationship. So as to improve the efficiency of capital allocation. Third, investors should pay close attention to the top five customer concentration indicators of enterprises when making relevant investments, and enterprises with a high degree of dependence on big customers should maintain investment vigilance.

In addition, this paper also has certain limitations: First, limited by the difficulty of data collection, this paper lacks in-depth analysis based on the characteristics of major customers. In the future, customers can be divided into listed or unlisted customers, connected customers or unconnected

customers for in-depth analysis, and cross-pollination tests can also be carried out on relevant variables to obtain the adjustment variables of big customer dependence that affect the efficiency of capital allocation of enterprises. Second, the measurement of enterprise capital allocation efficiency in this paper refers to the investment response model of Richardson (2006). In the future, the study of Mclean et al. (2012) can be used for reference to test the robustness of the research conclusions of this paper. The model is built with investment level as the explained variable, and the interaction term of the index of dependence on big customers and Tobin's Q value of investment opportunities as the explanatory variable.

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