

**THE INFLUENCE OF CEO DEMOGRAPHIC
CHARACTERISTICS ON ENTERPRISE
INNOVATION IN CHINA'S MANUFACTURING
INDUSTRY: THE MODERATING EFFECTS OF
FIRM SIZE AND AGE**

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UNIVERSITI SAINS MALAYSIA

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by

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LIST OF ABBREVIATIONS

TWB	The World Bank
GDP	Gross Domestic Product
UK	United Kingdom
R&D	Research and Development
UET	Upper Echelon Theory
TMTs	Top Management Teams
U.S.	United States of America
IPO	Initial Public Offering
CSMAR	China Stock Market & Accounting Research
CNRDS	Chinese Research Data Services Platform
VIF	Variance Inflation Factor

**KESAN CIRI DEMOGRAFI CEO TERHADAP INOVASI KORPORAT
DALAM INDUSTRI PEMBUATAN CHINA: KESAN PENYEDERHANAAN
SAIZ DAN UMUR FIRMA**

ABSTRAK

Industri pembuatan, sebagai asas ekonomi negara, dianggap memainkan peranan penting dalam pembangunan sosial dan ekonomi negara. Ketua Pegawai Eksekutif (CEO) adalah jiwa kepada sesebuah korporat dan penting dalam meningkatkan inovasi perusahaan dan dengan itu, meningkatkan daya saing terasnya. Keupayaan industri pembuatan untuk berinovasi adalah satu perkara yang membimbangkan pembangunan ekonomi berkualiti tinggi dan strategi pemulihan secara keseluruhan di negara China. Tujuan kajian ini adalah untuk meneroka kesan ciri demografi CEO terhadap inovasi korporat dalam industri pembuatan. Pada masa ini, terdapat banyak penyelidikan mengenai ciri demografi CEO dan inovasi korporat dalam kalangan akademik, tetapi hasil penyelidikan kebanyakannya tidak konsisten, dan ciri-ciri penyelidikan adalah berat sebelah. Oleh itu, kajian ini bertujuan untuk mengkaji dengan menyeluruh kesan ciri demografi CEO terhadap inovasi korporat. Untuk memahami isu ini dengan lebih mendalam, kajian ini membahagikan ciri demografi CEO kepada tiga ciri berbeza, iaitu jantina CEO, umur CEO dan taraf pendidikan CEO, untuk meneroka sama ada ciri berbeza mempunyai kesan berbeza terhadap inovasi perusahaan. Selain itu, kajian ini juga menyiasat interaksi faktor organisasi firma, khususnya saiz firma, dan umur firma, dalam menyederhanakan

hubungan antara ciri demografi CEO dan inovasi pembuatan. Interaksi faktor organisasi firma meningkatkan sumbangan penyelidikan dan memberikan kajian yang lebih mendalam dan komprehensif tentang inovasi korporat. Rangka sampel kajian ini adalah dari 2013 hingga 2022, meliputi 2555 syarikat pembuatan yang tersenarai di negara China. Kajian ini menggunakan kesan tetap regresi Poisson untuk menganalisis sampel. Daripada hasil penyelidikan, didapati CEO lelaki boleh mempromosikan inovasi pembuatan dengan lebih baik. Selain itu, CEO yang mempunyai tahap pendidikan tinggi lebih cenderung kepada inovasi korporat. Berkenaan interaksi faktor organisasi firma, kajian mendapati bahawa semakin kecil sesebuah firma, semakin kuat peranan CEO lelaki dalam mempromosikan inovasi korporat. CEO yang lebih tua boleh mempromosikan inovasi pembuatan dengan lebih baik di firma kecil. Selain itu, kajian ini juga mendapati bahawa kesan penyederhanaan umur firma adalah tidak ketara. Daripada hasil penyelidikan, kerajaan harus mengukuhkan integrasi bakat antara korporat dan institut penyelidikan universiti dan harus memperkenalkan dasar yang lebih relevan untuk menyokong pembangunan syarikat pembuatan kecil, dengan itu menggalakkan inovasi pembuatan dan merealisasikan strategi "pembangunan dipacu inovasi". Di samping itu, faktor kontingensi mempengaruhi hasil inovasi CEO. Oleh itu, syarikat mesti memilih CEO baharu yang mempunyai ciri demografi yang sesuai dengan faktor organisasi firma.

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ABSTRACT

Manufacturing industry, as the foundation of the national economy, is considered to play a crucial role in a country's social and economic development. The CEO is the soul of the enterprise and is crucial to improving enterprise innovation and thereby enhancing its core competitiveness. The ability of the manufacturing industry to innovate is a matter of concern to high-quality economic development and the overall strategy to rejuvenate the Chinese nation. The purpose of this study is to explore the impact of CEO demographic characteristics on enterprise innovation in the manufacturing industry. At present, there is a lot of research on the demographic characteristics of CEOs and enterprise innovation in academic circles, but the results of the research are mostly inconsistent, and the characteristics of the research are one-sided. Therefore, this study seeks to comprehensively study the impact of CEO demographic characteristics on enterprise innovation. To understand this issue more deeply, this study further divides CEO demographic characteristics into three different characteristics, namely CEO gender, CEO age and CEO education, to explore whether different characteristics have different impacts on enterprise innovation. In addition, this study also investigates the interaction of firm organizational factors, specifically firm size, and firm age, in moderating the relationship between CEO demographic

characteristics and enterprise innovation. The interaction of firm organizational factors increases the contribution of the research and provides a more in-depth and comprehensive study of enterprise innovation. The sample frame of this study is from 2013 to 2022, covering 2555 listed Chinese manufacturing enterprises. This study used fixed-effect Poisson regression to analyse the sample. From the research results, it is found that male CEOs can promote enterprise innovation better. In addition, CEOs with higher education levels are more inclined to enterprise innovation. Regarding the interaction of firm organizational factors, the study finds that the smaller the firm, the stronger the role of male CEOs in promoting enterprise innovation. Older CEOs can better promote enterprise innovation in small firms. Moreover, the study finds that the moderating effect of firm age is not significant. From the research results, the government should strengthen the integration of talents between enterprises and university research institutes and should introduce more relevant policies to support the development of small manufacturing enterprises, thereby promoting enterprise innovation and realizing the "innovation-driven development" strategy. In addition, contingency factors affect the innovation results of CEOs. Therefore, the company must select a new CEO with demographic characteristics that suit the organizational factors of the firm.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Manufacturing, as the foundation of the national economy, is widely acknowledged to have an indispensable impact on the social and economic progress of a nation (Herman, 2016; Wang & Mao, 2018). Therefore, increasingly attention is paid to research on enterprises in the manufacturing industry. Furthermore, it has been demonstrated that enterprises in the manufacturing industry stimulate economic expansion and are a significant source of employment opportunities, constituting a pillar of the economy (Ndubisi et al., 2021; Tokarcikova et al., 2022).

The manufacturing industry involves utilizing resources such as materials, energy, equipment, tools, funds, technology, information, and labor. It transforms these inputs into tools, industrial goods, and consumer products through various manufacturing processes to meet market demands (Ezell & Atkinson, 2011). As an emerging or developing nation, manufacturing industry in China is larger than that of other nations (Sun et al., 2020). However, China's manufacturing industry has been mired in the global value chain for a long time and is facing the dilemma of losing its traditional cost advantage, which prevents China from meeting its need for further economic development (Wen et al., 2022; Zhang, 2009). After the process of introducing and digesting foreign advanced technology, Chinese enterprises can only endure and thrive in the global marketplace by undertaking independent innovation.

These enterprises could improve innovation by creating goods and production processes with their own intellectual property rights (Zhou et al., 2012). Consequently, an important question raised is, “How can enterprises in China’s manufacturing industry promote enterprise innovation?”.

Enterprises in the manufacturing industry are the main pillar of China's national innovation-driven development strategy (Tokarcikova et al., 2022; Zhao et al., 2022). Cultivating and upgrading enterprise innovation in the manufacturing industry is crucial to improving their competitiveness and realizing China's technological independence (Zhao et al., 2022). Considering the importance of enterprise innovation in the manufacturing industry, this study's primary objective is to investigate how CEO demographic characteristics affect enterprise innovation in the manufacturing industry from the perspective of firm size and firm age. These would provide policy suggestions for improving enterprise innovation.

Following the description of the study's context, this chapter comprises the following: the problem statement, research questions, and research objectives. Following this, the significance of the study is examined, key terms are defined, and an outline of the subsequent chapters of this thesis is presented.

1.2 Background of the Study

Section 1.2 mainly analyses the importance of enterprise innovation in the manufacturing industry to a country's economy. It then focuses on the current situation of CEO demographic characteristics in China, as well as environmental improvements

faced by small and medium-sized firms and a significant increase in the number of young firms.

1.2.1 The Importance of Enterprise Innovation

The term "enterprise innovation in manufacturing" denotes the integration of new or significantly enhanced production or delivery methods (including significant changes in technology, equipment, and/or software) into manufacturing or logistics systems (Rogers, 2003). This innovation must replace existing production or service capabilities and, consequently, add value to the enterprise and its value chain (Mamasioulas et al., 2020).

In recent years, slow global commerce, decreased investment, and heightened policy uncertainty have impeded global economic growth, resulting in persistently poor performance (Barua & Suborna, 2020; Kose et al., 2017; Nicola et al., 2020). The World Bank (TWB) comprised of 189 member nations, functions as a cooperative. The World Bank's policy decisions are ultimately determined by its Board of Governors, which is composed of these member countries or shareholders. In 2020, the aggregate GDP amounted to 84.706 trillion US dollars. This figure decreased by 2,902 trillion US dollars compared to the 87,608 trillion US dollars recorded in 2019. As shown in the Figure 1.1 below, among the top ten countries' GDP, only the United States and China have achieved growth in recent years, but the growth rate is relatively slow. Other countries have experienced varying degrees of decline.

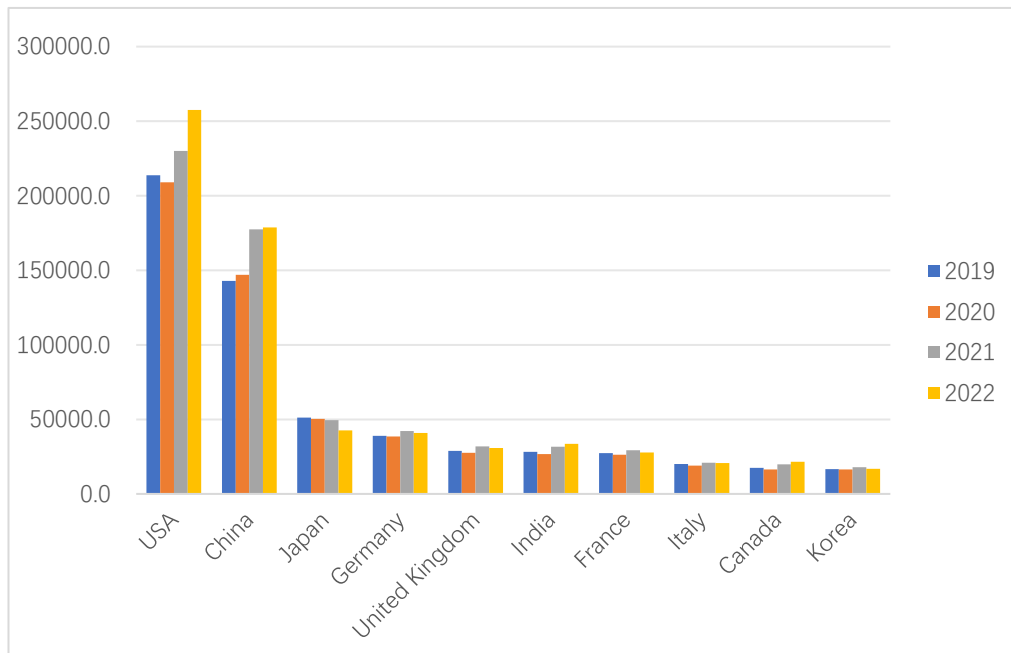


Figure 1.1 GDP of top 10 countries in the world between 2019 to 2022 (Million US dollars)

Source: Data from The World Bank. <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>

Based on the current economic situation, the United Kingdom (UK) government reaffirms its goal of increasing research and development (R&D) spending to 2.4% of GDP by 2027 in its R&D roadmap outlining strategic principles for boosting R&D and innovation (Roper & Turner, 2020). The Chinese government emphasizes that innovation is the primary driver of development and that for innovation and development to continue, innovation must be positioned at the center of the country's overall development (Li, 2018). In addition, in response to global health emergencies, the government focuses on developing more innovative products and services (Patrucco et al., 2022). Enterprise innovation is identified as a key aspect of economic recovery (Azoulay & Jones, 2020; Caballero-Morales, 2021).

Enterprise innovation is a critical competitive advantage for sustaining and advancing development (Wu et al., 2021a). Many studies confirm that enterprise

innovation enables organizations to expand new export markets (Love & Roper, 2015), gain competitive advantage (Hashi & Stojčić, 2013), and improve enterprise performance (Bloom & Van Reenen, 2002). Therefore, it is crucial to increase enterprise innovation to restore the economy.

1.2.2 The Relevance of Manufacturing Industry to a Nation's Economy

In a modern economy, the manufacturing industry performs a catalytic function and offers many dynamic benefits that are vital to economic transformation (Loto, 2012). From a global perspective, the present trend towards the service economy is obvious. According to TWB statistics, in 2020, the value added of global service industry accounted for 65.3% of the global GDP, up 3.3 percentage points from 62% in 2011 (TWB, 2020a). However, in 2020, the value added of global manufacturing industry only account for 16% of global GDP (TWB, 2020b). It is now believed that the function of manufacturing industry in developing economies is diminishing, while services such as finance, software or tourism may gradually become the leading sector (Attiah, 2019; Ho et al., 2016). However, this is not the case because a flourishing economy requires manufacturing and service industries to coexist (Ezell & Atkinson, 2011).

Manufacturing and service industries are inseparable and complementary (Ezell & Atkinson, 2011). Cornwall (1977) emphasizes that the manufacturing industry provides unique opportunities for embodied and disembodied technological development. The manufacturing industry is the source of technological advancement which spreads to other economic sectors, such as the service sector (Szirmai, 2012).

Capital goods used in the service industry are produced in the manufacturing industry (Attiah, 2019) and it is confirmed that the linkage and spillover effects between the manufacturing industry and the service industry is also very strong (Szirmai, 2012).

Secondly, the manufacturing industry is a substantial contributor to employment growth and a significant source of well-paying jobs for individuals with varying levels of education and experience (Ezell & Atkinson, 2011; Herman, 2016). Economists are generally of the opinion that the manufacturing industry has a significant multiplier effect and a substantial spillover effect on other industries. Every job in the manufacturing industry will create 2 to 5 jobs in other sectors of the economy (Shingler, 2009). In the United States, the wages and benefits of manufacturing jobs are 9% higher than those of the overall economy on average (Yakimov & Woolsey, 2010). In addition, the average wage in the high-tech sector (which includes a significant number of manufacturing positions) is 86 percent higher than the average wage in the private sector (James et al., 2010). This highlights the fact that the manufacturing industry is a major source of well-paying jobs for people with varying levels of education and experience.

Thirdly, the manufacturing industry is very important to a country's economic recovery and to improving its trade balance (Scott et al., 2013). When a country's imports exceed its exports, it will suffer a trade deficit. A weak manufacturing industry may lead to a long-term trade deficit (Ezell & Atkinson, 2011). This will result in the loss of millions of high-wages, high-skill manufacturing jobs and will force workers into lower-paying industries (Scott, 2002). Consequently, a country's economic

situation is affected. In other words, manufacturing allows a nation to meet domestic demand, reducing its reliance on imported manufactured products. Through manufacturing, nations can export their products. With reduced imports and increased exports, nations will be able to reduce their trade deficit and achieve economic recovery.

1.2.3 The Interrelatedness of CEO Demographic Characteristics and China National Innovation Strategies

China's talent and innovation are interrelated with the country's strategy (Cao et al., 2022). In 2012, the 18th National Congress of the Communist Party of China clearly proposed an innovation strategy: innovation-driven development. Subsequently, the Chinese government launched a series of supplementary strategies around this innovative strategy. For example: this sentiment was further reaffirmed at the 19th National Congress of the Communist Party of China, which further emphasized that innovation should be the first driving force for development (Zhu, 2022). In 2021, China proposed to "implement the talent revitalization strategy in the new era and build the world's major talent center and innovation center." The Fifth Plenary Session of the 19th CPC National Congress pointed out that by 2035, China will enter the forefront of innovative countries and form powerful talents (Cao et al., 2022). Therefore, China's talents are the key players in realizing innovation in the national strategy (Cao et al., 2022; Wang et al., 2023).

In addition, CEO demographic characteristics are interrelated with China's national innovation strategy (Cao et al., 2022; Zhou, 2021). Since talent drives

innovation, the Chinese government proposed that “innovation-driven development is essentially talent-driven development” (Wang et al., 2023; Yang & Yang, 2023). One aspect of cultivating talents in an enterprise is the cultivation and appointment of senior executives (Zhou, 2021). As a senior executive of the enterprise, the CEO’s demographic characteristics reflected in talent cultivation and appointment affect the development of the enterprise to a certain extent (Cao et al., 2022). Therefore, in research on enterprise innovation, CEO demographic characteristics have become a hot topic that scholars have paid attention to in recent years (Cid-Aranda & López-Iturriaga, 2023; Loukil et al., 2020; You et al., 2020).

1.2.4 Improvement of the Social Environment Faced by Small Firms

The Chinese government has developed an improved awareness of the innovative capabilities of small firms in recent years (Chen & Li, 2006; Huang et al., 2017). Small firms in China accounted for over 60% of the country's gross domestic product, over 70% of invention patents, and 80% of new products in 2018 (Yao et al., 2022). Most scholars have claimed that larger firms have innovation advantages because they can mobilize resources, resist market competition, and have strong manufacturing capabilities (Huang et al., 2017; Liu, 2009; Zhou et al., 2020). In China, the government’s policies for large firms are more beneficial (Huang et al., 2017). Although large firms possess greater resources for innovation endeavors, small firms also actively participate in patent and innovation activities (Verhees & Meulenber, 2004).

Moreover, the domestic environment faced by small firms has been greatly improved, although China's economic development is still facing difficulties and challenges (Chen & Wang, 2021). The "Small and Medium-sized Enterprises Promotion Law of the People's Republic of China" was promulgated and implemented on January 1, 2018. The promulgation of this regulation protects the legitimate rights and interests of small firms and promotes the innovative development of small firms (Chen & Wang, 2021). Subsequently, the State Council continued to introduce relevant tax reduction policies to promote and stimulate the innovation of small firms (Chen & Wang, 2021; Zhu et al., 2011). According to Zhu et al. (2011), government and institutional tax breaks and R&D subsidies can further tap the innovation potential of small firms.

1.2.5 A Significant Increase in the Number of Young Firms

In recent years, the number of young firms has increased sharply in China (Zhang et al., 2020a). The "2020 China Start-up Business Ecosystem Report" indicates that the total number of newly registered enterprises in China increased to 2.71 million between 2017 and 2019. Among these, 1.01 million were added in 2018, representing a rapid growth rate (Zhang, 2020). Start-up and new enterprises are essential to the economic development of modern societies; these young enterprises help drive innovation, encourage competition, and create jobs (Koster & van Stel, 2013; Men et al., 2017; Stel et al., 2005). Start-up enterprises are often referred to as young enterprises (MacVicar & Throne, 2013).

The number of start-up enterprises is growing rapidly, but the proportion of these young firms exiting the market is relatively high (Zhang et al., 2020a; Zhang et al., 2020b). The common view is that innovation improves an enterprise's chances of survival, which is often attributed to the benefits derived from innovative activities (Cohen & Klepper, 1996). Enterprise innovation puts young firms at risk, the advantages it brings are far more important than the risks (Zhang et al., 2020a). However, enterprise innovation is affected by firm age (Assefa et al., 2022; Bouncken et al., 2021; Coad et al., 2016; Sørensen & Stuart, 2000; Wei et al., 2015). Firm age affects the enterprise culture it creates, through which employees can generate crucial innovative ideas (Aziz & Samad, 2016; Mabenge et al., 2020). The two-way operation of firm age and enterprise innovation makes firm age a significant factor in the pursuit of innovation.

Given this context and the interest in CEO demographic characteristics, firm size, firm age, and enterprise innovation, this study will investigate the following: a) the relationship of CEO demographic characteristics on enterprise innovation; b) the moderating role of firm size on the relationship between CEO demographic characteristics and enterprise innovation and c) the moderating role of firm age on the relationship between CEO demographic characteristics and enterprise innovation.

1.3 Problem Statement

The lack of innovation in China's manufacturing industry is mainly due to poor quality of patents, thus reduces the motivation for enterprise innovation (Guellec & de

La Potterie, 2007; Prud'homme & Taolue, 2017; Sun et al., 2022). The definition of poor quality of patents comes from two different aspects, the proportion of valid patents as well as the average maintenance period of patents (Prud'homme & Taolue, 2017; Yu et al., 2022). A valid patent refers to a patent that is active and with a paid annual fee (Chiu et al., 2020). Even though the Chinese government's subsidies have made China's number of patent applications rank first in the world in 2019 (Cao et al., 2022; Hao et al., 2022), the proportion of valid patents in comparison to patent applications is low (Yu et al., 2022), and the average maintenance period of patents is short (Prud'homme & Taolue, 2017; Qiao, 2017).

The implementation of China's policies leads to the phenomenon of poor patent quality (Prud'homme & Taolue, 2017; Sun et al., 2022). Path dependence is produced by low-quality patents for inventions that do not make a substantial contribution to enterprise innovation (Prud'homme & Taolue, 2017). Therefore, China government's support policies does not completely change the lack of enterprise innovation in the manufacturing industry (Xu & Sim, 2017).

Lack of diversity in CEO demographic characteristics influences enterprise innovation. Many studies have confirmed that the diversified characteristics of senior executives can promote enterprise innovation (Griffin et al., 2021; Guo et al., 2021). Diversity of executive characteristics makes it easier for executives to accept failure and promotes enterprise innovation (Griffin et al., 2021). However, currently, CEOs of Chinese manufacturing companies are mainly male, highly educated, and over 45 years old, as shown in Figure 1.2.

According to Loukil et al. (2020), Garcia-Blandon et al. (2022), and You et al. (2020), the demographic characteristics of CEOs include CEO gender, CEO age, and CEO education. Figure 1.2 summarizes the overall situation of CEO gender, CEO age and CEO education between 2013 and 2022 in China's manufacturing industry. The total number of male CEOs of listed enterprises in China's manufacturing industry is 12118, while the number of female CEOs is far lower than the number of male CEOs, which is only 897. Additionally, the number of CEOs aged 45 and above is 10566, and the number of CEOs under 45 is 2449. Moreover, the number of CEOs with a bachelor's degree or higher is 10982, while CEOs with less than a bachelor's degree accounts for only 15% of the total. From these data, it can be found that the CEO positions of Chinese listed enterprises tend to be men with high academic qualifications and rich experience.

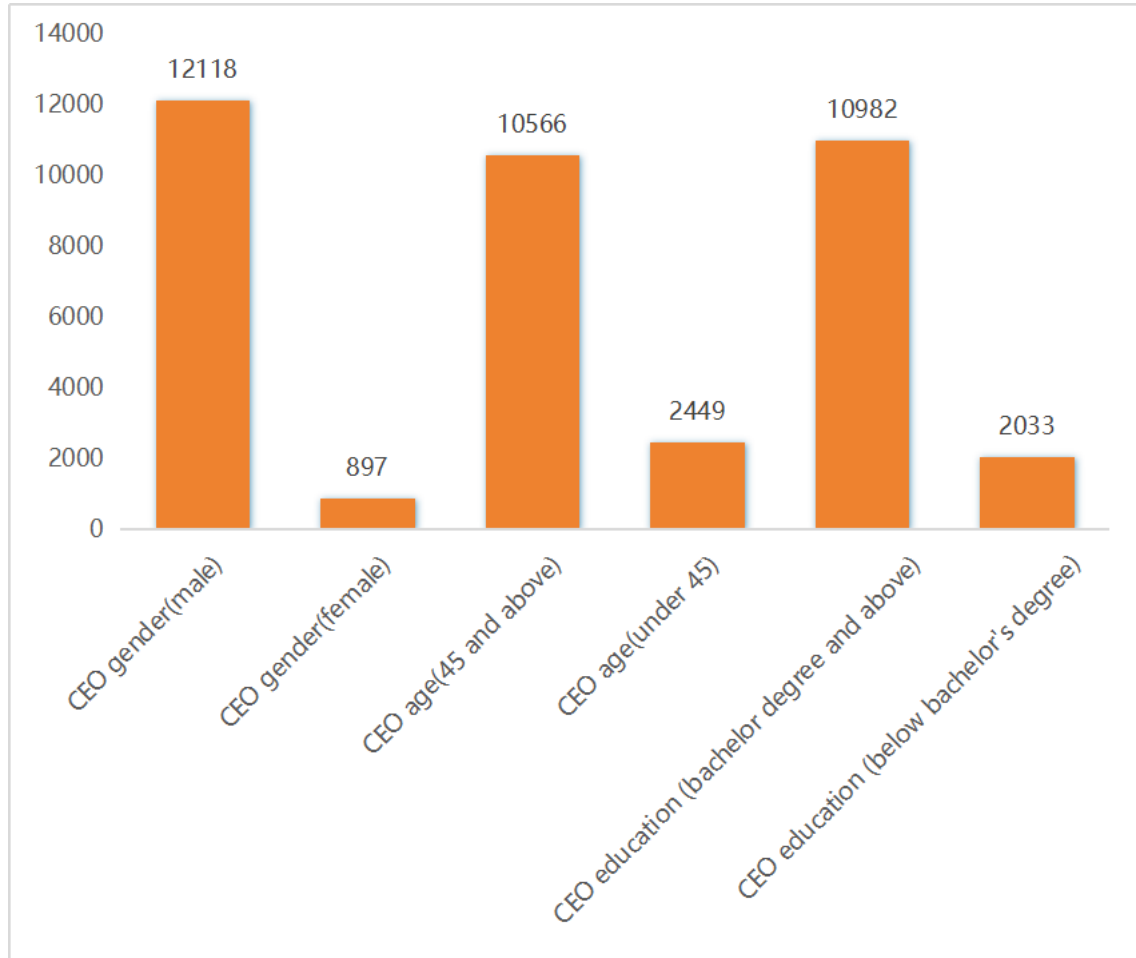


Figure 1.2 Summary of the number of CEO demographic characteristics in China's manufacturing industry from 2013 to 2022

Source: The data comes from the executive characteristics database in CSMAR and manually collects the number of CEOs with demographic characteristics from 2013 to 2022 in China's manufacturing industry.

Currently, firm size and firm age may influence the role of CEO demographic characteristics on enterprise innovation. The contingency approach has been identified as a valuable perspective in the study of CEO characteristics (Javed et al., 2023; Zona et al., 2012). Firm size and firm age have not been shown to influence enterprise innovation through CEO demographic characteristics.

The contingency approach not only broadens the comprehension of CEO characteristics but also resolves previously inconsistent findings (Prasad & Junni, 2017). This perspective has also been particularly beneficial in the context of

enterprise innovation, as recent publications have demonstrated that the main contingency factors of firm size and firm age have a substantial impact on enterprise innovation. Firm size has been found to moderate the impact of leadership style on enterprise innovation (Vaccaro et al., 2012) and has also been confirmed to affect enterprise innovation by affecting the psychological characteristics of CEOs (Prasad & Junni, 2017). In addition, firm age has also been found to affect company performance through CEO values (Yan et al., 2016). Overall, fully understanding enterprise innovation requires considering the diverse conditions (i.e., contingencies) that affect how executives pursue innovation.

In summary, due to the lack of innovation in China's manufacturing industry and the lack of diversity in CEO demographic characteristics, this study investigates how CEO demographic characteristics function and shape enterprise innovation in China's manufacturing industry. In addition, to fill the gap in previous research, this study explores the moderating effects of firm size and firm age on the relationship between CEO demographic characteristics and firm innovation.

1.4 Research Objectives

The purpose of this study is to discover empirical evidence regarding the relationships between CEO demographic characteristics, firm size, firm age, and enterprise innovation. Therefore, this study aims to achieve the following objectives:

- 1) To examine the relationship between CEO demographic characteristics (CEO gender, CEO age, and CEO education) and enterprise innovation in China's

manufacturing industry.

2) To examine the moderating effect of firm size on the relationship between CEO demographic characteristics and enterprise innovation in China's manufacturing industry.

3) To examine the moderating effect of firm age on the relationship between CEO demographic characteristics and enterprise innovation in China's manufacturing industry.

1.5 Research Questions

Based on the research objectives mentioned in Section 1.4, this study will mainly answer the following questions:

1) Do CEO demographic characteristics (CEO gender, CEO age, and CEO education) influence enterprise innovation in China's manufacturing industry?

2) Does firm size moderate the relationship between CEO demographic characteristics and enterprise innovation in China's manufacturing industry?

3) Does firm age moderate the relationship between CEO demographic characteristics and enterprise innovation in China's manufacturing industry?

1.6 Significance of Study

This study aims at expanding the comprehension of CEO demographic characteristics and enterprise innovation and providing insights for improving the enterprise innovation of the manufacturing industry in China. The theoretical contributions of this study include a greater understanding of the strategic significance

of CEO demographic characteristics, firm age, and firm size to enterprise innovation. In addition, this study provides practical contributions and provides policy suggestions for enterprise practitioners, decision-makers, and government policymakers to improve enterprise innovation.

1.6.1 Theoretical Contributions

This study contributes to literature in three main ways. First, it expands the knowledge base by exploring how CEO demographic characteristics influence enterprise innovation. Previous studies focused on the impact of corporate governance (Bianchini et al., 2017), innovation capability (Heider et al., 2021) and corporate social responsibility (Wu et al., 2021b) on enterprise innovation. Since the introduction of the upper echelon theory (UET), studies have shifted to focus on boards of directors or top management teams (TMTs) (Boone et al., 2019; Xie et al., 2020). However, the research on how individual executives affect enterprise innovation is still underexplored (Wu et al., 2021a; Zhang et al., 2022). In view of the importance of enterprise innovation, it is urgent to expand the knowledge on the effect of CEO demographic characteristics on enterprise innovation through this research.

Second, this study provides a new understanding of the relationship between CEO demographic characteristics on enterprise innovation. With the increase of the number of female executives (Wu et al., 2021a) and the promotion of women's status (Valeri & Katsoni, 2021), more and more studies confirm that female CEOs can improve enterprise innovation (Javaid et al., 2021; Prabowo & Setiawan, 2021). On the other hand, there is literature that confirms that male CEO has positive effects on

improving enterprise innovation (Strohmeier et al., 2017). Therefore, existing knowledge on whether there is a gender gap in innovativeness is still scant and inconclusive (Expósito et al., 2021). In addition, scholars have inconsistent results regarding the impact of CEO age on enterprise innovation. Some scholars insist that CEO age promotes enterprise innovation (Ricotta et al., 2021). On the contrary, some scholars show that young CEOs who are not afraid of risks can promote enterprise innovation (Barker & Mueller, 2002; Cao et al., 2022). Moreover, research on the role of CEO education on enterprise innovation has also yielded different empirical results (Barker & Mueller, 2002; Li & Tang, 2010; Zhou et al., 2021a). Therefore, this study analyzes the effect of CEO demographic characteristics (CEO gender, CEO age, and CEO education) on enterprise innovation, which can deepen understanding of the relationship between CEO demographic characteristics and enterprise innovation and provide researchers with different supporting materials.

Third, this study introduces the moderating effect of firm size and firm age and expands the research on the impact mechanism of enterprise innovation. There are currently some literatures that use organizational factors (firm age, firm size) as moderating variables to explore the impact of a certain CEO characteristics on enterprise innovation, but the research is limited to one of the CEO characteristics. For example, to the best of the author's knowledge, it is yet unknown whether firm age as an organizational factor has a moderating effect on the relationship between CEO gender and enterprise innovation (Zhang et al., 2022). Therefore, by including firm size and firm age in a framework that explores CEO demographic characteristics and

enterprise innovation, the study of the impact mechanisms of enterprise innovation and the research on CEO demographic characteristics are expanded.

1.6.2 Practical Significance

This study reveals some key relationship on management issues related to the importance of CEO demographic characteristics, firm size, and firm age to enterprise innovation in China's manufacturing industry. The boards of directors of the manufacturing industry will benefit from this study. The board of directors should pay close attention to the demographic characteristics when hiring a CEO so that they can select the right person to improve the innovation ability of the enterprise.

In addition, this study supports there is a relationship between CEO demographic characteristics and enterprise innovation. Indirectly, it will help to improve China's GDP. This is because enterprise innovation can grow the national economy (Azoulay & Jones, 2020; Caballero-Morales, 2021), and enable organizations to expand new export markets (Love & Roper, 2015), gain competitive advantage (Hashi & Stojčić, 2013), and improve enterprise performance (Bloom & Van Reenen, 2002). Moreover, this study can also echo China's policy of "talent-driven innovation and innovation-driven development" and is expected to provide theoretical support for relevant government policies.

Moreover, enterprise innovation is affected by firm size and firm age (Mabenge et al., 2020). To support the development of young and small firms, the Chinese government has launched a series of support policies in favor of them (Chen & Li, 2006; Huang et al., 2017; Zhang et al., 2020b; Zhu et al., 2011). This study investigates

the moderating effects of firm size and firm age on the relationship between CEO demographic characteristics and enterprise innovation. The results are expected to provide a theoretical basis for relevant support policies of the Chinese government and provide relevant suggestions for policy formulation.

1.7 Definition of Key Terms

The following are the definitions of important key terms used in this study:

Manufacturing industry

Manufacturing, an industry that uses manpower or machinery to make products from raw materials, usually systematically divides labor (Britannica, 2022).

Gross domestic product

Gross domestic product (GDP) measures the total economic output of a nation (Marcu et al., 2015).

CEO demographic characteristics

CEO demographic characteristics mainly include personal characteristics such as CEO education, CEO age, and CEO gender (Loukil et al., 2020; You et al., 2020).

Firm size

Firm size is determined by either the annual sales turnover or the number of employees (Kemp et al., 2003; Mabenge et al., 2020).

Firm age

Firm age is a property of enterprises that determines market share, strategic position, stakeholder relationships, reputation, and the firm's experience (D'Amato & Falivena, 2019).

Risk-taking

Risk-taking is defined as enterprise risk-taking. It consists of the proactive strategic choices made by management in the allocation of resources and the uncertainty surrounding the enterprise's income (Bromiley, 1991).

1.8 Organisation of Thesis

The basic situation of enterprises in China's manufacturing industry is described in Chapter 1. The discourse revolves around the pressing need for enterprise innovation that Chinese manufacturing enterprises are confronted with. Then, the research background and problem statement of this study are discussed, and the research questions and objectives are put forward. This chapter also introduces the operability of the variables being studied in this study, and the significance of this research is expounded in detail.

Chapter 2 is a literature review. This comes from past studies on enterprise innovation, CEO demographic characteristics (CEO gender, CEO age, and CEO education), firm age, and firm size. This chapter also discusses the key concepts

obtained from previous studies, finds out the gaps in this study through a literature review, and finally introduces and discusses its research framework and research hypotheses.

In Chapter 3, the research methodology is introduced. The following subjects are the primary focus of this chapter: research design, sample selection, measurement of variables, model specifications, additional analyses, and robustness test. This chapter lays a solid foundation for the empirical analysis in Chapter 4.

In Chapter 4, the research findings and results are presented. It mainly includes the results of the fixed-effect Poisson regression model and robustness test. The empirical results will verify hypotheses of this study.

Chapter 5 concludes with a discussion of the research findings and results. The pertinent conclusions include both practical and theoretical implications. In addition to discussing the study's limitations, this chapter also provides suggestions for future investigations.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter begins with the theoretical background that supports this research framework: the upper echelon theory (UET) and contingency theory. Then, the relationship between the development and structure of variables is examined in detail. Next, the concepts of firm size and firm age as the study's moderators are explained. Finally, all the relevant hypotheses, including all the variables in the theoretical framework, are rationalized, and summarized.

2.2 Theoretical Background

Most research on CEO demographic characteristics and enterprise innovation is explained from the UET perspective, with little consideration of the impact of external environmental factors and internal organizational factors (Prasad & Junni, 2017). However, to fully understand how CEO characteristics affect enterprise innovation, research must take into account the organizational context (Prasad & Junni, 2017). In some cases, specific CEO characteristics are highly effective, while in other cases they do not have any measurable impact on the organization (Owens & Hekman, 2012). Therefore, this study discusses the role of CEO demographic characteristics in enterprise innovation under the moderating influence of firm age and firm size, by deploying both UET and contingency theory.

2.2.1 Upper Echelon Theory (UET)

The UET refers to the personal characteristics of top managers with organizational results and holds that the background characteristics of the TMTs will influence the organization's strategic choice and performance (Hambrick & Mason, 1984). Hambrick and Mason (1984) argue that strategic choice has a large behavioral component, including the decision-maker's cognitive basis (knowledge or assumptions about future events, alternatives, and consequences) and the values that influence the cognitive basis. Observing the perceptions, values, and decision-maker's cognitive basis is difficult (Bennat & Sternberg, 2022), most upper-echelon research is based on measurable demographic indicators such as age, functional background, education, experience, or financial status (Bennat & Sternberg, 2022; Carpenter et al., 2016). As a result, the upper-echelon model plays a dual role as a theoretical model and a theoretical framework. The original upper-echelon model is shown in Figure 1 (Carpenter et al., 2016).

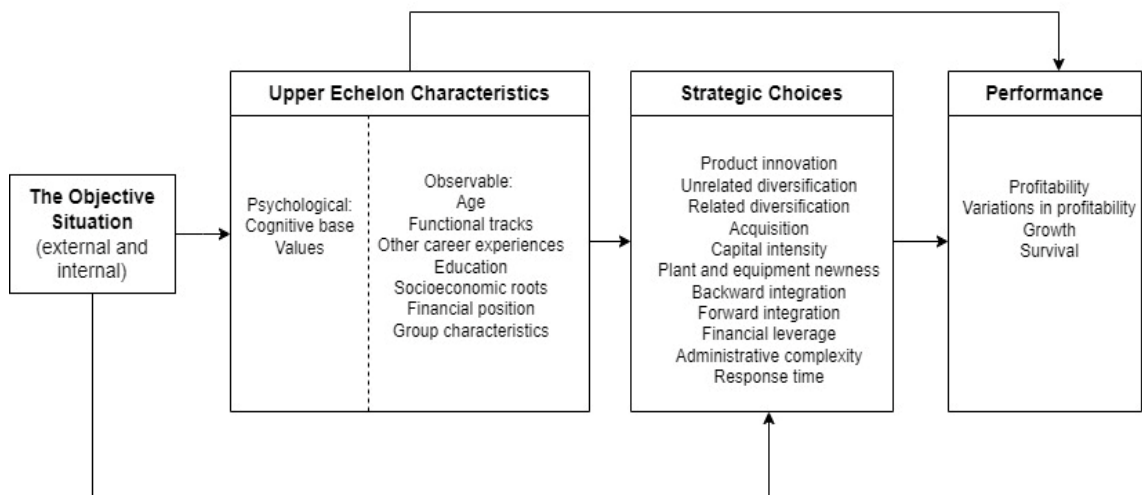


Figure 2.1 The original upper-echelon model

Under the theoretical background of UET, Wu (2021) points out that executives with different background characteristics should show apparent differences in preferences, cognition, and judgment. This difference may be reflected in their behavioral choices, which will have different effects on enterprises. Based on the UET, Cheng et al. (2010) make an empirical test on enterprises in China, and the results show that various demographic characteristics of executives (education level, title, age, and term of office) significantly impact enterprise performance. These findings show that the demographic characteristics of executives are the key human resources for business and the appropriate agents for managing network capabilities. Therefore, the demographic characteristics of executives are related to outstanding company performance.

In addition, a distinctive survey of 1,088 private enterprises operating in the manufacturing industry across 18 locations in China between 2000 and 2002 was undertaken by Lin et al. (2011). The research aims to investigate the impact of CEO attributes and motivations on enterprise innovation. The study's findings indicate that CEO education, political connections, professional background, and enterprise innovation have a positive relationship.

Loukil et al. (2020) use all listed enterprises in the Euronext Paris from 2001 to 2013 to study how CEOs attributes affect innovation. The results indicate that the educational background of the CEO may impact innovation efforts. Specifically, CEOs who have obtained science or engineering degrees are more inclined to allocate more funds towards R&D compared to their counterparts who possess degrees in