INSTITUTO
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The Influence of Financial Leverage on the Inefficient Investment Behavior of Chinese Glass Enterprises

CAO Zhiheng

Doctor of Management

Supervisors:
PhD Leandro Ferreira Pereira, Associate Professor,
ISCTE University Institute of Lisbon
PhD LI Qiang, Professor,
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May, 2024

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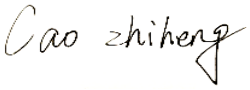
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Declaration

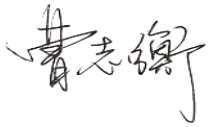
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Abstract

In the increasingly competitive glass industry, refined financial management, improving capital utilization efficiency, especially controlling inefficient investment behavior, has gradually become the key to balance risks and obtain sustainable competitive advantage. Financial leverage as an important means for enterprises to use liabilities to adjust investment income, it is of great significance to explore its antecedents, policy impact and impact on enterprise investment efficiency.

This thesis chooses Chinese glass enterprises as the research object to explore the impact of credit scale, financial leverage and structural policies on their inefficient investment behavior. Through statistical analysis, empirical research and case study, this thesis comprehensively discusses the core issues involved. The results show that: (1) The macro credit scale promotes the financial leverage of Chinese glass enterprises. The larger the macro credit scale, the more enterprises tend to increase financial leverage; (2) Financial leverage has a significant positive impact on inefficient investment. The new debt has a positive impact on inefficient investment and drives inefficient investment to the direction of over investment; Old debt restrains over investment and drives inefficient investment to the direction of under investment; (3) The inefficient investment coefficient is highly correlated with the government's financial policy. After the government's leverage policy, glass enterprises will actively expand the scale and speed of investment, leading to over investment. Similarly, after the government's deleveraging policy, glass enterprises tend to reduce the investment scale and speed, resulting in insufficient investment.

Based on the theory of modern capital structure, this thesis explores the impact of macro credit scale on the financial leverage of China's glass enterprises, and clarifies the impact mechanism of financial leverage on inefficient investment behavior, which is conducive to the further development of relevant theories on investment behavior. At the same time, this thesis explores the role of structural policies in investment and financing strategies, which is conducive to helping Chinese glass enterprises actively respond to external policy changes.

Keywords: macro credit policy, inefficient investment, financial leverage, Chinese glass enterprises, impact mechanism

JEL: M1, M2

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Resumo

Na indústria de vidro cada vez mais competitiva, a gestão financeira refinada, a melhoria da eficiência da utilização de capital e, especialmente, o controle do comportamento de investimento ineficiente tornaram-se gradualmente a chave para equilibrar riscos e obter vantagens competitivas sustentadas. A alavancagem financeira, como um meio importante para as empresas ajustarem o retorno do investimento através da dívida, é de grande importância para explorar seus antecedentes, impactos políticos e impacto na eficiência do investimento. Este artigo seleciona empresas de vidro chinesas como objeto de pesquisa para explorar o impacto de fatores como escala de crédito, alavancagem financeira e políticas típicas em seu comportamento de investimento ineficiente.

Através de análise estatística, pesquisa empírica e estudos de caso, este artigo discute de forma abrangente as questões centrais envolvidas. Os resultados indicam que: (1) A escala macro de crédito promove a geração de alavancagem financeira em empresas de vidro chinesas. Quanto maior a escala do crédito macro, mais inclinadas as empresas estão a aumentar a sua alavancagem financeira; (2) A alavancagem financeira tem um impacto positivo significativo nos investimentos ineficientes. A adição de novas dívidas tem um impacto positivo no investimento ineficiente e leva-o a investimentos excessivos; A dívida antiga suprime o excesso de investimento e conduz o investimento ineficiente ao subinvestimento; (3) O coeficiente de investimento de não eficiência está altamente correlacionado com as políticas financeiras governamentais. Depois que o governo implementa políticas de alavancagem, as empresas de vidro expandirão ativamente sua escala e velocidade de investimento, levando a investimentos excessivos. Da mesma forma, após a política de desalavancagem do governo, as empresas de vidro tendem a reduzir sua escala e velocidade de investimento, resultando em investimento insuficiente.

Este artigo explora o impacto da escala de crédito macro na alavancagem financeira de empresas de vidro chinesas com base na teoria moderna da estrutura de capital, esclarece o mecanismo do impacto da alavancagem financeira no comportamento de investimento ineficiente e é propício para o desenvolvimento de teorias relacionadas ao comportamento de investimento. Enquanto isso, este artigo explora o papel das políticas típicas nas estratégias de investimento e financiamento, o que é propício para ajudar as empresas de vidro chinesas a

responder ativamente às mudanças da política externa.

Palavras-chave: macro política de crédito, investimento ineficiente, alavancagem financeira, empresas de vidro chinesas, mecanismo de impacto
JEL: M1, M2

摘要

在竞争日益激烈的玻璃行业，精细化财务管理，提高资金利用效率，尤其是控制非效率投资行为逐渐成为其平衡风险，获取持续竞争优势的关键。财务杠杆作为企业利用负债来调节投资收益的重要手段，探索其前因、政策影响以及对企业投资效率的影响具有重要意义。

本文选择中国玻璃企业作为研究对象，探索信贷规模、财务杠杆以及典型政策等因素对其非效率投资行为的影响。通过统计分析、实证研究、案例研究，本文全面讨论了所涉及的核心问题。结果表明：（1）宏观信贷规模促进了中国玻璃企业的财务杠杆产生。宏观信贷规模越大，企业更倾向于增加财务杠杆；（2）财务杠杆对非效率投资有显著的积极影响。新增债务对非效率投资有积极影响并将非效率投资往过度投资方向拉动；旧债务抑制过度投资，并将非效率投资往投资不足方向拉动；（3）非效率投资系数与政府金融政策高度相关。玻璃企业在政府加杠杆政策之后，会积极扩大投资规模和速度，从而导致过度投资。同理，玻璃企业在政府去杠杆政策之后，偏向于缩减投资规模，并降低投资速度，从而导致投资不足。

本文基于现代资本结构理论探索了宏观信贷规模对中国玻璃企业财务杠杆的影响，厘清了财务杠杆对非效率投资行为影响机制，有利于进一步发展投资行为相关理论。同时，本文探索了典型政策在投融资战略中的角色，有利于帮助中国玻璃企业积极的应对外部政策变化。

关键词：宏观信贷政策，非效率投资，财务杠杆，中国玻璃企业，影响机制

JEL: M1, M2

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Chapter 1: Introduction

1.1 Research background

Glass is an indispensable and important material widely used in various fields such as real estate, automobile and public facilities. The glass manufacturing industry contributes significantly to China's economic development. The glass manufacturing industry has attracted a large number of multinational companies after China joined the WTO in 2001 creating opportunities including a huge market volume, abundant resources and low cost of labor. This has further led to the expansion and technological advancement in China's domestic glass industry which offers diverse opportunities within the entire value chain including production, service provision and sales. Stimulated by strong market demand, China's glass industry has maintained positive growth over the past 20 years. According to data from the National Bureau of Statistics, the production volume of flat glass in China reached 1,016. 647 million tons in 2021 as depicted in Figure 1.1. As at 2021, China's glass market had reached 83 billion yuan is projected to exceed 110 billion yuan by 2023.

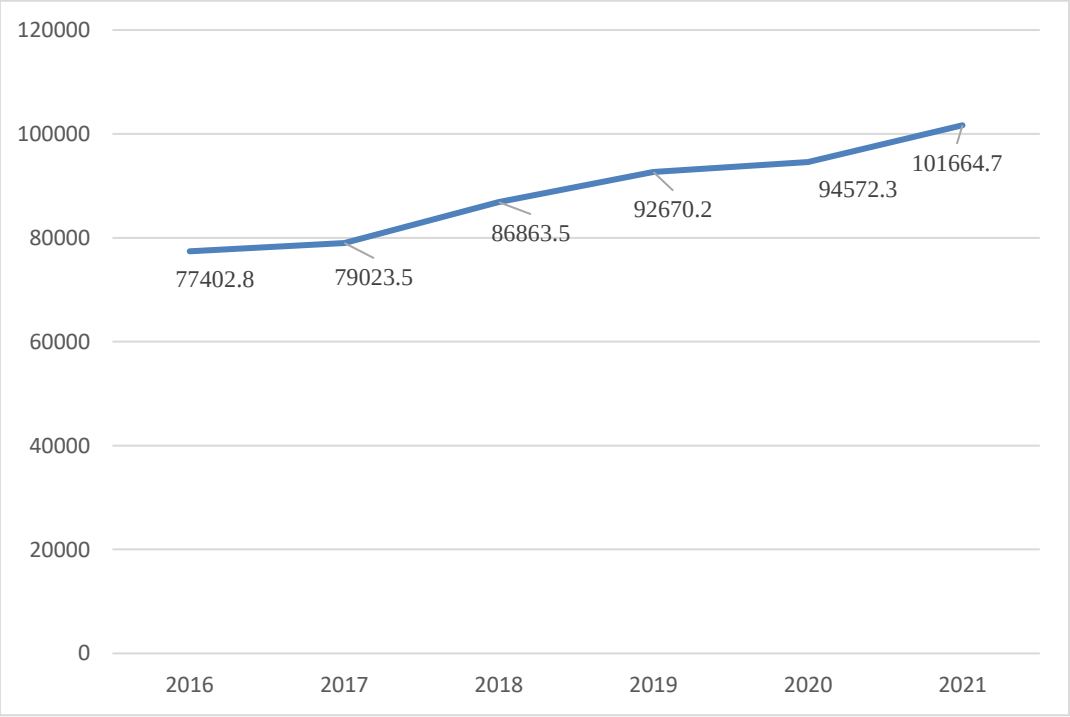


Figure 1.1 China's flat glass production capacity trend

Data source: National Bureau of Statistics of China

As a result of the high market demand and the lucrative nature of the industry, glass

companies (A company primarily engaged in glass business) are also receiving preferential credit treatment from financial institutions. Access to finance in the form of bank loans is relatively easy in the glass industry compared to other capital intensive industries. From 2013 to 2020, the proportion of manufacturing loans of given by large and medium-sized banks was generally high. When most banks issued loans to the transportation, warehousing and postal industries, manufacturing, water conservancy, environment and public facilities management, real estate. Entity enterprises account for the highest proportion of corporate loans, especially with large and medium-sized banks'. On the other hand, manufacturing loans account for a relatively high proportion of total loans, as depicted in Figure 1.2. The above data shows the significant role that finance plans in the economy. The support and influence of the bank-based financing system on China's real economy is mainly reflected in credit resources and policies. Commercial bank credit is usually the main financing method for Chinese enterprises. In order to obtain a loan, an enterprise must use assets such as real estate, fixed assets or inventory that meet the bank's credit requirements as collateral. Commercial banks tend to focus on mortgage loans, supplemented by credit loans. Mortgage itself determines that bank credit is based on collateral. This has led to the current bank credit structure favoring the development of capital-intensive industrial economy as the glass industry.

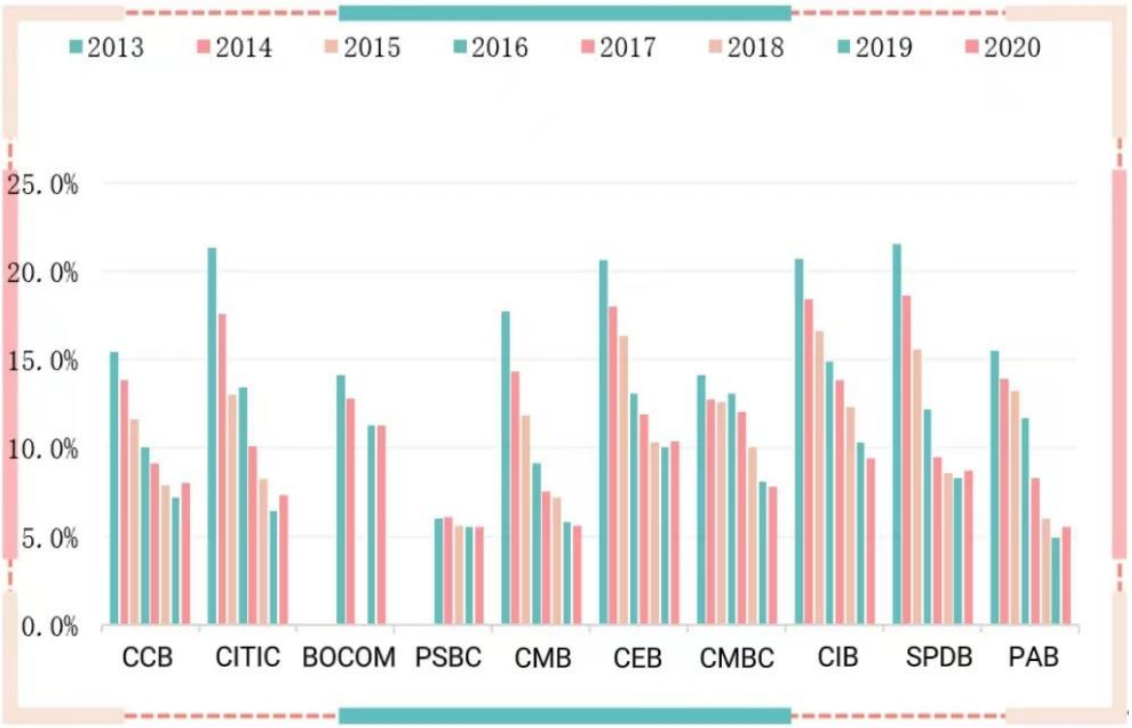


Figure 1.2 Proportion of large and medium-sized banks' manufacturing loans to total loans

Data source: People's Bank of China

In recent years, some companies have blindly accelerated investment as a result of the ease of access to finance, according to data from the glass network. As a result of this the production

capacity of the domestic glass industry has far exceeded the growth demand of downstream markets, such as real estate, automobile and other industries. Presently, the glass industry is facing other constraints as a result of the global financial crisis associated with the advent of the COVID-19 pandemic. These constraints also include market downturn, shortage of raw materials and rising labor costs leading to intensified competition in the entire glass industry. According to the Glass network information display, the utilization rate of flat glass was only 70% of the total inventory which reached 2,119 tons in December, 2021. It is important for glass companies to implement strategies to balance risks, improve survival rates and ultimately gain sustainable competitive advantage. These strategies include reducing management costs, refining financial management, improving capital utilization efficiency, and controlling non-efficient investment behaviors. Research shows that correct investment behavior is conducive to balancing financial risks and returns, and plays an important role in promoting the sound development of enterprises (X. H. Huang et al., 2018). Findings from a research by Meng and Song (2018) reveal that a large number of companies in China have inefficient investment behaviors which has brought serious systemic financial risks to enterprises. Inefficient investment behavior mainly includes over-investment (including asset substitution) and under-investment (Xie & Hong, 2020). Over-investment refers investing corporate funds in projects with small profit opportunities or negative net assets in order to realize their own interests (X. F. Xu et al., 2018). This will divert the company's investment from its current production and operational needs, thereby preventing the company from realizing its full growth potential. Underinvestment, on the other hand, involves deviating from investment projects with high NPV as a result of information asymmetry and other associated factors (Tian et al., 2021). Reasonable investment is thus crucial to the sustainable development of glass enterprises. The investment behavior of the glass industry can be categorized under three major levels namely macro-industry level, micro-industry and policy level behaviors. At the macro-industry level, the scale of macro credit affects the investment behavior of glass enterprises.

The glass industry is a traditional high-debt industry often mentioned in the supply-side reform process. After the implementation of the leverage increase policy in 2009 (the trend of credit scale is shown in Figure 1.3), as one of the representatives of the overcapacity industry, the glass industry is a surplus industry that is often mentioned in the often mentioned in the supply side reform process. The glass industry is closely related to the real estate industry. The real estate industry is deeply affected by the supply-side reform. The development of the glass industry is closely linked to the real estate industry, one of the main consumers. At the same time, the glass industry is a major player in environmental protection. In this round of reforms,

the key to minimizing "overcapacity" is environmental protection governance and strict control of production capacity indicators. The glass industry is also an industry that constitutes the "Environmental protection big family" under which and production capacity indicators are strictly controlled. With the advent of "carbon neutrality" and "carbon peaking" in recent years, the cyclical fluctuation of investment in the glass industry is significantly guided by the scale of credit. At present, the glass industry is in a critical year of structural changes, mainly focusing on five tasks of "de-overcapacity, de-inventory, de-leverage, reducing costs, and making up for shortcomings". As one of the key industries of macro-control, the glass industry has experienced different stages of overcapacity and de-overcapacity during the two periods of increasing leverage and de-leveraging, and is one of the typical industries in China that is most obviously affected by the scale of credit. The impact of this credit scale will affect the use of financial leverage of glass companies, which will have a profound impact on their inefficient investment behavior.

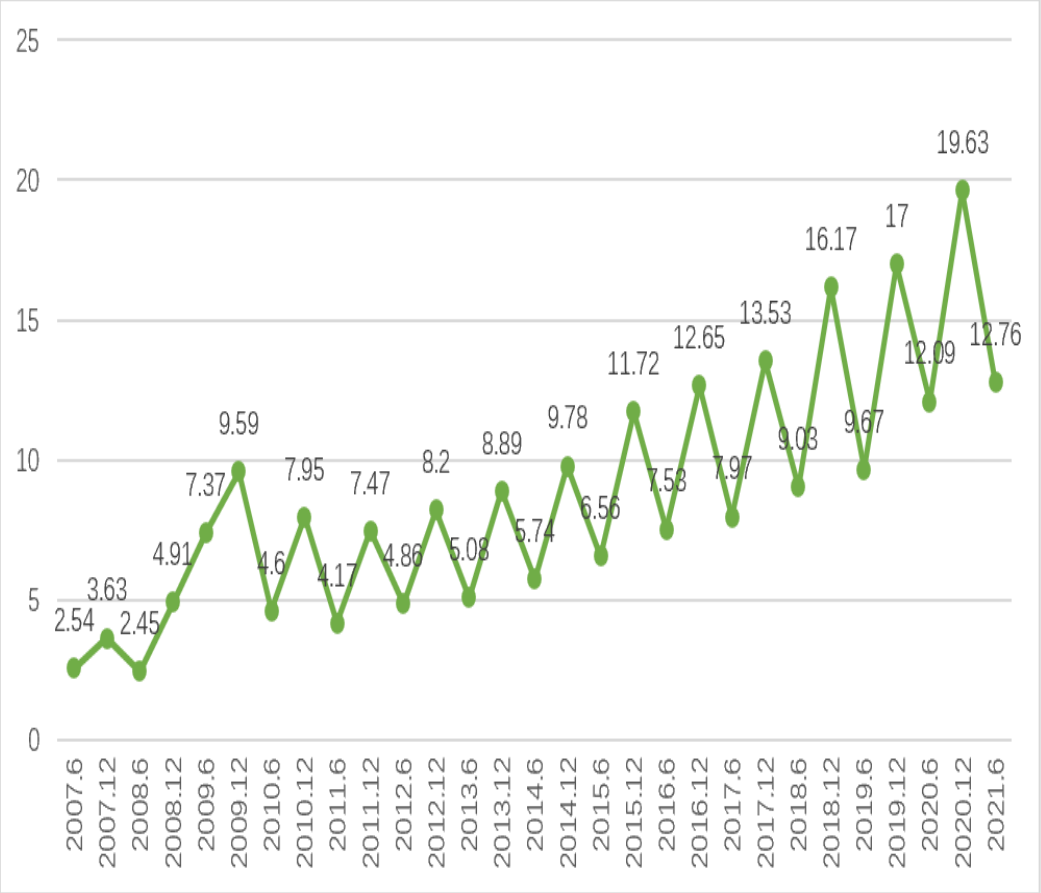


Figure 1.3 New RMB loans from June 2007 to June 2021

Data source: People's Bank of China

Secondly, from the micro-enterprise level, the financial leverage of glass companies has a lot to do with inefficient investment behavior. Since 2008, China has gone through two stages

of “leveraging” leading to excess capacity, and “de-leverage” emphasizing reducing capacity and improving innovation capabilities. In this context, many industries in China have experienced different stages of overcapacity and de-overcapacity, such as China's real estate industry, photovoltaic industry, steel industry, non-ferrous metal industry and glass industry. The overcapacity of the glass industry and the current task of de-overcapacity ties in with China's 4 trillion yuan economic stimulus policy in 2008 and the macro financial leverage of the supply-side structural reform proposed in 2015.Before 2008, China was in a stage of moderate increase in leverage. However, starting from the financial crisis in 2008, the “four trillion” investment launched at the end of 2008 and the huge credit issuance of 9. 6 trillion in 2009 interrupted the production capacity in 2007-2008.During the clearing process (the trend of credit growth rate is depicted in Figure 1.3), it has entered a new round of capacity expansion cycle. Leverage in China's non-financial corporate sector has soared after the 2008 crisis, rising from 96. 3% in December 2008 to 166. 8% in June 2016. The root cause lies in government intervention and institutional distortion of the normal operation of the market mechanism. Companies ramped up leverage wildly, production capacity expanded rapidly, and the leverage ratio of the non-financial corporate sector soared from 96. 3% to 119. 9% within one year. Since 2011, China’s economy has experienced a rapid downturn. Demand has fallen in comparison to the significant increase in the supply of new production capacity. The problem of excess capacity accumulated before has intensified. This has aggravated the debt burden of enterprises as operating conditions continue to deteriorate. At this time, excess production capacity should have been eliminated and market-based clearing should be carried out. However, due to the three-way game between enterprises, banks and local government, state-owned enterprises and heavy industrial enterprises can usually roll over their debts and take loans to repay old debt to sustain their businesses. This has greatly affected the elimination of excess production capacity. As operating conditions continued to deteriorate and the scale of debt continued to accumulate, the leverage ratio of the non-financial corporate sector further surged from 118.6% in September 2011 to 166. 8% in June 2016. In November 2015, General Secretary Xi Jinping first proposed "supply-side structural reform". Notwithstanding the "three removals, one reduction and one supplement" strategy of the structural reform, the leverage ratio of China's corporate sector continues to be low. These findings are evident of the negative impact inefficient investment behavior can have on financial leverage. This effect is even worse for glass manufacturing companies who operate with heavy assets.

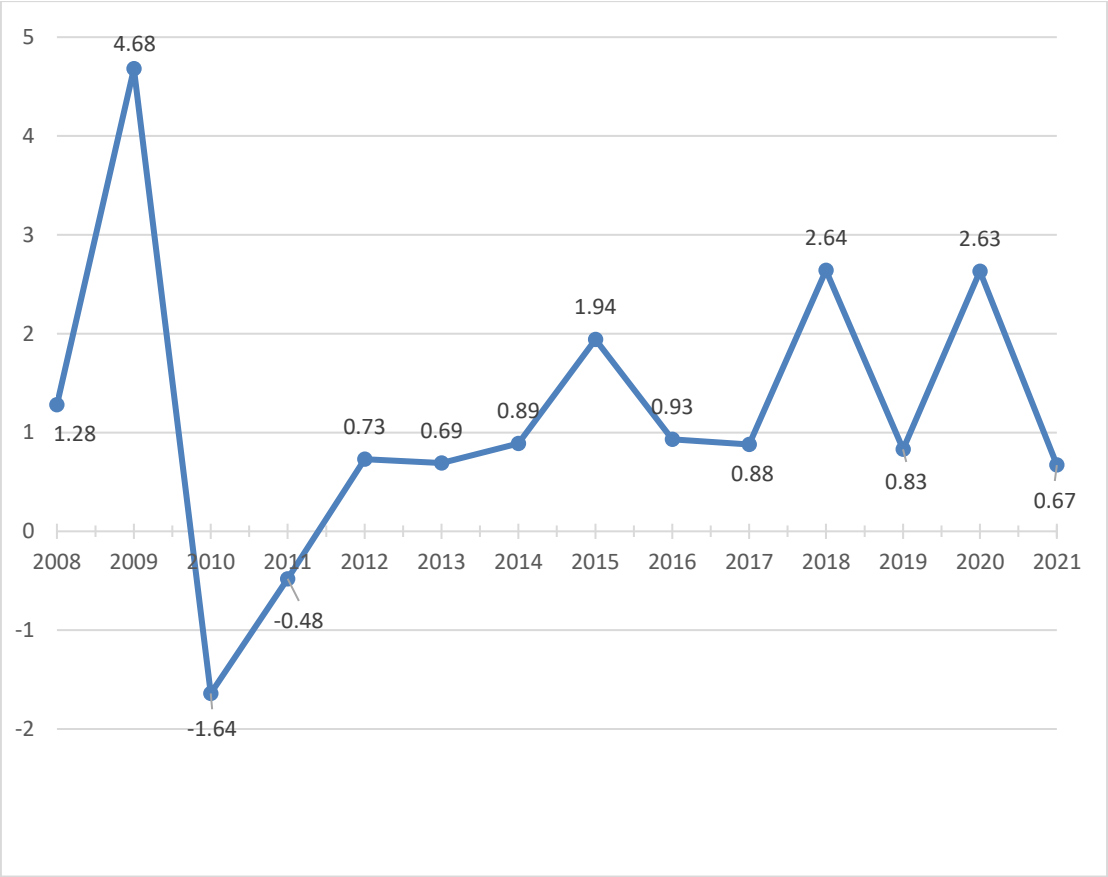


Figure 1.4 Growth rate of new RMB loans in H1 from 2008 to 2021

Data source: People's Bank of China

Thirdly, from a policy perspective, existing policies can either constrain or guide the management decision making of enterprises. These policies are likely to have an impact the investment behavior and financial leverage of enterprises including glass manufacturing companies.

Existing research shows that industrial policies are instrumental towards regulation of industries at the national level which is conducive to directional guidance of the micro-investment behavior of enterprises, and can restrain the irrational investment behavior of enterprises (Y. L. Wang, 2022). Policies are therefore important in regulating inefficient investment behaviors such as excessive expansion of production lines, excessive accrual of inventory and blind mergers (overly conservative operations). Specifically, financial policies will be beneficial glass manufacturing companies in obtaining financial loan support for industrial investment. In this case, the intervention of structural policies is likely to affect the production and management decisions of enterprises, which will in turn have a significant impact on the investment behavior of glass enterprises.

Overall, the scale of macro credit, financial leverage, and policies are likely to influence the investment behavior of glass companies. The question of how and the extent to which these

factors influence the investment behavior of glass companies arises. These questions have however not been explored in depth. Under the current trend of serious overcapacity of glass and the elimination of outdated production capacity at the national level, the development prospects of the entire glass industry have become a mystery for various glass companies. On the one hand, financial institutions implement "prudent treatment, structural adjustment, and strict control" policies to reduce or control excessive investment in production capacity of the glass industry. On the other hand, it is necessary to respond to the call of industrial technology upgrading and make great investment in the expansion of new technologies, new equipment and new production lines. Therefore, the financial strategy of glass enterprises should neither over-invest nor under-invest for a long time, which brings huge theoretical and practical challenges to enterprise investment management.

Based on the aforementioned, this thesis will combine the macro-level credit environment and the micro-level corporate financial leverage factors to empirically examine factors influencing glass companies' investment behavior. Additionally, this study will select typical cases to analyze the impact of policies on glass companies' investment behavior and development. The research will be relevant in influencing operations strategies and offering important theoretical and empirical value to the investment strategy of glass companies.

1.2 Research problem

In the face of increasingly fierce industry competition, reducing management costs, refining financial management, improving capital utilization efficiency, and controlling inefficient investment behavior has gradually become an important key for glass companies to balance risks, improve survival rates, and ultimately gain sustainable competitive advantage. At present, the academic community has conducted extensive research on the impact of financial leverage on the inefficient investment behavior of Chinese glass companies.

First, the current research has extensively explored the impact and role of financial leverage on enterprises, but there is insufficient research on the antecedents of corporate financial leverage. The research focuses on the impact of financial leverage on enterprise product quality (Sodeyfi, 2016), corporate value (Malshe & Agarwal, 2015), financial performance (Mule & Mukras, 2015), investment decisions (Sajid et al., 2016), corporate innovation (N. Iqbal et al., 2020), corporate profitability (Pham & Nguyen, 2019), corporate social responsibility (Oware & Mallikarjunappa, 2019), financial risks (Finishtya, 2019), and other aspects. These studies illustrate the results of financial leverage, but there are few studies on the antecedents of firms'

adoption of financial leverage. Especially for Chinese glass companies, like the real estate industry, the development cycle is greatly affected by the scale of macro credit. At the same time, existing research has shown that the scale of macro credit will directly affect the venture capital strategy of enterprises (Y. L. Wang et al., 2020), and have an important impact on the financial capital operation of enterprises (Y. R. Wang & Zhao, 2022). To sum up, the scale of macro credit is likely to be an antecedent variable, which affects the adoption of differentiated financial leverage strategies by glass companies. Similar research has strong guiding significance for the practice of financial leverage strategy of Chinese glass companies. However, the current theoretical research is inconclusive and needs to be further developed.

Secondly, the investment behavior of Chinese glass companies is greatly affected by financial leverage, but there is a lack of in-depth exploration of the relationship between them. For example, H. F. Guo et al. (2021) found that appropriate financial leverage can optimize the investment and financing structure of enterprises, and at the same time, enterprises with the optimal capital structure have higher efficiency; C. L. Yang and Lai (2021) pointed out that increasing financial leverage can effectively promote companies to adopt more aggressive R&D investment behaviors; Danso et al. (2019) argued that for companies with a high degree of information asymmetry, the impact of financial leverage on corporate investment is negative and significant. These studies demonstrate a complex, yet uncertain, intrinsic link between corporate financial leverage and investment behavior. However, for Chinese glass companies, the driving factors of investment behavior, such as the impact of financial leverage on inefficient investment behavior, are not fully demonstrated. In view of this lack of research, this thesis will focus on the impact of the financial leverage of glass companies on their inefficient investment behavior (mainly including underinvestment and overinvestment). The research conclusions of this thesis will help to improve the relevant theory of investment and financing of glass enterprises, and then help guide the investment and financing practice of glass enterprises.

Finally, Chinese glass enterprises are seriously affected by structural policies, but related theoretical explorations are insufficient. Existing studies have shown that some structural policies are conducive to restraining investment in high-energy-consuming industries (Y. L. Wang et al., 2020), improving the efficiency of enterprises' utilization of resources (Zou & Tian, 2020), and improving the investment efficiency of enterprises (Y. Wang & Li, 2022). Y. R. Wang and Zhao (2022) also pointed out that structural policies have an important impact on asset-heavy enterprises such as real estate. Chinese glass companies are closely related to the real estate industry and are asset-heavy companies, which are greatly affected by

macroeconomic policies, such as "leveraging" and "deleveraging" and other typical regulatory policies. However, the current research has not yet clarified the reasonable response process of glass companies to structural policies. In view of this lack of research, this thesis will further explore the impact of structural policies on the investment and financing behavior of Chinese glass companies. Relevant research will help us to deeply understand the role and effect of structural policies in the investment and financing strategies of Chinese glass companies, and explore the impact process mechanism, which will help guide Chinese glass companies to actively respond to external policy changes.

To sum up, combined with the limitations of existing research, this thesis will carry out research from three aspects: "The Impact of Macro Credit Scale on the Financial Leverage of Glass Enterprises", "The Impact of Financial Leverage on Inefficient Investment Behavior", "The Impact of Structural policies on the Investment and Financing Behavior of Chinese Glass Enterprises". It is expected that this thesis will draw research conclusions based on the data of Chinese glass enterprises, supplement the existing research system, and provide theoretical reference for the investment and financing decision-making practice of Chinese glass enterprises.

1.3 Research questions

Chinese glass enterprises can neither over-invest nor under-invest for a long period of time, which brings huge theoretical and practical challenges to enterprise investment management. The main topic of this research is therefore to investigate the investment behavior of glass companies focusing on their macro credit scale, financial leverage and policies.

According to this topic, the research question of this thesis focuses on the impact of financial leverage on investment behavior of Chinese glass companies. In order to complete this research tasks, this thesis will take China's financial policy as the background to explore the impact of factors such as credit scale, financial leverage, and policies on the investment behavior of Chinese glass companies.

The investment behavior of enterprises (in this case glass companies), the inefficient investment behavior of over-investment or under-investment is significantly related with debt financing. This thesis breaks down the research question into three specific questions:

(1) Macro level of credit scale

What impact does the macro credit leverage or credit environment have on the debt financing of glass companies?

To study how changes in macro credit scale and loan environment affects the development of the glass industry from different policy stages, easing policy stage and tightening policy stage. Judging from past economic development, the different levels of monetary and credit policies (loose and stringent) which tend to have varied impact on the investment behavior of industries need to be analyzed in detail. Descriptive statistical analysis with data of Chinese glass enterprises will be used to explore the impact of macro credit leverage or loan environment changes on the use of debt financing by glass enterprises. This analysis will focus on the relationship between the macro credit scale and the investment and financing behavior of glass industries to reveal the relationship between macro credit leverage, loan environment changes and corporate financial leverage.

(2) Micro corporate level

How does the financial leverage of glass companies affect their inefficient investment behavior?

From a micro enterprise level, most of the financing channels of Chinese enterprises are credit channels, and the financial leverage of enterprises is mainly issued through bank credit. Financial leverage therefore affects the operation and development of enterprises to a large extent. Companies investment decisions, new construction and production capacity, whether to expand production capacity, investment and merger intentions. , are largely related to the company's financial leverage and financing capabilities. This study therefore assesses financial leverage and its effect on the investment behavior of enterprises specifically the level of investment from the perspective of efficiency and volume (excessive or underinvestment). This section will also analyze the relationship between financial leverage and investment behavior (investment level and inefficient investment) of glass enterprises at the enterprise level. Data on upstream and downstream glass enterprises will be used to conduct empirical analysis to explore the impact of financial leverage on corporate investment behaviors such as mergers and acquisitions and fixed asset investment.

(3) Policy evaluation

What is the impact of typical policy adjustments on the relationship between corporate bank loans and investment behavior?

The impact of financial policies on real industries and enterprises is unquestionable and cuts across many dimensions. This section will study the impact of structural policies on the relationship between bank loans and investment behaviors of glass companies from the perspective of policy evaluation. Data on influential cases in the industry, such as CSG, Fuyao, Follett, Grant and other corporate cases will be used to analyze the impact of structural policies

on corporate bank loans and inefficient investment behaviors during the development of glass companies. Specifically, based on the previous question, the two policy control factors of "leveraging" and "de-leveraging" will be further introduced. The study will additionally compare and explore whether the financial leverage of glass companies will have a weaker or stronger impact on their inefficient investments after the cycle of increasing or decreasing leverage.

1.4 Research objectives

The overall goal of this research is to examine how financial leverage affects the investment behaviour of Chinese glass companies from both macro and micro levels, and to reveal the possible factors and mechanisms that lead to inefficient investment. Combining this goal and the research questions subdivided above, this study sets the following specific research goals:

(1) Explore the impact of macro credit scale on the debt financing structure of glass companies. From the perspective of macro credit scale and loan environment an unbalanced panel data of listed glass companies since 2006 will be used to carry out descriptive statistical analysis.

(2) Explore the impact of financial leverage of glass companies on their inefficient invest behavior. There are two key points to achieve this research goal. On the one hand, it is necessary to quantitatively measure the financial leverage ratio of financial enterprises. On the other hand, it is necessary to further define, classify, and analyze investment behaviors for the same investment types. Further, this thesis intends to collect a large number of glass and glass industry chain closely related enterprise data, carry out empirical analysis and draw conclusions.

(3) From the aspect of policy evaluation, this study explores the influence of structural policies on the relationship between corporate bank loans and investment behaviors. To achieve this goal, we need to find a representative glass company as a research case, compare the changing trend of the impact of the financial leverage of the case company on its inefficiency investment after the "leveraging" and "de-leverage" cycles.

1.5 Research methods

For different sub research questions, this study will use literature research, statistical analysis, empirical research, and case analysis methods to carry out specific explorations, in order to achieve the various research objectives of this study.

(1) Literature research

Literature research will be applied as the overall structural concept of the study and the theoretical support for various studies. As a traditional and widely used scientific research paradigm, the literature research method has been highly recognized by the academic community. The focus of this method is on the search, identification, organization, comparison, and induction of relevant literature on various modules of this study, such as financial leverage theory, financial policy, and inefficient investment behavior. Literature reading is an indispensable and important part of theoretical research. This study has formed a large amount of literature by reading relevant literature on the glass industry, financial leverage, and inefficient investment behavior. Furthermore, these literatures will be sorted and summarized, and ultimately applied to the research framework of this study (full text), descriptive statistical analysis conclusion discussion (the impact of credit scale on corporate financial leverage), theoretical deduction and hypothesis proposal section (the impact of corporate financial leverage on inefficient investment behavior), and case discussion (the impact of structural policies). Therefore, literature research is an important method applied in this thesis, which has played an important role in the formation of this thesis and the ultimate achievement of research objectives.

(2) Descriptive statistical analysis

The study on the impact of credit scale on corporate financial leverage in this study will be conducted using descriptive statistical analysis methods. By conducting statistical analysis on the data of upstream and downstream glass enterprises in China, to understand the trend of changes in financial leverage of enterprises, and comparing the trend of changes in the macro credit environment. Through this comparison, we can draw conclusions about the impact of macro credit scale and loan environment on the financial leverage of Chinese glass enterprises.

(3) Regression analysis

This study will use regression analysis methods to investigate the impact of corporate financial leverage on their inefficient investment behavior. Regression analysis is an empirical analysis (research) method, it is an important research method in the fields of management and economics. It mainly analyzes the objective connections between various economic indicators and enterprise management indicators, excluding subjective value judgments, and thus has been widely applied. This study intends to use STATA software to empirically explore the impact of leverage in glass enterprises on their inefficient investment behavior. The detailed steps include data sorting, descriptive statistics and correlation analysis, model and method selection (such as fixed effects or random effects), regression analysis, robustness testing, and other processes.

Through regression analysis, this study will explore the inherent and objective laws and connections between variables. These findings will effectively help us summarize the impact of financial leverage on inefficient investment behavior in glass enterprises, ultimately benefiting management decision-making and bringing important theoretical and practical reference value.

(4) Case study

This study will use a case study method to conduct research on the relationship between structural policies and financial leverage and investment behavior. Case studies can compare and analyze materials under the guidance of theoretical sampling principles, in order to identify the development patterns of the analyzed case units, and thus draw conclusions or achieve theoretical construction (Eisenhardt, 1989). This study will use the case material of Fuyao Glass Company, a representative Chinese glass enterprise, to compare its responsiveness to changes in financial leverage and its impact on inefficient investment behavior after the policy cycles of "adding leverage" and "deleveraging". Based on this, typical policy impact conclusions will be drawn.

1.6 Thesis structure

Based on the above research objectives and methods, the entire study has been conceptualized as follows:

Chapter 1: Introduction

This section mainly analyzes the current development status of Chinese glass enterprises and proposes research questions from a financial perspective. At the same time, decompose the main research questions into three sub questions. On this basis, formulate research methods, research objectives, research data acquisition plan, and research structure.

Chapter 2: Literature Review

This section mainly analyzes relevant literature on research, financial leverage, investment behavior, credit policies, and other fields related to Chinese glass enterprises, which lays a theoretical foundation for subsequent research.

Chapter 3: Methodology

This section will provide a detailed introduction to the research ideas and framework, research methodology, and research hypotheses involved in empirical research.

Chapter 4: Data Analysis and Results

The study mainly focuses on three aspects:

(1) The impact of macro credit scale on the financial leverage of glass enterprises. By obtaining panel data of listed companies in the upstream and downstream of glass and glass products, conducting theoretical analysis and descriptive statistical analysis, comparing the correlation between the trend of credit environment changes and the trend of corporate financial leverage, exploring their mutual influence patterns, and drawing relevant conclusions; (2) A study on the impact of financial leverage in glass enterprises on their inefficient investment behavior. Propose relevant hypotheses and conduct descriptive statistical analysis, correlation analysis, regression analysis, robustness testing. by obtaining data from listed companies in upstream and downstream glass and glass products enterprises, to examine the relationship between financial leverage and inefficient investment behavior, as well as the impact of new and old debts in financial leverage on overinvestment and underinvestment, respectively. Finally, make a conclusion on each hypothesis (whether it is true or not); (3) The impact of policy regulation on the relationship between financial leverage and inefficient investment behavior. This chapter focuses on Fuyao Company, conducting interviews with senior, middle, and grassroots management personnel, and conducting a case analysis based on the inefficiency investment coefficient calculated earlier. Focus on comparing the changes and trends in the relationship between financial leverage and inefficient investment behavior before and after the "add/remove leverage" cycle, and draw conclusions.

Chapter 5: Findings and Discussion.

This chapter further summarizes the previous research results and discusses the comparison between the research results and existing theories.

Chapter 6: Conclusion.

The research conclusions, discuss the theoretical contributions and practical value of the research, review the shortcomings of this study, and pointed out future research directions.

The research structure and chapter arrangement of this study are shown in Figure 1.5.

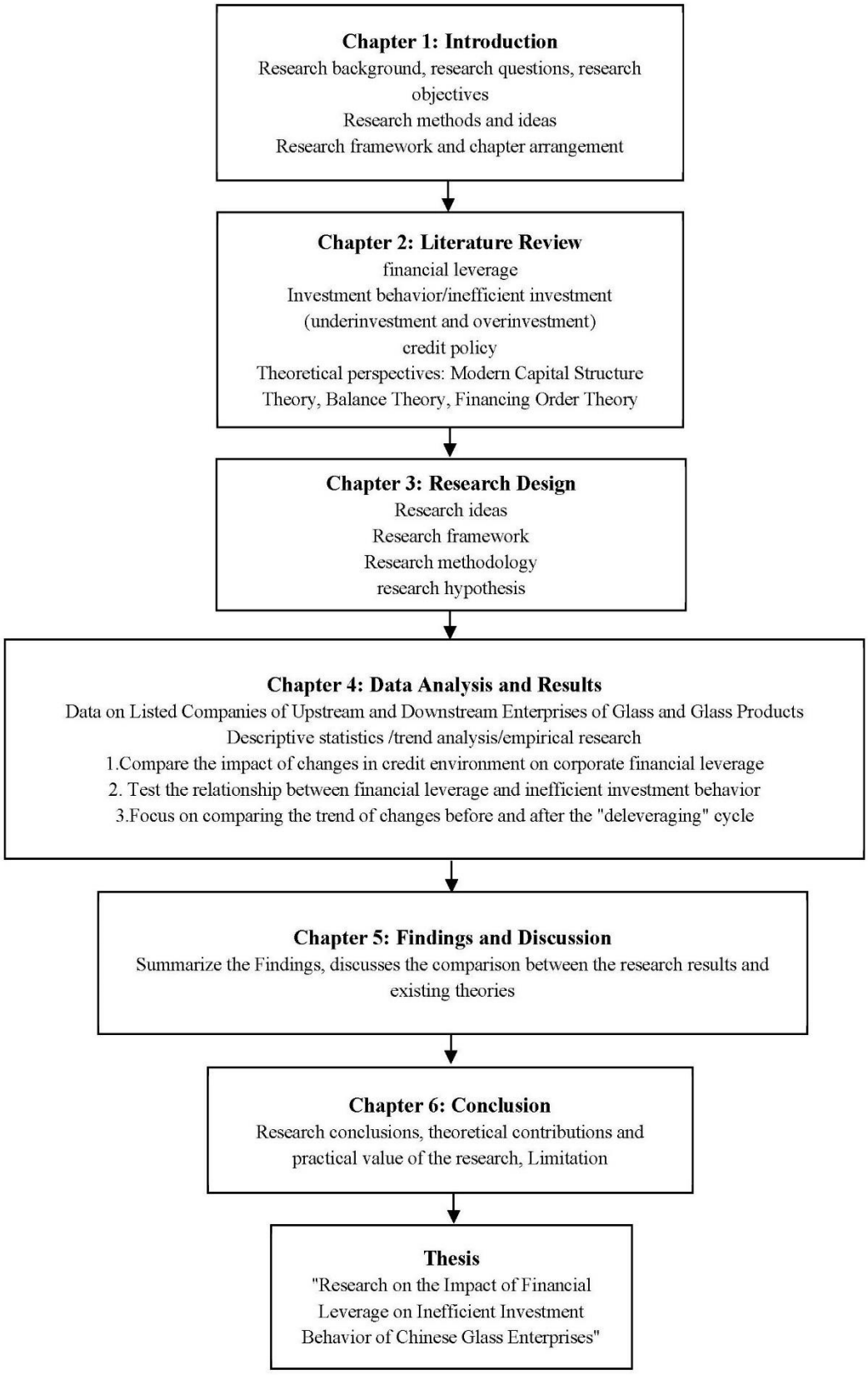


Figure 1.5 Research structure and chapter arrangement of the study

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Chapter 2: Literature Review

The first chapter describes the background of the research problem in this thesis in detail, and lists the research questions and research objectives. This chapter reviews the relevant literature and provides a theoretical foundation for research and hypotheses to help address the research questions raised in Chapter 1.

2.1 Theoretical perspective

2.1.1 Modern capital structure theory

In recent years, scholars have carried out extensive research on this topic (Brusov et al., 2018). The research described new and meaningful implications in capital structure theory, discovered modern capital cost and capital structure theory, and revealed that BFO (Basic Formal Ontology) theory changed some of the main existing financial management principles. Deloof and Van Overfelt (2008) examined whether modern theory could explain capital structure in a historical environment of poor investor protection, booming stock markets, strong banks, and taxes that did not affect leverage.

(1) Research on the relationship between capital structure and income at the enterprise level

Based on firm-level research, J. J. Chen (2004) investigated company-level panel data to conduct a preliminary study on the determinants of the capital structure of Chinese listed companies and pointed out that some insights from the capital structure of modern financial theory could be transplanted to China. Y. H. Chen and Hammes (2004) analyzed the factors that affect the corporate leverage ratio. The study found that enterprise size, profitability, tangible assets, and price-to-book ratio had a significant impact on the choice of corporate capital structure. Tangible assets were positively correlated with leverage ratio, while profitability and leverage ratio were significantly negatively correlated. Vo (2017) illustrated whether the determinants of capital structure differed in emerging markets. Sheikh and Wang (2011) pointed out that profitability, liquidity, earnings volatility, and tangible assets (asset structure) were negatively related to debt ratios, while firm size was positively related to debt ratios. Non-debt tax barriers and growth opportunities did not appear to be significantly associated with debt ratios. Sofat and Singh (2017) explored the most important determinants of the capital structure

of Indian manufacturing firms and used a multiple regression model to examine whether foreign capital structure models provided a convincing explanation for Indian firms' capital structure decisions. Uwalomwa and Uadiale (2012) explored the relationship between capital structure and financial performance of Nigerian listed companies using a sample of 31 listed companies on the Nigerian Stock Exchange. Matemilola et al. (2013) examined the significance of unobservable firm-specific effects on the capital structure model. The study used restricted least squares to test the significance of unobservable firm-specific effects in a fixed-effects model that included unobservable effects and an ensemble ordinary least squares model that excluded unobservable effects. Dakua (2019) empirically investigated the capital structure of the Indian steel industry from 2010 to 2017 and the determinants that affected capital structure, as well as how these determinants related to financial leverage.

Hovakimian and Li (2011) conducted simulation experiments showing that both partial adjustment and debt-equity selection models could produce falsely significant estimates, consistent with the assumption that firms have target debt ratios. Abor (2007) examined the impact of industry classification on the capital structure of Small and Medium Enterprises (SMEs) in Ghana. The research results showed that the capital structure and asset structure or collateral value of agricultural SMEs were the highest, while the debt ratio and asset structure of wholesale and retail trade were the lowest. The industrial effect was an important factor in explaining the capital structure of SMEs, with differences between industries. Hermuningsih (2016) examined the impact of profitability, growth opportunities, and capital structure on firm value. The findings showed that profitability, growth opportunities, and capital structure had a significant positive impact on firm value. Additionally, capital structure mediated the impact of growth profitability on firm value, but not profitability. Avarmaa et al. (2011) investigated systematic differences in the capital structure formation of local companies and subsidiaries of multinational corporations (MNCs) in the Baltic countries between 2000 and 2008.The study found that local companies were more leveraged than multinational companies, mainly due to the use of intra-group equity financing, lower investment intensity, and higher profit retention. Siddik et al. (2017) found that capital structure had a negative impact on bank performance. Kyereboah-Coleman (2007) showed that most Microfinance Institutions (MFIs) were highly leveraged and financed with long-term rather than short-term debt. Furthermore, highly leveraged microfinance institutions enjoyed economies of scale by reaching more customers, which enhanced their ability to manage risks and address moral hazard and adverse selection.

Majumdar and Chhibber (1999) analyzed the sample of Indian companies to examine the relationship between debt levels in capital structure and performance. Existing theories assume

a positive relationship; however, data analysis shows that for Indian companies, the relationship is clearly negative. Le and Phan (2017) investigated unbalanced panel data of all non-financial listed companies from 2007 to 2012 to examine the effect of capital structure on company performance in Vietnam. The results shows that the debt ratio is significantly negatively correlated with corporate performance. K. Chen (2002) found that the optimal capital structure of an enterprise is closely related to the growth potential of the enterprise, as well as variables such as enterprise size and industry characteristics. Based on the notion that firm value of high-growth firms is negatively related to leverage, while for "low-growth" firms, firm value is positively related to leverage, the study observed that growth opportunities may affect optimal capital structure. Chui et al. (2002) found that national culture affects the capital structure of companies. Empirical hypotheses drawn from financial models and cross-cultural psychology were tested on a sample of 5,591 firms from 22 countries. The results shows that countries with high scores on the conservatism and cultural proficiency dimensions tended to have lower corporate debt ratios. Malinic et al. (2013) explored the determinants of the capital structure of listed companies in Serbia's regulated market. The research shows that liquidity, tangibility, profitability, and cash gap had significant negative effects on both debt ratios. The revenue volatility and growth opportunities of Serbian firms had a significant positive impact on the leverage level.

Gottardo and Moisello (2014) found that the capital structure choices of large and medium-sized family businesses were related to balance sheet variables such as net working capital and capital turnover ratio, which were not used in previous research, and were significantly affected by the family's social-emotional wealth-related dimensions-the need for control and influence. Family firms are more leveraged than non-family firms, but this difference is economically and statistically significant only for medium and large firms. The presence of the family in active management increases the leverage of the firm, as family endowments in the firm are higher. Chandra and Rusliati (2019) explored the factors that affect capital structure, profitability, and stock returns, as well as the relationship between capital structure, profitability, and stock returns. The findings argued that only the profitability variable affected stock returns. Variables such as capital structure, firm size, growth opportunities, tangibility, and liquidity did not significantly affect stock returns. Variables that affect capital structure were only influenced by growth opportunities, while other variables were not significant. The variables that affect profitability were firm size, growth opportunities, uniqueness, and volatility.

Based on agency theory, Dawar (2014) empirically explored the impact of capital structure choices on the performance of Indian firms in emerging economies. Empirical results argued

that leverage had a negative impact on the financial performance of Indian firms, contrary to the assumptions of agency theory generally accepted in other developed and emerging economies. Deesomsak et al. (2004), by investigating the determinants of the capital structure of firms operating in the Asia Pacific region, argued that firms' capital structure decisions were influenced by the environment in which they operate, as well as firm-specific factors identified in the existing literature. Band (1992), through the exploration of agency theory or enterprise management theory, found that it had limitations. Jensen and Smith (2000) analyzed some recent research findings on agency theory, the nature of residual claims, and the separation of corporate management and risk-introduced. These research results have certain implications for corporate structure, especially in the resolution of conflicts of interest among shareholders, managers, and creditors. Nuswandari (2013) took manufacturing companies listed on the Indonesian Stock Exchange as the research object, analyzed the factors affecting the capital structure. It examined variables such as profitability, company size, and operating risk from the perspective of priority financing theory, and analyzed variables such as growth opportunities and management's shareholding from the perspective of agency theory.

(2) Influence and factors

Liang et al. (2014) explored the determinants of the capital structure of Chinese real estate listed companies. The research results confirmed that state-owned shares, fixed asset value, total asset size, and profitability had a positive and significant impact on the leverage ratio of Chinese listed real estate companies and the applicability of the trade-off theory to Chinese real estate companies (except for the correlation between leverage and tax avoidance). G. H. Huang (2006) found that state-owned or institutional shareholding had no significant impact on capital structure, and Chinese companies considered tax effects in long-term debt financing. Unlike other countries, Chinese companies tend to have much lower long-term debt. Öztekin (2015) explored the reliable determinants of artificial leverage, such as firm size, tangibility, industry leverage, profits, and inflation. The quality of state institutions had a significant impact on leverage and the speed of adjustment to target leverage, with high-quality institutions leading to faster leverage adjustments, while laws and traditions that protect creditors relative to shareholders (e.g., more efficient insolvency proceedings and stronger creditor protection) would lead to higher leverage.

Chaganti and Damanpour (1991) argued that the size of external institutional holdings had a significant impact on a firm's capital structure. Shyu (2013) aimed to explore the mutual influence of ownership structure, capital structure, and performance on the agency problem of group affiliates and the internal capital market. Aggarwal and Baliga (1987) found that, in Latin

America's capital structure, country and industry are important determinants, not only in bivariate but also in multivariate statistical tests. As a result, multinational and diversified companies in Latin America cannot afford the consistency of capital structures across countries and industries, and they must take these differences into account when formulating and setting policies on capital structure, financing, evaluation, and management of subsidiaries. Gul (1999) provided complementary evidence for the contract-theoretic argument on the relationship between growth opportunities, capital structure, and dividend policy by observing 5,308 Japanese listed companies between 1988 and 1992. L. Li and Islam (2019) used a sample of Australian listed companies from 1999 to 2012 to demonstrate the importance of company-specific and industry-specific factors in leverage decisions. Empirical results showed that some firm-specific factors differed across industries, whereas some previous studies had found that the effects of these factors were the same. In addition, the study found that industry-specific factors had direct and indirect effects on the formation of Australian firms' capital structure, but the results of certain industry-specific factors were influenced by the choice of leverage ratio. Seppa (2008) explored the relationship between Estonian non-financial firm-specific financial factors and capital structure decisions and examined differences in behavior between firms of different sizes.

(3) The trade-off theory in modern capital structure theory

The trade-off theory in modern capital structure theory holds that the company decides the ratio of debt financing to equity financing by weighing the pros and cons of debt (Hackbarth et al., 2007). The benefits of indebtedness include tax savings, the tax shield. The cost of debt refers to the cost of financial distress. As the debt ratio increases, the marginal benefit of debt gradually decreases, and the marginal cost gradually increases. In order to maximize value, a company must weigh the benefits and costs of debt to choose an appropriate debt-to-equity financing ratio. In recent years, scholars have widely applied the trade-off theory in various academic researches. Sardo and Serrasqueiro (2017) analyzed whether the capital structure decisions of Portuguese SMEs were in line with the predictions of the dynamic trade-off theory, more precisely, the speed of adjustment of short-term debt (STD) and long-term debt (LTD), with their respective target debt ratios. Dierker et al. (2019) examined the external financing activities after the change of enterprise risk and provided a new perspective for the relevance of the dynamic trade-off theory of capital structure.

Hackbarth et al. (2007) explored the use of trade-off models of bank and market debt for optimal mix and priority structures, where banks have the unique ability to renegotiate outside of formal bankruptcy. Research argued that flexible bank debt offers a better trade-off between

tax avoidance and bankruptcy costs. Singh and Kumar (2012) used the time series hypothesis to empirically test two competing theories of capital structure: trade-off theory and hierarchy theory. Glover and Hambusch (2014) examined the effect of operating leverage and managers on the relationship between firm profitability and optimal financial leverage to provide an alternative (rational) explanation for the observed negative relationship between these two quantities. Sarkar and Zapatero (2003) found that there should be a negative correlation between the optimal leverage ratio and the current return level in the case of mean return regression, and the return regression parameter played an important role in determining the capital structure. Huu and Wakely (2000) proposed that the focus on urban center and distance should be shifted to two other types of parameters: housing status and living quality. Models of the interaction between these parameters can be used not only to describe but also to predict various types of residential development in different urban contexts.

Gamal et al. (2004) explored the delay characteristics and throughput-delay trade-offs of fixed ad hoc networks and mobile ad hoc networks. Förster et al. (2003) argued that speed/accuracy (or quantity/quality) decisions were influenced by the strategic tendencies of players with different regulatory focuses, rather than inherent trade-offs. Porath and Gilboa (1994) provided an axiom of the linear inequality measure representing the binary relationship on the subspace of income distribution with the same total income. Interpreting binary relations as policy-maker preferences, extending the axioms to the entire space, they found that they characterize a linear social evaluation function. Research argued that policymakers with linear measures of inequality over subspaces should have linear evaluations over the entire space. Fang (2008) divided customer engagement into two dimensions: information resource customer engagement (CPI) and co-developer customer engagement (CPC), and explored the moderating role of downstream customer network connectivity and the interdependence and complexity of the new product development process.

2.1.2 Theory of priority-order financing

The pecking order theory was proposed by Myers and Majluf (1984). This theory holds that the financing decision of an enterprise is based on various factors, such as the dispersion of control rights and financial costs, and that enterprises choose different financing methods in turn according to the principle of cost minimization. That is, they first choose endogenous financing without transaction costs, such as the accumulation of operating profits; secondly, they choose debt financing with lower transaction costs; and lastly, for equity financing, which has the strictest information constraints and may lead to the dispersion of corporate control and the

underestimation of value, companies rank it at the bottom. The following literature applies the theory of financing sequence to research:

Vasiliou et al. (2009) argued that different approaches may lead to different effects on the validity of the hierarchy theory. Bulan and Yan (2010) identified firms according to the two life cycle stages of growth and maturity and examined the optimal financing theory. The study found that the financing behavior of mature enterprises has a strong maturity effect; that is, the Priority-Order Financing theory can better describe the financing behavior of mature enterprises than that of growing enterprises. Bontempi (2002) proposed an empirical model of the Modified Theory of Priorities (MPO) that nests trade-off (TO) and prioritization (PO) models. The MPO model is specified as an error correction mechanism and applied to a large panel dataset. De Jong et al. (2010) extended Shyam-Sunder and Myers' basic hierarchical ranking model by separating the effects of financing surplus, normal deficit, and large deficit. Zoppa and McMahon (2002) identified the hierarchical ordering theory (POT) of corporate finance proposed by Myers and Majluf (1984) to explain, to some extent, the financial structure of 871 manufacturing SMEs legally organized as private companies in Australia from 1995-96 to the longitudinal survey of businesses for the two fiscal years 1997-98.The findings provided further empirical evidence broadly revealing the prioritization financing behavior of SMEs.

Ni and Yu (2008) used the entire cross-sectional sample of Chinese listed companies in 2004, examined whether the financial structures of Chinese listed companies followed a priority order from debt to equity. Zeidan et al. (2018) found that even in the case of subsidized loans, the ultimate owners of private firms follow rank-ordering theory. Serrasqueiro et al. (2011) found that the capital structure decisions of service-oriented SMEs are different from those of other types of enterprises. Compared with other types of enterprises, the capital structure decision-making of service-oriented SMEs is closer to the assumptions of the priority order theory and further away from the assumptions of the trade-off theory. D. H. Chen et al. (2013) invastigated panel data of listed companies in Taiwan from 1990 to 2005, tested the rank-order theory and market-timing theory. Adair and Adaskou (2015) tested the trade-off theory (TOT) and prioritization theory (POT) assumptions about corporate leverage. Frank et al. (2020) found that companies use internal resources to cover losses where possible. If there is insufficient internal funding, the business acquires external debt.

J. Agyei et al. (2020) examined the theoretical predictions of the priority financing theory and the trade-off theory to determine which competing theory can better explain the financing decisions of SMEs. The results also showed that profitability, age, liquidity, growth, scale, and asset tangibility all had a significant impact on the capital structure of SMEs. Minola et al.

(2013) explored whether the financing strategies of new technology companies were based on prioritization theory. Jumono et al. (2013) found that the application of priority theory does not always change as net worth grows. This means that in order to improve the effectiveness of information sorting theory and enhance shareholder value, it is necessary to conduct in-depth research in conjunction with the company's profitability. Bundala (2012) analyzed the validity test of three theories of capital structure in the Tanzanian context: static trade-off theory, hierarchy theory (information asymmetry theory), and agency cost theory. The study found that the static trade-off theory has no strong evidence to test and rarely supports the priority financing theory, but the agency cost theory has been proven effective and practiced in Tanzania. Eldomiaty et al. (2017) examined whether firms followed the financing tiers argued by the Priority Order Theory (POT). The following conclusions were drawn: Sustainable financing can be obtained and maintained if the business plans for sustainable growth in sales.

Chaklader and Padmapriya (2021), based on the theory of prioritization, explored various financial factors that affect the decision-making of a company's top-level capital structure. Zhao et al. (2004) examined the applicability of sequencing theory and signal theory in agribusiness. The results shows that agricultural enterprises not only follow the hierarchy theory but also follow the signal theory. Agricultural enterprises mainly rely on their large scale and good historical management records to facilitate investment and financing. Allen (1993), using accounting information for 89 listed Australian industrial and commercial companies extracted from the 1954 CRIF document of the Australian Graduate School of Management, explored the hierarchical order hypothesis further developed by Myers and Majluf (1984).

Ghosh and Cai (2004) argue that there is no significant difference between a firm's debt level moving toward the industry average versus moving away from the industry average, and when a firm's debt level is higher than the industry average, its movement towards the industry average is very different. Ang and Jung (1993) introduced different methods to test Myers's hierarchical ordering theory of capital structure. The results shows that neither marginal analysis nor sensitivity analysis could support Myers' pecking order theory. For the sample, borrowing from banks remained the preferred source for all groups in the medium or long term. When debt was high, companies were willing to issue equity as a preferred source. Mazen (2011) examined the validity of static trade-off theory and hierarchy theory. Empirical tests showed that we could not formally reject two theories explaining financing behavior, and they confirmed the importance of the considerations offered by static trade-off theory. Oktavina et al. (2018) collected data from the Indonesian Stock Exchange from 2012 to 2016 and analyzed the determinants of capital structure policy decisions for listed family businesses using a sample

of 38 Indonesian family businesses. Their research suggests that capital structure is measured by the debt to equity ratio (DER), and the determining factors of capital structure include profitability (ROA), asset structure, growth, company size, and business risk. Furthermore, their research indicates that the negative impact of ROA on DER is not significant， asset structure has a significant positive impact on DER, growth has no significant negative impact on DER, and size has no significant positive impact on DER. The results show that Indonesian family businesses still fit Pecking Order Theory in the application of capital structure. Christianti (2006) examined the impact of changes in certain factors identified by capital structure theory (asset tangibility, growth, profitability, volatility, and flexibility) on corporate leverage (short- and long-term debt). Empirical results showed that asset tangibility, growth, and profitability support POT, but earnings volatility does not support STO and POT. M. Su et al. (2022) introduced the first known attempt to test the theory of hierarchical order in the context of ecclesiastical organizations, a large but opaque subset of non-profit organizations. This study increased our understanding of church finances and congregation capital structure. It highlighted the value of transparency in church capital markets and filled a significant gap in the literature on non-profit finance research and the field of religion. Onatca et al. (2019) determined the capital structure and evaluated which capital structure theory was suitable for the development of the company. Frank and Goyal (2008) pointed out that direct transaction costs and indirect bankruptcy costs played an important role in corporate debt selection. Vanacker and Manigart (2010) discussed incremental financing decisions for high-growth companies. Research indicated that profitable companies preferred to invest with retained earnings. Outside equity was especially important for unprofitable businesses with high debt, limited cash flow, high risk of bankruptcy, or significant investments in intangible assets. IPOs were extremely important for high-growth companies to grow beyond their debt capacity.

2.2 The impact of financial leverage on enterprises

2.2.1 The impact on business performance

Regarding financial leverage and company performance, Ojo (2012) found that leverage significantly affects company performance in Nigeria. He further argued that theories should be developed to suit the macroeconomic variables of the country, rather than relying on the structural theories of the world's advanced developed countries, as these theories could not be used as suitable proxies for advancing the process of developing countries. Dimitrov and Jain

(2008) pointed out that changes in financial leverage are not only related to accounting gains but also to value. Sodeyfi (2016) analyzed the interaction between financial leverage and product quality, reviewing relevant and empirical research on the link between financial leverage, product quality, and operating conditions. Malshe and Agarwal (2015) explored how a company's financial leverage affects marketing results and the corresponding company value. The study found that leverage has a dual effect: it reduces customer satisfaction and moderates the relationship between satisfaction and firm value. Obradovich and Gill (2012) pointed out that board size has a negative impact on the value of U.S. service companies, and that financial leverage and return on assets have a positive impact on the value of U. S. service companies. Rayan (2008) found that an increase in financial leverage was negatively related to firm value. Goel et al. (2015) found that financial leverage has a significant impact on different indicators of operating liquidity. Further research found that operating liquidity and financial leverage have a considerable impact on the performance of Indian machinery companies. This study provided insights into the interrelationship between operational management and financial management and its impact on firm performance. M. S. Long and Malitz (1985) found that the more discretionary investment opportunities a business faces, the lower its financial leverage. Other possible capital structure determinants, such as the availability of internal funding, tax implications, and risks, while significant, do not affect the importance of discretionary investing. Jones and Sharma (2001) pointed out that companies in the old economy did have significant earnings management, which was positively correlated with leverage and free cash flow levels, but it was far less pronounced in the new economy. Mule and Mukras (2015) concluded through research that financial leverage has an important negative predictive effect on financial performance measured by return on assets and Tobin's Q; ownership concentration has a negative predictive effect on financial performance measured by Tobin's Q, while asset tangibility has a significant positive predictive effect on performance measured by ROE and Tobin's Q.

Prezas (1987) pointed out that when the real decision-making and financial decision-making of the enterprise are separable, the change in capital structure will affect the degree of financial leverage, but not the degree of operating leverage. On the other hand, when real decisions and financial decisions interact, changes in capital structure affect both the Degree of Operating Leverage (DOL) and the Degree of Financial Leverage (DFL). Sajid et al. (2016) explored the impact of financial leverage on investment decisions of Pakistani KSE-30 index listed companies. They identified the most important factors that influence a company's investment decisions and lead to the bankruptcy of Pakistani listed companies. Thirty (financial

and non-financial) companies in Pakistan were analyzed using descriptive statistics, correlation analysis, and pooled ordinary least squares regression models. The results shows that financial leverage had a significant negative impact on investment decisions. N. Iqbal et al. (2020) examined the impact of financial leverage on company innovation. The results shows that from the perspective of the number of patents, financial leverage is not conducive to input innovation, but is conducive to output innovation. Conversely, leverage has a negative effect on output innovation as measured by the number of inventions. This means that leverage is more disruptive to China's highest form of innovation (invention). Input innovation is more sensitive to changes in long-term leverage than short-term leverage. Pham and Nguyen (2019) explored the moderating effect of corporate governance mechanisms on the relationship between financial leverage and profitability of emerging market firms. The study found that board size, board independence, and state-owned nature have significant positive effects on the relationship between financial leverage and profitability. The effect of CEO duality on the leverage-profitability relationship tends to be negative, while the effect of CEO ownership on the leverage-profitability relationship tends to be positive, although neither is statistically significant.

On the impact of financial leverage on other financial indicators, Moradi et al. (2010) introduced the income method to study the relationship between financial leverage and surplus reaction coefficients. It is intended to provide further evidence for the factors influencing the surplus reaction coefficient. The study included companies listed on the Tehran Stock Exchange. The study data were collected for a seven-year period from 2002 to 2008, and the data analysis was carried out using a multiple regression method. The results shows that the surplus response coefficient of the low-leverage company group was greater than that of the high-leverage company group, and the mean difference between the groups was statistically significant. Barakat (2014) examined the impact of financial structure, financial leverage, and profitability on the value of industrial companies. The study pointed out that there is a weak negative correlation between financial leverage and the value of the stock, and this relationship is not significant, so there is no statistically significant relationship between financial leverage and the value of the company. Gweyi and Karanja (2014) sought to investigate the impact of financial leverage on the financial performance of Kenyan savings Saccos. The results shows that the debt-to-equity ratio is completely positively correlated with the return on net assets and after-tax profit within the 99% confidence interval, and there is a weak positive correlation between the debt-to-equity ratio and the return on assets and income growth. Ozdagli (2012) found that the tax deduction for interest payments increases the irreversibility of effective

investments, while the irreversibility of investments weakens the relationship between book capitalization and income. Acheampong et al. (2014) explored the effect of financial leverage and the market size of selected stocks on stock returns. When using overall industrial data, the study established a negatively significant relationship between leverage and stock returns. Ting et al. (2015) explored the effect of CEO personal characteristics on financial leverage. Ahmad et al. (2020) examined the impact of contraction flexibility and operating leverage on financial leverage from the perspective of proxy conflict between shareholders and creditors. Research proved that shareholder contraction elasticity may adversely affect financial leverage, and that where shrinkage flexibility exists, the alternative relationship between operating leverage and financial leverage is continuous or significant. U. Iqbal and Usman (2018) examined the relationship between determining financial leverage and the performance of Pakistani textile composites companies. The study shows that financial leverage had a significant negative impact on the return on net assets of enterprises and a significant positive impact on the return on total assets of enterprises. Further research shows that financial leverage had a positive impact on corporate performance, provided that corporate liabilities did not exceed equity.

R. L. Yang et al. (2016) explained the relationship between venture capital (VC), financial leverage, and corporate performance. The empirical results showed that VC is positively correlated with corporate performance, and financial leverage is negatively correlated with corporate performance. Further research shows that by introducing the intersection of venture capital and financial leverage, this negative relationship becomes larger and more pronounced in venture capital-backed companies. F. J. Xu et al. (2013) explored the impact of financial leverage on profitability and whether there was smoothing for listed companies on the Tehran Stock Exchange. The results of the study confirmed a smooth relationship between financial leverage and profitability of listed companies on the stock exchange, and showed that the smoothing of listed companies includes operating profit, gross profit, and net profit. The primary results showed that although there is a significant relationship between some of the study assumptions of smoothed and non-smoothed businesses, there are significant differences in financial leverage and profitability between the two groups of firms. Tonye and Sokiri (2020) found that financial leverage has a positive impact on the management of the corresponding surplus, while both financial leverage and total leverage have a negative impact on actual surplus management. The study recommends that users of financial statements should reduce/increase their expectations of the reliability of earnings, introduced into account financial leverage when assessing reported returns. Idowu and Adebayo (2018) examined the impact of financial leverage on voluntary corporate social disclosures for listed manufacturing

companies selected by the Nigeria Stock Exchange. The study found that among the manufacturing listed companies selected by the Nigeria Stock Exchange, financial leverage does not significantly affect voluntary disclosure of economic and environmental information. However, financial leverage significantly affects voluntary social disclosure of manufacturing listed companies selected by the Nigeria Stock Exchange. The study recommends that companies should participate in voluntary corporate social disclosure regardless of their level of financial leverage. Sari (2020) pointed out that the return on assets has no positive effect on the initial yield, financial leverage has a positive impact on the initial yield, and trading volume has a negative impact on the initial yield. Z. Y. Chen et al. (2019) demonstrated the impact of operating leverage on corporate profitability and financial leverage, as well as the empirical relationship between profitability and financial leverage. Danso et al. (2020) contributed to the capital structure literature by examining the impact of financial leverage on corporate performance, as well as the importance of firm size and crisis in the leverage-performance relationship. Bitok et al. (2021) explored the impact of financial leverage on the financial sustainability of microfinance institutions. The findings pointed to a positive and significant impact on the financial sustainability of microfinance institutions. The study recommended that managers of MFIs use financial leverage prudently to improve their overall profitability and increase investor confidence in their strategic decisions, thereby achieving financial sustainability. Towo et al. (2019) pointed out that financial leverage has a negative impact on labor productivity. The findings argued that increased financial leverage leads to lower labor productivity, which may be due to underinvestment caused by debt backlogs, higher financing costs (which reduce future investments), labor costs due to highly regulated lending, and loan recovery activities. These findings suggest that microfinance companies must control their costs and ensure that they generate more revenue from loans received by other financial institutions.

Coleman and Baidoo (2020) found that there is an S-curve relationship between financial leverage and working capital management and cash holdings. The relationship between internationalization and dividend payments also has a significant regulatory effect. This means that companies involved in international activities place a high priority on borrowing as part of their capital structure, rather than relying entirely on the owner's capital, as most domestic companies might. Pakpahan (2019) showed that there is a very strong relationship between financial leverage and return on investment, and financial leverage and return on invested capital. Motalebian and Zahra (2019) pointed out that there is a significant negative correlation between institutional supervision and financial leverage. The impact of institutional controls and management holdings on financial leverage is positive and significant. Chandra and

Rusliati (2019) found that financial leverage and liquidity have a significant negative impact on stock yields. To a certain extent, leverage has a significant negative impact on liquidity, but not significantly on liquidity. GCG's ability to regulate the simultaneous effect of financial leverage and liquidity on stock returns is positive, but the effect is not significant. GCG, on the other hand, has a significant positive effect. Putri and Lutfillah (2020) examined and analyzed the impact of profitability, company size, financial leverage, and dividend payout ratios on revenue smoothing practices. The study noted that partial profitability, company size, financial leverage, and dividend payout ratios had no significant impact on revenue smoothing practices. M. I. Ahmad et al. (2017) explored the relationship between financial leverage and financial performance. Research shows that financial performance is primarily a financial lever chosen by businesses rather than by overall economic health, especially in the context of non-financial companies in Pakistan.

2.2.2 The impact on corporate social responsibility

Financial leverage and social responsibility.

Mishra and Modi (2013) analyzed the moderating effect of corporate financial leverage. The study shows that corporate social responsibility (CSR) has a significant impact on the idiosyncratic risk of enterprises. Positive corporate social responsibility can reduce the risk, while negative corporate social responsibility can increase the risk.

Ghosh and Jain (2000) argued that the increase in financial leverage results from an increase in debt capacity.

Oware and Mallikarjunappa (2019) examined the mediating role of third-party assurance (TPA) in the CSR-financial performance relationship and the moderating role of financial leverage. The research shows that corporate social responsibility (CSR) is positively correlated with the financial performance (ROA (return on assets) and ROE (return on equity)) of Indian listed companies.

Riantani and Nurzamzam (2015) found that company size has a positive and significant impact on corporate social responsibility disclosure, financial leverage has no significant impact on corporate social responsibility disclosure, and profitability has no significant impact on corporate social responsibility disclosure.

2.2.3 The impact on financial risk control

Bretó and Carles (2014) modeled leverage as stochastic but independent of return shocks and

volatility, and used S&P 500 data for likelihood-based inference through a recently developed iterative filtering algorithm for the still weak stochastic leverage. Empirical support for change provides new evidence.

Feltham et al. (2010), using an equity valuation model characterized by cyclical incomplete accounting information, examined how financial leverage affects a company's accounting quality choices (i.e., precision). The study found that the presence of financial leverage prompts companies that perform on average to prepare high-precision accounting information. Thus, they concluded that when a company performs poorly, it has an incentive to reduce accounting accuracy in order to reduce the likelihood of debt contract violations and the detection of accounting biases.

Dimitropoulos (2014) showed through research that effective corporate governance mechanisms, such as increased board size and independence, and the presence of more decentralized ownership (management and institutions), lead to lower levels of leverage and debt, which in turn reduce the risk of financial instability.

Anagnostopoulou and Tsekrekos (2017) showed that the level and increase of leverage had a positive and significant effect on upward risk management but had no significant effect on the risk management of income increases. For firms with very high levels of leverage and variability, there is a complementary effect between risk management and risk management at unexpected levels. Furthermore, leverage-induced asset pricing is not as easily perceived by market participants as debt-induced asset pricing, although the former may imply deviations from optimal business practices.

Bae et al. (2017) found that financial leverage and Tobin's Q have a U-shaped relationship, and marketing intensity has a positive adjustment effect on the curve relationship between the two. Aydemir et al. (2007) examined the impact of financial leverage on market mixes, as well as the impact on small companies with special risks and market risks. In an economy with constant interest rates and constant risk prices, the volatility of equity returns generated by financial leverage at the market level is small, but it varies greatly at the level of individual companies. In economies where interest rate and risk price changes are more realistic, there are significant changes in equity yield fluctuations at both the market and corporate levels.

Finishtya (2019) empirically examined the impact of ratios on cash flow, profitability, and financial leverage from operating activities on possible financial distress for Indonesian manufacturing companies. The findings show that operating cash flow, as measured by operating cash flow/net sales, has a significant impact on the company's financial distress, profitability measured by Return on Assets (ROA) has a significant impact on financial distress,

and financial leverage measured by Debt-to-Equity Ratio (DER) does not have a significant impact on financial distress.

Malm and Krolikowski (2017) used a unique hand-collected corporate litigation dataset to study the relationship between litigation risk and financial leverage. The study found that increased litigation risk was associated with a significant reduction in total debt. Dividing total debt into long-term and short-term debt, they found that litigation risk is negatively related to long-term debt, while there is no significant relationship between litigation risk and short-term debt.

Gloy and Baker (2002) noted that the addition of risk-free assets significantly improves the ability of the general stochastic advantage criterion to distinguish risk management strategies.

Matemilola et al. (2012) viewed debt leverage as an important risk factor that can be priced in equity valuations. The results also show that the dynamics of corporate capital structure decisions cannot be ignored.

Dimitrov and Jain (2003) found that changes in financial leverage were negatively correlated with future risk-adjusted returns. In addition, research suggests that changes in financial leverage are associated with changes in future returns on equity, which may partly explain unusual patterns of future returns.

2.2.4 The impact of typical financial leverage

(1) The impact of typical financial leverage on various industries

Rafique (2011) examined the impact of their financial leverage on capital structure. Through regression analysis and correlation coefficient test to test the relationship between the models, it is found that during the study period, the corporate profitability and its financial leverage have no significant impact on the capital structure of the explored companies. Rehman (2013) explored the financial impact of financial leverage and examines whether financial leverage has an impact on financial performance, introduced evidence from listed sugar companies in Pakistan. The results show that the debt-to-equity ratio is positively correlated with the return on assets and sales growth rate, and negatively correlated with earnings per share, net profit rate, and return on equity. Pachori and Totala (2012) examined the impact of financial leverage on shareholder returns and market capitalization of Indian Pithampur (MP) automotive cluster companies. Through simple linear regression analysis, the impact of financial leverage on shareholder earnings and market value was judged, and the impact status of leverage was found out. Alexandridis et al. (2020) was the first to study the relationship between the financing policies of shipping companies and corporate investment decisions. The focus is on

the impact of deviation from the target capital structure on corporate mergers and acquisitions. Higher debt levels have a negative impact on a company's ability to acquire and a positive impact on the quality of a company's investment. This model has direct policy implications for shipping companies, management teams and shareholders. Kizildag and Ozdemir (2017) used a combination of micro- and macro-level accounting data, the authors present new stylized facts about the underlying causes of fluctuations in the level of financial leverage of U. S. hotel and travel companies over the period 1990-2015.The study pointed out that firm-specific leverage factors can significantly affect short-term leverage, while long-term leverage is mainly determined by macroeconomic indicators. In addition to this, all companies have more favourable book leverage than market leverage. Bui (2020) explored the impact of financial leverage and supply chain finance on the performance of vietnamese construction enterprises. Using the generalized moment method (GMM), the results reveal the significant impact of financial leverage and supply chain finance on the performance of construction firms. In particular, financial leverage (FL) can affect business performance more than supply chain finance (SCF). The results also show that supply chain finance plays a key role in improving corporate performance. At the same time, more debt and inefficient use of debt can have a negative impact on business performance. Mallinguh et al. (2020) explored the role of foreign ownership levels and financial leverage in mediating firm performance, including the impact of the corporate sector and corporate age on corporate performance. The results show that in addition to equity, the enterprise sector, the age of the enterprise, the level of foreign shareholding and financial leverage will significantly affect the performance of the enterprise. Foreign ownership plays a significant intermediary role between the company's age and performance, but has no impact on leverage. Foreign ownership and leverage do not have a significant intermediary role in the relationship between the corporate sector and financial performance. Bangun et al. (2017) examined the impact of financial leverage, enterprise size and employee stock ownership schemes (ESOP) on corporate performance of manufacturing companies on the 2013-2015 Indonesia Stock Exchange was examined and obtained. The findings show that employee stock ownership plans (ESOP) have no impact on return on total assets and return on net assets. Akhtar et al. (2022) explored the impact of financial leverage on the performance of 424 Pakistani non-financial listed companies during the period 2001-2017. The results of the study confirm the inverted U-shaped relationship between financial leverage and performance, indicating that the increase in the financial leverage level of listed companies in Pakistan will raise the performance to a certain level, and the further improvement of the financial leverage level will reduce the performance.

(2) In terms of simulated business

Sarkar (2020) examined the relationship between simulated operating leverage and financial leverage. The results of the study found that when the externality of operating leverage is specified, financial leverage is a monotonous decreasing function of operating leverage. When the externality of financial leverage is specified, the operating leverage shows a trend of first increasing and then decreasing in financial leverage. Finally, when a company chooses operating and financial leverage, they can be positively correlated, negatively correlated, or uncorrelated, depending on the underlying parameters that drive change.

(3) On the board of directors

Tahir et al. (2020) pointed out that financial leverage has a partial intermediary effect between the age of board members, board diversity and dividend payment policies. Financial leverage also mediates between the number of female directors, the binary gender of the CEO and the dividend policy. However, financial leverage does not regulate the relationship between board size and dividend policy.

(4) In terms of recommendations

Afolabi et al. (2019) argued that companies should continue to use debt capital in order to benefit from available tax protections and ultimately improve profitability. Afey and Warui (2019) found that enterprise size, profitability, tangibility, liquidity, growth and financial leverage were significantly negatively correlated. The study recommends that top executives of public companies should develop growth and expansion strategies at scale, such as segment and share growth.

(5) In terms of strategic behavior and competition

The level of leverage affects both the strategic behavior of the enterprise and the strategic behavior of the enterprise (Istaitieh & Rodríguez, 2003). Brown et al. (2009) examined whether leveraged buyouts (LBOs) increase the bargaining power of companies and suppliers. The study found that in the announcement of downstream leveraged buyouts, the abnormal returns of suppliers were significantly negative. In addition, suppliers that may have made significant relational-specific investments were more negatively impacted in terms of abnormal returns on stocks and lower margins than suppliers of commodity products or short-term suppliers. Jermias (2008) empirically explored the impact of competitive intensity and corporate strategy on the relationship between financial leverage and corporate performance. Introduced US manufacturing companies as a sample, it confirms the hypothesis that the cost of debt of product differentiated companies is higher than that of cost-leading companies. Furthermore, the findings show that the intensity of competition has a negative effect on the leverage-

performance relationship, suggesting that competition can substitute for the opportunistic behaviour of debt-constrained managers.

(6) In terms of policies

Gilchrist (2004) confirmed that highly leveraged economies are particularly vulnerable to a slowdown in the world economy. The extent to which leverage will amplify the impact on the world economy depends on the nature of the turmoil. In the presence of financial accelerators, capital-specific supply shocks can be more volatile than those without entities. Dwenger and Steiner (2014) estimated the impact of profits tax on corporate financial leverage a period that saw the introduction of major corporate tax reforms in Germany. Q. Z. Cao et al. (2022) took the online voting policy in the Chinese market as a natural experiment on the protection of minority shareholders, the relationship between the protection of minority shareholders and the company's financial leverage is explored. The research results show that the participation of minority shareholders in the online voting of shareholders' meetings can significantly reduce the financial leverage of enterprises. In addition, the heterogeneity test results show that the impact of online voting on financial leverage is more pronounced in enterprises with small capital scales, non-state-owned enterprises and relatively low levels of external supervision. Evodila et al. (2020) found that the Board of Auditors is able to reconcile the impact of information asymmetry on surplus management, while, on the other hand, the Board is unable to reconcile financial performance and the impact of financial leverage on surplus management.

(7) Research on financial leverage and investment and investment efficiency

H. F. Guo et al. (2021) found that there is an inverted U-shaped relationship between the level of financial leverage and the efficiency of the enterprise. This shows that enterprises with the best capital structure have high efficiency. Bernini et al. (2015) examined a negative causal relationship between corporate leverage ratio and export quality, in which quality is inferred from discrete selection model estimates of foreign consumer demand. In addition, through the estimation of investment models, it is found that the negative impact of leverage on quality is consistent with the theory that the agency cost of debt determines suboptimal investment. C. L. Yang and Lai (2021) found that the launch of cross-listing significantly increased the level of financial leverage of enterprises, followed by a significant increase in corporate R&D investment. The aggressive strategy of cross-listed companies to support R&D investment by increasing financial leverage has further significantly influenced industry competitors to increase R&D investment as a coping strategy. W. C. Guo et al. (2011) explored a general equilibrium model for asset trading with financial leverage, in which investors can speculate based on different beliefs about the fundamental value of an asset. Studies have shown that the

increase in leverage leads to an increase in the current stock price through the "leverage effect", and leads to the borrowing of more funds, the purchase of more stocks, thereby pushing up the stock price in the subsequent period, which is the "pyramid effect". When stock prices fall, there can also be a "de-pyramid effect" as lenders issue margin call notifications that force stocks to sell, causing the stock price to plummet further.

B. H. Agyei (2015) examined the impact of cross-border acquisitions on financial leverage, based on 782 acquisitions by UK companies between 1982 and 2009. Results show that cross-border M&A has a negative impact on the financial leverage of acquiring companies. However, when acquirers choose developed countries as their targets, and when multinationals make acquisitions, the negative impact of cross-border acquisitions disappears. Bahreini et al. (2013) analyzed the relationship between changes in economic leverage and operating performance of companies admitted to the Tehran stock market. The findings suggest a significant relationship between economic leverage and stock prices. The increase in debt has led to an increase in the relationship between economic leverage and stock prices. There is a significant negative correlation between economic leverage and stock prices. Changes in economic leverage are negatively correlated with changes in the ratio of expenditure to property. Danso et al. (2019) found that financial leverage is significantly inversely associated with corporate investment. For enterprises with a high degree of information asymmetry, the impact of financial leverage on corporate investment is significant. In addition, there is a significant relationship between leverage and corporate investment in low-growth firms, while there is no significant relationship between leverage and investment in high-growth firms.

2.3 The investment behavior and influencing factors of enterprises

2.3.1 The concept of firm’s investment behavior

According to the search results of BAIDU website, Firm’s investment behavior refers to the firm’s investment activities of investment entities at all levels in a certain economic environment. Its essence is the externalization of capital investment in different stages of economic organizations at different levels. Reasonable firm investment behavior is of great significance for grasping the direction of investment, adjusting the investment structure, improving the distribution of productive forces, and coordinating economic development.

Firm’s investment behavior can generally be attributed to two foundations:

one is the need for investment, which is reflected in the requirements for investment in

national economic and social development (for enterprises, production development);

The other is to achieve certain effects through investment activities, reflecting the various benefits to be realized by the investment. Firm's reasonable investment behavior is of great significance to the sustainable development of enterprises, and scholars have conducted a lot of research on this.

Numerous studies have shown that firm's investment behavior is complex and influenced by a combination of factors. Scholars have extensively explored the impact of various factors in the operation and management of enterprises on investment behavior.

2.3.2 The impact of decision maker personal factors on investment behavior

On the influence of the characteristics of investors on investment behavior. Lapanan (2018) examined the relationship between investor behavior and socially responsible (SR) funds. The results show that most SR investors rebalance their portfolios more frequently than traditional investors, are likely to hold more diversified portfolios, and hold hybrid portfolios that combine traditional and SR funds. Furthermore, while SR investors' buying decisions are equally sensitive to SR and traditional fund past returns, SR investors' selling decisions are more sensitive to SR's negative past returns than to traditional funds, suggesting that with the decline in past negative returns , investors are less likely to sell SR than traditional funds. Additionally, aggregated flows from SR and traditional funds are equally sensitive to past returns. However, most investors are sticky SR investors whose total flow of SR funds is less sensitive to past positive returns. Finally, the flow of sticky SR investors (at the individual level) is more sensitive to past positive returns and less sensitive to SR's negative past returns than traditional funds. While these results suggest that sticky SR investors do have value-driven motives for holding SR funds, the persistence of their flows to SR funds is lower than to traditional funds, suggesting the likelihood that these investors will reinvest in SR lower than traditional funds; Saleem et al. (2021) provided empirical evidence of investor behavior toward mutual fund behavior by considering the relationship between investor behavior and risk perception (RP), return perception (Return P), investment standards (IC), mutual fund awareness (MFA), and financial literacy. The findings show that RP, Return P, and MFA do not have a significant impact on the behavior of fund investors and have a negative impact on the behavior of mutual fund investors. Investment standards have a significant negative impact on the behavior of mutual fund investors. Financial literacy has a positive and non-significant impact on the behavior of mutual fund investors. The findings provide better information and guidance for investors and policymakers on the factors influencing mutual fund investor behavior. In terms

of family characteristics, André et al. (2021) explored the long-term associations between early family breakdowns and investment behavior. The study shows that fund managers who experienced the death or divorce of their parents in childhood showed a stronger disposition effect, took less risk, and were more likely to sell their shares after an increased risky corporate event. This finding is consistent with persistent symptoms of post-traumatic stress and strengthens as treatment intensifies. These signs enhance our understanding of the role of social factors and "nurturing" in finance and the origins of investment biases.

Risk-introduced aspects, F. A. W. Ahmad et al. (2017) identified investment objectives, barriers to gold investment and financial risk tolerance as one of the predictors influencing the gold investment behavior of Malaysian employees. The results show that the main purpose of investing in gold is to save in the form of physical products. More than a third of the 403 respondents reasoned that they did not have the funds to invest in gold, followed by the complexity of the gold investment process, which was a major obstacle to their less familiar gold investment. Significant predictors of gold investment behavior are financial risk tolerance, gold investment attitudes, subjective norms and perceived behavior control, with an explanatory variance of 30. 4%. In addition, the subjective norms of gold investment are superior to other standards in predicting gold investment behavior, but gold investment knowledge has little significance for gold investment predictions. It can be concluded that peer groups are important in determining a person's intention to invest in gold; In terms of attitudes towards innovative finance, Antony (2020) further explored the role of innovation in investment preferences, the findings show that investors are more aware of new financial instruments, but they are consistently more inclined to invest in traditional financial instruments. At the same time, the author also tested parameters such as investment objectives, herding effect, asset familiarity, and risk tolerance, and the research results remained unchanged.

In terms of investor gender, Marinelli et al. (2017) examined the effects of gender differences on investment behavior. Based on a proprietary dataset of 2,374 clients, they found that after controlling for socio-demographic and economic variables, different genders still have many differences in the investment decision-making process, risk appetite and portfolio characteristics, thus indicating the role of gender in investment behavior. However, gender does not show a difference in portfolio liquidity and diversification, meaning that gender does not affect the quality of the portfolio;Similar gender studies, Baig et al. (2021) found that women entrepreneurs are not inclined to take risks in their businesses to make investment decisions, and they are somewhat conservative and risk-averse. The study also notes that if they spend a lot of time and get better training on the nuances of different investment vehicles, they will also

be willing to take risks in their investment activities. The results of this research will help investment managers understand the psychology of women to develop important portfolio recommendations, help service providers develop consulting training centers, and help policymakers reduce risk and maximize return opportunities; Witra and Subriadi (2022) investigated differences in gender behavior among boards in IT investment decisions. The results show that gender plays a key role in determining the behavior of board directors in IT investment decisions, with both male and female leaders having specific attributes that contribute to the success of IT investment decisions.

(3) Environmental characteristics

On the impact of environmental characteristics on investment behavior. In terms of color recognition, Bazley et al. (2017) conducted an empirical analysis of the impact of color on investment behavior. First, the study found that when investors indicate potential losses in red, risk introduced is reduced. Second, when investors indicate past negative share price paths in red, expectations for future stock returns are lowered. Consistent with red causing "avoidance behavior," red reduces investors' tendency to buy stocks. However, in cultural contexts, the impact is mild, for example in China, where red is not used to visualize economic losses. This research introduces assumptions from color psychology and visual science to enhance the general public understanding of individual investor behavior; In terms of management tone, Berns et al. (2022) pointed out that a change in the tone of management can predict the investment activity of a company. The change in tone in the management discussion and analysis section was positively correlated with subsequent capital investment and M&A activity. The study shows that the content of the forecast of the change in tone exists at the company and industry level, and the results of this study expand the scope of information contained in the change in tone of the financial statements when considering alternative sources of incremental information related to the company's investment activities; On the contender side, Ferretti et al. (2021) investigated the behavior of group investors when competing products were simultaneously released on online platforms. The findings show that the presence of competitive products affects the amount invested and, to a lesser extent, investment decisions, while the exposure of heuristics varies depending on the investor's profile. In addition, selectors and consecutive investors are those who are less exposed to heuristics, while early and late stage investors are affected by the herd effect when they post multiple campaigns on the platform. This study has important implications for entrepreneurs and platform managers in crowdfunding portal selection and information design; Ersahin et al. (2021) examined the impact of competition and reputation on the behavior of venture capital (VC) firms and startups,

the findings suggest that increasing competition reduces the return on investment of well-known venture capital firms and undermines their motivation to invest; In terms of interest rates, Apere and Akarara (2018) found that high interest rates inhibit investment, so it is recommended that monetary policy interest rates and lending rates be reduced to single digits to attract investors to obtain funds. in order to translate into the economic growth of the country; Horn et al. (2018) found that the different environments of Japan and Thailand intersected with each other, creating basic institutional conditions for organizing investment. The study also found that economic policymaking at home and abroad and the resulting investment restrictions (or investment opportunities) affect JMNE's close ties with the Thai economy.

2.3.3 The impact of social stability on investment behavior

In terms of social stability, Büttner et al. (2022) argued that there is a negative correlation between political instability and financial savings, the accumulation of durable goods, investment in housing improvements, and education and health and investment. Political instability, in particular, appears to lead to a shift from investment spending to increased food consumption, which means that future growth prospects are declining. The huge impact on economic growth, education and health seems particularly worrisome; D. A. Li and Shen (2022) found that the impact of social environment on healthy investment behavior is mainly reflected in investors' resistance to cultural distance and its compensation for the benefits of cross-institutional distance. Moreover, their common impact, predominantly cultural distancing, remains negative, which can still be demonstrated that institutional distancing mitigates the negative impact of cultural distancing on OFDI. Therefore, according to the findings of this thesis, in order to promote international healthy investment behavior, it is feasible to improve the mitigation effect of institutions in the short term and promote the level of cultural exchange in the long term; Imamah et al. (2020) explored the impact of the anti-corruption campaign on the investment behavior of Political Affiliates in China between 2007 and 2016. The results show that the anti-corruption campaign has had an impact on the investment expenditure and investment efficiency of Listed Companies in China. Compared with before the anti-corruption campaign, the investment expenditure of various governments and enterprises after the anti-corruption campaign has decreased significantly, and the investment efficiency of state-owned enterprises and non-state-owned enterprises controlled by local governments has improved. Further analysis shows that this is mainly due to an improvement in the underinvestment of locally controlled state-owned enterprises and the reduction of underinvestment and overinvestment by non-state-owned enterprises; Ososuakpor (2021) introduced real option

investment theory to examine the impact of market uncertainty and macroeconomic uncertainty on corporate investment decisions. The results show that there are significant differences in the impact of macroeconomic uncertainty and market uncertainty on corporate investment decisions. Macroeconomic uncertainty is positively correlated with corporate investment, while linear market uncertainty and secondary market uncertainty are not significantly related to corporate investment.

2.3.4 The influence of the company's own attributes on investment behavior

On the impact of the characteristics of the enterprise itself on investment behavior. In terms of financial data, Liu et al. (2021) took a sample of Chinese listed companies, the relationship between real and accrued surplus management activities and the company's capital investment behavior is examined. Referring to the threshold model proposed by Hansen (1999), the authors found that companies managing surpluses may experience overinvestment or underinvestment due to unstable levels of return on equity (ROE) in companies. The results show that there is an inverse relationship between earnings management and corporate investment, and this relationship changes from negative to positive as ROE exceeds a certain threshold level. The authors also found that ROE levels affect whether managers use both true and accrued operations together or as a substitute for influencing a company's investments. The results of this study are important because they shed light on the relationship between surplus management activities and the company's investment behavior, suggesting that ROE may be an important determinant of this relationship. This finding is significant for policymakers such as the China Securities Regulatory Commission (CSRC) as it suggests that the regulatory benchmarks they set could have a significant impact on the investment behavior of companies; In terms of ownership, Tsao et al. (2019) explored whether the creation of family ownership will alleviate or exacerbate short-sighted R&D investment behavior. The study found that establishing family ownership can alleviate short-sighted R&D investment in the case of small declines or losses in returns and breaches of debt contracts. In the supplementary analysis, the study found that in both cases, even if the opportunities for family businesses to participate in accrual surplus management are limited, family businesses will continue to avoid short-sighted R&D curtailment. Also, the family CEO It has been shown to be responsible for mitigating the company's tendency to engage in short-sighted R&D investment behavior, while the mitigating effect on short-sighted R&D investment behavior exists only in the absence of such as voting rights-Divergence of cash flow rights and other control enhancement mechanisms in family businesses; Meantime. Y. Cao et al. (2020) argued that institutional ownership generally

improves the efficiency of a company's investments. The study found that only stress-resistant institutional ownership can improve the efficiency of corporate investment by alleviating the problems of overinvestment and underinvestment. The study also found that the vision of institutional investors who resist pressure is important. In particular, the more pressure-resistant institutional investors with a higher shareholding ratio, the longer they hold shares, the more concentrated the impact on the investment efficiency of enterprises. Easing external financing constraints, reducing agency costs and increasing executive incentives can significantly improve the efficiency of corporate investment;In terms of financial assets,Bikas and Glinskytė (2021) briefly reviewed and summarized the previous research literature, conducted a study of 16 Lithuanian joint-stock companies, and the results of the study provided strong evidence that the company's financial assets had a positive impact on capital and overall profitability, that is, Lithuanian companies with higher profitability invested more frequently in financial instruments, while companies with higher borrowing funds and financial constraints invested less. Studies have shown that the performance indicators of Lithuanian companies have a weak impact on the size of their financial assets; Therefore, it can be assumed that this is related to cognitive factors and heuristics.

2.3.5 The impact of other factors on investment behavior

Other aspects. With regard to the influence of religion on investment behaviour, Akguc and Al Rahahleh (2021) explored the investment patterns of Shariah (SC) compliant and Non-Shariah (NSC)-compliant companies in six Gulf Cooperation Council (GCC) countries between 2000 and 2014.It was found that SC companies invest significantly less than NSC companies and have a stronger impact on investment reduction among companies with higher investment opportunities. This investment behavior is partly attributable to the relatively limited access to capital by SC companies, as they tend to keep leverage low. And this strong empirical result remains true when the authors use various model specifications, alternative definitions of long-term physical investments and different sub-samples, even introduced into account the endogenous nature of the option of complying with Sharia law; Regarding the impact of real estate on investment behavior, R. Wang et al. (2017) verified the dynamic links between real estate prices and corporate investment behavior in China. Based on China's quarterly data from 2005Q3 to 2014Q4, quantitative general equilibrium models confirm the existence of "collateral channels" in the private sector, but do not assume the potential endogenous problems in empirical research. What's more, the authors found channels of "crowding out" between private enterprises and state-owned enterprises caused by discriminatory financial restrictions;

Jia and Wang (2017) examined the effect of general partners' own investments (capital commitments) in venture capital (VC) funds under their management on their investment behavior and fund performance. The study found that the general partner's capital commitment has an inverted U-shaped relationship with investment speed, investment distance and industry specialization. The general partner's capital commitment is also associated with a greater exit success rate. These effects are more pronounced for limited partner (LP) venture capital funds with less regulation; Harjito (2022) examined the impact of financial attitudes, financial knowledge and control points on investment decisions. The findings show that financial attitudes, financial knowledge and control points have a positive impact on investment decisions; Croci et al. (2022) found that the operating performance of family businesses declined after listing compared to non-family businesses and private companies. The impact is long-term and not due to pre-IPO surplus management. The research also shows that family businesses are no different from other firms in terms of investment activity, but their leverage has fallen less.

2.4 The inefficient investment behavior of enterprises

The most discussed investment behavior in investment behavior is inefficient investment behavior, which mainly includes overinvestment and underinvestment, which will be discussed separately in conjunction with the collected literature.

2.4.1 Over-investment

Over-investment means that managers invest corporate funds in projects with small profit opportunities or negative net assets in order to realize their own or other interests (X. F. Xu et al., 2018). This will divert the company's investment from its current production and operational needs, thereby deviating from the real development opportunities of the enterprise. Scholars explored the influencing factors and consequences of overinvestment from multiple perspectives.

In terms of influencing factors, Fan and Phromphitakkul (2021) explored the relationship between the proportion of women in the top management team and the excessive investment behavior of listed companies. The results of the study show that: 1) The presence of female top management can effectively curb the occurrence of excessive investment behavior in companies. 2) The higher the proportion of female executives, the less likely it is that the listed company will have excessive investment behavior; Hamamura et al. (2021) found that

complementarities are an important factor in overinvestment decisions. Due to the complementarity of goods, increased demand for efficient enterprise products leads to increased demand for inefficient enterprises. Efficient companies may take aggressive investments to gain a competitive edge and improve demand. In addition, the study used analytical models to propose a new variable that affects overinvestment and demonstrates that it has a significant impact on managers' decision-making. This finding makes an important contribution to the over-investment literature. Elseoud et al. (2020) explored the impact of executive compensation on companies' overinvestment. The findings suggest that total executive compensation is inversely correlated with overinvestment; The study also found that the relationship between overinvestment and stock rewards was not significant, but it was significantly related to stock options, and that CEO compensation significantly reduced overinvestment by companies. The inverse relationship between executive compensation and overinvestment is consistent with agency cost assumptions. Therefore, the hypothesis that there is a positive correlation between executive compensation and overinvestment can be considered to hold; H. M. Zhang et al. (2020) explored the impact of customer concentration on the over-investment behavior of supplier companies. Based on a large sample analysis of the U. S. market, the study found that supplier companies with a high customer concentration may over-invest beyond the optimal level of investment identified by the investment opportunity. The study also found that the positive correlation between customer concentration and overinvestment weakens when the largest customer of a supplier company is a government entity, the duration of the supplier-customer relationship is extended, and the supplier company has a larger market share in its industry; Zandi et al. (2020) pointed out that the impact of inflation uncertainty on excessive investment is positive and significant. In addition, the findings suggest that managers' excessive trust in overinvestment also has a positive effect on risk-introduced, and ultimately significantly increases their likelihood of introduced risks, so inefficient investments in companies will increase; X. Jiang (2016) examined the relationship between the tenure of a CEO and the efficiency of his company's investment. The study found that overinvestment was more severe in the early days of the CEO's tenure than in the later stages of the CEO's tenure. The results also indicate that overinvestment increases as cash flow generated within the company increases; Du et al. (2016) explored the influence of Buddhism, the most influential religion, on overinvestment in firms, studies have shown a significant negative correlation between Buddhism and overinvestment, suggesting that Buddhism as a set of social norms can reduce owner-manager agency conflict, alleviate opportunistic behavior and overconfidence among managers, and thus alleviate overinvestment; Y. Li and Mao (2015) examined the impact of

smog control on excessive investment in heavily polluting enterprises. Compared with other enterprises, the effect of smog control on excessive investment in heavy air polluting enterprises is more obvious, and the effect on non-state-owned heavy polluting enterprises is more significant.

In terms of over-investment avoidance, D. N. Zhang (2020) analyzed the relationship between intangible assets and low business investment at the corporate level. The findings suggest a negative correlation between intangible assets and fixed investments. By controlling intangible assets, the underinvestment gap since 2002 can be significantly reduced. This effect is magnified, especially for companies with higher leverage, lower formability and lower labor productivity; Shi and Gao (2018) explored the overinvestment caused by free cash flow from the perspective of ownership concentration. The study found a significant positive correlation between overinvestment and free cash flow, confirming the free cash flow hypothesis. In addition, equity concentration is negatively correlated with excessive free cash flow of the company. Equity concentration can effectively curb excessive investment caused by free cash flow; C. J. Huang et al. (2015) found that the cash value of overinvested companies is lower than that of underinvested companies, and the magnitude of overinvestment is negatively correlated with the marginal value of cash holdings by examining listed companies on the Taiwan stock market. In addition, further testing shows that higher block holdings and the presence of independent directors on the board of directors can effectively mitigate the negative impact of overinvestment on the marginal value of cash holdings; Lu and Liu (2016) explored data from China's A-share listed companies from 2010 to 2014 to examine the impact of management overconfidence on corporate investment decisions and the inhibition of corporate governance. There is evidence that management overconfidence is significantly positively correlated with corporate overinvestment, and corporate governance can effectively constrain this behavior.

Other relevant studies. In terms of forms of expression, Eaton et al. (2019) found that leasing appears to be a mechanism for overinvestment compared to capital expenditure investments, even in companies with high reporting quality and negative free cash flow. The findings suggest that overinvestment in leased assets triggers future sales growth, but profit growth declines over the next three years. The study also found that overinvestment was negatively correlated with stock returns over the same period, suggesting that investors view leasing overinvestment as value-damaging. Finally, despite negative return and return consequences, the study found that overinvestment in leasing was associated with increased CEO compensation, driven primarily by future sales growth; Credit risk perspective, C. H. Xu

and Zhou (2016) introduced the A-share listed companies in Shanghai and Shenzhen from 2009 to 2013 as a sample, the impact of excessive investment on the company's credit risk is explored, and the improvement of the quality of internal control can be effectively improved to control the credit risk caused by excessive investment; other points of view, Bakir and Campbell (2015) did not believe that the Great Depression and subsequent downturn in the US economy were a crisis of overcapacity caused by overinvestment. They argued that the previous research evidence does not support viewing it as an overinvestment crisis.

2.4.2 Under-investment

In addition to over-investment, inefficient investment also includes under-investment. Under-investment refers to the fact that managers are affected by factors such as information asymmetry, which leads to higher financing costs, which ultimately leads to management deviating from investment projects with high net present value (Tian et al., 2021). Scholars explored the influencing factors and consequences of underinvestment from multiple perspectives.

On the factors influencing underinvestment. H. Zhang (2017) analyzed the impact of environmental uncertainty on investment efficiency, introduced into account the impact of executive equity incentives on inefficient investments in the concentration of opportunistic investments. The study found that environmental uncertainty will increase investment efficiency and reduce the level of over-investment. Executive equity incentives will reduce the level of overinvestment and promote underinvestment; Yin and Hu (2016) introduced the theory of financial elasticity, and explored the impact of financial elasticity (including cash elasticity and debt elasticity) on the relationship between free cash flow and insufficient investment. The results show that the level of free cash flow is a constraint on the behavior of underinvestment; Both cash flexibility and debt flexibility have a significant positive moderating effect on the relationship between free cash flow and underinvestment; From the perspective of different sources of debt elasticity, the residual short-term bank lending capacity has a significant positive adjustment effect on the relationship between free cash flow and insufficient investment, while the impact of the residual commercial credit capacity on the relationship is not significant; Nakamura (2014) explored the heterogeneous impact of corporate governance on investment cash flow sensitivity. Studies have shown that the succession of management powers has a large positive effect on the sensitivity of investment cash flow, which can lead to overinvestment, and basically the lower the value of the net debt profile, the greater the impact, but when the level of the net debt profile declines, this effect also disappears, and in its place

the total debt amount has a significant negative impact on the investment. In the latter case, a strong incentive to maintain a negative net debt position can lead to underinvestment.

In terms of the process and causes of underinvestment. Bolle (2011) pointed out that in a two-stage oligopoly, where the first stage is investment and the second stage is quantitative or price competition, studies have shown that overinvestment usually occurs if the commodity is a substitute and its competitors are strategic alternatives, but underinvestment usually occurs if the commodity is a complementary and a competitor is a strategic complement, or if the combination is complementary and strategic alternatives or substitutes and strategic complementarities, there is usually an underinvestment; You (2014) conducted a new discussion on the reasons why some rural Households in China are difficult to maintain from the perspective of assets, emphasizing the long-term impact of shocks and risks on family agricultural asset holdings. The study found that household responses to uninsured shocks and risks led to inefficient and inadequate investment in agricultural asset accumulation. The multiple equilibrium of family farming asset dynamics and insufficient investment as a risk response make it difficult for some households to earn income above the poverty line and trap them in chronic low-balance asset poverty; Aharonovitz (2010) constructed a life cycle profile of human capital, assuming that individuals decide to invest in education, but employers decide to invest in training at a later stage. Shorter time spans for employers lead to underinvestment in training, which leads to underinvestment in schooling; Perelman and Walheer (2020) elaborated on a ratio that measures underinvestment by a country that combines the advantages of simplicity, intuitiveness, ease of calculation and non-parametrics. This study proved that there is an underinvestment situation in all countries. Over time, the distribution of underinvestment ratios in research experiments also appears to have become bimodal, meaning that underinvestment plays a role in economic differentiation between countries.

In terms of coping strategies. Nocke (2007) examined whether collusive underweight can be supported by the threat of rising investment spending. When there are no spillover effects, even if by deviation, companies can gain a sustained strategic advantage, but there will be an under-investment equilibrium. However, when the spillover effect is strong, insufficient investment equilibrium does not exist.

2.5 Research on China's credit policy and its impact

2.5.1 Credit policy and investment behavior

Credit policy is the embodiment of the country's economic policy in the supply of credit funds in a certain period of time. It consists of two parts: the loan supply policy and the loan interest rate policy. The loan supply policy stipulates the direction, scale, support focus, restriction targets of loans, and the overall objectives of promoting the development of the national economy; The loan interest rate policy stipulates the overall level of the loan interest rate and the principle of differential interest rate. The two are interconnected, complementary and work together. Credit policy has an important impact on investment behavior and has attracted great attention from scholars.

Regarding credit policies and investment efficiency and costs, Y. L. Wang et al. (2020) discussed the impact of green credit policies on capital investment of energy-intensive enterprises, and the empirical results show that after the promulgation of the green credit guidelines, the capital investment of energy-intensive enterprises has decreased significantly. The results of the study also show that green credit policies have been well implemented and promoted in China. Curbing investment in high energy consumption is of great significance to improving resource utilization efficiency and promoting green and low-carbon development; Y. Wang and Li (2022) found that after the release of China's new credit policy, the Green Credit Guidelines, there has been a significant increase in green technology innovation for all enterprises. Companies with greater deficiencies in the legality of environmental compliance have been more responsive to the Green Credit Guidelines. And because of the increase in productivity of its applied technology innovation after the publication of the guideline, it has led to a significant increase in green technology innovation. The investment efficiency of all enterprises has been significantly improved, which is an important channel for increasing green technology innovation; Zou and Tian (2020) established inventory models for supply chains that use both flexible trade credit contracts and two-tier trade credit policies. The inventory model is designed to determine the best ordering and payment strategy for retailers. The findings suggest that providing flexible trade credit can reduce the retailer's total cost, while providing a two-tier trade credit contract increases the retailer's total cost and reduces the retailer's advance payment portion; Zaman (2018) examined the impact of cash ratio, debt-to-equity ratio and return on dividend payout ratio on ABN listed manufacturing companies, and the results shows that the cash ratio and asset return variables had a significant positive impact,

while the asset-liability ratio variable had a significant negative impact on dividend payout ratio.

2.5.2 Credit policy and macroeconomics

The impact of credit policy on financial and monetary policy. D. He (2018) summarized the characteristics of Hong Kong's approach to financial stability. Hong Kong's financial policy framework emphasizes the importance of limiting the leverage level of private and public sector balance sheets so that households, businesses and governments can navigate the financial cycle. Therefore, There are two main elements of Hong Kong's approach to financial stability: first, macroprudential measures to curb credit growth and increased leverage during the upward phase of the financial cycle; Second, contingency planning and stress testing to ensure that participants in the financial system are able to survive as going concerned businesses during the downward phase of the financial cycle; Minetti and Peng (2018) explored the impact of the macroprudential credit policy implemented by the People's Bank of China on macroeconomic fluctuations. The study found that the role of counter-cyclical credit policies in stabilizing the real economy cannot be ignored, and this effect is more obvious when credit conditions are more relaxed. The study also shows that macroprudential credit policies can significantly improve welfare, allowing the entrepreneurial sector to benefit more than the household sector; Lakdawala and Moreland (2019) explored option prices and investment data at the company level. The conclusion that higher responsiveness is driven by companies with more leverage-dependent on long-term debt suggests that monetary policy has been very effective in influencing long-term financing conditions since the financial crisis; Anarfo et al. (2019) pointed out that there is a double causal relationship between monetary policy and financial inclusion. Specifically, the impact of monetary policy on financial inclusion is obvious, and financial inclusion is also affected by monetary policy. The policy implication of this study is that the effectiveness of monetary policy depends on financial inclusion. Therefore, governments of sub-Saharan African countries should focus on policies that strengthen financial inclusion in order to effectively implement monetary policy. In addition, promoting financial inclusion will require sub-Saharan African governments to lower their monetary policy rates.

With regard to policy stability, Matousek et al. (2020) examined how uncertainty in economic policy affects capital shortages for financial firms in the event of a new crisis. By adopting the Global Economic Policy Uncertainty Index, the study notes that an increase in policy uncertainty in the event of a severe market downturn leads to an increase in future capital shortages. The impact of this policy uncertainty is generally similar for all companies and

industries in all regions, although with some exceptions. As the study expected, well-capitalized financial firms were less affected. The study also notes that companies will face additional and unexpected capital requirements during periods of heightened policy uncertainty and severe market downturns; Y. Jiang et al. (2019) provided empirical evidence from China on the impact of monetary policy and macroprudential policy coordination on financial stability and sustainability. The results show that: First, the supervision of bank risk behavior, monetary policy and macro-prudential policy should be counter-cyclical regulation at the same time; Second, the regulation of housing prices, tight monetary policy and tightening macro-prudential policy should be implemented alternately. Third, to regulate the stock price bubble, macro-prudential policy should be the first line of defense, and monetary policy should be the second line of defense.

The impact of credit policies on loan repayment and risk. Amo (2019) explored the credit policy of Suma Rural Bank and its impact on loan repayment. The study found that the credit policy of Suma Rural Bank was effective. There is also a strong positive correlation between credit policy and loan recovery. Banks use fines, legal procedures, collateral to check for loan defaults or late payments. The study suggests that the management of Suma Rural Bank needs to educate and listen to their grievances to make them aware of the credit and loan recovery process. Banks should also segment customers based on their needs, size, and type of business to implement a loan differentiation strategy. Management should also design products to meet the unique needs of segmented customers at the most competitive price for each segment; Y. Q. Li et al. (2022) analyzed the impact of consumer transfer in the dual-channel supply chain of capital constraints, and the results show that trade credit contracts can alleviate the financial pressure of retailers with limited funds and achieve the coordination of dual-channel supply chains. In addition, the adoption of trade credit has spurred ordering behavior among retailers. However, by using trade credit, the risk of default for capital-constrained retailers increases compared to well-capitalized retailers. In a dual-channel supply chain, manufacturers share risk with retailers through trade credit.

2.5.3 Credit policy and business operations

The impact of credit policies on businesses. R. Chen (2022) pointed out that green credit policies try to curb the formation of credit subsidies for zombie enterprises by reducing bank loan subsidies and evergreen loans. However, green credit policies promote mismanaged zombie companies by strengthening financial constraints on firms and reducing working capital and investment efficiency. The green credit policy has not had a significant impact on integrated

zombie enterprises. In addition, green credit policies have had a more significant impact on state-owned enterprises, enterprises in highly competitive industries that are highly dependent on external financing, and enterprises with a high degree of financial marketization; Credit policy has an important impact on the real estate market, Y. R. Wang and Zhao (2022) revealed several important results. First, the relaxation of credit policies has increased the liquidity of the real estate market, while the tightening of credit has reduced the liquidity of the real estate market. Second, the direction and duration of the real estate market being affected by credit policies are changing over time and are sensitive to market conditions; When the property market is down, the effect of loose credit policies to improve market liquidity is weak, and when the property market is up, market liquidity is more sensitive to monetary policy. Finally, real estate market confidence is the intermediary between credit policy and real estate market liquidity. These achievements are of great significance for improving the intelligence and efficiency of government supervision of the real estate market; Azman and Ramakrishnan (2021) found that three of the four-dimensional factors were excluded: credit structure, accounts receivable management, and inventory control. Only one factor was accepted and had a significant impact on the company's performance, namely accounts payable management. The results of the study show that 41% of the company's performance depends on the credit policy; Mugova and Kwenda (2020) investigated whether BRICS companies pursued the optimal level of trade credit policy targets. The study shows that companies have prudent trade credit target levels in their pursuit of growth opportunities. The company's pursuit of the target optimal level of trade payables and accounts receivable and the size of the company affect creditworthiness and capital market access, which affects the speed at which the current trade payable is adjusted to the desired level. Investment trade receivables require access to capital to obtain additional capital and the underdeveloped financial sector makes it costly to adjust to optimal credit levels. Different levels of financial sector development affect capital with access to alternative resources, which affects optimal trade credit policies.

Ding et al. (2021) used the implementation of the Green Credit Guidelines as a quasi-natural experiment to examine its impact on the risk of stock crashes in highly polluting companies. Since highly polluting businesses are less likely to get "green credit", this will lead to increased financial constraints on them. It prompted these companies to hoard more negative company-specific information, and as a result, highly polluting companies attracted less media attention and were more likely to be shorted after policy. The increase in information asymmetry between companies and investors has led to a higher risk of collapse. In addition, research shows that highly polluting companies should follow the government's initiative and

transform into greener businesses. By doing so, these companies can stabilize their stock prices, thereby reducing the risk of stock crashes; Q. He and Zhao (2022) explored the impact of the dual credit policy on R&D collaboration between suppliers and manufacturers in the automotive industry. The results show that cooperation can effectively promote R&D investment in fuel economy and the fuel economy of the final product than non-cooperation. The government intends to formulate a dual credit policy to guide the R&D cooperation behavior of the automotive industry supply chain, not only to consider the impact of credit unit price, but also to consider the public's awareness of fuel conservation and environmental protection. The comprehensive effect of fuel saving on R&D cooperation led by different forces means that the government should take into account the different situations of the automotive industry supply chain with the goal of encouraging R&D cooperation, formulate dual credit policies, adjust the demand relationship between supply and dual credit policies to affect credit unit prices, thereby affecting the comprehensive effect of fuel saving, and encourage R&D cooperation in the automotive industry supply chain to achieve energy conservation and emission reduction.

2.5.4 Credit policy and supply chains

On the impact of credit policies on upstream and downstream supply chains. Khanna et al. (2018) explored tertiary supply chains, in which manufacturers offer fully permissible delays to the entire seller, which in turn adopts different trade credit policies for their subsequent downstream retailers. Research analysis shows that signing shorter contracts with new retailers is beneficial for the entire seller, as a higher percentage of the initial purchase cost can be obtained from them at the same time. In addition to the above, the batch that the entire seller received from the manufacturer was not perfect, containing some defects, so he checked the item before selling it to the retailer. To make the study more realistic, Class I and II misclassification errors and out-of-stock situations were taken into account. The effects of type I errors have been found to be crucial in research; Ahmad et al. (2020) pointed out that there is a positive correlation between the use and supply of trade credit by listed manufacturing companies. It reveals that listed manufacturing companies reallocate credit to their customers through trade credit channels. In addition, the study also found that financial depth has a significant negative impact on the supply of trade credit to listed manufacturing companies, and determined that financial depth as a regulator has a buffer impact on the credit redistribution of listed companies; Tahir et al. (2020) explored the determinants that determine dividend payments. The findings suggest a statistically significant positive correlation between board

size, ROA and dividend payments. However, there is a significant negative correlation between financial leverage and dividend policy. But the study revealed a statistically insignificant positive correlation between a board of directors' diversification and dividend payments; Carrasco-Gallego (2020) explored the ability of the real estate market to stabilize the economy through different macroprudential policies facing multiple shocks to achieve financial stability as a driver of sustainability. The findings suggest that in the context of real estate sector shocks and technological shocks, more effective policies are based on counter-cyclical rules based on the loan-to-value ratio of the real estate sector, known as macroprudential tools. In addition, in the case of house price shocks, the shock may be exacerbated if the macroprudential authorities implement macroprudential policies based on counter-cyclical capital buffers. The study also notes that when a financial shock occurs, macroprudential authorities may weigh between multiple macro financial policies based on their objectives. Therefore, it is not recommended to automatically apply macroprudential policies without careful analysis of the nature of economic shocks and how different policies stabilize or destabilize different markets in order to achieve higher or lower sustainability.

2.5.5 Credit policy and government finance

Scholars have explored the impact of credit on government, politics and finance.. Kern and Amri (2021) examined the existence of political credit cycles and the positive linkage between credit and elections. The findings suggest that both government and private credit increased significantly during election years. The finding suggests that politicians not only use fiscal and monetary policies to attract voters, but also implement credit policies, such as interest rate subsidies and debt tax cuts, to boost credit growth. The study also found that a higher degree of financial openness weakens the frequency and magnitude of political credit cycles; However, the conditional effect of financial openness on developing countries is stronger than that of developed countries. Cecchetti et al. (2020) investigated corporate-level data from nearly 1,000 financial institutions in 21 countries over the past 15 years, scholars examined the impact of sustained monetary policy easing on risk-introduced behavior. The study found that with the easing of domestic monetary policy, both banks and non-bank institutions have increased their leverage ratios. Surprisingly, after the U. S. (but not the eurozone) also eased, the leverage ratio of non-U. S. companies also increased, which was higher than the level after the domestic relaxation. Research continues to show that spillovers from U. S. policy are stronger in countries with more financially advanced finances, less open trade, and smaller total dollar liabilities.

Fouejieu et al. (2019) established a framework to analyze the trade-offs between macroeconomics and financial stability when central banks have financial stability objectives. Relying on the new Keynesian model with endogenous financial bubbles, research suggests that central banks trying to "go against the wind" may face a trade-off between inflation/output stability and financial stability. Therefore, the study argues that interest rates should be used to achieve traditional macroeconomic objectives, followed by macroprudential instruments that should complement policy rates to cope with the accumulation of financial risks; Carriero et al. (2018) explored whether and how the impact of monetary policy shocks depends on credit market conditions, the findings suggest that the computational response of economic activity and prices to monetary policy tightening/easing and monetary policy large/small shocks is asymmetrical. These asymmetries can be explained by the impact of monetary policy shocks on credit conditions and the likelihood of regime change; Goodhart et al. (2019) argued that the official policy rate and the financial wedge, the spread between lending and deposit rates, are key variables in analyzing the interaction between price stability and financial vulnerability. Research shows that even if prices are completely flexible, monetary policy interest rates and financial wedges have a real impact. Tao and Xu (2019) investigated the non-equilibrium panel data of 142 commercial banks in China from 2007 to 2016, scholars used the GMM model to examine the impact of economic policy uncertainty on bank credit. Empirical results show that increased uncertainty leads to conservative bank behavior and inhibits the scale of bank credit. At the same time, this uncertainty will have a greater impact on non-state-owned banks and non-listed banks; Hwang and Kim (2020) investigated whether an institution's rating policy changes as the macroeconomic cycle changes. The study found that rating policies became more stringent after a recession than economic expansion, which is consistent with theoretical projections. In addition, from the perspective of the game between various macroeconomic indicators, the default spread is the strongest indicator of the change of rating standards over time. Scholars investigated whether an institution's rating policy changes as the macroeconomic cycle changes. The study found that rating policies became more stringent after a recession than economic expansion, which is consistent with theoretical projections. In addition, from the perspective of the game between various macroeconomic indicators, the default spread is the strongest indicator of the change of rating standards over time.

2.6 Research comment

The above research and data are a good discussion of financial leverage, investment behavior

and credit policy related theories, from the perspective of the relevant theory and practice of Chinese glass enterprises, there are still the following deficiencies:

First of all, the current research on the application of financial leverage by enterprises focuses on exploring corporate performance, financial risk control, credit policies, industry differences, and investment behavior. In fact, from the perspective of macro industry, the scale of macro credit may also have an important impact on the financial leverage of glass enterprises, which in turn will affect their investment behavior. At present, there are fewer studies on glass and glass manufacturing upstream and downstream enterprises. As one of the representatives of the excess capacity industry, the glass industry is often mentioned in the process of supply-side reform, which is greatly affected by the credit environment and macro-control. Therefore, how Chinese glass companies respond to the changing external credit environment is a question worth exploring but has not yet been theoretically determined. Based on the existing theory of financial leverage, this thesis will explore the impact of the credit environment (mainly credit scale) on the financial leverage of China's glass and glass manufacturing upstream and downstream enterprises, analyze the trend of glass enterprise financial leverage changing with the change of credit scale, and the research conclusions will provide an important reference for the financial strategic decision-making of Chinese glass enterprises.

Secondly, the research on investment behavior focuses on the study of individual investment behavior, the study of enterprise investment behavior, and the study of inefficient investment behavior (including overinvestment and underinvestment). Studies have analyzed exploring the motivations, mechanisms, and investment performance that result from these behaviors. For Chinese glass companies, the driving factors of investment behavior, such as the impact of financial leverage on inefficient investment behavior, are not well documented. Based on the relevant research basis of existing financial leverage and non-efficient investment behavior, this thesis will explore the influence of financial leverage of glass enterprises on their inefficient investment behavior (underinvestment and excessive investment), and the research conclusions can bring theoretical reference and practical enlightenment to the financial management of glass enterprises.

Finally, studies have shown that government-related financial policies are an important reference for enterprise development and financial decision-making. Credit policy has an important impact on investment behavior, macroeconomics, enterprise operation, individual investment, upstream and downstream industry supply chain, and government finance. For glass companies, due to their heavy assets and close correlation with real estate, they are greatly affected by the regulation and control of macro policies. The current research has not yet

clarified the characteristics of the reaction of glass companies to structural policies, such as "leverage" and "deleveraging" after the implementation of these structural policies, how Chinese glass companies should effectively respond. The current theories related to this are lacking, but they have important research value for Chinese glass companies. Therefore, based on the relevant research of existing credit policies, this thesis will further explore the influence of typical credit policies on the relationship between financial leverage and inefficient investment behavior, explore the role and role of credit policies, and the mechanism of the influencing process. Related research can bring important reference value to China's glass enterprises to cope with external policy changes.

In summary, this thesis will combine the existing theories and explore the impact of the credit environment on financial leverage, the impact of financial leverage on inefficient investment behavior, and the role and mechanism played by structural policies based on the data of Chinese glass enterprises. It is expected that through the relevant research of this thesis, the relevant theories in the field of existing glass enterprises will be supplemented, and at the same time, it will bring reference value to enterprise management decisions.

2.7 Chapter summary

According to the theoretical literature in this chapter, the important variables involved in this thesis are summarized here, as shown in Table 2.1. Table 2.2 also summarizes the references.

Table 2.1 Definition of important variables of this thesis

Variables	Concept definition
Macro credit scale	Macro credit scale, also known as "loan scale", occupies a core position in my country's economy and finance (P. X. Wu, 2008). It is an indicator determined in advance by the central bank to control bank loans in order to achieve monetary policy objectives in a certain period (from Baidu Baike knowledge database).
Corporate financial leverage	Corporate financial leverage is an important part of corporate governance. It refers to the use of assets and liabilities and other elements by companies to amplify investment results, which has an important impact on financial performance and corporate value (Al-Slehat et al., 2020; M. L. Zhou et al., 2021).
Inefficient investment	Inefficient investment is the behavior that the actual investment expenditure of the enterprise is inconsistent with the optimal investment level, mainly including over-investment and under-investment (Jensen, 1984; L. J. Xiao et al., 2021).
Overinvestment	Overinvestment means that managers invest corporate funds in projects with small profit opportunities or negative net assets in order to realize their own or other interests (X. F. Xu et al., 2018). Overinvestment will divert a company's investment from its current production and operational needs, thereby deviating from the company's true growth opportunities (Trong & Nguyen, 2020).

Underinvestment	Underinvestment refers to the fact that managers are affected by information asymmetry and other factors, resulting in increased financing costs and ultimately leading management to deviate from investment projects with high net present value (Tian et al., 2021).

Table 2.2 References summary

Topic	Author (Year)	Topic
Modern capital structure theory	J. J. Chen (2004), Y. H. Chen and Hammes (2004), Vo (2017), Sheikh and Wang (2011), Sofat and Singh (2017), Uwalomwa and Uadiale (2012), Matemilola et al. (2013), Dakua (2019), Hovakimian and Li (2011), Abor (2007), Hermuningsih (2016), Avarmaa et al. (2011), Siddik et al. (2017), Kyereboah-Coleman (2007), Majumdar and Chhibber (1999), Le and Phan (2017), K. Chen (2002), Chui et al. (2002), Malinic et al. (2013), Gottardo and Moisello (2014), Chandra and Rusliati (2019), Dawar (2014), Deesomsak et al. (2004), Band (1992), Jensen and Smith (2000), Nuswandari (2013)	Research on the relationship between capital structure and income at the enterprise level.
	Liang et al. (2014), G. H. Huang (2006), Öztekin (2015), Chaganti and Damanpour (1991), Shyu (2013), Aggarwal and Baliga (1987), Gul (1999), L. Li and Islam (2019), Seppa (2008)	Influence and factors of modern capital structure.
	Sardo and Serrasqueiro (2017), Dierker et al. (2019), Hackbarth et al. (2007), Singh and Kumar (2012), Glover and Hambusch (2014), Sarkar and Zapatero (2003), Huu and Wakely (2000), Gamal et al. (2004), Förster et al. (2003), Porath and Gilboa (1994), Fang (2008), Myers and Majluf (1984), Vasiliou et al. (2009), Bulan and Yan (2010), Bontempi (2002), Jong et al. (2010), Zoppa and McMahon (2002), Myers and Majluf (1984), Ni and Yu (2008), Zeidan et al. (2018), Serrasqueiro et al. (2011), D. H. Chen et al. (2013), Adair and Adaskou (2015), Frank et al. (2020), J. Agyei et al. (2020), Minola et al. (2013), Jumono et al. (2013), Bundala (2012), Eldomiaty et al. (2017), Chaklader and Padmapriya (2021), Zhao et al. (2004), Allen (1993), Myers and Majluf (1984), Ghosh and Cai (2004), Ang and Jung (1993), Mazen (2011), Christianti (2006), M. Su et al. (2022), Onatca et al. (2019), Frank and Goyal (2008), Vanacker and Manigart (2010)	The trade-off theory in modern capital structure theory.
The impact of financial leverage on enterprises	Ojo (2012), Dimitrov and Jain (2008), Sodeyfi (2016), Malshe and Agarwal (2015), Obradovich and Gill (2012), Rayan (2008), Goel et al. (2015), M. S. Long and Malitz (1985), Jones and Sharma (2001), Mule and Mukras (2015), Prezas (1987), Sajid et al. (2016), N. Iqbal et al. (2020), Pham and Nguyen (2019), Moradi et al. (2010), Barakat (2014), Gweyi and Karanja (2014), Ozdagli (2012), Acheampong et al. (2014), Ting et al. (2015), U. Iqbal and Usman (2018), R. L. Yang et al. (2016), F. J. Xu et al. (2013), Tonye and Sokiri (2020), Idowu and Adebayo (2018), Sari (2020), Z. Y. Chen et al. (2019), Danso et al. (2020), Bitok et al. (2021), Towo	The impact of financial leverage on business performance.

	et al. (2019), Coleman and Baidoo (2020), Pakpahan (2019), Motalebian and Zahra (2019), Chandra and Rusliati (2019), Putri and Lutfillah (2020), M. I. Ahmad et al. (2017)	
	Mishra and Modi (2013), Ghosh and Jain (2000), Oware and Mallikarjunappa (2019), Riantani and Nurzamzam (2015)	The impact of financial leverage on corporate social responsibility.
	Bretó and Carles (2014), Feltham et al. (2010), Dimitropoulos (2014), Anagnostopoulou and Tsekrekos (2017), Bae et al. (2017), Aydemir et al. (2007), Finishtya (2019), Malm and Krolikowski (2017), Gloy and Baker (2002), Matemilola et al. (2012), Dimitrov and Jain (2003)	The impact of financial leverage on financial risk control.
	Rafique (2011), Rehman (2013), Pachori and Totala (2012), Alexandridis et al. (2020), Kizildag and Ozdemir (2017), Bui (2020), Mallinguh et al. (2020), Bangun et al. (2017), Akhtar et al. (2022)	The impact of typical financial leverage on various industries.
	Sarkar (2020)	The impact of typical financial leverage on simulated business.
	Tahir et al. (2020)	The impact of typical financial leverage on the Board of Directors.
	Afolabi et al. (2019), Afey and Warui (2019)	The impact of typical financial leverage on recommendations.
	(Istaitieh & Rodríguez, 2003), Brown et al. (2009), Jermias (2008)	The impact of typical financial leverage on strategic behavior and competition.
	Gilchrist (2004), Dwenger and Steiner (2014), Q. Z. Cao et al. (2022), Evodila et al. (2020)	The impact of typical financial leverage on policies.
	H. F. Guo et al. (2021), Bernini et al. (2015), C. L. Yang and Lai (2021), W. C. Guo et al. (2011), B. H. Agyei (2015), Bahreini et al. (2013), Danso et al. (2019)	Research on financial leverage and investment and investment efficiency.
The investment behavior and influencing factors of enterprises	Lapanan (2018), Saleem et al. (2021), André et al. (2021), F. A. W. Ahmad et al. (2017), Antony (2020)	The impact of policymaker characteristics on investment behavior.
	Marinelli et al. (2017), Baig et al. (2021), Witra and Subriadi (2022)	The impact of gender characteristics on investment behavior.
	Bazley et al. (2017), Berns et al. (2022), Ferretti et al. (2021), Ersahin et al. (2021), Apere and Akarara (2018), Horn et al. (2018)	The impact of environmental characteristics on investment behavior.
	Büttner et al. (2022), D. A. Li and Shen (2022), Imamah et al. (2020), Ososuakpor (2021)	The impact of social stability on investment behavior.
	Liu et al. (2021), Hansen (1999), Tsao et al. (2019), Y. Cao et al. (2020), Bikas and Glinskytė (2021)	The influence of the company's own attributes on

		investment behavior.
	Akguc and Al Rahahleh (2021), R. Wang et al. (2017), Jia and Wang (2017), (Harjito, 2022), Croci et al. (2022)	The impact of other factors on investment behavior.
The inefficient investment behavior of enterprises	Fan and Phromphitakkul (2021), Hamamura et al. (2021), Elseoud et al. (2020), H. M. Zhang et al. (2020), Zandi et al. (2020), (X. Jiang, 2016), Du et al. (2016), Y. Li and Mao (2015), D. N. Zhang (2020), Shi and Gao (2018), C. J. Huang et al. (2015), Lu and Liu (2016), Eaton et al. (2019), C. H. Xu and Zhou (2016), Bakir and Campbell (2015)	The influencing factors and consequences of overinvestment from multiple perspectives.
	H. Zhang (2017), Yin and Hu (2016), Nakamura (2014), Bolle (2011), You (2014), Aharonovitz (2010), Perelman and Walheer (2020), Nocke (2007)	The influencing factors and consequences of underinvestment from multiple perspectives.
Research on China's Credit Policy and Its Impact	Y. L. Wang et al. (2020), Y. Wang and Li (2022), Zou and Tian (2020), Zaman (2018)	Credit policy and investment behavior.
	D. He (2018), Minetti and Peng (2018), Lakdawala and Moreland (2019), Anarfo et al. (2019), Matousek et al. (2020), Y. Jiang et al. (2019), Amo (2019), Y. Q. Li et al. (2022)	Credit Policy and Macroeconomics.
	R. Chen (2022), Y. R. Wang and Zhao (2022), Azman and Ramakrishnan (2021), Mugova and Kwenda (2020), Ding et al. (2021), Q. He and Zhao (2022)	Credit policy and business operations.
	Khanna et al. (2018), Ahmad et al. (2020), Tahir et al. (2020), Carrasco-Gallego (2020)	Credit policy and supply chains.
	Kern and Amri (2021), Cecchetti et al. (2020), Fouejieu et al. (2019), Carriero et al. (2018), Goodhart et al. (2019), Tao and Xu (2019), Hwang and Kim (2020)	Credit policy and government finance.

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Chapter 3: Research Design

3.1 Research framework design

This thesis selected glass enterprises and upstream and downstream suppliers of glass industry as the research object, because the glass related industry is the most seriously affected by macro policies and financial capital (Other industries seriously affected by policies and financial capital, such as photovoltaic industry and real estate industry).

According to the previous research background, research problems, research objectives and research ideas, this thesis mainly explores the impact of corporate financial leverage on its inefficient investment behaviour. It also involves antecedents and influencing factors, namely, the impact of macro credit environment and policy regulation on corporates' financial leverage and inefficient investment.

First, this thesis explores the impact of macro credit environment on corporate financial leverage. The financial leverage of Chinese glass enterprises and their upstream and downstream enterprises in the supply chain is affected by the macro financial environment, especially the change of macro credit scale will have an important impact on enterprises' leverage behaviour. In order to explore the impact relationship, this thesis will collect macro credit scale data from the official website of the National Bureau of statistics of China. According to the change of credit scale, it divides the stages, and then analyzes the linkage effect of the change of credit scale on the change of enterprise financial leverage in stages.

Second, this thesis explores the impact of financial leverage on inefficient investment. There is likely to be a significant correlation between financial leverage and inefficient investment of Chinese glass enterprises and their upstream and downstream enterprises in the supply chain. This thesis tested the hypothesis through empirical research.

The research is unfolded from two main aspects:

(1) Measurement of inefficient investment and the influence of financial leverage on two kinds of inefficient investment (Over-investment and under-investment);

(2) Debt structure in financial leverage—the impact of new debt and old debt on two kinds of inefficient investment (Over-investment and under-investment).

Finally, this thesis explores the impact of policy factors on inefficient investment. The

leverage policy and deleveraging policy are likely to be related to China's glass enterprises and their upstream and downstream enterprises in the supply chain. This thesis is demonstrated by the case study of Fuyao Glass Company.

The research is unfolded from three main aspects:

(1) Analysis of the basic situation of Fuyao Glass company and collecting data to lay the foundation for case analysis;

(2) Time node and stage division of leverage and deleveraging policies;

(3) This thesis analyzes the inefficient investment and development trend of Fuyao Glass Company under the background of leverage policy and deleveraging policy, and draws a conclusion.

To sum up, the overall research framework of this thesis is shown in Figure 3.1.

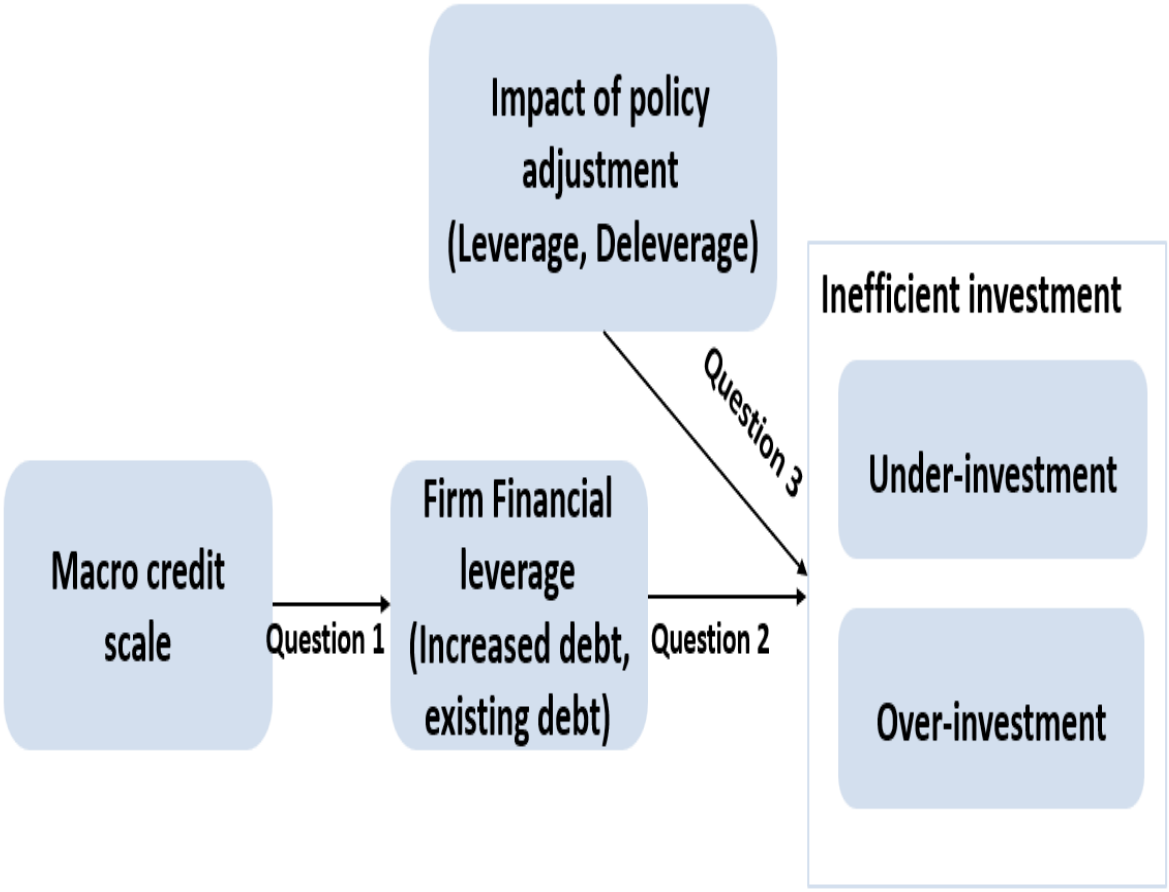


Figure 3.1 Research framework of the study

3.2 Methodology

Based on different research questions, this thesis formulates different research methods and strategies.

(1) Regarding “research question 1: How the macro credit environment affects the financial leverage level of glass enterprises?”.

Because this issue will be analyzed using descriptive methods for statistical analysis, it is suitable to use panel data from upstream and downstream glass enterprises for research.

Firstly, this thesis will obtain a list of all listed companies and enterprises since 2005 based on CSMAR and WIND databases;

Secondly, it screens out the list of glass and glass products industry as well as its upstream and downstream enterprises;

Thirdly, it obtains detailed company information and financial indicators from the database, such as enterprise age, enterprise size, net profit, asset liability ratio, and other data;

Fourthly, macro credit data will be obtained from the credit reports released by the People's Bank of China every year.

Through the above data, combined with the method of descriptive statistical analysis, this theis will be able to draw the change trend diagram of the change of macro credit environment on the change of enterprise financial leverage, form the research conclusion, and answer the research question 1 of this thesis.

(2) Regarding “research question 2: How does the financial leverage of glass enterprises affect their inefficient investment behaviour?”.

Because of this problem, the regression analysis will be carried out by using the method of empirical research. It is suitable to use Panel data of listed companies for research. The process and method of obtaining panel data are the same as that of research question 1. The data in this thesis will use unbalanced panel data in regression analysis, with the help of STATA software to calculate and draw a conclusion.

Specifically, first of all, in view of the impact of financial leverage on inefficient investment of China's glass enterprises and their upstream and downstream enterprises in the supply chain, this thesis uses multiple hierarchical regression model to test its correlation. The key indicators to be investigated include the impact coefficient and significance of financial leverage on inefficient investment, and the impact coefficient and significance of new and old debt on inefficient investment respectively;

Secondly, considering that inefficient investment is divided into Over-investment and

under-investment, in order to better show the results, this study will set 0,1 dummy variables, and use logit regression to further test the impact of financial leverage and old and new debt on inefficient investment;

Finally, this thesis further examines the details of inefficient investment, such as the impact coefficient and significance of new debt on Over-investment and under-investment, and the impact coefficient and significance of old debt on Over-investment and under-investment.

Through the above methods, this study answers the research question 2 of this thesis.

(3) Regarding “research question 3: How policy regulation affects the relationship between financial leverage and inefficient investment behaviour?”.

Because of this problem, the method of case study will be used to find the influence law of structural policies on enterprise financial leverage and investment behaviour changes.

This thesis intends to select one representative and influential enterprise with a long establishment time (long enough to cover all policy change cycles explored in this thesis) as the case study object.

The proposed case is Fuyao Glass Industry Group Co., Ltd. Which established in 1987. The company has a long history of development and has completely gone through various stages of changes in China's financial policies, meanwhile, they are among the best in the industry, with high exposure and a large number of public data, which can form a triangle verification with the interview data to ensure the accuracy of the data, to check.

This thesis gathered case information through interviews with some senior managers of the company, combined with publicly available data and video materials of the CEO accepting interviews with other media.

Further through the case study of this enterprise, this thesis will explore the impact of structural policies such as "leveraging" and "deleveraging" on the relationship between financial leverage and inefficient investment behaviour, thereby answer the research question 3 of this thesis.

3.3 Research hypotheses

According to the idea of research design, the research hypothesis needs to be carried out through empirical research in the part of "the impact of financial leverage on inefficient investment" in this thesis.

Combined with the previous research framework, this thesis puts forward the following research hypotheses.

3.3.1 Financial leverage and inefficient investment

Financial leverage means that under the condition of unchanged capital structure, due to the existence of fixed financial expenses, the earnings per share of common stock increase by a greater margin due to the increase of EBIT (Earnings Before Interest and Taxes). Financial leverage refers to the means by which enterprises use liabilities to adjust the return on equity capital. The reasonable use of financial leverage brings additional benefits to the equity capital of enterprises, that is, the benefits of financial leverage.

There are many influencing factors of firm's financial leverage, which can be summarized as external environmental factors and internal environmental factors. The external environmental factors mainly include relevant national policies, industry environment, price level and inflation rate, while the internal environmental factors mainly include firm size, solvency (W. J. Su & Zhou, 2023). As the financial leverage is affected by many factors, while obtaining the benefits of financial leverage, it is also accompanied by immeasurable financial risks. Therefore, a careful study of financial leverage and an analysis of various factors affecting financial leverage, as well as an understanding of its role, nature and impact on the return of equity funds of enterprises, are the basic premise for the rational use of financial leverage to serve enterprises.

The inefficient investment behaviour of the managers of listed companies means that the investment decisions made by the managers of listed companies are different from the objectives of maximizing the value of the company (including maximizing the interests of shareholders), moreover, these managers often make decisions on investment activities with the goal of maximizing their own interests, resulting in low investment efficiency, loss of company value and reduction of shareholders' interests, which will seriously hinder the development of the company and is not conducive to the healthy growth of the company (F. F. Wu, 2016). The academic research trend on inefficient investment behaviour has gradually shifted from the perspective of principal-agent to the perspective of market environment change, with more emphasis on the impact of changing external environment on enterprise investment behaviour (H. X. Zhou & Ouyang, 2004).

This thesis only analyzes the financial leverage of Chinese glass enterprises and their upstream and downstream suppliers on inefficient investment.

From the perspective of the international market environment, after the rapid development in recent years, the glass technology of China has formed a certain international competitiveness. Through market-oriented operation, it can achieve a win-win situation with the jointly

restructured enterprises (Peng, 2009). Based on modern capital structure theory, capital structure is the core issue of enterprise financing decision-making. Enterprises should comprehensively consider the relevant influencing factors, use appropriate methods to determine the optimal capital structure, and continue to maintain it in the future additional financing.

Meanwhile, a reasonable financial capital structure and appropriate financial leverage can improve the value of enterprises, and the impact on inefficient investment is positive, which can promote inefficient investment to play a good role, and then it can be inferred that financial leverage can promote inefficient investment.

To sum up, this study puts forward the following hypotheses:

H1: The financial leverage of Chinese glass enterprises and their upstream and downstream suppliers has a positive impact on their inefficient investment.

In the debt structure of financial leverage, there are differences between new debt and old debt. Specifically, the new debt is the total amount of bank borrowings increased in the current year over the previous year divided by the total assets at the end of the year, and the old debt is the total amount of bank borrowings in the previous year divided by the total assets at the end of the year (Q. Li et al., 2014). It is generally believed that there are differences in the effect of old and new debts on inefficient investment of enterprises.

First of all, the increase of financial leverage ratio caused by new debt will lead to the agency conflict between shareholders and creditors, which will lead to the occurrence of insufficient investment and make the enterprise's investment level and investment expenditure unable to meet the requirements of value maximization, while the increase of new debt provides a new source of funds for enterprises, increases the amount of funds available to enterprises, helps alleviate the problem of insufficient investment caused by insufficient funds, and thus promotes excessive investment. The existence of old debt makes the debt interest of the enterprise unchanged during operation, so for investors, the increase in income is substantial, in other words, the old debt will increase the financial leverage ratio, thus increasing the risk of Over-investment.

Secondly, the issuance of new debt represents the reduction of interest rate, which helps to reduce the financing cost of enterprises, so that enterprises can obtain funds at a lower price and improve their investment willingness and efficiency. The existence of old debt may limit the financing ability of enterprises. When an enterprise needs to raise funds for new financing, the old debt may increase the financing pressure of the enterprise, thus affecting its investment decision. In the case of high interest rates, the old debt may have a negative impact on the cash

flow of the enterprise, which may lead to under-investment. At the same time, the payment of old debt interest can reduce the abuse of free cash flow within the enterprise, and the external supervision faced by the enterprise will also be enhanced, so as to alleviate the Over-investment caused by the conflict between managers and shareholders (Q. Li et al., 2014).

Finally, as an external financing method, new debt can provide new sources of funds for enterprises and supplement the deficiency of internal financing. The Pecking Order Theory predicts that due to the information asymmetry between managers and the capital market and the market will punish those companies that issue the most sensitive information securities. Therefore, the company will choose to issue securities according to the information sensitivity: the order is internal capital-debt-equity. T. W. Long and Shi (2021) pointed out, from the perspective of the Pecking Order Theory, when the company's internal funds are insufficient, it will consider external funds and issue more debts. Therefore, the new debt will have a more positive impact on inefficient investment. On the other hand, old debt can significantly alleviate Over-investment. Q. Li et al. (2014) argued that the increase of old debt not only helps to strengthen the external supervision of creditors over the enterprise, but also reduces the Over-investment which pointed out by Jensen and Meckling (2019). Moreover, the pressure of debt service will directly reduce the free cash flow of enterprises, and then effectively alleviate the excessive investment caused by the abuse of managers' free cash flow.

To sum up, this study proposes the following two hypotheses:

H2: The new debt has a positive impact on inefficient investment.

H3: The old debt has a positive impact on inefficient investment.

3.3.2 The impact of financial leverage on overinvestment

Inefficient investment includes over-investment and under-investment.

Among them, over-investment refers to that managers invest enterprise funds into projects with small profit opportunities or negative net asset value in order to realize their own or other interests (X. F. Xu et al., 2018). It will make the investment of the enterprise deviate from its current production and operation needs, thus deviating from the real development opportunities of the enterprise.

Early investment theory believed that investment and financing decisions were independent variables. However, the development of the theory of principal-agent and information economics has made people gradually realize that the financial leverage ratio of enterprises will distort the investment behaviour of enterprises by triggering stakeholder conflicts. Specifically, according to the research of Dou and Li (2015), there is a significant negative correlation

between debt and capital expenditure level of listed companies in China. It also explores the impact of corporate debt on investment efficiency, and finds that the impact of debt ratio is different in enterprises with different growth characteristics. In addition, the increase of financial leverage ratio caused by liabilities will lead to shareholder creditor agency conflict, which will lead to the occurrence of under-investment or Over-investment, and make the enterprise's investment level and investment expenditure unable to meet the requirements of value maximization.

Therefore, this thesis argues that financial leverage has a significant positive impact on Over-investment (Y. T. Xiao, 2021).

First of all, the higher financial leverage ratio of enterprises indicates that the credit financing ability of enterprises is enhanced. On the one hand, Y. X. Li (2022) argued that enterprises with debt financing advantages tend to over invest. Therefore, only by adopting strict deleveraging policies, increasing corporate financing constraints to improve the maturity structure of corporate debt and reducing long-term debt, the Over-investment of enterprises can be restrained. On the other hand, under the condition of low leverage, the improvement of leverage ratio will promote enterprises to increase the scale of research and development investment, and enable enterprises with better financial flexibility and greater growth opportunities to increase the proportion of research and development investment (S. C. Ma et al., 2022). C. L. Yang and Lai (2021) found that the launch of cross listing significantly improved the level of corporate financial leverage, followed by a significant increase in corporate research and development investment. The aggressive strategy of cross listed companies to support research and development investment by improving financial leverage further significantly affects the industry competitors to increase research and development investment as a coping strategy.

Secondly, corporate financial leverage will affect the stability of the stock market. According to the Pecking Order Theory, borrowing from banks in the medium or long term remains the preferred source for all groups. When the debt is high, the company is willing to issue shares as the preferred source (Ang & Jung, 1993). According to the "pyramid effect", the increase of the financial leverage ratio of enterprises will lead to the rise of the current stock price through the "leverage effect", and will cause enterprises to borrow more funds to buy more shares, thus pushing up the stock price in the subsequent period (W. C. Guo et al., 2011). R. Ma (2022) found that the rising leverage ratio of non-financial enterprises in China will strengthen the volatility of the stock market.

Stock price fluctuation is a factor that managers must consider when making investment

decisions. When the stock price has a trend of rising above the real value, it will reduce the capital preparation cost and financing constraints, so as to promote the equity financing of enterprises and carry out radical investment behaviour (Qi, 2014). According to F. F. Wu (2016), Stock price fluctuation is positively correlated with inefficient investment. The rapid fluctuation of stock price will induce investors to make wrong investment decisions and increase the possibility of over-investment of enterprises.

Finally, the rise of corporate financial leverage ratio means that the liabilities and cash flow of company increase. When ownership and management rights are separated, agency conflicts arise due to different objectives between shareholders and managers, and the maximization of shareholders' interests will not always be the main objective of managers. When the free cash flow of enterprises increases, managers may choose to invest in projects with low net present value but increased private income, resulting in excessive investment (Jensen, 1986). State owned enterprises account for the largest proportion in China's listed companies, and a dominant state-owned share also has serious internal management system problems.

But both Hart (1995) and Shleifer and Vishny (1997) found that under the effect of lack of effective incentives and insufficient regulatory constraints, enterprise managers are prone to opportunistic behaviour in order to expand their business territory, leading to inefficient investment. G. F. Zhang (2007), Richardson (2006) found that enterprises are more likely to over invest when the level of free cash flow is high.

Therefore, this study proposes the following hypotheses:

H4: The new debt promotes inefficient investment to shift to Over-investment side, which has a positive impact on Over-investment.

H5: The Old debt promotes inefficient investment to shift in the opposite side of Over-investment, and inhibits Over-investment.

3.3.3 The impact of financial leverage on underinvestment

In addition to over-investment, inefficient investment also includes under-investment. Under-investment refers to that managers are affected by factors such as information asymmetry, which leads to the increase of financing costs, and ultimately leads to the deviation of management from investment projects with high net present value (Tian et al., 2021).

Many scholars have conducted in-depth research on the influencing factors of insufficient investment in enterprises. According to Myers (1977), in the context of enterprise risk liabilities, due to the inequality between the cash flow generated by the existing new project and the investment cost borne by shareholders, the value added of the new project investment is not

high, which leads to the lack of investment power to maximize the value of the company. M. Y. Chen (2018) argued that the external profit pressure will affect the investment decision of managers. Due to the instability of enterprise investment, managers will ignore the long-term development of enterprises in order to reduce losses, resulting in insufficient investment. While the increase of enterprise financial leverage ratio reflects the enhancement of enterprise financing ability, which will have a positive effect on enterprise Over-investment behaviour (Y. X. Li, 2022). Therefore, this thesis argued that financial leverage has a negative impact on under-investment.

First, the financial leverage ratio of enterprises is closely related to the financing ability of enterprises. According to the Pecking Order Theory, financing capacity will directly affect the investment behaviour of enterprises. Zhu and Xia (2010) argued that the financing ability of enterprises will affect the investment decision of enterprises to a certain extent. When the financing ability is limited, it will affect the investment level of enterprises; and when the financing ability is strong, it will improve the efficiency of capital investment of enterprises, so as to curb the lack of investment.

C. L. Yang and Lai (2021) found that as the financing capacity of enterprises increases, enterprises will increase investment in technological innovation and scientific research to improve market share, and take radical investment behaviour. In addition, the external financing ability of enterprises also has a significant positive impact on the intensity of OFDI, which further promotes enterprises to increase investment. When an enterprise decides to strengthen OFDI, it indicates that the return on investment of its project is higher than the cost of capital of the company, which will promote the enterprise to expand the scale of investment and bear the corresponding risks (X. X. Yang, 2022). According to Qiu and Liu (2016), due to the late development of China's financial market, loans through financial institutions such as banks are still the main financing method of many companies. The more funds raised from outside, the more positive impact on enterprises' foreign direct investment behaviour.

Secondly, according to the Pecking Order Theory, the financing decision of enterprises is to choose different financing methods based on the principle of minimizing costs after considering various factors. In order to avoid dilution of equity and strengthen control over the enterprise, enterprises are more willing to choose debt financing methods (Benfratello et al., 2008). Obviously, the rise of corporate financial leverage ratio reflects that the enterprise has sufficient cash flow and high repayment ability, which means that the enterprise is more willing to carry out debt financing. According to Niu (2023), increasing the proportion of bond financing can improve the insufficient investment and improve the investment efficiency of

enterprises.

On the one hand, increasing the proportion of debt financing can diversify enterprise financing, expand available funds, improve enterprise investment efficiency, improve debt structure, and effectively reduce financing constraints. On the other hand, enterprises that carry out debt financing will be more willing to increase investment in fixed assets, and thus obtain a higher return on assets. In addition, Deng et al. (2016) argued that bank loans can effectively alleviate the financing constraints of enterprises, play an important role in avoiding information asymmetry and protecting enterprise operation, and remain the main channel for enterprise financing. According to M. L. Chen et al. (2018), Bank loans and credit claims can significantly ease the financing constraints of enterprises.

Finally, high corporate financial leverage means high debt ratio of corporate capital structure. According to the research of Jensen and Meckling (2019), when an enterprise has a high debt capital structure, it will strengthen the opportunistic investment behaviour of shareholders, which will significantly increase the risk of investment failure of the enterprise, and most of the losses of project failure will be borne by creditors.

Therefore, high leverage level may cause excessive investment of the enterprise. When enterprises have strong financing ability, they tend to prefer projects with high risk and return. But J. Y. Chen et al. (2009) argued that the debt maturity structure has a significant impact on the investment efficiency of enterprises. For project activities with medium or high risk level, the higher the proportion of short-term debt, the more likely it will lead to over investment.

Therefore, this study proposes the following hypotheses:

H6: The new debt alleviates the insufficient investment of China's glass enterprises and their upstream and downstream suppliers, which inhibits the insufficient investment.

H7: The old debt promotes the inefficient investment of Chinese glass enterprises and their upstream and downstream suppliers to shift to the direction of insufficient investment, which has a positive impact on insufficient investment.

3.3.4 New-old debt ratio and inefficient investment

According to the above hypotheses: the financial leverage of Chinese glass enterprises and their upstream and downstream suppliers has a positive impact on inefficient investment. In the debt structure of corporate financial leverage, there are new and old debts, both of which have a positive impact on inefficient investment.

First, new debt promotes Over-investment.

Based on the early investment theory, this thesis argued that the financial leverage ratio of

enterprises will distort the behaviour of enterprises by triggering stakeholder conflicts and other ways. Specifically, the impact of corporate liabilities on investment efficiency varies in different environments. In addition, the rise of corporate financial leverage caused by liabilities will lead to under-investment or over-investment, which makes the enterprise unable to maximize value.

Therefore, the positive impact of financial leverage on over investment is mainly reflected in the following three aspects: Firstly, the higher financial leverage ratio of enterprises indicates that the credit financing ability of enterprises is enhanced; secondly, the leverage ratio of enterprises will affect the stability of the stock market. When the stock price shows an upward trend, it will reduce the cost of capital preparation and financing constraints, so as to promote the equity financing of enterprises and carry out radical investment behaviour; finally, the rise of corporate financial leverage ratio means that the company's liabilities and cash flow increase, making it more prone to over investment.

Second, the old debt promotes insufficient investment.

Existing studies generally believe that insufficient investment is affected by financing constraints. Financing constraints can be understood as the lack of financing channels for enterprises to raise sufficient funds at a reasonable cost. However, even if the enterprise itself has sufficient cash flow, it may make the investment decision of insufficient investment (H. M. Yang et al., 2019). As mentioned above, the rise of corporate financial leverage reflects the enhancement of corporate financing capacity, which has a positive effect on over investment behaviour. Therefore, it can be inferred that financial leverage has a negative impact on under-investment. Mainly in the following three aspects:

(1) The financial leverage ratio of enterprises is closely related to the financing ability of enterprises. A strong financing ability will improve the efficiency of capital investment of enterprises, thus inhibiting insufficient investment;

(2) The rise of corporate financial leverage ratio indicates that the current liquidity of enterprises is sufficient and the repayment ability is high, which means that enterprises are more willing to carry out debt financing;

(3) High corporate financial leverage means high debt ratio of corporate capital structure, which leads to over investment.

So, the greater the new debt, the more likely it is to lead to over investment; The larger the old debt, the more likely it is to lead to under-investment.

Therefore, this study further proposes the following hypotheses:

H8: In financial leverage, the ratio of old and new debt has a positive effect on

inefficient investment.

That is, the higher the proportion of new debt, the more it promotes inefficient investment by Chinese glass companies and their upstream and downstream suppliers to shift towards over investment. On the contrary, the inefficient investment of Chinese glass enterprises and their upstream and downstream suppliers will shift to the direction of under investment.

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Chapter 4: Data Analysis and Results

According to the research design, this chapter will use the data of Chinese glass enterprises to explore the impact of financial leverage on inefficient investment behaviour, including three aspects:

In terms of antecedents, this study needs to explore the impact of macro credit environment on financial leverage through descriptive statistical analysis;

In terms of core content, this study needs to explore the relationship between financial leverage and inefficient investment through empirical research, including the relationship between new debt and old debt in financial leverage and two kinds of inefficient investment behaviour, namely, over investment and under investment;

In terms of influencing factors, this study needs to explore the impact of policy factors on inefficient investment through a typical case.

These contents are respectively arranged in sections 4.1, 4.2 and 4.3 of this chapter.

4.1 The impact of macro credit environment on financial leverage

In order to further explore the impact of macro credit scale on the financial leverage of China glass and its upstream and downstream suppliers, this thesis will be carried out on the basis of theory and data.

Firstly, the theoretical analysis is carried out, and the relevant conclusions of the existing literature are obtained;

Then, according to the change trend of macro credit scale of China in recent years, combined with the actual data of glass and its upstream and downstream suppliers of China, the demonstration is carried out in stages;

Finally, the trend analysis and summary are carried out to draw a conclusion.

4.1.1 Theoretical analysis of the influence of credit scale on financial leverage

Macro credit scale, also known as "loan scale", occupies a core position in China's economy and Finance (P. X. Wu, 2008). Related to it, H. T. Gao (2017) takes the relationship between credit scale and asset price as the research object, and defines the loan scale as "the index for

controlling bank loans determined in advance by the central bank to achieve the monetary policy objectives in a certain period, which generally refers to the loan increment in a certain period". The scale of macro credit is the result of the regulation and control of macro prudential policy and monetary policy at the national level. Controlling the scale of macro credit is an important means for the financial regulatory authorities to control the upper limit of credit expansion of financial institutions, and an effective "two pillar" regulatory framework has an important impact on the regulation of enterprise credit financing (G. L. Li & Gao, 2021). Therefore, this thesis argued that macro credit scale is highly correlated with corporate financial leverage.

Firstly, macro credit scale is closely related to enterprise growth opportunities. According to the modern capital structure theory, when the growth opportunities of enterprises increase, the financial leverage ratio of enterprises will also increase accordingly (Malinic et al., 2013). As an important market subject participating in economic activities, enterprises must be directly affected by the scale of macro credit in making strategic decisions. The scale of macro credit expands with the relaxation of macro prudential policies. Based on the theory of social psychology, this will make enterprises more willing to take risks, more inclined to adopt radical investment strategies and increase venture capital in innovation activities (A. G. Wang et al., 2022), and then increase the growth opportunities of enterprises. H. Wang and Xu (2023) found that increasing innovation investment is the core means of enterprise competition. On the one hand, it helps enterprises to use excellent products to expand market share and improve business profits, so as to obtain more abundant resources for the development of new products and services, expand the scale of enterprises and continuously improve the growth ability of enterprises; on the other hand, increasing innovation investment will help improve the comprehensive quality of employees and increase the growth opportunities of enterprises.

Secondly, the increase of macro credit scale will affect the optimization of enterprise capital structure. On the one hand, when the macro credit scale increases, the central bank implements the expansionary monetary policy, and enterprises can obtain more credit funds, which will more easily lead to high leverage motivation and over investment behaviour of enterprises, thus increasing the debt ratio and affecting the capital structure decision of enterprises (G. L. Li & Gao, 2021); relaxation of macro prudential policies may lead to excessive expansion of bank credit, which will lead to upward deviation of the capital structure of enterprises due to excessive financing (Y. Chen & Li, 2022). This also makes it more difficult for enterprises to dynamically adjust the actual financial leverage ratio to the target financial leverage ratio. On the other hand, according to modern capital structure theory, the profitability of enterprises is

negatively correlated with leverage ratio (Y. H. Chen & Hammes, 2004), and the optimal capital structure of an enterprise will have an impact on its profitability. Profitability is the basic concern of enterprise shareholders. Enterprises in financial difficulties will be forced to borrow or issue equity under adverse circumstances. At the same time, when the capital structure of enterprises is affected, too high debt ratio will lead to lower profit margin, increase the tax burden of the company, and thus reduce the profitability of enterprises. Sheikh and Wang (2011) pointed out that profitability, profit volatility and debt ratio are negatively correlated.

Finally, macro credit scale will affect bank credit decision and monetary policy. On the one hand, China's financing environment is dominated by banks. The study found that the loose interest rate policy will promote banks' credit allocation to small and micro enterprises (D. X. Gao et al., 2022). Due to the unbalanced development of the stock market and the bond market, listed enterprises of China still prefer equity financing, and the main way of financing is still to obtain credit loans through banks, which leads to the fluctuation of bank credit supply and will directly affect the company's capital structure decision (K. Wu, 2018). On the other hand, monetary policy will positively affect the leverage ratio of non-financial enterprises through credit channels. The increase of money supply, that is, the implementation of loose monetary policy, can increase the leverage ratio of non-financial enterprises. When the market interest rate increases, it will also increase or even have a greater impact on the leverage ratio of enterprises. In the short term, the rise of interest rate may lead to the decline of the leverage ratio of enterprises, but in the long run, it will still improve the financial leverage ratio of enterprises (H. L. Li, 2022). C. Wang et al. (2022) pointed out that loose monetary policy will weaken the scale advantage of large enterprises and the ownership advantage of state-owned enterprises, make banks prefer medium and micro enterprises and non-state-owned enterprises with high risks return, and reduce the average financing cost of enterprises, which will significantly promote the debt financing behaviour of enterprises and increase the debt ratio of enterprises. In addition, Tan et al. (2018) argued that in order to reduce the leverage ratio of non-financial enterprises of China, it is necessary to reduce the debt level of state-owned enterprises. Rao (2019) found that the high debt level of state-owned enterprises will lead to the high leverage ratio of non-financial enterprises of China. Obviously, the loose interest rate policy and monetary policy will promote the debt financing behaviour of state-owned enterprises. Since state-owned enterprises have financing advantages, it may further lead to the increase of their debt level.

To sum up, from the perspective of theoretical research, macro credit scale has a significant impact on corporate financial leverage. With the expansion of macro credit scale, the financial

leverage of enterprises is likely to show an expansion trend.

4.1.2 The stage characteristics of China's credit scale

According to the law of economic development, the macro credit environment will have an important impact on the financial leverage of enterprises. Among them, the loose monetary and credit environment and the tight credit environment will bring different leverage strategies. At the same time, these strategies will not be exactly the same due to industry differences, which requires specific analysis of specific problems. This section will use the method of descriptive statistical analysis, which is using the data of upstream and downstream enterprises in glass industry chain of China, to explore the impact of changes in macro credit scale or loan environment on the use of debt financing of glass enterprises.

In order to deeply analyze the impact of cyclical changes in macro credit scale on corporate financial leverage, this thesis collected the new credit data of each year from the National Bureau of statistics, as shown in Table 4.1. According to Table 4.1, this thesis further draws Figure 4.1. To sum up, in Figure 4.1, the macro credit scale changed significantly at three time points: 2006, 2008-2009, and 2020. Date show that the scale of new loans increased significantly at the three time points of 2006, 2008-2009 and 2020. The growth rate was 76. 57% in 2006, 34.71% in 2008, 95.63% in 2009 and 18.64% in 2020. In 2015, the credit scale also increased significantly compared with the adjacent years, but compared with the three nodes of 2006, 2008, 2020, the change in 2015 was relatively gentle. Considering this factor, 2015 was not included in the key node analysis of credit scale change.

Table 4.1 Scale and growth rate of new loans in each year

Time (year)	GDP scale	New credit scale	Year-on-year growth of new loans
2004	161800	20436	-
2005	187300	17327	-15.21%
2006	219439	30594	76.57%
2007	270092	36406	18.99%
2008	319245	49042	34.71%
2009	348518	95943	95.63%
2010	412119	79450	-17.19%
2011	487940	74715	-5.96%
2012	538580	82038	9.80%
2013	592963	88917	8.39%
2014	643563	97813	10.00%
2015	688858	112693	15.21%
2016	746395	124372	10.36%
2017	832036	138432	11.30%
2018	919281	156712	13.21%
2019	986515	168835	7.74%
2020	1013567	200309	18.64%
2021	1149237	199404	-0.45%

2022	1210207	209147	4.89%

Data source: Data published by the National Bureau of Statistics

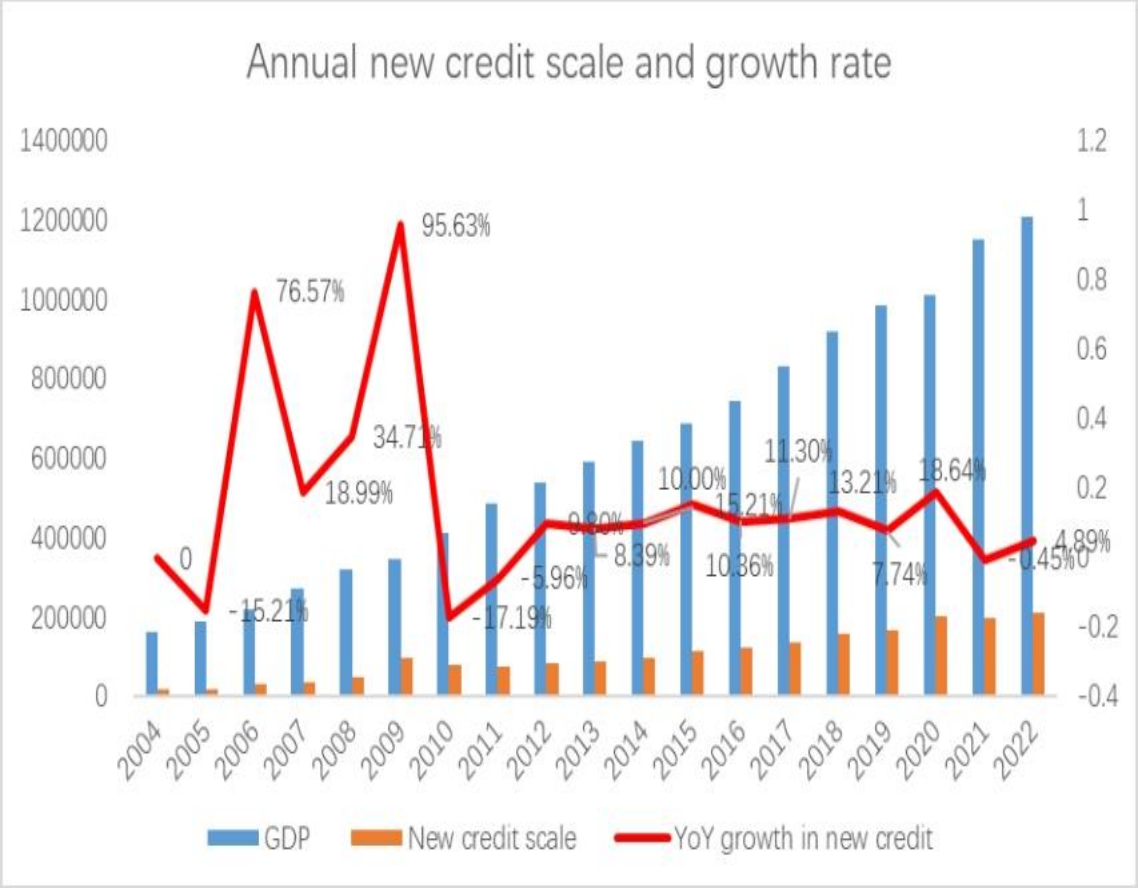


Figure 4.1 Credit scale change trend over the years

4.1.3 Characteristics of Chinese listed glass companies' financial leverage

In order to further explore the impact of changes in macro credit scale on the improvement of financial leverage of enterprises, this study collected the financial leverage data of China's glass and glass supply chain upstream and downstream enterprises from 2005 to 2022 through CSMAR database. Financial leverage is measured by dividing debt by total assets.

Mean-value analysis of trend chart. In order to show clearly, this thesis draws the trend of annual credit scale and average financial leverage of enterprises, as shown in Figure 4.2. At the same time, Figure 4.3 is drawn according to the comparative data of leverage ratio and credit scale.

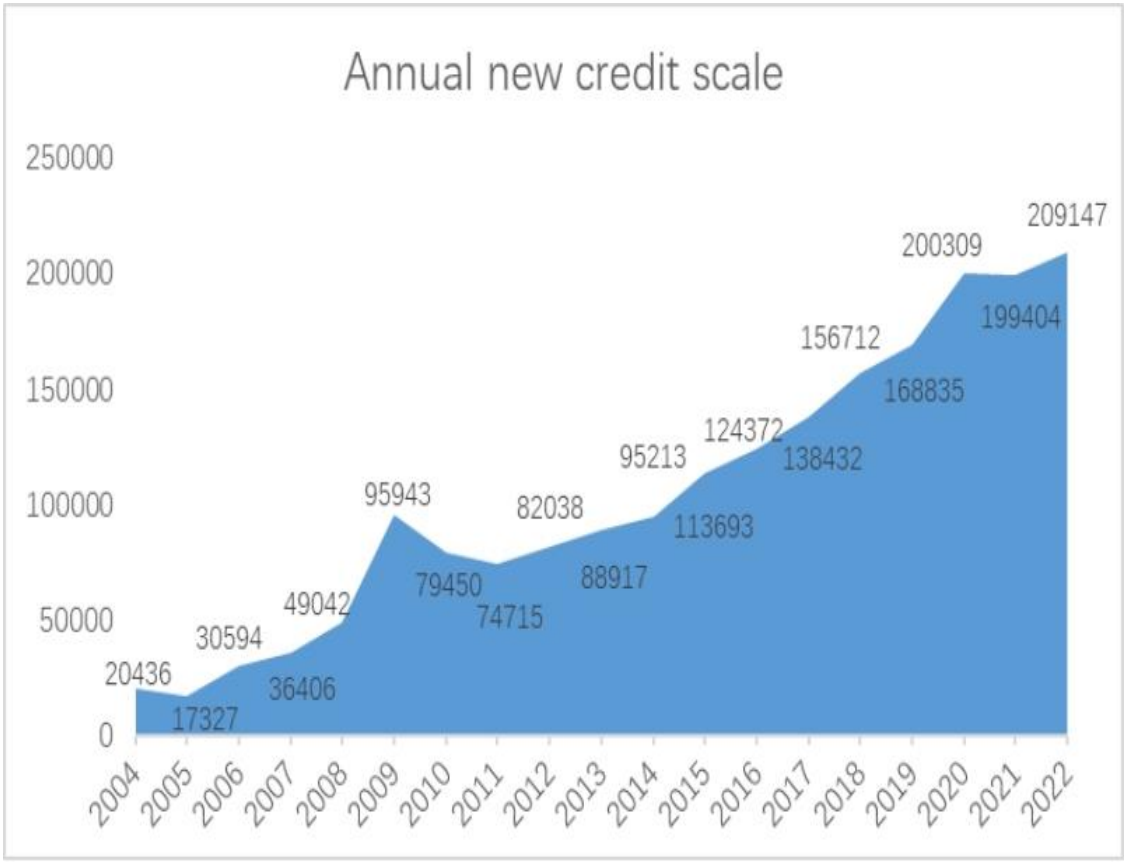


Figure 4.2 New credit scale in China from 2004 to 2022 (Unit: RMB 100 million)

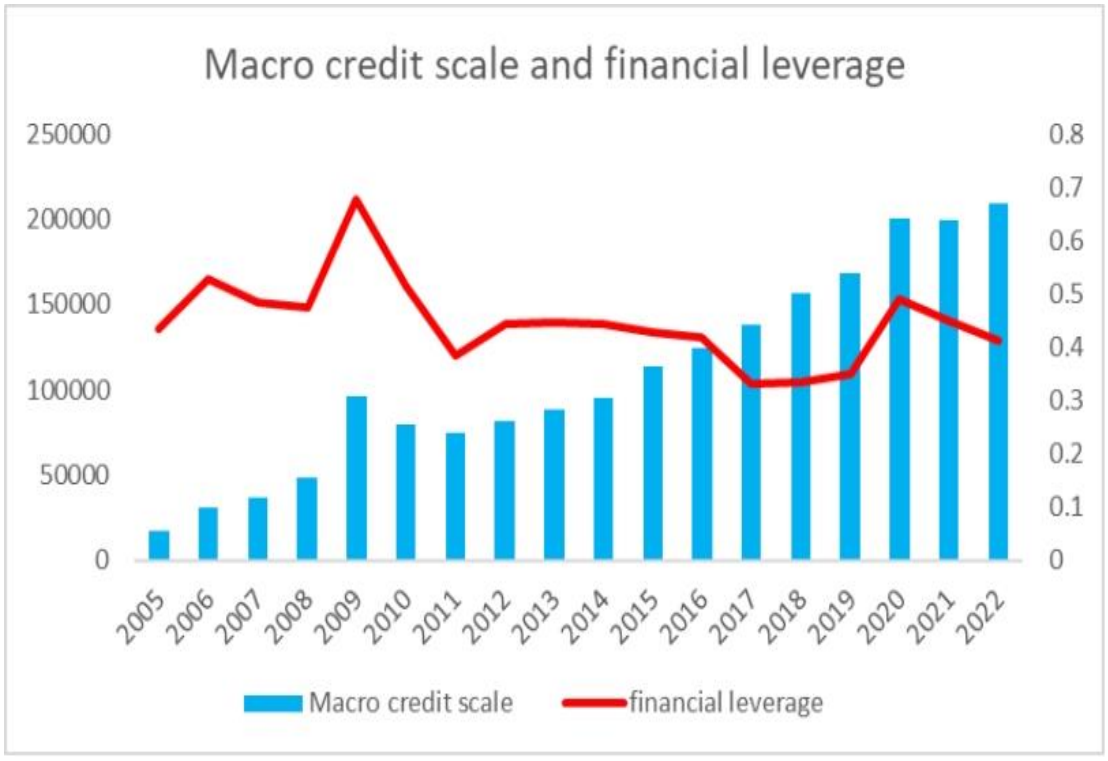


Figure 4.3 Comparison of average financial leverage ratio and credit scale from 2005 to 2022

Figures 4.2 and 4.3 show that in 2006, 2009 and 2020, the credit scale showed a large growth (including continuous high-speed growth in 2008-2009). Accordingly, the average

leverage ratio of enterprises showed a significant growth trend in 2006, 2009 and 2020. This shows that the macro credit scale has a significant impact on the financial leverage of enterprises.

According to the data comparison results in Figure 4.3, the analysis and comparison results of enterprise financial leverage at each stage are as follows:

(1) From 2004 to 2006, changes in corporate financial leverage caused by changes in the credit environment in 2006. In 2006, economy of China operated well, and all walks of life developed rapidly. At the same time, the problem of excessive growth of investment and credit also appeared. Since the beginning of 2006, M2 (Money supply in a broad sense) of China has shown a rapid upward trend. In January 2006, the growth rate of M2 was close to 20%, and the balance of M2 exceeded 33trillion yuan in November. Overheated investment led to a rapid increase in credit scale from 1.7 trillion yuan in 2005 to 3 trillion yuan in 2006. At the beginning of 2006, the loose monetary policy continued until the end of the year, and the new loans increased by 76% compared with. Correspondingly, the financial leverage ratio of enterprises has increased significantly since 2006 compared with 2005, as shown in Figure 4.3.

(2) From 2007 to 2009, the change of corporate financial leverage caused by the change of credit environment in 2009. In response to the global financial crisis in 2008, the Chinese government issued a package of measures to maintain stable economic growth. From the second half of 2008 to the end of 2009, the Chinese government implemented monetary easing policy, reduced loan interest rates, and significantly adjusted the credit scale of national commercial banks for many times. In June, 2009, the "4trillion" economic stimulus plan was issued. Under the loose monetary policy, new loans increased by 95% in 2009 compared with 2008.Correspondingly, since 2009, the financial leverage ratio of enterprises has increased significantly compared with 2008.As shown in Figure 4.3, compared with 2008, the overall financial leverage ratio of enterprises after 2009 has been greatly improved.

(3) From 2010 to 2020, changes in corporate financial leverage caused by changes in the credit environment in 2020. In 2020, China's economy has shifted from a high-speed growth stage to a high-quality development stage, and the economy has entered a stage of slight fluctuation due to the new crown epidemic. From the perspective of the international environment, the interest rate reduction measures taken by Europe, America, Japan and other countries in 2020 will be conducive to the increase of China's export demand. At the same time, 2020 is the acceptance year for China to build a well-off society in an all-round way and the 13th five years plan. In order to maintain the stable operation of the economy and ensure sufficient monetary liquidity, relatively loose financial measures have been implemented.

Social finance scale M2 of China will reach 30 trillion yuan, and the new credit scale will exceed 2 billion yuan. Correspondingly, the financial leverage ratio of enterprises after 2020 has increased significantly compared with 2019, as shown in Figure 4.3.

To sum up, the comparison of data at various stages in the trend chart shows that the macro credit scale has a positive impact on the improvement of corporate financial leverage.

4.2 Empirical analysis of financial leverage on inefficient investment

4.2.1 Data sources and sample selection

According to the research framework, this study selects glass manufacturing and its upstream and downstream related enterprises as the research object.

In terms of data collection, this thesis obtained the unbalanced panel data of 533 glass and glass products upstream and downstream enterprises in Shanghai and Shenzhen A-shares through CSMAR and wind databases. The sample interval was from December 31, 2004 to December 31, 2022 (all variables were based on the year-end statistical data).

4.2.2 Data matching and data filtering

In this thesis, the basic information, operation data and financial data of 533 listed companies in the upstream and downstream of glass and glass industry chain are obtained through CSMAR and wind databases.

On the basis of quantitative data, data acquisition, data matching and data screening are carried out in this thesis. After eliminating the enterprises with missing data and some marked ST, the data of 399 enterprises were finally obtained, as shown in Table 4.2.

Table 4.2 Total sample size

Initial number of enterprises	Number of enterprises excluding ST Mark	Number of enterprises lacking many of key-data	Number of final Enterprises
533	19	115	399

Considering that there are data items of the previous year (such as income growth) in the panel data, the data of the initial year (2004) were not adopted after data processing, so the year of the final sample data is 2005-2022.

The statistical results show that there are 4021 pieces of unbalanced panel data of 399 enterprises in this thesis from 2005 to 2022 (a small number of enterprises were later delisted or reorganized into other companies), and 509 samples with missing data were eliminated, and 3508 pieces of data were finally obtained. Table 4.3 for data volume of each year.

Table 4.3 Sample screening and final sample size

Time (year)	Sample size	Eliminate missing-items, St, restructure or delist	Final sample size
2005	96	4	92
2006	97	3	94
2007	111	15	96
2008	124	21	103
2009	138	25	113
2010	156	39	117
2011	170	47	123
2012	186	31	155
2013	192	8	184
2014	203	9	194
2015	215	18	197
2016	235	27	208
2017	276	37	239
2018	304	44	260
2019	343	32	311
2020	352	26	326
2021	396	63	333
2022	423	60	363
total	4021	509	3508

4.2.3 Variable definition and index measurement

4.2.3.1 Explained variable: inefficient investment

The explanatory variable of this study is inefficient investment behaviour. According to D. Y. Yang et al. (2023), inefficient investment behaviour mainly includes over-investment and under-investment.

Among them, over investment refers to that managers invest enterprise funds into projects with small profit opportunities or negative net asset value in order to realize their own or other interests (X. F. Xu et al., 2018).

Under-investment refers to the fact that managers are affected by factors such as information asymmetry, which leads to the increase of financing costs and ultimately leads to the deviation of management from investment projects with high net present value (Tian et al., 2021).

Referring to Richardson (2006), this thesis estimates the reasonable amount of investment by using the regression model of the new investment amount to the variables such as enterprise investment opportunities, as shown in model (1).

$Invest_t$ is the natural logarithm of the new investment and Growth is an investment growth opportunity. This thesis uses the growth rate of operating income to calculate;

Age is the enterprise age;

Size is enterprise size. This thesis is measured by the number of employees;

NP is net profit;

FS is government subsidy;

$Invest_{t-1}$ is the investment amount of the previous year, introduced the natural logarithm;

Cash is the proportion of cash stock in assets;

Return is the return of the shares of company.

$$Invest_t=\beta 0+\beta 1Growth_{t-1}+\beta 3Age_{t-1}+\beta 4Size_{t-1}+\beta 5NP_{t-1}+\beta 6Invest_{t-1}+\beta 7Cash_{t-1}+\beta 8Return_{t-1}+\varepsilon_{i,t} \quad (1)$$

Based on the research model proposed by Richardson (2006) mentioned above and referring to the measurement method of Q. Li et al. (2014) the influencing factors and related variable measurements of reasonable investment amount in this study are shown in Table 4.4.

Table 4.4 Definition and description of variables for calculation of reasonable investment amount

Types	Variable and symbol	Definition and description
Explained variables	Investment amount: Invest	The natural logarithm of the total cash paid for the purchase and construction of fixed assets, intangible assets and other long-term assets is used to measure the actual investment of the enterprise.
Explanatory and control variables	Investment investment lags by one period: $Invest_{t-1}$	The natural logarithm of the total cash paid for the purchase and construction of fixed assets, intangible assets and other long-term assets in the previous period is used to measure the amount of enterprise investment in the previous period.
	Growth opportunities: $Growth_{t-1}$	The operating income of the previous period minus the operating income of the previous period lags behind the operating income of the previous period, which is used to measure the growth opportunity of the enterprise.
	Enterprise age: Age_{t-1}	The age of enterprises as of 2022 lags behind by one period.
	Enterprise size: $Size_{t-1}$	Use the number of employees to measure the size of the enterprise and take the natural logarithm.
	Net profit ratio: NP_{t-1}	The ratio of net profit to total assets, net profit/total assets, lags behind by one period.
	Cash Stock: $Cash_{t-1}$	Cash and cash equivalents of the previous period excluding total assets of the previous period.
	Stock return: $Return_{t-1}$	Stock return lags by one period

Referring to Q. Li et al. (2014), the reasonable investment is calculated as $\hat{I}_{\hat{I}}$. The total investment of the enterprise in the acquisition and construction of fixed assets, intangible assets and other long-term assets is recorded as I. Then the inefficient investment is $I-\hat{I}_{\hat{I}}$, and after standardization is $(I-\hat{I}_{\hat{I}})/\hat{I}_{\hat{I}}$. Since Invest in model (1) takes the natural logarithm ln (I) for new investment, the following simple changes are made to obtain the measurement index of inefficient investment, as shown in the following model.

$$\frac{I-\hat{I}}{\hat{I}} = \frac{I}{\hat{I}} - 1 = e^{ln(I)-ln(\hat{I})} - 1 \quad (2)$$

To sum up, This paper used the residual of the regression model in Richardson (2006) and Q. Li et al. (2014) research to take the index and then subtract 1 as the measure of inefficient investment. If the value is positive, it means that over investment occurs, otherwise, under investment occurs, and thus 0/1 dummy variable is set. Over investment is set to 1, and under investment is set to 0.

In addition, in order to better distinguish and reflect over investment and under investment, the inefficient investment indicators of the two types of sub-samples are sorted respectively, and the sub-samples of 5% greater than 0 and less than 0 are eliminated respectively, and finally they are regarded as the sub-samples of over investment and under investment. After elimination, 1728 over investment sub-samples and 1604 under investment sub-samples were finally obtained.

4.2.3.2 Explanatory variable: financial leverage

Financial leverage Lev: it plays an important role in the process of enterprise operation. It can help investors expand the scale of investment and increase potential income. According to the definition of financial leverage, this thesis uses the ratio of total debt to assets to measure the leverage coefficient; It is Lev= Debt/Total assets. A high Lev value indicates a high financial leverage ratio, while a low Lev value indicates a low financial leverage ratio.

Further, considering the existence of old and new debts in corporate liabilities, this study further takes them as independent variables into the model to further explore the impact of financial leverage structure on corporate inefficient investment, Including new debt and old debt.

New debt (Ndebt): Referring to the research of Q. Li et al. (2014), divide the total amount of bank borrowings increased in this year compared with the previous year by the total amount of assets at the end of this year to measure the new debt.

Old debt (Odebt): Referring to the research of Q. Li et al. (2014), the total amount of new bank borrowings in this year, excluding the existing bank borrowings in the previous year, is used to measure the old debt.

New to old debt ratio (NOdebt): Used to calculate the proportion of new debt in the overall debt structure, and calculate it as new debt/old debt.

4.2.3.3 Control variable

The inefficient investment of enterprises is affected by many factors. Referring to the research

of Q. Li et al. (2014) and D. Y. Yang et al. (2023), the investment behavior of enterprises is affected by factors such as enterprise age, enterprise scale, net profit ratio, cash stock, and annual return of stocks.

This thesis takes them as the control variables of the model. Among them, the deadline for calculating the age of the enterprise is 2022, so the age is calculated as 2022- the year of data acquisition; In similar industries full of market competition, the per capita production efficiency of each enterprise is relatively close, and the number of employees reflects the size of the enterprise to a certain extent. Therefore, this study uses the number of employees to measure the size of enterprises; measuring the profit ratio by the ratio of net profit to assets; cash stock is measured by dividing ending cash and cash equivalents by total assets; The annual return of stocks is the rate of return of stocks.

To sum up, the data measurement and data sources in this thesis are summarized in Table 4.5.

Table 4.5 Variable description

Types	Variables and symbols	Definition and description
Explained Variable	Inefficient Investment NEI	The residual error of the regression model for estimating the reasonable amount of investment takes the index and then decreases by 1, indicating the degree of inefficient investment. A positive value indicates excessive investment, while a negative value indicates insufficient investment.
	Over-investment NOI	In the residual term of regression analysis of model (1), the array with ε_{it} greater than 0 is over investment. After sorting from small to large, the 5% sample closest to 0 is eliminated, and the remaining sub-samples are over investment samples.
	Under-investment NUI	In the residual term of regression analysis of model (1), the array with ε_{it} less than 0 is the under investment group. After sorting from small to large, the 5% sample closest to 0 is eliminated, and the remaining sub-samples are under invested samples.
explanatory variable	Leverage: Lev	Debt to asset ratio
	New debt: Ndebt	Total bank borrowings increased in the current year over the previous year divided by total assets at the end of the year
	Old debt: Odebt	Total bank borrowings of the previous year divided by total assets of the current year
	New to old debt ratio: NOdebt	New debt/old debt
control variable	Enterprise age: Age	The age of the enterprise is calculated as 2022 minus the year of establishment.
	Enterprise size: Size	The number of employees is taken as the natural logarithm
	Cash Stock: Cash	Cash and cash equivalents of the previous period to be divided by total assets of the previous period.
	Net profit: Np	Ratio of net profit to total assets
	Stock return: Return	Stock return lags by one period

4.2.4 Model setting and test method

According to the research hypothesis, this thesis constructed the regression model of corporate financial leverage on inefficient investment. The independent variable inefficient investment Lev is calculated according to the formula above.

Inefficient investment includes over investment and under investment. The samples with ε_{it} greater than 0 are over-investment. After deleting the first 5% close to 0, the remaining samples are over investment subsamples. The ε_{it} value indicates the degree of over investment, and the variable is named NOI（Over-investment）; on the contrary, the sample with ε_{it} less than 0 is under-investment. After deleting the first 5% close to 0, the remaining sample is under investment subsample. The ε_{it} value indicates the degree of under investment, and the variable is named NUI (under-investment).

Explanatory variables include financial leverage (Lev_lag), new debt (Ndbet), and old debt (Odbet). The measurement is shown in Table 4.5.

The control variables include enterprise age (Age), enterprise size (Size), cash stock (Cash), net profit (Np) and stock return (Return). The measurement is shown in Table 4.5.

According to the research objectives, the part of empirical analysis of this thesis establishes the regression model (4.1) - (4.4). The explained variables of all models are NEI. The explanatory variables are financial leverage, new debt level, old debt level and the ratio of new to old debt. The control variables are enterprise age, enterprise scale, cash stock, net profit and annual return on stocks

The regression models involved in this thesis are summarized as follows:

$$\mathbf{NEI=b_0+b_1lever_lag+b_2age_lag+b_3size_lag+b_4cash_lag+b_5np_lag+b_6return_lag+m} \quad (4.1)$$

$$\mathbf{NEI=b_0+b_1Ndebt+b_2age_lag+b_3size_lag+b_4cash_lag+b_5np_lag+b_6return_lag+m} \quad (4.2)$$

$$\mathbf{NEI=b_0+b_1Odebt+b_2age_lag+b_3size_lag+b_4cash_lag+b_5np_lag+b_6return_lag+m} \quad (4.3)$$

$$\mathbf{NEI=b_0+b_1NOdebt+b_2age_lag+b_3size_lag+b_4cash_lag+b_5np_lag+b_6return_lag+m} \quad (4.4)$$

4.2.5 Descriptive statistics and correlation analysis

(1) Descriptive statistics

This study calculated the mean and standard deviation of the variables involved and all

variables applied in the calculation, as shown in Table 4.6.

Table 4.6 Descriptive statistics of main variables

Variables	N	Minimum	Maximum	Mean value	Standard deviation
NEI	3508	-0.99	483.96	.90	9.74
Growth (ratio)	3508	-.96	25.26	.20	.94
Lev (ratio)	3508	.02	63.97	.49	1.09
Np (ratio)	3508	-48.32	2.16	.02	.82
Size (logarithm)	3508	1.61	12.57	7.81	1.27
Age (year)	3508	7.00	64.00	24.31	5.36
Return (ratio)	3508	-.87	5.32	.23	.75
Cash (ratio)	3508	-.06	.74	.13	.11
Invest (ln)	3508	8.58	24.79	18.69	1.89
Ndebt (ratio)	3508	-55.49	21.73	.09	1.10
Odebt (ratio)	3508	.02	64.34	.52	1.10
NOdebt (ratio)	3508	-1.00	51.88	.29	1.53

The average value of the inefficient investment coefficient NEI of glass enterprises in the sample is 0.90, the maximum value is 483.96, the minimum value is -0.99, and the standard deviation is 9.74, it shows that the investment efficiency of glass enterprises is uneven, and there are great differences among different enterprises;

The mean of growth opportunity is 0.20, the maximum value is 25.26, the minimum value is -0.96, and the standard deviation is 0.94, it shows that there are great differences in investment opportunities among different enterprises, which need to be discriminated;

The mean value of financial leverage Lev is 0.49, the minimum value is 0.02, the maximum value is 63.97, and the standard deviation is 1.09, it indicates that glass enterprises and their upstream and downstream enterprises have a lot of liabilities or invest through loans;

The ratio NP of net profit to total assets is 0.02, the maximum is 2.16, the minimum is -48.32, and the standard deviation is 0.82, the net profit of the industry is low, and the data basically matches the size of the enterprise, which conforms to the objective law;

The size of the enterprise is measured by introduced the natural logarithm size of the number of employees, and the mean value after introduced the logarithm is 7.81, it shows that large-scale manufacturing enterprises occupy a certain number, which is basically consistent with the object of this thesis. Because glass enterprises and upstream and downstream enterprises are also labor-intensive enterprises, they need to employ a large number of employees;

The average age is 24.31 and the standard deviation is 5.36, indicating that most of the enterprises in this study were established in the 1990s and have experienced a long period of development.

Other variables, such as the return average of stock return is 0.23, the minimum value is -

0.87, the maximum value is 5.32, and the standard deviation is 0.75;

The cash stock to total assets ratio cash mean value is 0.13, the minimum value is -0.06, The maximum value is 0.74, and the standard deviation is 0.11;

The mean value of logarithmic investment is 18.69, the minimum value is 8.58, the maximum value is 24.79, and the standard deviation is 1.89;

The average new debt is 0.09, the mean of old debt is 0.52, and the average ratio of old debt to new debt is 0.29. These data are within a good range.

(2) Variable correlation analysis

The regression model of this thesis involves enterprise variables such as inefficient investment, financial leverage, enterprise age, enterprise size, cash stock, net profit, stock return. By putting all the data (including over investment group and under Investment Group) into SPSS to calculate the Pearson correlation coefficient, the matrix Table 4.7 is obtained.

Table 4.7 Correlation analysis of variables

Variables	Lev	Age	Size	Cash	Np	Return	NEI
Lev	1						
Age	.041*	1					
Size	.035*	.044**	1				
Cash	-.085**	-.063**	-.134**	1			
Np	-.012	.005	.335**	.029	1		
Return	.010	.055**	.017	-.006	.019	1	
NEI	.007	.034*	-.107**	-.030	-.007	.008	1

**β<0.01; *β<0.05; N=3508 (full sample); two-tailed test.

The data shows that financial leverage is highly correlated with the age of enterprises (p=0.041, β<0.05), that is, the establishment time of the enterprise is relatively long and the financial leverage is high, which is consistent with the actual situation; Financial leverage is highly correlated with scale (p=0.035, β<0.05), that is, the enterprise scale is relatively large, it is easier to obtain bank loans, and the financial leverage ratio is high, which is in line with the actual situation; Financial leverage is negatively correlated with cash stock (p=-0.085, β<0.01), which is consistent with the actual situation;

The inefficient investment was positively correlated with the age of the enterprise (p=0.034, β<0.05), The query of original data found that most of them were state-owned enterprises with a long history of establishment, indicating that the inefficient investment of old state-owned enterprises established earlier was more serious; Inefficient investment is negatively correlated with enterprise size (P=-0.107, β<0.01), which shows that with the expansion of enterprise scale, more attention should be paid to the rationality of investment.

At the same time, the data show that the correlation coefficient between each variable is less than 0.7 in the full sample data used in the regression model, so the serious collinearity

interference of variables is excluded.

4.2.6 Panel data regression analysis

4.2.6.1 Model selection: fixed effect and random effect

This thesis uses 3508 unbalanced panel data from 399 enterprises. There are cross year data for a single enterprise, which are repeated observations in different years, and there may be strong correlation between the data of the same enterprise in different years. Considering the interference of these cross-year linked data on the results of regression analysis, the processing method of cross-sectional data is not suitable. Therefore, this thesis selects the processing method of longitudinal panel data for model selection.

For the commonly used panel data regression model, in order to control the interference of individual effect and improve the accuracy of estimation and prediction, it is particularly important to judge whether the sample regression uses fixed effect or random effect. Hausman test is a classical and commonly used method for panel data regression model selection, which was proposed by J. A. The original hypothesis of Hausman test H0 is "the unobserved individual is independent of the explanatory variable in the model. If the data result rejects the original hypothesis, the fixed effect model (FE) is selected; If the original hypothesis is not rejected by the data results, the random effect model (RE) is selected. Hausman test results showed that Prob > chi2 = 0.000, less than 0.05 in the total sample, rejected the original hypothesis, so it is suitable to use the fixed effect model. It shows that the deviation between the sample data is reasonable, and the heterogeneity of similar industries is small, which is the basic characteristics of the selected sample.

4.2.6.2 Benchmark regression results

The empirical study of the impact of financial leverage on inefficient investment needs to be carried out from three aspects:

Firstly, the regression of the impact of overall financial leverage on inefficient investment;

Secondly, considering the existence of new debt and old debt in the financial leverage structure, this study further makes a regression analysis of the impact of new and old debt on inefficient investment;

Finally, in order to more clearly show the impact of debt structure ratio, this study also needs to regress the old and new debt ratio and inefficient investment.

According to this idea, this section takes the inefficient investment NEI as the explanatory variable, the financial leverage LEV, the new debt level Ndebt, the old debt level Odebt, and

the ratio of new to old debt as the explanatory variables, and the enterprise age, enterprise size, cash stock cash, net profit NP, and stock return as the control variables for multiple regression analysis. Then Table 4.8 is obtained.

Table 4.8 Benchmark regression results of the impact of financial leverage on inefficient investment

Variables	Explained variable: NEI (total financial leverage)			
	Model1	Model2	Model3	Model4
Lev_1	2.884** (0.878)			
Ndebt		1.793*** (0.281)		
Odebt			-2.122* (0.832)	
NOdebt				0.784*** (0.106)
Age_1	0.053 (0.032)	0.075* (0.032)	0.083* (0.032)	0.079* (0.032)
Size_1	-1.083*** (0.149)	-0.921*** (0.14)	-0.786*** (0.150)	-0.890*** (0.14)
Cash_1	0.295 (0.176)	0.312 (0.176)	0.295 (0.177)	0.302 (0.175)
Np_1	3.741** (1.163)	-2.046*** (0.374)	-2.806* (1.109)	-0.043 (0.197)
Return_1	0.597 (0.323)	0.640* (0.321)	0.714* (0.323)	0.615 (0.321)
Cons	6.482*** (1.329)	5.994*** (1.322)	6.006*** (1.331)	5.569*** (1.322)
Individual fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Within R^2	0.0175	0.0259	0.0163	0.0297
F	10.37***	15.43***	9.65***	17.77***
Sample size	3508	3508	3508	3508

*P<0.05, **P<0.01, ***P<0.001. The above models were all regressed by fixed effects model.

(1) Model 1 is the regression analysis of financial leverage on inefficient investment in glass enterprises.

The results show that the control variable in model 1, the regression coefficient of enterprise scale on inefficient investment is -1.083, which is significant at the level of 1‰, which indicates that enterprise scale has a negative impact on inefficient investment;

The regression coefficient of net profit on inefficient investment is 3.741, which is significant at the 1% level, indicating that net profit has a positive impact on inefficient investment;

The R2 and F values of other parameters were 0.0175 and 10.37, which is significant at 1‰ level, and are in the normal range;

In model 1, the regression coefficient of the independent variable financial leverage (lev_1) on the dependent variable inefficient investment is 2.884, which is significant at the 1% level,

indicating that the financial leverage of glass and its upstream and downstream enterprises has a significant positive impact on their inefficient investment.

Hypothesis H1 is verified.

(2) Model 2 is the regression analysis of new debt level on inefficient investment.

The results show that in the control variable of model 2, the regression coefficient of enterprise age on inefficient investment is 0.075, which is significant at the 5% level, indicating that enterprise age has a positive impact on inefficient investment;

The regression coefficient of enterprise scale on inefficient investment is -0.921, which is significant at 1‰ level, indicating that enterprise scale has a negative impact on inefficient investment; The regression coefficient of net profit on inefficient investment is -2.046, which is significant at 1‰ level, indicating that net profit has a negative impact on inefficient investment;

The regression coefficient of annual stock return on inefficient investment is 0.640, which is significant at the level of 5%, indicating that the annual stock return has a positive impact on inefficient investment;

The R2 value of other parameters is 0.0259, and the F value is 15.43, which are significant at 1‰ level, and both are in the normal range;

The regression coefficient of the independent variable new debt level (Ndebt) to the dependent variable inefficient investment in model 2 is 1.793, which is positively significant at 1 ‰ level, it shows that the new debts of glass and its upstream and downstream enterprises have a positive impact on inefficient investment and drive inefficient investment in the direction of over-investment (positive direction of NEI coefficient).

Hypothesis 2 and hypothesis H4 are verified.

(3) Model 3 is the regression analysis of old debt level to inefficient investment.

The results show that in the control variable of model 3, the regression coefficient of enterprise age on inefficient investment is 0.083, which is significant at the 5% level, indicating that enterprise age has a positive impact on inefficient investment;

The regression coefficient of enterprise scale on inefficient investment is -0.786, which is significant at 1‰ level, indicating that enterprise scale has a negative impact on inefficient investment;

The regression coefficient of net profit on inefficient investment is -2.806, which is significant at the level of 5%, indicating that net profit has a negative impact on inefficient investment;

The regression coefficient of annual stock return on inefficient investment is 0.714, which

is significant at the level of 5%, indicating that the annual stock return has a positive impact on inefficient investment;

The R2 value of other parameters is 0.0163, F value is 9.65, which are significant at 1‰ level, both are in the normal range;

In model 3, the regression coefficient of the independent variable old debt level (Odebt) to the dependent variable inefficient investment is -2.122, which is significant at the 5% level, indicating that the old debt of glass and its upstream and downstream enterprises inhibits over investment and pulls inefficient investment in the direction of under investment (negative direction of NEI coefficient).

Hypothesis H3 and hypothesis H5 are verified.

(4) Model 4 is the regression analysis of old debt to inefficient investment.

The results show that in the control variable of model 4, the regression coefficient of enterprise age on inefficient investment is 0.079, which is significant at the 5% level, indicating that enterprise age has a positive impact on inefficient investment;

The regression coefficient of enterprise scale on inefficient investment is -0.890, which is significant at 1‰ level, indicating that enterprise scale has a negative impact on inefficient investment;

The R^2 value of other parameters is 0.0297, and the F value is 17.77, which are significant at the 1‰ level, and both are in the normal range;

In model 4, the regression coefficient of the independent variable new old debt ratio (NOdebt) to the dependent variable inefficient investment is 0.784, which is positively significant at 1‰ level, indicating that the higher the proportion of new debt of glass and its upstream and downstream enterprises, the more likely it will lead to over investment behavior (positive direction of NEI coefficient).

The hypothesis H8 is verified.

4.2.6.3 A further test of debt structure's impact on inefficient investment

Inefficient investment includes over investment and under investment.

Table 4.8 makes regression analysis with inefficient investment as the explained variable, but lacks discussion on the specific types of inefficient investment. In order to more clearly show the two directions of inefficient investment, this study sets 0/1 dummy variable for over investment and under investment. Over investment is 1, under investment is 0.

Refer to the research of Q. Li et al. (2014) for Logit regression and then obtain Table 4.9. In Table 4.9, over-investment is represented by 1 and no over-investment is represented by 0,

so over-investment can be regarded as an explanatory variable. The explanatory variables are the new debt level and the old debt level.

Table 4.9 Logit regression analysis of dummy variables set by independent variables on inefficient investment

Variables	Explained variable: 0, 1 dummy variable, over-investment is 1, under-investment is 0	
	model5	model6
Ndebt	1.080*** (0.268)	
Odebt		-0.077* (0.169)
Age_1	0.008 (0.006)	0.006 (0.006)
Size_1	-0.079** (0.030)	-0.083** (0.031)
Cash_1	0.087* (0.044)	0.082 (0.043)
Np_1	-1.232*** (0.31)	0.097 (0.225)
Return_1	-0.050 (0.045)	-0.041 (0.046)
Cons	0.450 (0.275)	0.550* (0.274)
Pseudo R^2	0.0143	0.0101
Wald chi2(6)	25.40***	9. 60***

N=3508, *P<0.05, **P<0.01, ***P<0.001.

Model 5 data shows that the regression coefficient between the new debt and over-investment of glass and glass upstream and downstream enterprises is 1.080, which is significant at 0.001 level, indicating that the new debt in the debt leverage of enterprises is an important factor to promote over-investment.

Model 6 data shows that the regression coefficient of old debt and over-investment of glass and glass upstream and downstream enterprises is -0.077, which is significant at 0.05 level, indicating that the old debt in corporate debt leverage plays an inhibitory role on over-investment.

Further, this study separately studies two sub-samples of over-investment and under-investment, and conducts multiple regression analysis to obtain Table 4.10.

Table 4.10 Sub-sample analysis of inefficient investment

Variables	NEI sub-sample of over-investment		NEI sub-sample of under-investment	
	model7	model8	model9	model10
Ndebt	1.810*** (0.416)		0.116*** (0.03)	
Odebt		-4.723** (1.639)		-0.094** (0.028)

Variables	NEI sub-sample of over-investment		NEI sub-sample of under-investment	
	model7	model8	model9	model10
Age_1	0.128*	0.141*	-0.002	-0.002
	(0.061)	(0.062)	(0.001)	(0.001)
Size_1	-1.788***	-1.481***	0.045***	0.044***
	(0.275)	(0.294)	(0.005)	(0.005)
Cash_1	0.483	0.457	-0.009	-0.009
	(0.323)	(0.324)	(0.006)	(0.006)
Np_1	-2.073***	-6.232**	0.249***	0.265***
	(0.55)	(2.174)	(0.058)	(0.058)
Return_1	1.319*	1.499*	0.005	0.005
	(0.665)	(0.668)	(0.01)	(0.010)
Cons	12.423***	12.479***	-0.657***	-0.654***
	(2.578)	(2.586)	(0.045)	(0.045)
Individual fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Within R^2	0.0382	0.0322	0.0837	0.0813
F	11.28***	9.46***	24.04***	23.30***
Observed value	1728	1728	1604	1604

*P<0.05, **P<0.01, ***P<0.001. The sub-sample deleted the top 5% samples with over investment and under investment close to 0.

The results of model 7 show that the regression coefficient of the new debt level to inefficient investment in the over investment sub-sample is 1.810, which is significant at the level of 0.001, indicating that the degree of over investment of Chinese glass enterprises increases with the increase of new debt;

The results of model 9 show that in the sub-sample of under-investment, the regression coefficient of the new debt level to inefficient investment is 1.116, which is significant at the level of 0.001, indicating that the new debt will pull the direction of inefficient investment to the direction of less under investment. That is, the degree of enterprise under-investment will be alleviated with the increase of new debt.

Hypothesis H6 is verified.

The results of model 8 show that in the sub-sample of over investment, the regression coefficient of old debt level to inefficient investment is -4.743, which is significant at the level of 0.01, indicating that old debt inhibits over investment and has a significant inhibitory effect; The results of model 10 show that in the over-investment sample, the regression coefficient of old debt level to inefficient investment is -0.094, which is significant at the level of 0.01.That is, the degree of enterprise under-investment increases with the increase of existing debt level.

Hypothesis H7 is verified.

4.2.6.4 Empirical results summary

Firstly, the glass enterprises and their upstream and downstream suppliers of China, have

serious inefficient investment behaviour on the whole, and the degree of inefficient investment is affected by the financial leverage of enterprise. According to Dou and Li (2015), the increase of financial leverage caused by liabilities will lead to shareholder creditor agency conflict, which will lead to the occurrence of under-investment or over investment, and make the enterprise's investment level and investment expenditure unable to meet the requirements of value maximization. The increase of financial leverage ratio caused by liabilities will lead to shareholder creditor agency conflict, which will lead to the occurrence of under investment or over investment, and make the enterprise's investment level and investment expenditure unable to meet the requirements of value maximization. According to S. C. Ma et al. (2022), the improvement of leverage ratio will promote enterprises to increase the scale of investment, increase the proportion of research and development investment for enterprises with better financial flexibility and greater growth opportunities, and increase the possibility of inefficient investment. In addition, according to Y. X. Li (2022), enterprises with debt financing advantages tend to invest inefficiently. The rise of corporate financial leverage ratio means that the company's liabilities and cash flow increase. Therefore, when the enterprise's financial leverage increases, the degree of inefficient investment will increase. On the contrary, when the financial leverage decreases, the degree of inefficient investment will be effectively reduced.

Secondly, the ratio of old and new debts in the debts of Chinese glass enterprises and their upstream and downstream suppliers has a significant impact on the direction of inefficient investment. According to the research of Q. Li et al. (2014), debt structure has a significant impact on the direction of inefficient investment. The higher the proportion of new debt, the stronger the short-term cash flow. At this time, with the increase of the proportion of new debt, inefficient investment shifts to the direction of over investment; On the contrary, when the proportion of new debt decreases (the proportion of old debt increases), the inefficient investment shifts to the direction of insufficient investment.

Finally, the old and new debts of Chinese glass enterprises and their upstream and downstream suppliers have different effects on inefficient investment. According to G. F. Zhang (2007) and Richardson (2006), over-investment is more likely to occur when the level of free cash flow is high. The generation of new debt increases the cash flow level in the short term, while the old debt to be repaid reduces the cash flow level. The increase of the new debt level will promote the over-investment behaviour of enterprises and alleviate the under-investment behaviour at the same time; The high level of old debt will inhibit over investment and promote under-investment.

The above conclusion is shown in Figure 4.4.

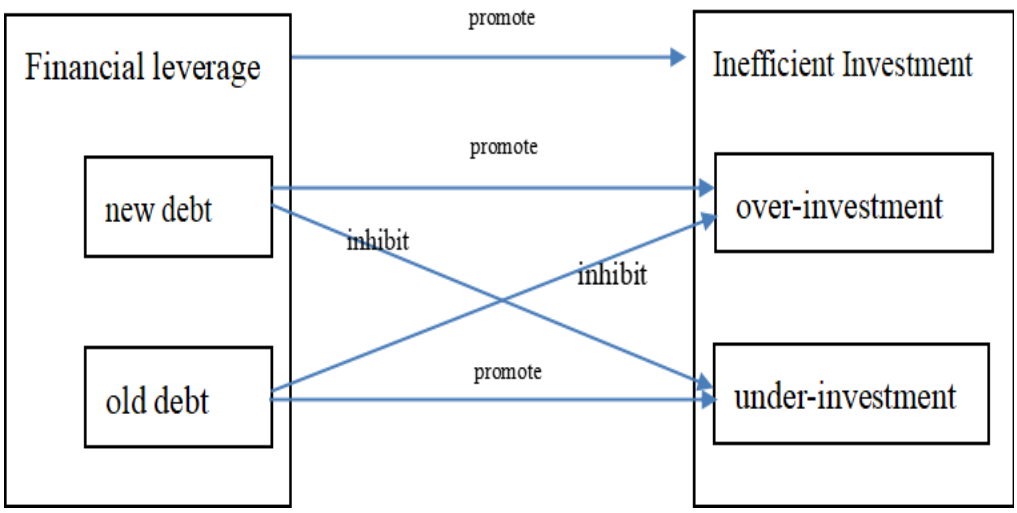


Figure 4.4 Summary of the relationship between financial leverage and inefficient investment

4.2.7 Robust test

4.2.7.1 Other measures of inefficient investment

In order to obtain more robust regression results, referring to D. Y. Yang et al. (2023) and Biddle et al. (2009), this thesis established a mathematical model for inefficient investment, and based on this, calculated the coefficient of inefficient investment. The fixed effects model regression results show that the regression coefficient of financial leverage on inefficient investment is 2.369, which is significant at 1‰ level, indicating that financial leverage has a promoting effect on inefficient investment, which is consistent with the previous research results; The regression coefficient of new debt on inefficient investment is 1.791,which is significant at 1‰ level, indicating that new debt promotes over-investment behavior and suppresses under-investment behavior; The regression coefficient of old debt on over-investment is -0.093,which is significant at 1% level, indicating that old debt suppresses over-investment behavior and exacerbates under-investment behavior.

4.2.7.2 Excluding the influence of leading enterprises

According to Q. Li et al. (2014), this thesis excludes the top 5% of the turnover of the enterprise sample, and makes regression analysis of the remaining samples.

The results show that the regression coefficient of financial leverage on inefficient investment is 1.936, which is significant at the level of 1‰, indicating that financial leverage can promote inefficient investment, which is consistent with the previous research results of model 1;

The regression coefficient of new debt to inefficient investment is 2.248, which is

significant at 1‰ level, indicating that new debt promotes over investment behavior and inhibits under-investment behavior;

The regression coefficient of old debt to over investment is -1.537, which is significant at the 5% level, indicating that old debt inhibits over investment behavior and aggravates under-investment behavior.

The above test results are basically consistent with the results obtained in this study. Therefore, the results of this study have good robustness.

4.3 The impact of macro policy on inefficient investment: Case of Fuyao Glass Company

In the previous study, financial leverage has a significant impact on the inefficient investment of Chinese glass enterprises and has been empirically tested. According to the research ideas, this section will study the impact of typical policy adjustments on the inefficient investment of Chinese glass enterprises and upstream and downstream glass enterprises from the perspective of policy evaluation. This section uses the case of Fuyao Glass Company, an influential glass company in the industry, to analyze the impact of structural policies on corporate loans and inefficient investment behavior in the development of Chinese glass enterprises. Specifically, this thesis introduces two policy control factors, namely, "leveraging" and "deleveraging", to compare and explore the inefficient investment of glass enterprises after the cycle of leveraging and deleveraging.

4.3.1 Case introduction

Fuyao Group (full name: Fuyao Glass Industry Group Co., Ltd.), founded in Fuzhou, China in 1987, is a large multinational group focusing on automotive safety glass. It was listed on the main board of Shanghai Stock Exchange in 1993 (A-share Code: 600660).

Since its establishment, Fuyao Group has been committed to making its own piece of high-quality glass for the Chinese people, playing a supporting role in the automotive industry, adhering to the core values of "diligence, simplicity, learning and innovation", and adhering to the strategic line of independence, application research and development, openness and inclusiveness. After more than 30 years of development, Fuyao Group has established modern production bases and business institutions in 16 provinces and cities in China and 11 countries and regions such as the United States, Russia, Germany, Japan and South Korea, and has set up

11 research and development and design centers in China, the United States, Germany and Japan, with about 29000 employees worldwide. the products of Fuyao have been certified and selected by world-renowned automobile manufacturers and major automobile manufacturers, including Bentley, Mercedes Benz, BMW, Audi, General motors, Toyota, Volkswagen, Ford, Chrysler, to provide them with global OEM supporting services and a full range of automotive glass solutions, and have been rated as "global excellent supplier" by major automobile manufacturers.

Fuyao Group is an active explorer and practitioner of "industry 4.0". The company is guided by intelligence and driven by innovation. Through intelligent manufacturing, the company provides customers with a piece of glass with "soul". Its information technology and production automation are in the forefront of the same industry in the world. In recent years, Fuyao Group has successively won various innovation honors and qualifications such as "China Quality Award", "intelligent manufacturing demonstration enterprise", "national innovation demonstration enterprise", "national enterprise technology center".

Fuyao Group has been ranked among the Fortune 500 in China and the top 500 private enterprises in China for many years, and has won many social honors such as "China's best corporate citizen", "Chinese top 10 listed companies" and "the best employer of CCTV". Mr. Caodewang, the chairman of the board of directors, has donated more than 16billion yuan since 1987, which is known as "the real first charity"; In 2018, Caodewang was selected as "one hundred outstanding private entrepreneurs in the 40 years of reform and opening up"; In 2009, it won the "Oscar" - Ernst&Young Entrepreneur Global Award in the business community; In 2016, it won the Golden Phoenix award, the highest award in the global glass industry. The jury said that "Caodewang led Fuyao Group to change the pattern of the world automotive glass industry".

To sum up, Fuyao Group is a Chinese glass enterprise with great influence, which is representative and typical, and is suitable to be selected as the case object of this study.

4.3.2 Case data collection

In order to explore the policy influencing factors of inefficient investment in Fuyao Glass Company, this chapter needs to further collect qualitative research data to provide supporting materials for the case. Including the following processes:

Firstly, executives are decision-makers and participants in major issues within a company. Therefore, interviews with executives can promote researchers' understanding of the case company, facilitate the analysis of scenarios, and uncover the underlying mechanisms of the

impact process. Because Fuyao Company is a large and well-known enterprise, there are some difficulties in interviewing CEOs. Therefore, this study adopts an alternative approach: on the one hand, interview some middle and senior managers. The target manager of this study has extensive work experience and a deep understanding of Fuyao Glass Company. The wide distribution of job positions among respondents is conducive to a comprehensive understanding of the enterprise; On the other hand, a large number of interview videos of CEOs accepting news media were collected, and through these interview videos, some case materials and evidence were formed.

Secondly, this study collected some second-hand qualitative data as material support and multi perspective validation. The channels for obtaining this data include news databases, enterprise official website data, and various related media reports. Through these channels, this study collected over 1000 news data texts and obtained a large amount of information on enterprise operations, financial control, risk management, and other aspects. These materials are beneficial as material support for our argument.

The case data sources for this study are shown in Table 4.11.

Table 4.11 The case data sources

Types	Data sources	Detail
Interview data	1 Financial Mangers 2 Middle-level cadres in the Finance Department 1 R&D Department Managers 2 Human Resources Managers 1 Production Department Managers 1 Director of Innovation and Engineering Center	The financial status, debt situation, operational situation, policy impact, future strategy, risks and problems faced by the company
Interview videos	Interviews with CEOs by Other Media	Future strategy, risks and problems faced by the company
Other data	News database; Enterprise official website; Various media reports	Collected over 1000 news texts and obtained a large amount of information on enterprise operations, financial control, risk management, and other aspects

4.3.3 The impact of the "adding leverage" policy analysis

The adding leverage policy refers to a series of incentive measures that the government, in order to stimulate the economy, relaxes financial restrictions to a certain extent and allows enterprises to appropriately increase the proportion of liabilities. In the process of Chinese economic development, the export-oriented foreign trade economy before 2008 gradually turned to meet domestic demand after the 2008 financial crisis.

The period from the second half of 2008 to the end of 2009 is a period of leverage.

Introduced Fuyao Glass Company as an example, during this period, the enterprise experienced three stages: self-rescue, recovery and development and over-investment.

(1) Self-rescue before the leverage policy in 2008

Before the outbreak of the global financial crisis in 2008, China mainly relied on foreign trade exports to drive domestic economic development, and the proportion of foreign trade reached a record high of 35%. According to the economic characteristics at that time, China was heavily dependent on external demand, so the economic development before 2008 did not need to increase domestic leverage. With the intensification of the global financial crisis, the overseas market had been seriously affected. At this time, a large number of domestic foreign trade enterprises had serious business problems, product exports were blocked, and overcapacity was serious. In order to stop the spread of foreign financial crisis to China, the Chinese government decided to save the domestic economy through fiscal and monetary "double strong stimulus" measures at the same time. Since the second half of 2008, a series of measures have been introduced to support leverage, including the relaxation of regulatory policies and the famous "4trillion" stimulus plan. Through these leveraged policies, the domestic demand for real estate, automobiles and other fields rose sharply, and the macro leverage ratio rose rapidly from 141.1% at the end of 2008 to 177. 7% at the end of 2011 (Data from the financial world).

Take Fuyao Glass Company as an example, its export accounts for 40%. In 2008, Fuyao company was seriously affected by the financial crisis. At that time, Chinese real estate industry was in a downturn, the export demand for float glass shrank, and the financial crisis in 2008 led to a reduction in domestic orders for glass for furniture processing in the short term. Fuyao company had to reduce the price of float glass, and even the price in the industry was lower than the cost. Affected by the financial crisis, Fuyao company suspended four production lines in Fuqing, Shuangliao and Hainan in the second half of 2008 to reduce operating costs.

(2) Recovery and development of enterprises after the leveraged policy

Since the second half of 2008, with the introduction of the leverage policy of government, Chinese economy has recovered rapidly, especially the real estate and automobile industries that are highly related to the glass industry. Especially in the automotive industry, Chinese auto sales increased by 44% after the introduction of the leverage policy, as shown in Figure 4.5.

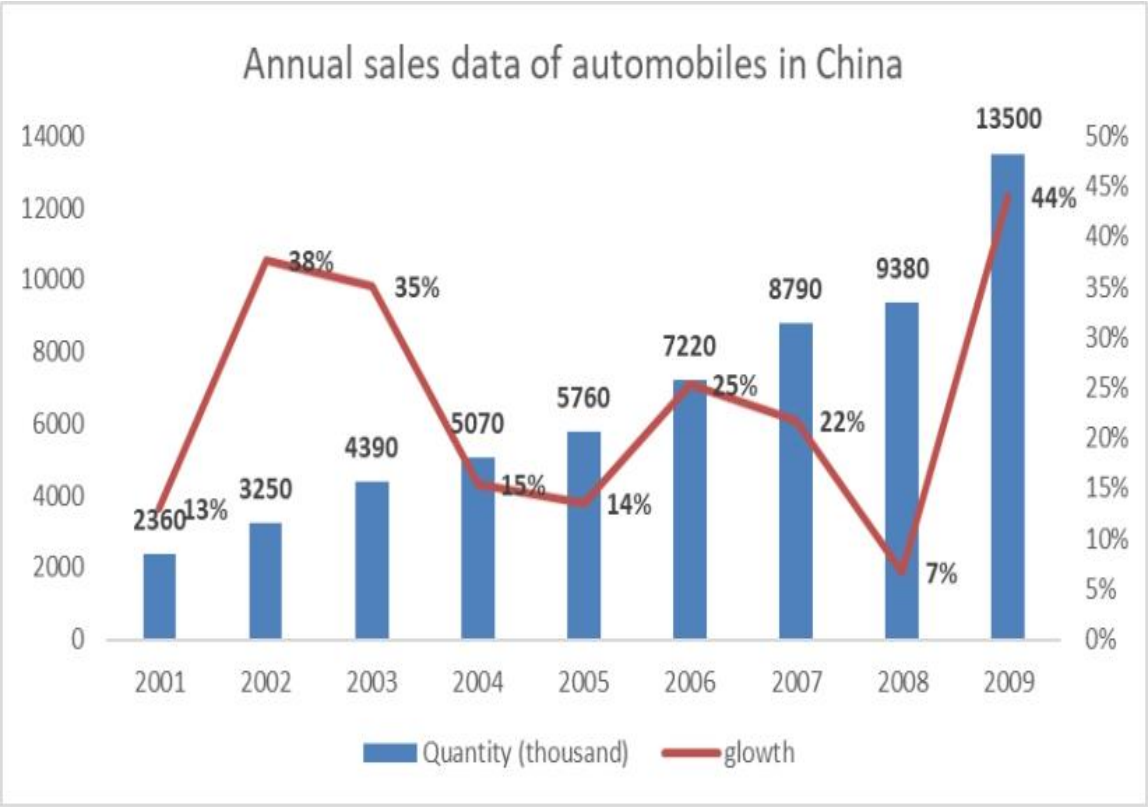


Figure 4.5 2001-2009 sales volume and growth rate of China's automobile industry

Data source: statistical data of autohome website

The leveraged policy has promoted the development of the domestic market, especially the great increase in the demand for glass in the automotive and real estate industries, which led to a year-on-year increase of more than 300% in the net profit of Fuyao Glass in 2009. According to the announcement data of listed companies, the reasons for the rapid development of Fuyao company in 2009 are four:

Firstly, due to the rapid development of the passenger car industry and the expansion of the automotive glass export market;

Secondly, due to the lean production and energy saving measures implemented by Fuyao company, the cost has been reduced;

Thirdly, due to the optimization of debt structure and the reduction of management expenses during the economic crisis in 2008;

Fourth, optimize and adjust the business structure, withdraw from some architectural float glass businesses, and focus more on the development of automotive glass.

(3) Generation of over-investment

After the policy of increasing leverage from the second half of 2008 to the end of 2009, the market economy has recovered rapidly.

In 2009, the operating revenue of Fuyao Glass Company exceeded 6 billion yuan, an

increase of 6.34% over 2008. Affected by the economic crisis, the growth rate in scale is limited, but affected by market demand, the profit level has reached a new high level: the net profit is 1.118 billion yuan, the growth rate is 354%, and the earnings per share is 0.56 yuan. As of 2010, the automotive glass produced by Fuyao company has occupied more than 50% of the domestic market share, especially in the medium and high-end market, with a share of more than 70%. In the international market, Fuyao company has become a supplier to large automobile manufacturers such as Mercedes Benz and BMW, accounting for 20% of the global market share. The market demand and high profit margin made the management decide to invest in more production lines. At the same time, the loose credit policy also contributed to the decision of Fuyao company to invest on a large scale. In 2010, the scale of construction in progress of Fuyao company reached 744million yuan, and the cash flow from investment activities was -1.081 billion yuan.

To further understand the investment efficiency, this study calculated the inefficient investment coefficient of Fuyao company before and after the leverage by referring to the model in the previous section (as calculated in the previous section, this section searches the ID of Fuyao Glass Company in the data and gets the inefficient investment coefficient of the company in each year). 2008 and 2009 are the self-rescue period of enterprises, and the inefficient investment coefficient is -0.456 and -0.304 respectively. The coefficients are all less than 0, so the main performance during this period is under-investment; By 2010, after the leveraged policy, the enterprise has also entered a period of rapid development, with an over-investment coefficient of 0. 372 in 2010 and 0. 246 in 2011.The coefficients are greater than 0, so the main performance during this period is over-investment.

The evolution trend of inefficient investment coefficient of Fuyao Glass Company before and after leverage is shown in Figure 4.6.

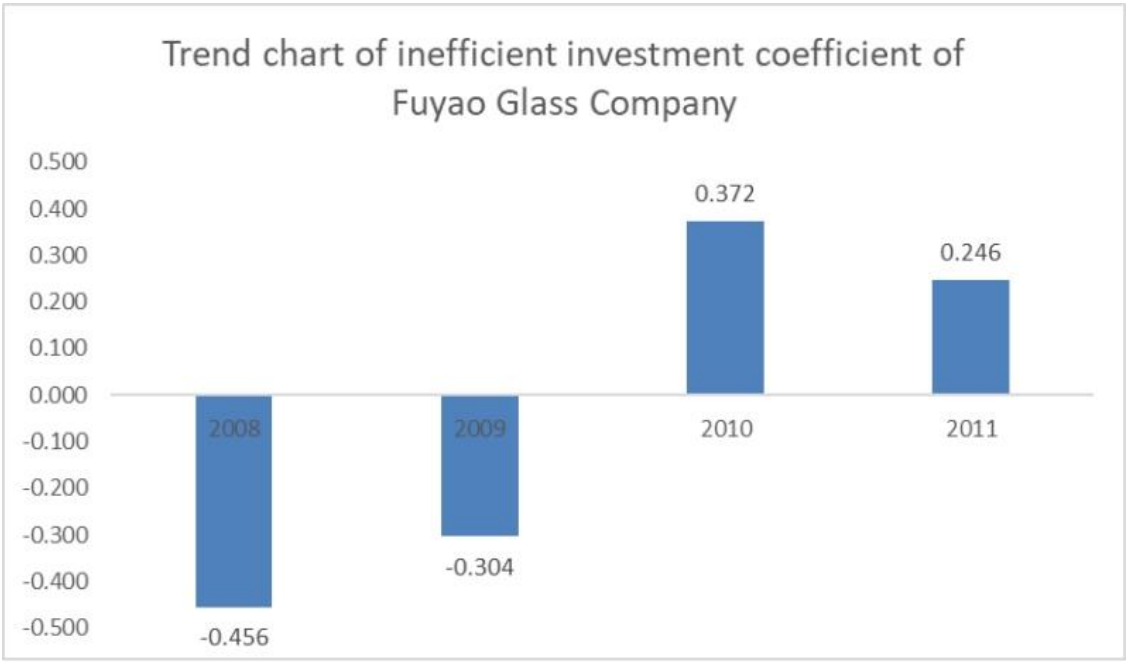


Figure 4.6 Evolution trend of inefficient investment coefficient of Fuyao Glass Company before and after leverage

To sum up, it can be found that the inefficient investment coefficient of Fuyao Glass Company is highly correlated with the financial policies of government. Before the leveraged financial policy of government, when enterprises encounter economic difficulties, they will reduce their investment business, or even break their arms to save themselves; After the leverage policy of government, when enterprises resume high-speed development, they will actively expand the scale and speed of investment, which is likely to reduce the efficiency of investment, leading to over-investment.

4.3.4 Analysis of the impact of "deleveraging" policy

Deleveraging policy refers to a series of control measures taken by the government to strengthen financial restrictions to a certain extent in order to reduce systemic economic risks and reduce the proportion of liabilities. After the global economic crisis in 2008, the Chinese government advocated loose monetary and credit policies, and the debt ratio in the financial market increased year by year. From 2012 to the end of 2014, the Chinese government continued to implement a relatively moderate financial policy in order to further develop the domestic economy. Until the beginning of 2015, according to the data of Chinese national balance sheet, the leverage ratio of whole society of China reached 249%. Considering the expansion of systemic financial risks, the central economic work conference of China proposed the task of "deleveraging". After the release of the deleveraging policy, the large-scale investment in

Chinese glass industry has been greatly affected.

Introduced Fuyao Glass Company as an example, in response to the basic idea of government, enterprise structural deleveraging, under the deleveraging policy, it actively carried out debt control. It has gone through three stages: deleveraging, growth recovery and under-investment.

(1) Fuyao Glass Company deleveraging. After 2015, with the gradual introduction of the deleveraging policy of government, the management of Fuyao Glass Company reflected on the breath introduced experience of the 2008 financial crisis and mainly implemented a relatively stable debt control strategy. It is mainly manifested in measures such as increasing cash reserves, controlling debt ratio, actively operating to improve the market leading position in the glass industry, and controlling and balancing the investment layout at home and abroad. Through a series of measures, Fuyao Glass's large amount of investment after 2015 has been well controlled. The leverage ratio decreased from 47. 84% in 2014 to 33.88% in 2015, and rose slightly to 39. 60% in 2016. The leverage ratio in subsequent years has been controlled around 40%, as shown in Figure 4.7.

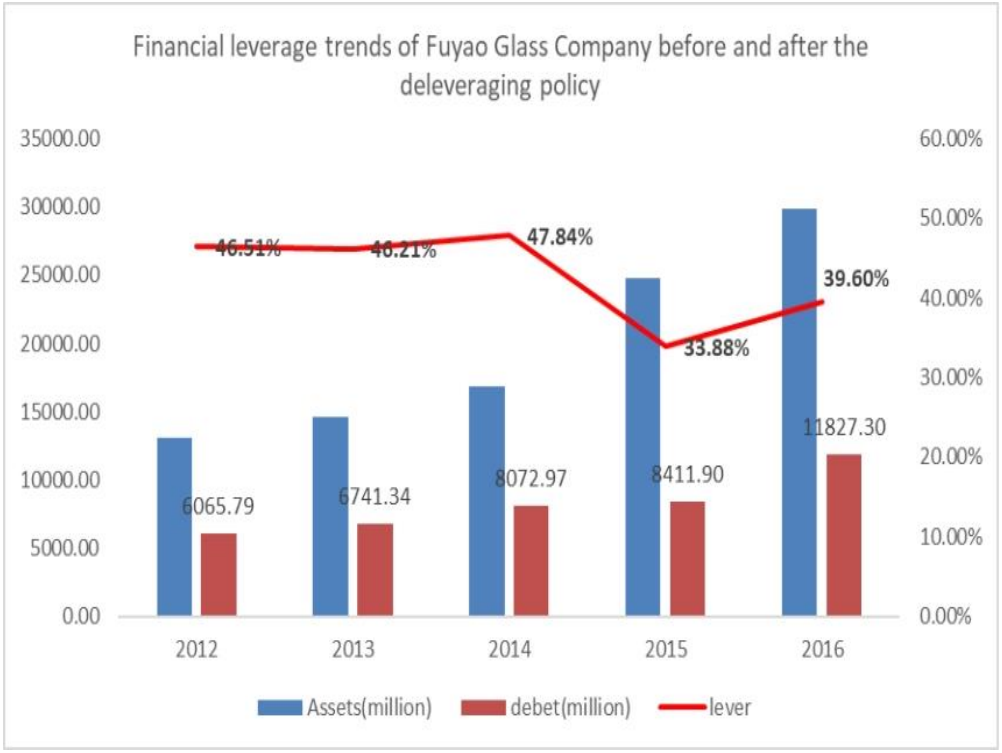


Figure 4.7 Change trend of debt leverage ratio of Fuyao Glass Company before and after deleverage

(2) The growth rate recovered strongly. After robust financial control, the growth of Fuyao Glass Company also slowed down in 2015, with a total revenue of 13.5 billion yuan in 2015, an increase of only 5% over the previous year, and a net profit of 2.6 billion yuan, an increase of 17% over the previous year. After adapting to the deleveraging policy and strengthening and

optimizing the internal financial management, Fuyao Glass Company started a rapid and strong development in 2016. The total revenue in 2016 was 16.6 billion yuan, an increase of 22% over 2015, and the profit was 3.1 billion yuan, an increase of 21% in 2015. As shown in Figure 4.8.

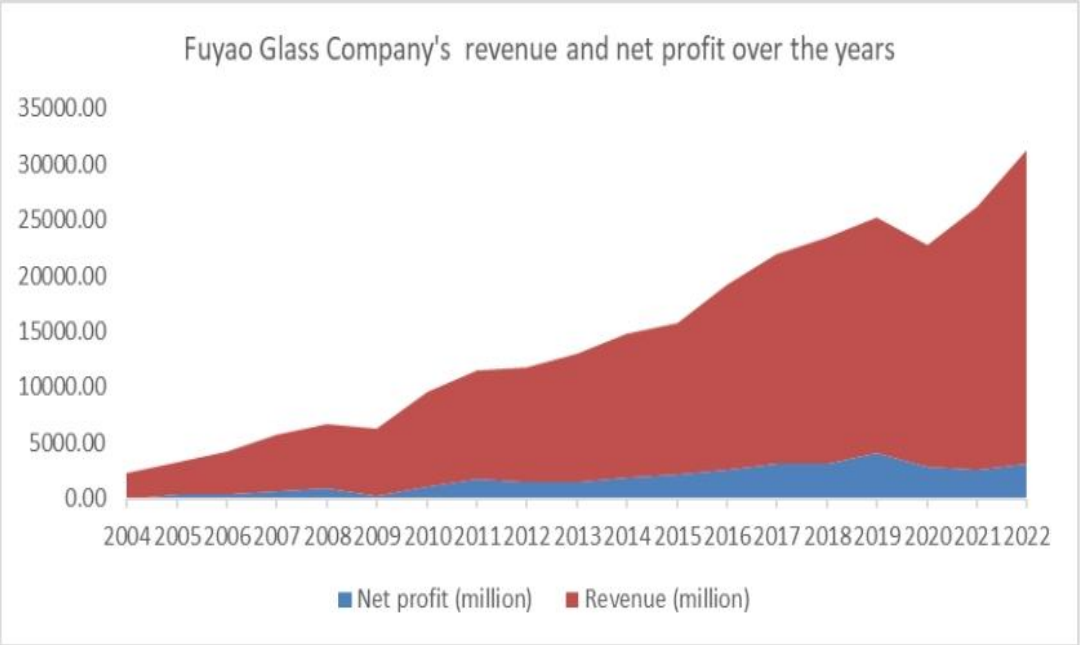


Figure 4.8 Revenue and profit of Fuyao Glass Company in each year

(3) Generate under investment. The "deleveraging" policy in 2015 was one of the five major tasks of the central economic work conference. After the implementation of the policy, the government strengthened control through multiple channels from the monetary level to the financial regulatory level, forming a policy superposition effect. Under the superposition effect, banks and other financial institutions began to control the scale of credit and reduce and relax the amount of credit. In the process of policy implementation, there is even a "one size fits all" phenomenon. In 2015, some companies defaulted on their debts, and a large number of private enterprises were short of funds and had difficulties in turnover in the short term.

Under the "deleveraging" policy, Fuyao Glass Company has made many efforts to avoid debt risk. On the one hand, apply for debt financing as much as possible. Fuyao Glass Company applied for about 1.2 billion yuan of ultra short-term financing bonds in 2015, and actually issued 50million yuan. In 2015, the repayment of bank loans was about 6. 886 billion yuan, and the repayment of short-term and ultra short-term financing bills was 350million yuan, further reducing the debt level; On the other hand, with the approval of the Hong Kong Stock Exchange on March 31, 2015, the overseas listed foreign shares issued by Fuyao Glass Company were listed and traded on the main board of the Hong Kong stock exchange to facilitate access to funds. At the same time, Fuyao company controlled other investment projects except American factories, and further comprehensively promoted the management mode of both capital

intensification and budget, including measures such as improving material utilization, improving automation, optimizing personnel allocation, improving efficiency, saving energy and reducing consumption, and strictly controlling process costs, which ensured the maximization of capital efficiency and reduced costs. Through the above mentioned measures of "deleveraging", "risk reduction" and "debt reduction", Fuyao Glass Company sharply reduced its debt leverage ratio from 48% in 2014 to 34% in 2015.

The tightening policy of deleveraging policy prompted Fuyao Glass Company to significantly reduce its investment. In order to further understand the investment efficiency, this study calculates the annual inefficient investment coefficient of Fuyao before and after deleveraging. Before the release of the deleveraging policy, the inefficient investment coefficients in 2013 and 2014 were 0.370 and 0.775. The coefficients are all greater than 0, so it is mainly over-investment during this period; By 2015, after the Chinese government issued the deleveraging policy, enterprises also entered the contraction period of investment, the inefficient investment coefficient in 2015 was -0.346. The coefficient is less than 0, so the main performance during this period is under-investment.

The result of evolution trend of inefficient investment coefficient of Fuyao Glass Company before and after deleveraging is shown in Figure 4.9.

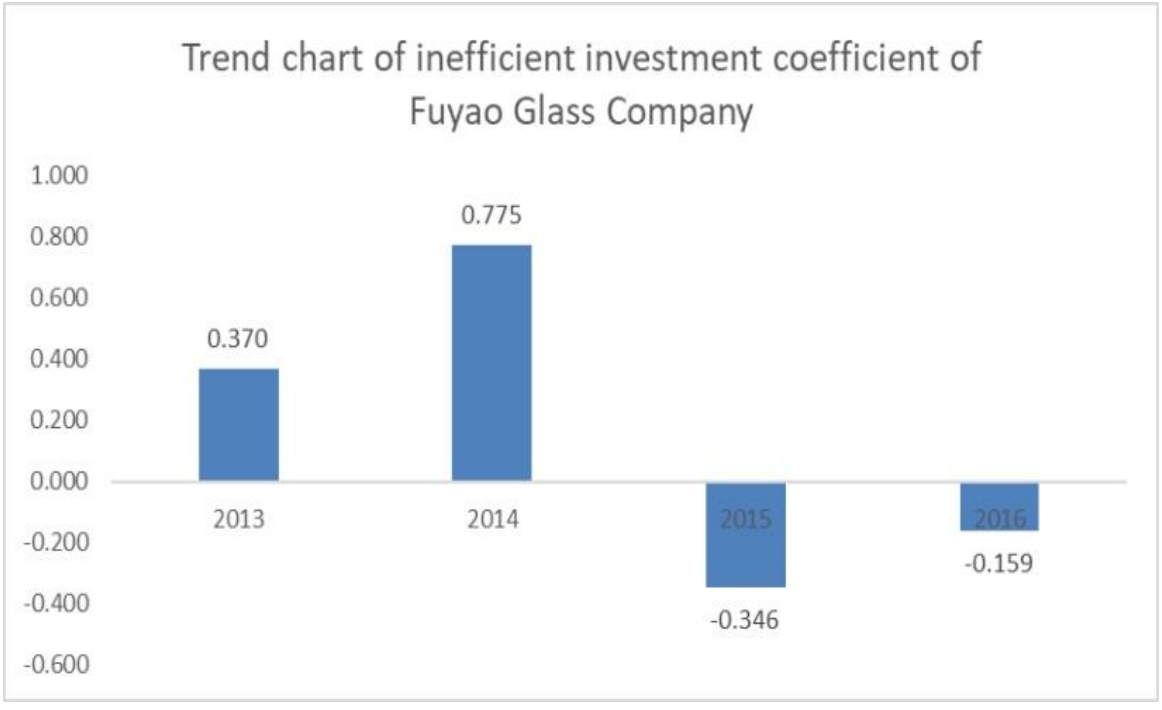


Figure 4.9 Evolution trend of inefficient investment coefficient of Fuyao Glass Company before and after deleveraging

To sum up, it can be found that the inefficient investment coefficient of Fuyao Glass Company is highly correlated with the financial policies of government. Before the release of

the deleveraging financial policy of government, enterprises had sufficient policy support, were optimistic about the investment prospects, and adopted relatively positive investment strategies. When the deleveraging policy of government is introduced, affected by the capital or the macro environment, the glass enterprises are pessimistic about the investment prospects and adopt relatively negative investment strategies. After the deleveraging policy of government, reduce the scale of investment and reduce the speed of investment. At this time, it is likely to reduce the efficiency of the use of funds, resulting in the occurrence of under-investment.

4.4 The conclusion of this chapter

This chapter is the core content of the study.

Firstly, this thesis studies the impact of macro credit environment on the financial leverage of Chinese glass enterprises and their upstream and downstream suppliers, and analyzes the impact trend in stages. The results show that the macro credit scale has a significant impact on the financial leverage of enterprises. The larger the macro credit scale, the more enterprises tend to increase the financial leverage;

Secondly, it explores the relationship between financial leverage and inefficient investment through empirical research. The results show that financial leverage has a significant positive impact on inefficient investment. The higher the level of new debt, the more inefficient investment shifts to over-investment, and the higher the level of old debt, the more inefficient investment shifts to under-investment;

Finally, combined with the case of Fuyao company, this thesis demonstrates the impact of leverage and deleveraging policy factors on enterprise inefficient investment. The results show that the leverage policy promotes the generation of over-investment, and the deleveraging policy promotes the generation of under-investment.

Chapter 5: Research Findings and Discussion

5.1 Findings

Based on the above content, the main research findings of this study are summarized as follows:

Firstly, the impact of macro credit environment on the financial leverage of Chinese glass enterprises and their upstream and downstream suppliers was explored, and the impact trends were analyzed in stages. This study collected new credit data from the National Bureau of Statistics for each year, and collected financial leverage data of upstream and downstream enterprises in China's glass and glass supply chain from 2005 to 2022 through the CSMAR database. The results indicate that the macro credit scale has undergone significant changes at three time points, namely 2006, 2008-2009, and 2020. In 2006, 2009, and 2020, the scale of credit showed significant growth (with continuous high-speed growth from 2008 to 2009). Correspondingly, the average leverage ratio of enterprises showed a significant growth trend in 2006, 2009, and 2020. This indicates that the scale of macro credit has a significant impact on the financial leverage of enterprises. The larger the scale of macro credit, the more inclined the enterprise is to increase its financial leverage;

Secondly, it explores the relationship between financial leverage and inefficient investment through empirical research. In this thesis, through CSMAR and WIND database, we obtained the unbalanced panel data of 533 glass and glass products upstream and downstream enterprises in Shanghai and Shenzhen A shares. After eliminating unqualified samples, we obtained 399 samples, a total of 3508 valid data. The panel data regression results show that:

(1) the regression coefficient of financial leverage (lev_1) on the dependent variable inefficient investment is 2. 884 and is significant at the 1% level, that is, the financial leverage of glass and its upstream and downstream enterprises has a significant positive impact on their inefficient investment;

(2) The regression coefficient of the new debt level (ndebt) on inefficient investment is 1.793 and is positive at the significance level of 1‰, which indicates that the new debt of glass and its upstream and downstream enterprises has a positive impact on inefficient investment and drives inefficient investment in the direction of excessive investment (positive direction of Nei coefficient);

(3) The regression coefficient of old debt level (Odebt) to inefficient investment is -2.122 and is significant at the significance level of 0.05, which indicates that the old debt of glass and its upstream and downstream enterprises inhibits over investment and pulls inefficient investment in the direction of under investment (negative Nei coefficient);

(4) The regression coefficient of the ratio of new to old debt (NOdebt) to inefficient investment is 0.784 and is positive at the significance level of 0.001, which indicates that the higher the proportion of new debt of glass and its upstream and downstream enterprises, the more likely it will lead to over investment behavior (positive direction of NEI coefficient);

(5) The regression coefficient between the new debt and overinvestment of glass and glass upstream and downstream enterprises is 1.080 and is significant at the level of 0.001, that is, the new debt of Chinese glass enterprises has a significant positive impact on overinvestment. This shows that the new debt in the corporate debt leverage is an important factor to promote overinvestment. When the new debt increases, the enterprise can use sufficient funds, and the cash flow of the enterprise is stronger in the short term. At this time, it is conducive to promoting radical investment decisions and leading to over investment;

(6) The regression coefficient between the old debt and overinvestment level of glass and glass upstream and downstream enterprises is -0.077 and is significant at the level of 0.05, that is, the old debt of Chinese glass enterprises has a significant negative impact on overinvestment. This shows that the old debt part of corporate debt leverage is an important factor to curb overinvestment. When there are a large number of old debts, the pressure on the enterprise to repay the debt is greater, the available funds are insufficient, and the cash flow of the enterprise is weaker. At this time, radical investment decisions can not get financial support, and ultimately curb the generation of over investment;

(7) In the sub sample of over investment, the regression coefficient of new debt level to inefficient investment is 1.810 and is significant at the level of 0.001, which indicates that the degree of over investment of Chinese glass enterprises increases with the increase of new debt;

(8) In the sub sample of under investment, the regression coefficient of the new debt level to inefficient investment is 1.116 and is significant at the level of 0.001, which indicates that the new debt will pull the direction of inefficient investment to a lower degree of under investment, that is, the degree of under investment of enterprises will be alleviated with the increase of new debt;

(9) In the sub sample of over investment, the regression coefficient of old debt level to inefficient investment is -4.743 and is significant at the level of 0.01, which indicates that old debt inhibits over investment and has a significant inhibitory effect;

(10) In the overinvestment sample, the regression coefficient of old debt level to inefficient investment is -0.094 and is significant at the level of 0.01, that is, the degree of enterprise underinvestment increases with the increase of existing debt level.

Finally, this thesis obtained the case data by interviewing the senior managers of Fuyao Glass Company, collecting a large number of interview videos of CEOs accepting the news media, and collecting the second-hand qualitative data including news database, official website data and various relevant media reports as material support. Combined with the case materials of Fuyao company, this thesis demonstrates the influence of the policy factors of adding leverage and deleveraging on the inefficient investment of enterprises. The results show that the inefficient investment coefficient of Fuyao Glass Company is highly correlated with the government's financial policy:

(1) Before the government's leveraged financial policy stimulus, when enterprises encounter economic difficulties, they will reduce their investment business, or even break their arms to save themselves; After the government's leverage policy, when enterprises resume high-speed development, they will actively expand the scale and speed of investment, which is likely to reduce the efficiency of investment, leading to excessive investment;

(2) Before the release of the government's deleveraging financial policy, enterprises had sufficient policy support, were optimistic about the investment prospects, and adopted relatively positive investment strategies. When the government's deleveraging policy was introduced, the glass enterprises were pessimistic about the investment prospects and adopted relatively negative investment strategies due to the impact of capital or the impact of the macro environment on the upstream and downstream supply chain enterprises. After the government's deleveraging policy, the scale of investment will be reduced and the speed of investment will be reduced. At this time, the efficiency of capital utilization will probably be reduced, resulting in insufficient investment.

5.2 Results discussion

Firstly, the results of this study show that macro credit scale has a significant positive impact on corporate financial leverage. The scale of macro credit is closely related to the growth opportunities of enterprises. On the one hand, the scale of macro credit expands with the relaxation of macro prudential policies. Based on social psychology theory, this will make enterprises more willing to take risks, more inclined to adopt aggressive investment strategies, and increase risk investment in innovation activities, thereby increasing the growth

opportunities of enterprises (Y. L. Wang et al., 2020). On the other hand, increasing innovation investment can help improve the comprehensive quality of employees and increase the opportunities for enterprise growth. Based on modern capital structure theory, when a company's growth opportunities increase, it often leads to a corresponding increase in its financial leverage ratio (Malinic et al., 2013). In addition, the increase in macro credit scale will affect the optimization of corporate capital structure. The decision-making of corporate capital structure is influenced by the debt ratio. When the central bank implements expansionary monetary policy, enterprises can obtain more credit funds, which will more easily lead to high leverage motivation and excessive investment behavior, resulting in an increase in debt ratio, making it more difficult for enterprises to dynamically adjust their actual financial leverage ratio to the target financial leverage ratio. At the same time, the optimal capital structure of a company will have an impact on its profitability, and the profitability of a company is negatively correlated with its leverage ratio. Y. H. Chen and Hammes (2004) argued that financially distressed companies are forced to borrow or issue equity in unfavorable circumstances. When the capital structure of a company is affected, a high debt ratio can lead to a decrease in profit margin, increase the company's tax burden, and thus reduce the company's profitability. From the external environment, the scale of macro credit will affect bank credit decisions and monetary policy. Research has found that loose interest rate policies can promote banks to allocate credit to small and micro enterprises (D. X. Gao et al., 2022). Monetary policy will have a positive impact on the leverage level of non-financial enterprises through credit channels. When the money supply increases, implementing loose monetary policy can increase the leverage ratio of non-financial enterprises. When market interest rates increase, it can also increase the leverage ratio of enterprises or even have a greater impact. In the short term, an increase in interest rates may lead to a decrease in the leverage ratio of enterprises, but in the long run, it will still increase the financial leverage ratio of enterprises (H. L. Li, 2022). Therefore, with the expansion of macro credit scale, the financial leverage of enterprises is likely to show an expanding trend.

Secondly, the results of this study show that financial leverage has a significant positive impact on inefficient investments. There are many factors that affect financial leverage, which can be generally summarized as external environmental factors and internal environmental factors. The external environmental factors mainly include national policies, industry environment, price level, and inflation rate, while the internal environmental factors mainly include company size and debt repayment ability (W. J. Su & Zhou, 2023). Due to various factors affecting financial leverage, while gaining benefits from financial leverage, it is also

accompanied by incalculable financial risks (Peng, 2009). Based on modern capital structure theory, it is known that capital structure is the core issue of corporate financing decisions. Enterprises should comprehensively consider relevant influencing factors, use appropriate methods to determine the optimal capital structure, and continue to maintain it in future additional financing. At the same time, a reasonable financial capital structure and moderate financial leverage can increase the value of enterprises, and have a positive impact on inefficient investment. It can be inferred that financial leverage has a promoting effect on inefficient investment. In the debt structure of financial leverage, there is a difference between new debt and old debt. It is generally believed that there are differences in the effects of new and old debt on inefficient investment by enterprises. Non efficiency investment includes both overinvestment and underinvestment. The increase in new debt provides new sources of funding for enterprises, increases the amount of funds available to them, and helps alleviate the problem of insufficient investment caused by insufficient funds, thereby promoting overinvestment. However, old debt can increase financial leverage and have a negative impact on a company's cash flow, leading to potential underinvestment behavior. Therefore, the higher the level of new debt, the more inefficient investment shifts towards overinvestment, while the higher the level of old debt, the more inefficient investment shifts towards underinvestment.

Finally, by analyzing the results of this study, it was found that the leveraged policy promoted the generation of overinvestment, while the deleveraged policy promoted the generation of underinvestment. Research has found that on the one hand, the inefficient investment coefficient of enterprises is highly correlated with government financial policies. Before the government's leveraged financial policy stimulus, when enterprises encountered economic difficulties, they would compress their investment business and even cut off their arms to save themselves; After the government's leverage policy, when enterprises resume high-speed development, they will actively expand their investment scale and speed, which is highly likely to reduce investment efficiency and lead to overinvestment. On the other hand, the inefficient investment coefficient of enterprises is highly correlated with government financial policies. Before the government's deleveraging financial policy was introduced, enterprises had sufficient policy support, were optimistic about investment prospects, and adopted relatively proactive investment strategies. After the government's deleveraging policy is implemented, glass companies are pessimistic about their investment prospects and adopt relatively negative investment strategies due to the impact of funds or the macro environment on upstream and downstream supply chain enterprises. After the government's deleveraging policy, reducing investment scale and lowering investment speed is highly likely to reduce the efficiency of fund

utilization, leading to insufficient investment.

5.3 Research contributions

This study will help glass enterprises solve the current management puzzle and bring important theoretical and practical value to the value investment strategy of glass enterprises.

5.3.1 Theoretical contributions

Firstly, this thesis explores the impact of macro credit environment on financial leverage based on modern capital structure theory, and expands the application of this theory in the glass related industry. The current research focus on the impact of financial leverage on various performance indicators of enterprises, such as company value (Malshe & Agarwal, 2015), financial performance (Mule & Mukras, 2015), corporate profitability (Pham & Nguyen, 2019), corporate social responsibility (Oware & Mallikarjunappa, 2019), and financial risk (Finishtya, 2019). These studies focus on the results of financial leverage and overlook the exploration of the antecedents of financial leverage. The development cycle of Chinese glass enterprises is greatly influenced by the macro credit scale, but there is little research found on this topic. This thesis explores the impact of the credit environment on the financial leverage of Chinese glass and glass manufacturing upstream and downstream enterprises based on modern capital structure theory, and analyzes the trend of the financial leverage of glass enterprises with the change of credit scale. This thesis expands the application of modern capital structure theory in the study of financial leverage and its antecedents in Chinese glass enterprises.

Secondly, this study has opened up the black box of financial leverage and inefficient investment, clarifying the impact mechanism of financial leverage on inefficient investment behavior in Chinese glass enterprises, which is conducive to further developing investment behavior related theories. Existing research has shown that there is a complex internal connection between corporate financial leverage and investment behavior (W. J. Su & Zhou, 2023). For example, H. F. Guo et al. (2021) found that moderate financial leverage can optimize the investment and financing structure of enterprises, and at the same time, enterprises with the best capital structure have higher efficiency; C. L. Yang and Lai (2021) pointed out that increasing financial leverage can effectively promote companies to adopt more aggressive R&D investment behavior; Danso et al. (2019) found that for companies with high levels of information asymmetry, the impact of financial leverage on corporate investment is negatively significant. These conclusions indicate that the role of financial leverage in investment behavior

is not yet clear, and further exploration of the internal black box is needed. Based on this, this study decomposes financial leverage into new debt and old debt, decomposes inefficient investment into overinvestment and underinvestment, and explores their internal influencing mechanisms. The results show that the direction of inefficient investment (over investment or under investment) changes with the proportion of new and old debts. The results of this study are beneficial for resolving some controversies about financial leverage and investment behavior, and further developing the application boundaries of investment behavior related theories.

Finally, this thesis further explores the impact of structural policies on the investment and financing behavior of Chinese glass enterprises. The results show that the leveraged policy promotes the generation of overinvestment, and the deleveraging policy promotes the generation of underinvestment. This study is helpful for us to understand the role and role of structural policies in the investment and financing strategies of Chinese glass enterprises, and then help Chinese glass enterprises to actively respond to external policy changes.

In conclusion, this thesis studies three aspects: "the impact of macro credit scale on the financial leverage of glass enterprises", "the impact of financial leverage on inefficient investment behavior", and "the impact of structural policies on the investment and financing behavior of Chinese glass enterprises", systematically demonstrates the influencing mechanism between various variables, which complements the existing research system and provides a theoretical reference for the investment and financing decision-making practice of Chinese glass enterprises.

5.3.2 Practical implications

For glass companies, this thesis highlights the severe systemic financial risks that inefficient investment behaviors can bring. Therefore, reasonable investment is very important for the sustainable and healthy development of glass enterprises, and on the basis of existing research, this thesis demonstrates three relevant aspects that affect the investment behavior of enterprises, which brings practical guidance value to glass enterprises.

Macro policy implications. Firstly, the implementation of macro debt and leverage policies have significant impacts on the investment efficiency of China's glass industry. When formulating economic policies, the government should assess them in advance and pay attention to the potential impact of these measures on enterprises. Alternatively, the government can adopt gradual policy changes and provide enterprises with a longer policy adaptation period to promote the sustainable development of the glass industry; Secondly, the healthy growth of

glass enterprises is closely related to the development of the national economy. The financial system dominated by the Bank of China should integrate with the development of glass enterprises and formulate reasonable financial systems and preferential policies. Through financial regulation, it can affect the investment decisions of enterprises and ultimately promote the healthy and sustainable development of glass enterprises;

Micro enterprise management implications. Firstly, this thesis emphasizes that macro credit scale has a positive role in promoting the financial leverage of glass companies, which in turn affects their investment behavior. Therefore, glass company managers should always pay attention to the changing trend of macro credit scale, and then judge the financial leverage of the company; Secondly, this thesis pointed out that the policy of increasing leverage promotes the occurrence of overinvestment, while the policy of deleveraging promotes the occurrence of underinvestment. Therefore, glass companies should pay close attention to the country's macro-financial policies and take corresponding preventive measures under different policies to avoid inefficient investment behavior; Thirdly, this thesis pointed out that corporate financial leverage has a promoting effect on inefficient investment behavior. Therefore, managers should pay attention to the financial leverage ratio of the enterprise. The increase of corporate financial leverage will aggravate the degree of inefficient investment, while the decrease of financial leverage can effectively alleviate the degree of inefficient investment.

5.4 The summary of this chapter

This chapter further summarizes the previous research results, and discusses the research results and existing theories.

Chapter 6: Conclusion

This chapter summarizes the entire research process and the final findings. The first part is an overview and summary of the research. The second part focuses on the theoretical and practical contributions of this thesis. The third part explores the limitations of the research and future research directions.

6.1 Research summary

The research in this thesis mainly explores three central research questions: First, the study explores the impact of the macro credit environment on the financial leverage of firms. Second, the study explores the impact of financial leverage on inefficient investment. Finally, this thesis explores the impact of typical credit policies on the relationship between financial leverage and inefficient investment behavior, as well as the mechanism of the influencing process.

In order to better determine the influence of relevant variables, this study reviews the relevant literature and theories, including relevant research on Chinese glass enterprises, relevant literature in the fields of financial leverage, investment behavior, credit policy, as well as theories of modern capital structure and preferential financing. These literatures and theories provide a basis for the logical framework proposed in this study, and also lay a theoretical foundation for subsequent research.

In this thesis, three different methods are used to solve different research questions, namely descriptive analysis, empirical methods, and case analysis methods.

(1) Question 1: How does the macro credit environment affect the financial leverage level of glass companies?

In response to the study "Question 1: How does the macro credit environment affect the financial leverage level of glass companies?" "This thesis uses the method of descriptive analysis for statistics analysis. In terms of data collection, this thesis obtains the list of all listed companies since 2005 through the CSMAR and WIND databases, then screens out the list of glass and glass products industry and its upstream and downstream enterprises, and finally obtains the required company details and financial indicators from the database, such as enterprise age, scale, net profit, asset-liability ratio and other data. In addition, macro credit data will be obtained from the credit reports published by the People's Bank of China every year.

Based on the above data, combined with the method of descriptive statistical analysis, the change trend chart of the change of macro credit environment on the change of corporate financial leverage are obtained, and the research conclusion is formed.

The results show that in 2006, 2009 and 2020, the credit scale showed a large growth (including continuous high-speed growth in 2008-2009). Accordingly, the average leverage ratio of Chinese glass enterprises showed a significant growth trend in 2006, 2009 and 2020. This shows that the macro credit scale has a significant impact on the financial leverage of Chinese glass enterprises.

(2) Research Question 2: How does financial leverage affect the inefficient investment behavior of glass companies?

In response to the question "Research Question 2: How does financial leverage affect the inefficient investment behavior of glass companies?" This thesis uses the empirical research method for regression analysis, and uses the panel data of listed companies to carry out the research, and the process and method of obtaining the panel data are the same as those in research question 1. On this basis, this thesis uses regression analysis to analyze the data with the help of STATA software, and uses a multivariate hierarchical regression model to test its correlation, focusing on the indicators including the impact coefficient and significance of financial leverage on inefficient investment, and the impact coefficient and significance of new and old debts on inefficient investment. In addition, considering that inefficient investment is divided into two types: over-investment and under-investment, in order to better show the results, this study will set up 0, 1 dummy variables and use Logit regression to further test the relationship between financial leverage and the impact of old and new debts on inefficient investment. Finally, this study further examines the details of inefficient investment.

The results show that:

Firstly, the glass enterprises and their upstream and downstream suppliers of China, have serious inefficient investment behavior on the whole, and the degree of inefficient investment is positively affected by the financial leverage of enterprise;

Secondly, the ratio of old and new debts in the debts of Chinese glass enterprises and their upstream and downstream suppliers has a significant impact on the direction of inefficient investment. The higher the proportion of new debt, the stronger the short-term cash flow. At this time, with the increase of the proportion of new debt, inefficient investment shifts to the direction of over investment; On the contrary, when the proportion of new debt decreases (the proportion of old debt increases), the inefficient investment shifts to the direction of insufficient investment.

Finally, the old and new debts of Chinese glass enterprises and their upstream and downstream suppliers have different effects on inefficient investment. The generation of new debt increases the cash flow level in the short term, while the old debt to be repaid reduces the cash flow level. The increase of the new debt level will promote the over-investment behavior of enterprises and alleviate the under-investment behavior at the same time; The high level of old debt will inhibit over investment and promote under-investment.

(3) Research Question 3: How does policy regulation affect the relationship between financial leverage and inefficient investment behavior?

In response to the question "Research Question 3: How does policy regulation affect the relationship between financial leverage and inefficient investment behavior?" This thesis uses a case study method to find out the influence of structural policies on the changes in corporate financial leverage and investment behavior. This thesis selects Fuyao Glass Industry Group Co., Ltd. (founded in 1987) as the case study object, and analyzes the case of this company to explore the influence of structural policies such as "leverage" and "deleveraging" on the relationship between financial leverage and inefficient investment behavior.

The results show that the inefficient investment coefficient of Glass Company is highly correlated with the financial policies of government. Before the release of the deleveraging financial policy of government, enterprises had sufficient policy support, were optimistic about the investment prospects, and adopted relatively positive investment strategies. When the deleveraging policy of government is introduced, affected by the capital or the macro environment, the glass enterprises are pessimistic about the investment prospects and adopt relatively negative investment strategies. After the deleveraging policy of government, reduce the scale of investment and reduce the speed of investment. At this time, it is likely to reduce the efficiency of the use of funds, resulting in the occurrence of under-investment.

6.2 Limitations and future research directions

This thesis has made efforts in theoretical development, data collection, data analysis, but still has some limitations:

Firstly, the limitations of research data. There are many glass companies in China, but only the data of listed companies in China's glass industry are selected in this study, and there are some missing data from a small number of companies, which may lead to deviations in the research results. On the one hand, incomplete data may have some deviations from complete data of Chinese glass companies; on the other hand, listed companies in glass companies may

have essential differences from non-listed companies in capital operation, investment and financing. For example, lower financing costs and banks' willingness to lend money to listed companies. These factors lead to differences in debt structure and inefficient investment behavior between listed and non-listed companies, which may result in deviations in research results. Follow-up research can be based on non-listed glass companies to conduct questionnaire surveys and field research, and comparative studies based on data from non-listed glass companies can be carried out to obtain more convincing conclusions.

Secondly, this study adopts a case analysis method when studying the impact of macroeconomic policies on inefficient investment in enterprises, and only selects a case of a glass enterprise. Therefore, the relevant conclusions need to be more rigorously proven. This study suggests that future researchers need to apply structural equation modeling to examine variables in this area. In addition, this study only adds a regulatory variable of policy regulation to the model. In future research, researchers can expand the model and add more equally important variables to conduct more detailed research.

Finally, there is a limitation in the scope of application of the research results in this thesis. The data and cases selected in this study are from Chinese glass companies, while companies in different countries face different external environments and policies. Therefore, the research conclusions in this study are applicable to Chinese glass companies, and the applicability to other industries needs further demonstration. This study welcomes other researchers in the future to conduct relevant research on other regions and other industries (i. e. , the influencing factors of inefficient investment behavior of enterprises) to verify the scope of application of the research conclusions in this study.

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