ISCTE IUL

Instituto Universitário de Lisboa

Linking Transformational and Paternalistic Leadership to Innovation Performance

YANG Changhong

Thesis submitted as partial requirement for the conferral of

Doctor of Management

Supervisor:

Prof. Henrique Duarte, Assistant Professor, ISCTE University Institute of Lisbon

Co-supervisor:

Prof. SHAO Yunfei, Professor, University of Electronic Science and Technology of China, School of Management and Economics

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Full name YANG Changhong
Course Doctor of Management
Student number 201520
Email address 529528592@qq.com
Personal email address _____
Telephone number 13984085452
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Signed: 杨昌洪 Yang changhong

Abstract

The current research aims to study the status quo of innovation in high-tech enterprises in Guizhou Province, and to explore the internal process of organizational innovation through answering "(1) whether transformational leadership and paternalistic leadership influence organizational innovation performance at the same time, (2) the possible mediation by ambidexterity, and its possible impact, (3) whether these relationships are different due to the internal and external environment of the organization, and what are the important internal and external environmental factors". The first research reveals the differences between Guizhou high-tech enterprises and other regions in China at a more macro level. The second study goes deeply into the internal organizational process, revealing the important influence mechanism of transformational leadership and paternalistic leadership on organizational innovation. These findings, while promoting theoretical research in related fields, also provide some inspiration for management practitioners and policy makers.

Keywords: Transformation leadership; paternalistic leadership; innovation ambidexterity; innovation performance

JEL: M10; O32

Resumo

A presente investigação pretende estudar o presente situação da inovação das empresas tecnológicas na província de Guizhou, e explorar os processos internos associados à inovação respondendo a 3 questões: (1) em que medida os tipos de liderança transformacional e paternalista podem afetar simultaneamente o desempenho de inovação; (2) a existência de uma possível mediação da ambidestria e do seu impacto; (3) qual importância do ambiente externo e interno da organização e em que medida ele afeta o tipo de relações existente entre as variáveis. O estudo 1 mostra, num nível macro, quais as diferenças entre a região de Guizhou e as outras regiões da China. O estudo 2 analisa com mais profundidade os processos organizacionais internos, revelando a importância da liderança transformacional e da paternalista na inovação organizacional. Estes resultados, aprofundam os contributos em campos teóricos conexos e também fornecem orientações aos gestores e aos decisores políticos.

Palavras-chave: Liderança de inovação; liderança paternalista; ambidestria da inovação; desempenho da inovação

JEL: M10; O32

摘要

该文致力于探究贵州省高新技术企业的创新现状，并通过研究“（1）变革型领导和家长式领导是否同时影响到组织创新绩效，（2）如果存在显著的影响，其过程是怎样的，（3）这些关系是否因组织内外部环境而不同，以及有哪些重要的内外部环境因素”来探索其组织创新的内部过程。研究一在更宏观的层面上揭示了贵州省高新技术企业与中国其它区域的差异性。研究二则深入组织内部，揭示了变革型领导和家长式领导对组织创新的重要影响机制。这些发现在推动相关领域理论研究的同时，也为管理实践者和政策制定者提供了一定的启示。

关键词：变革型领导；家长式领导；创新双元；创新绩效

JEL: M10; O32

Acknowledgements

It is my great honer to gratfully ackonwledge the aprreciated instructions and help from all people for their important roles for the completion of my thesis.

At first, I would like to thank my supervisors. They are my Portugueses supervisor professor Henrique Duarte and my Chinese supervisor professor Yunfei SHAO. Their profound knowledge, rigorous studying attitude and modesty character have set up a good example for me. I can never finish my research without the help from them. They were, are, and will be my respected supervisors in my whole life.

I would like to thank my respected professors from both ISCTE University Institute of Lisbon and School of Management and Economics of UESTC for their selfless and wonderful instruction and teaching. Thank my classmates for the happy and valuable time that we shared together. Every discussion with them had brought inspiration to me. Thank all research participants, only with their support and help, can I finish my research. Their kindness, enthusiasm and friendship, as well as the appreciated suggestions and comments, have given me strong support.

Finally, I have my whole family to thank for the completion of my thesis. They have given any possible support to me and shown their grateful patence over the years. This is one of the critical factors guarantee the completion of my thesis.

致谢

非常荣幸地在此向所有帮助我完成博士论文的所有人致以衷心的谢意！

首先，要衷心感谢我的两位导师。他们是葡萄牙里斯本大学商学院 Henrique Duarte 教授和电子科技大学经济与管理学院邵云飞教授！他们学识渊博、学风严谨、为人谦虚，我将永远以他们为榜样。

衷心感谢电子科大经济与管理学院的全体老师！感谢 DBA 项目团队的全体老师！对大家给予我学习和生活上的关心和帮助致以诚挚的谢意！衷心感谢全体同学和同门师兄师弟师姐师妹！这些将是我永远感谢的！

最后，感谢我的家人！这些年来，他们给予我任何可能的支持，对我表现出无经的耐心。这些是我能够成功完成博士论文的重要条件！

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Chapter 1: Introduction

1.1 Research background

Since 1950s of 20th century, the third technological revolution has been making people recognize the critical role of science and technology in the development of society and economy. Technological innovation has become an important driver of economic growth. People pay increasing attention to the economic and social benefits brought about by technological innovation. Scholars have conducted continuous research on innovation process. Innovation is an important driving force for social and economic development (Qiu & Gao, 2004) and plays an irreplaceable role in maintaining the competitive advantage of a country, an area, and a company (Lengnick-Hall, 1992; Amarakoon, Weerawardena, & Verreynne, 2016). In the 21st century, with the acceleration of globalization and the rapid development of information technology, innovation has become even more important. In this era of knowledge-based economy and economic globalization, all countries have to achieve their competitive advantages through the development of high technology. The competition among enterprises is based on the comprehensive strength of organizational innovation.

Based on the importance of organizational innovation, a lot of scholars put a great deal of attention to explore how to strengthen organizational innovation (Klein & Sorra, 1996; Kumar, 2012). Some of them tried to find solution from knowledge and learning perspective (Liao, Fei, & Liu, 2008), others tried the perspective of power system (Dougherty & Hardy, 1996), total quality management practices (Bon & Mustafa, 2014) or leadership (Gumusluoğlu & Ilsev, 2009a). Among them, due to the critical roles of leadership in any organization, leadership has been given much attention (Cummings & O'Connell, 1978; Gumusluoğlu & Ilsev, 2009b). For example, a research based on the data from 163 R&D employees from 43 micro-and small-sized Turkish entrepreneurial software companies found that transformational leadership had a positive effect on organizational innovation, external support for innovation positively moderated this effect, while internal support for innovation did not have significant moderating effect (Gumusluoğlu & Ilsev, 2009b). Although the extant researches have given some evidences for whether leadership can influence organizational innovation and how the influences happen, more researches are needed to rich our understanding about these two

constructs, especially when taking the contextual management perspective into consideration (Van de Ven & Jing, 2012).

In China, the government and the people increasingly realize the critical importance that science and high technology especially high-tech innovations play the most important roles for developing productive forces. Technological innovation has always been highly valued by Chinese Communist Party (CCP) and central government. Relevant policies for the advancement and innovation of science and technology, and reform of the science and technology system have been continuously proposed as an important approach to the transformation of economic development patterns. In the 18th National Congress of the Communist Party of China, it was clearly stated that technological innovation is a strategic support for improving social productivity and overall national strength and must be placed at the key position of the country's overall development strategy. Since the 18th Central Party Congress of the Chinese Communist Party, under the guidance of innovation-driven development strategy, China has made many achievements in its scientific and technological development. From then on, more and more has been given to innovation, in the report of 19th Central Party Congress of the Chinese Communist Party, the term "innovation" appeared more than 50 times. The General Secretary of CCP, Xi Jinping repeatedly emphasized that "innovation is the primary driving force for development."

Through theoretical innovation, practical innovation, institutional innovation, cultural innovation, and other innovations, China is accelerating the construction of an innovative country. The Chinese government has increased investment in innovation and given more policy support. The governments at all levels have adopted series of measures such as establishing a national high-tech industrial development zone to promote enterprise innovation. Although these measures and policies have achieved certain achievements, the overall level of innovation remains relatively low, and there differences among different regions (Wang, Fan, Zhao, & Wang, 2016) and different enterprises (Wu & Yu, 2007) remain significant. Recently, in the Sino-U.S. trade friction, the ZTE crisis caused by the ban on sales to ZTE has provided a clear footnote for Chinese enterprises' lack of innovation. One obvious inference is that if we do not universally improve the innovation capability and corresponding innovation performance of Chinese companies, the "ZTE Crisis" will emerge in an endless stream. Accelerating innovation is a prerequisite and a necessary path for Chinese enterprises to develop faster and better. It is also a prerequisite and an inevitable path to get rid of the "ZTE Crisis". Therefore, how to achieve better innovation performance has become an important

issue that needs urgent consideration and resolution, for both the CPC, the governments, managers and scholars.

Although, much attention has been given to innovation of high-tech enterprises in China, there are still some limitations. First, many researches on innovation have adopted economic research perspectives and paradigms. They mainly discuss how to promote regional and corporate innovation from the macro level, but neglect the differences among the enterprises and the underlying theories, to some extent. For example, a research was based on DEA to measure the tech innovation efficiency of 30 provinces of China and analyzed their difference, then proposed some policymaking suggestions (Chi, Yu, & Li, 2004), another one developed an indicator system to measure the differences between eastern and western regions of China, and then proposed some countermeasures (Gan & Yan, 2011).

Second, the existing research which taken the individual-enterprise-perspective usually adopt the paradigm of normative discussion which mainly discuss how things should be. For example, used data envelopment analysis (DEA) to measure the technical efficiency, pursue technical efficiency and scale efficiency and analyzed the differences of the three efficiencies among 42 high-tech enterprises, but the authors did not explore why these differences existed from management theory perspective (Xiong, Zheng, & Tang, 2012). Such kind of normative discussion need to be improved to be more scientific and more practical, therefore, more empirical researches based on management theories are needed to understand the innovation black box at enterprise level, the empirical research results based on enterprise-level data are relatively few.

Third, because of China’s vast territory and vast resources, the regional socio-economic development is uneven, for example, the differences between developed eastern regions and underdeveloped western regions are very large. This kind of differences are also manifested in the development of high-tech enterprises, but the existing researches focused on the high-tech enterprises in western region are very few. Therefore, to study innovation at enterprise level in these regions can contribute to the development of these regions. Meanwhile, such kind of researches can rich our understanding of organization innovation by providing empirical evidences.

As can be seen in the Chapter 4, Guizhou Province is a good representative for the underdeveloped regions of China, thus is a good research setting. From the literature review of innovative research linked with Guizhou, the following two features are shown: First, there is a lack of researches on this topic. The results from Baidu's academic research on “innovation”

and “Guizhou” in title indicate that there are only 89 articles from Peking University core journals, and only 39 CSSCI journal articles among which only 7 articles related to enterprises and technological innovation (Hong, 2002; Zeng, 2006, 2007; Zhang & Meng, 2011; Zhang, Fan, & Tian, 2013; Peng & Zhu, 2015; Hu & Tu, 2018); there is almost no research on innovation management of high-tech enterprises. Second, there is a lack of empirical research. Among the seven CSSCI papers mentioned above, only one employed the micro-management perspective to explore the micro-process of corporate innovation. But this article is only based on two cases (Hu & Tu, 2018). Therefore, the empirical research based on the perspective of management and a relatively big sample of high-tech enterprises in Guizhou is still a blank.

Based on the above background, the current research plans to take the high-tech enterprises in Guizhou as the research objects, adopts management perspective to explore their innovation, tries to find out the approaches and method to accelerate the innovation performance, especially of those enterprises in western Chine. In the next section, a brief literature review will be conducted to identify the research questions.

1.2 Research question

Scholars and managers have given much attention to innovation because of its importance. Innovation is a key factor for the survival and development of the organization (Martensen & Dahlgaard, 1999), and sometimes decide an organizations’ survival (Helmers & Rogers, 2010; Marple, 2010; Deng, Guo, Zhang, & Wang, 2014). The related concepts include innovation performance (Han, Luo, & Zhong, 2016), innovation efficiency (Papachroni, Heracleous, & Paroutis, 2016), and innovation capabilities (Slater, Mohr, & Sengupta, 2014). Among them, innovation performance is the result of innovation activities, therefore has become the most noticeable outcome variable in this research field, and more and more attention has been given to it. When search the accurate key words “innovation performance” with the date from 1997 to 2017, the result from Google Scholar (https://scholar.google.com/) shows that there are near 100,000 recorders, including many high-impact achievements (Ahuja & Katila, 2001; Laursen & Salter, 2006). Figure 1-1 depicts the distribution of these achievements over the years. By the end of the last century, there were relatively few relevant documents. For example, there were only 194 articles in 1997. The number of these documents began to show a significant increase from around 2010. The accumulated number of documents since 2014 has exceeded 30,000, indicating that this area has received more and more attention from international scholars.

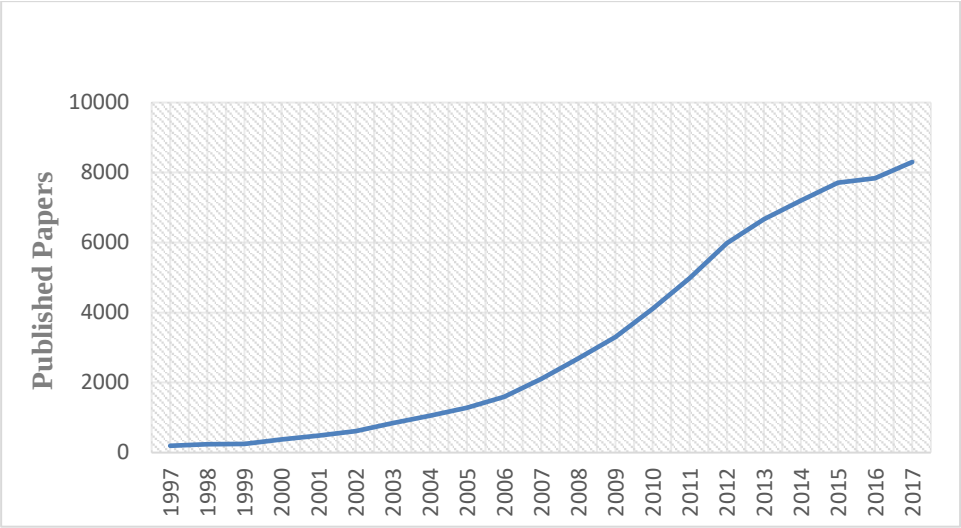


Figure 1-1 Published Papers on “Innovation Performance” in Google Scholar

With the same research method in CNKI (https://www.cnki.net), the accurate key words "innovative performance" bring about 4,000 articles. As shown in Figure 1-2, these achievements have shown a rapid upward trend in recent years. Also, these returned results includes a number of papers published in authoritative peer-reviewed Chinese journals such as "Management World (in Chinese)" and "Journal of Management Science in China (in Chinese)" (Han & Liao, 2007; Qian, Yang, & Xu, 2010).

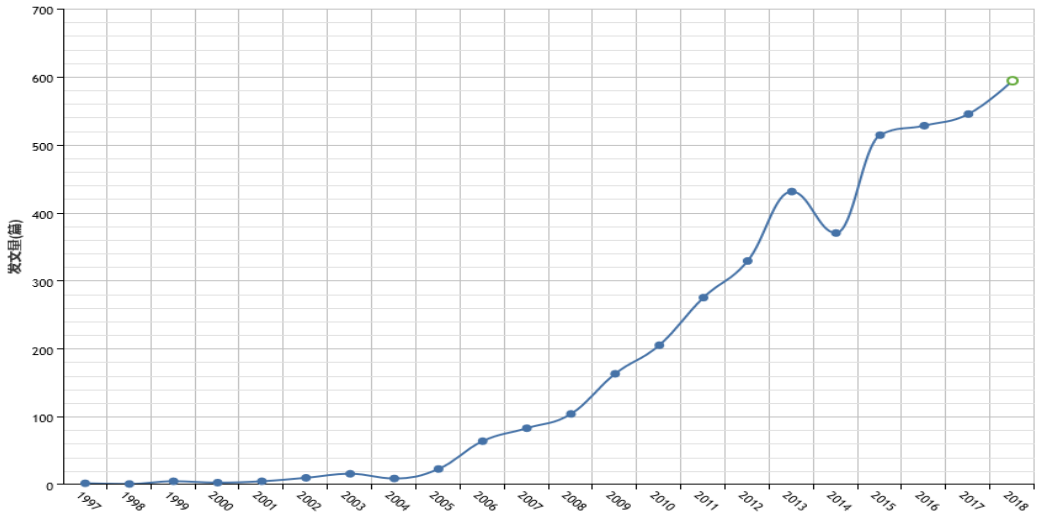


Figure 1-2 Published Papers on “Innovation Performance” in CNKI

According to Schumpeter, the key to innovation lies in the new combination of production factors, and entrepreneurs play a crucial role in this process (Schumpeter, 1934). Leaders are most critical for any organization, they decide the strategic direction, control the distribution of organizational resources, influence key internal processes and organizational features

(Hambrick & Mason, 1984; Hambrick, 2007), therefore are considered to be indispensable factor for promoting organizational innovation (Hülsheger, Anderson, & Salgado, 2009). Leaders may directly or indirectly influence organizational innovation (Mendes, Gomes, Marques-Quinteiro, Lind, & Curral, 2016) because of at least two reasons (Denti & Hemlin, 2012): first, the innovations have to happen in a specific organizational environment, and the leaders can purposefully construct such kind of organizational environment to strengthen organizational innovation; second, leaders can set goals and expectations for both individuals, groups and the whole organization, and make them to achieve these goals by managing rewards and granting autonomy. Therefore, the relationship between leadership and innovation has been one important topic of both leadership field and innovation field (Gilley, Dixon, & Gilley, 2008; Barsh, Capozzi, & Davidson, 2011; Sethibe & Steyn, 2015; Mendes et al., 2016). Empirical researches indicate that leaders can enhance the organizational innovation by influencing innovation speed (Kessler & Chakrabarti, 1996) and organizational learning (Hsiao & Chang, 2011; Nasution, Mavondo, Matanda, & Ndubisi, 2011), another recent research found that leaderships do positively influence team innovation performance (Han et al., 2016).

Transformational leadership is one of the hottest topics in leadership research field (Qu, Janssen, & Shi, 2015; Chen, Zheng, Yang, & Bai, 2016; Schmitt, Hartog, & Belschak, 2016; Zheng, Liu, & Gong, 2016; Ng, 2017). Transformational leadership was proposed by Burns in the process of analyzing political leaders, separating transformational leadership from transactional leadership (Tichy & Devanna, 1990). It was believed that transformational leadership and transactional leadership are located at the ends of a continuous line in which there are several breakpoints which represent different leadership styles (Bass, 1996, 1999; Bass & Riggio, 2006). Theoretically, transformational leaders have the ability to motivate subordinates to overfulfill their mission, so this kind of leadership has been described as a number of important factors such as idealized influence (including both the traits and behaviors), inspirational motivation, intellectual stimulation and individualized consideration (Bass, 1996, 1999; Bass & Riggio, 2006). At the individual level, transformational leadership influences many individual outcome variables including innovation behavior and innovation performance through five key mechanisms, including affective mechanisms, motivational mechanism, identification mechanism, social exchange mechanisms, and justice enhancement mechanisms (Ng, 2017). Based on emotional event theory (Weiss & Cropanzano, 1996) and expectancy theory (Vroom, 1964), the emotional mechanism describes the process by which transformational leaders stimulate their positive emotional experiences, thereby enabling them

to exhibit more positive behaviors and achieve better job performance; based on social cognitive theory (Bandura, 2001), incentives describe the process by which change leadership leaders can motivate subordinates to enhance their self-efficacy through intellectual stimulation, thereby demonstrating a more active industry and achieving better job performance; based on social identification theory (Abrams & Hogg, 1999; Vignoles, Regalia, Manzi, Golledge, & Scabini, 2006), the identity mechanism describes that members of the organization are inspired by transformational leaders and then generate personal recognition for transformational leaders or their values, which motivate the organization's members to demonstrate a more active industry and thus achieve better job performance; based on the theory of social exchange (Blau, 1964; Emerson, 1976), the social exchange mechanism describes the process by which transformational leadership encourages the members of the organization to work harder to achieve better job performance by strengthening the leadership-member social exchange relationship; based on the group value model (Tyler, Degoey, & Smith, 1996), fairness Strengthening machine describes the transformational leadership by express future resource allocation and the corresponding program is fair to members, thereby encouraging them to contribute to organizational goals. There are also studies that have shown that transformational leadership has significant effect on group-level outcome variables (Bass, Avolio, Jung, & Berson, 2003; Braun, Peus, Weisweiler, & Frey, 2013) and organizational-level outcome variables (Barrick, Thurgood, Smith, & Courtright, 2015). Although existing researches provide useful theoretical frameworks and empirical results for understanding transformational leadership, a recent meta-analysis-based research indicates that transformational leadership should receive more research beyond the individual level (Ng, 2017).

Paternalistic leadership is an important construct in the context of Chinese culture (Farh & Cheng, 2000), and it has been found to be closely related to variables at individual and organizational levels (Pellegrini & Scandura, 2007). Paternalistic leadership is based on the Confucian idea embedded in Chinese cultural background and consists of three dimensions: morality, benevolence and authority (Farh & Cheng, 2000). The leader’s morality shows that he is public, has no favoritism, does not use formal power for personal gain, and does not prey on the interests of others; benevolence emphasizes that the leader’s individual, comprehensive and long-term care given to their followers; and authoritarian emphasizes more on the shock and mastery of subordinates. The significant effect of paternalistic leadership can be traced to the human relations movement which suggested that the managers should focus on employees rather than on mechanistic production, then the employees will be more satisfied and more

productive. The obedience and reciprocation of followers are the key mechanisms to explain the effective paternalistic leadership, which are supported by empirical evidences (Pellegrini & Scandura, 2007). Paternalistic leadership not only influences employees' work attitude, behavior and performance, but also occurs at organizational level and management level (Pellegrini & Scandura, 2007). For example, paternalistic leadership may benefit organizations through increased job performance (Chou, Cheng, & Jen, 2005), organizational commitment (Farh, Cheng, Chou, & Chu, 2006). Although researchers have focused on the impact of paternalistic leadership on innovation (Fu, Li, & Si, 2012) and group creativity (Zhang, Tsui, & Wang, 2011a), more researches are needed for understanding how paternalistic leadership actually affects organizational-level innovation performance (Pellegrini & Scandura, 2007).

Transformational leadership and paternalistic leadership are two important concepts which attract much attention from scholars, but there is still a dearth of researches which can help people understand the process of "leadership-to-innovation performance" (Denti & Hemlin, 2012). Given that the importance of both transformational leadership and paternalistic leadership for organizational innovation and innovation performance, we need to pay attention to that paternalistic leadership is more cultural than transformational leadership. As we know, cultural background has important influence on both leadership and innovation process as well as their connections. The leadership style is a concept closely related to cultural background (Den Hartog, House, Hanges, Ruizquintanilla, & Dorfman et al., 1999). Cultural factors provide a unique background for the formation of leadership style, the exertion of its effect, and the perception of leadership styles of organizational members (Rickards & Fisher, 1996; Den Hartog et al., 1999; Emmerik, Euwema, & Wendt, 2008; Sadri, Weber, & Gentry, 2011). The organizational innovation process is can also be influenced by cultural background (Alam, 2011). For example, the organizations in different cultural backgrounds may conduct different service innovation (Alam, 2006), and the innovation process and corresponding performance are significantly influenced by cultural background (Winkler & Bouncken, 2009). Recently, a meta-analysis shows that the power distance has a significant impact on the innovation process (Sarooghi, Libaers, & Burkemper, 2015). While, from its definition and its four core components (Bass & Riggio, 2006; Ng, 2017), it is easy to assert that transformational leadership seems to be more personal. In conclusion, these two types of leadership have different roots and play their roles through different mechanisms. Therefore, to study leadership and innovation within a specific cultural context may bring significant contribution to both the leadership field and the innovation field, rich the understanding of the two concepts on one

hand and provide empirical evidence in specific cultural background on the other hand.

About organizational innovation, ambidexterity is another important construct which cannot be neglected (March, 1991). Originally, the term "ambidexterity" means that a man is able to use either hand equally well (Longman Dictionary). Now, in organization research field, organizational ambidexterity refers to an organization which can do both exploration and exploitation well at the same time (March, 1991), and such organizations can be more innovative (Duncan, 1976). The organizational ambidexterity theory emphasizes a balance and coordination which aim at the purpose of gaining a sustainable competitive advantage; for this reason, an organization must make reasonable choices and arrangements between continuing the current model and seizing the opportunity of the future (O'Reilly & Tushman, 2013). However, such kind of pursuing seemingly contradictory goals may be a complex and severe challenge for all organizations (Birkinshaw & Gibson, 2004).

Based on above discussion, a framework can be drawn like "leadership-ambidexterity-innovation performance". In fact, several researches have examined one or some of the links. For example, a recent research found that transformational leadership has positive effect on innovation ambidexterity (Zheng et al., 2016); other researches provide evidences for the effect of ambidexterity on innovation performance (Popadić, Černe, & Milohnić, 2015a; Jingkun & Jimei, 2016). However, a recent literature review shows that although there exist many researches on leadership, organizational innovation, and performance, but few studies are devoted to revealing the complete relationship of "leadership-innovation-performance" (Sethibe & Steyn, 2015). And, there are still many limitations existed in extant literature about "leadership-innovation-performance" (Sethibe & Steyn, 2015).

First, in terms of research on leadership and innovation relations, most of them focus on transformational leadership, and a few focuses on transactional leadership, but paternalistic leaders just receive a little attention. As discussed previously and later in literature review, paternalistic leadership is important for understanding management phenomenon in Pacific Asian business context (Dorman & House, 2004), especially in Chinese culture (Pellegrini & Scandura, 2007; Farh, Liang, Chou, & Cheng, 2008). Extant researches provide sound evidence for its positive effect on both individual and organizational outcomes (Pellegrini & Scandura, 2007). Therefore, it should not be neglected in exploring the "leadership-innovation-performance" process.

Second, although innovation ambidexterity has received more attention and has been considered as an important strategy to enhance the competitiveness of one organization, there

are also research results showing that the leadership will enhance the organization's innovative ambidexterity through various means (such as knowledge sharing) (Lin & Iii, 2011), but there is no direct empirical research aimed to explore whether and how paternalistic leadership and transformational leadership influence innovative performance, especially at the same time.

Third, the existing research results on the relationship between leadership and innovation are not consistent. Although most research results support the positive relationship between transformational leadership and innovation, there are also studies that show no significant relationship between these two (Sethibe & Steyn, 2015). At the same time, the paternalistic leadership is facing the criticism that it has complicated and controversial connotation, and very few research study how paternalistic leadership influence innovation performance.

Fourth, innovation and innovation performance are two concepts that are obviously different. However, existing researches based on “leadership-innovation-performance” mostly focus on financial performance and operational performance, with insufficient attention given to innovation performance. Surely, there should be tight connections among these constructs, however, innovation performance is quite distinct from financial and operational performance. Theoretically, good innovation performance may lead to good financial performance and operational performance, vice versa. While, in terms of the innovation performance measurement, earlier researches usually used objective indicators (Liu & Buck, 2007); later, scholars proposed that subjective measures should employed to grasp the whole innovation process (Zheng, Jin, & Ma, 2009). Therefore, both innovation performance and its measurement need more attention.

Based on the above-mentioned practical and theoretical background, this paper proposes three research questions: (1) What are the current situations of the high-tech enterprises of Guizhou? If they are worthy of any special attention? (2) Does transformational leadership and paternalistic leadership affect organizational innovation performance at the same time? (3) If there are significant effects, what is the process? (4) Are these relationships dependent on the internal and external environment of the organization? If yes, what are the major internal and external ones?

1.3 Research design

To answer these research questions more scientifically and reliably, a rigorous scientific plan must be prepared and carried out. Before conduct a research, several aspects must be taken

into consideration, such as the overall planning and specific research methods, which will be discussed below.

1.3.1 General plan

The overall research plan for this article can be summarized as the technical roadmap shown in Figure 1-3. From the point of view of the work process, the plan includes six major phases from the definition of research question to the completion of the final revision, and finally the submission. In the corresponding phases, the corresponding chapters of the thesis will be finished.

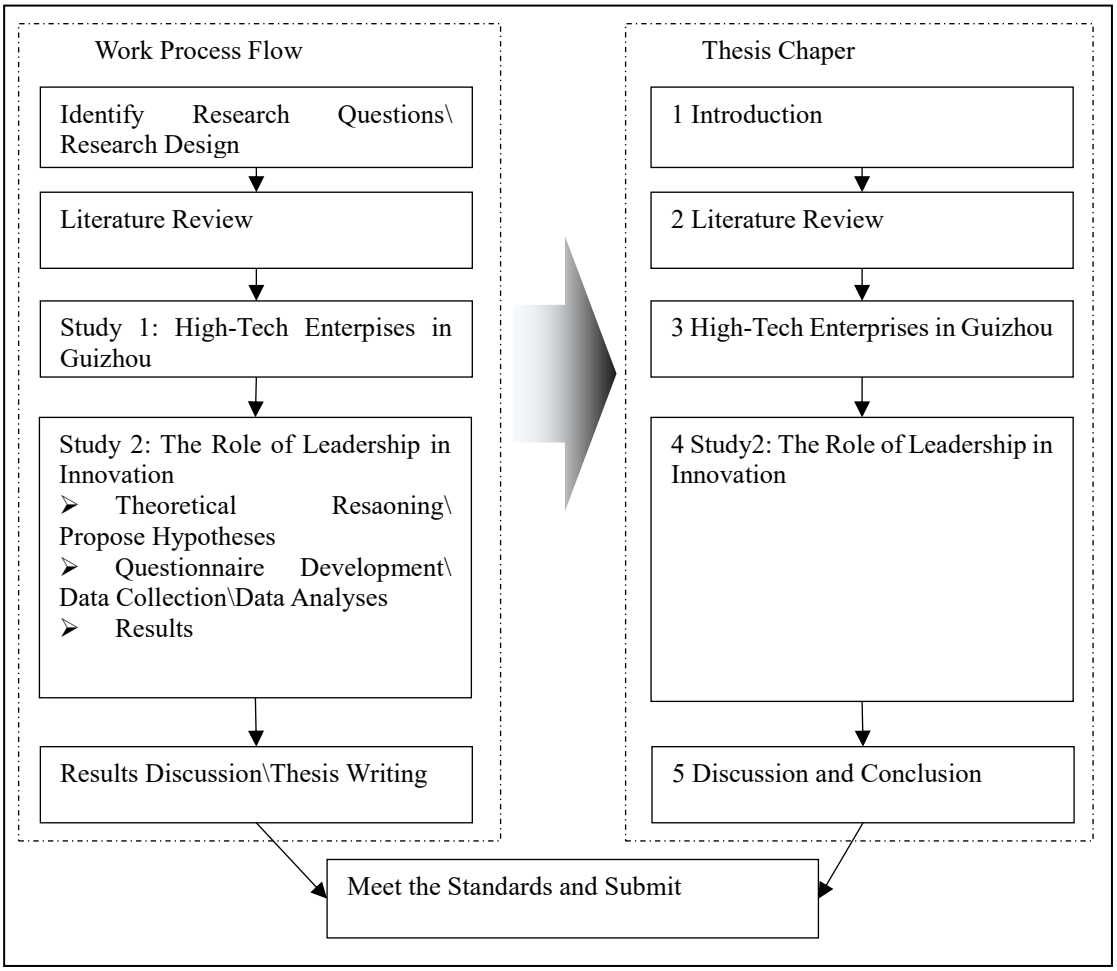


Figure 1-3 Research Process and Thesis Writing Process

The entire research process starts from the personal interest and the current situation of China and Chinese enterprises, closely connected with the specific background of Chinese companies' innovation to set the interested research topic, then defines the specific research questions through literature review, designs detailed research plans and demonstrates their feasibility in detail. The research design includes the plan of the research process and the design

of the empirical research process, which are carried out according to the general research plan. Also, the collection and analysis of documents and data are completed and the writing of the paper should be completed in time. Of course, this process is not completely linear, and some of the work processes and the corresponding work contents may affect each other, even in some loop iterations between/among some links. In the above-mentioned work process, each important work process will be discussed with the tutors to form a more reasonable implementation scheme; the difficulties and problems encountered will be resolved through various methods, including discussing with the research team members, asking for instruction from both the foreign supervisor and the Chinese supervisor, consulting with experts, thus ensuring the quality of the research and the thesis.

In next section, the specific method applied in the research process will be reported.

1.3.2 Specific method

In this section, the specific method applied in each major work phase will be discussed briefly, more details about empirical research will be reported in Chapter 5.

1.3.2.1 Identify research questions

The first is to combine my research interests with the current world situation and research status to determine the research topics, and then to identify specific research questions. According to my own interests and the great importance of high technology, high-tech enterprises has been chosen as the research object. The analysis of the status of high-tech enterprises in China reveals two notable features, one is the domestic enterprises have low levels of innovation performance, the other is there are significant differences among regions as well as among enterprises. Therefore, further clarify the focus of research, and set research themes as “innovative performance”. To identify the research question, literature search was conducted by Google Scholar and CNKI with key words of “innovative performance”. The searched articles indicate that the innovation performance has increasingly attracted the attention of international and domestic scholars. The innovation theory and preliminary literature analysis demonstrated that leaders should have great influence on innovation performance, and this is also supported by relevant empirical evidences. Further examination on the leadership and innovation literature demonstrated that transformational leadership and paternalistic leadership are the concepts that have received the most attention in the field of leadership research. However, literature analysis shows that there are still many limitations in

the study of “leadership-innovative performance”. Based on these limitations and the current situation of China's corporate innovation, three specific research issues are proposed. According to the needs of answering these research questions, an overall research plan has been designed, and each research phase has been considered as carefully as possible, including the specific research methods that will to be applied in the research process.

1.3.2.2 Literature review

The literature review includes three distinct and interrelated processes: literature search, literature reading, and analysis report. Among them, literature search is the starting point of work. When searching the literature, based on keyword search techniques, use “Baidu Scholar” and “Google Scholar” to conduct a quick search to locate high-level and high-cited results that are closely related to research issues, through reading abstracts to determine whether the full text is needed, if yes, to search the full text in the CNKI and EBSCO professional databases and download. NoteExpress software has been used to manage all downloaded full text or important reference information, so that it is easy and convenient for reading and citing.

When read literature, a combination of extensive reading and intensive reading is adopted. For articles involving important concepts, important theories, important results, and important methods, the full text needs to be intensively read; for those not so important, their different parts need to be read according to the needs of the study. During the reading process, keeping taking some notes is good for future referencing. The “snowball” method can be applied to discover important articles from the literature.

In the analysis report section, the structure of the report should be organized according to the core concepts of this study. The research history, important results, and limitations of each important concept need to be discussed one by one. For writing literature review section, one of the most important goals is to determine the status of the study in the literature. Only by a systematic literature review, can only to clarify the contributions of the current study.

1.3.2.3 Study 1: High-tech enterprises in Guizhou

This study aims to examine the high-tech enterprises in Guizhou at a more macro level. In organizing the study, following the general to specific principle, first introduce the general situation of Guizhou Province, then demonstrate the overall level of innovation of high-tech enterprises in Guizhou Province by comparing Guizhou with the regions of mainland China, and followed by the differences among regions in Guizhou Province and the differences among

industries in Guizhou. Firstly, the geographical location, economic development and the general situation of high-tech industries of Guizhou have been give descriptive study. Then, several kinds of comparisons were conducted among the representative regions in China mainland, in terms of input and output. It is very necessary to conduct this study before the second main study which aims to test the hypotheses directly because Guizhou Province and its high-tech enterprises are relatively unfamiliar to international readers, this article will be submitted to international scholars for review，some relatively detailed explanations may be required for them. Therefore, relevant data on Guizhou Province and its associated high-tech enterprises were also collected and organized into a dedicated chapter to provide enough information for international readers to understand the research context and research objects.

1.3.2.4 Study 2: Roles of leaderships for organizational innovation

This study is based on a standard empirical research paradigm. The major process including following steps.

(1) Theory deduction and hypotheses

Based on related theories, existing results and empirical evidence, the research theoretical model to be studied in this paper is proposed, and the assumptions involved in the model are discussed one by one. The discourse on each hypothesis should follow the order of “first theory, later evidence”, first discuss theoretically, and then provide published empirical evidence, so that the hypothesis can be strongly supported. For the arrangement of the order of each hypothesis, the direct–effect–related hypotheses in the model should be presented at first, followed by those mediating–effect–related hypotheses. This order can help the reader to better understand the theoretical framework of this study.

(2) Design and data collection

Questionnaire design and data collection are two closely related tasks. Questionnaire design is the preliminary work of data collection. However, when the questionnaire is designed, it is necessary to consider some special requirements of the data collection. This study will use multiple sources to collect data to avoid common method bias (CMV). Therefore, the relevant variables need to be designed into different questionnaires. The wording of the questionnaire items should be modified accordingly. Due to the adoption of multi-source data collection programs, to improve the efficiency of data collection, surveys may need to be conducted in multiple ways. Therefore, it is necessary to design questionnaires that are suitable for various survey approaches.

In the data collection process, special attention should be paid to data clean-up work. Several data clean-up approaches can be applied. For example, manually review each piece of recorder to eliminate invalid data; use descriptive analysis to observe each item to identify the outliers. For those recorders with a small portion of missing items in an individual questionnaire, statistical techniques can be used to estimate the missing value. For instance, if a missing value has been identified as a random missing, the EM algorithm is a proper estimation method. By doing so, the reduction in the degree of freedom caused by the deletion of data can be minimized mostly as possible. For the returned paper questionnaires, special attention must be paid to the quality audit and the accuracy of input. Two people rotation method can be used to enter data.

(3) Data analysis

The data analysis mainly includes two stages. The purpose of the first stage is to modify the questionnaire, to provide a high-quality questionnaire for collecting data for the main study to ensure the rigorous and reliable final research results. Because the relevant measurement tools are mainly the tested scale from the literature, the confirmatory factor analysis technology is mainly used to test the consistency of the data structure and the theoretical structure. In the second stage of analysis, the main purpose is to test measure model, to describe the sample, to analyze the correlations among key concepts and to test the proposed hypotheses finally.

SPSS and MPlus are the analysis software tools. The former is used to do some preliminary and preparatory analysis, such as descriptive analyses and correlation analysis; the latter is used to test the measure models and all hypotheses.

1.3.2.5 Results discussion

This work process should answer the following questions: What is the discovery of the study? What contribution does the current research bring for relevant research fields? What implications can the results bring for management practitioners? Does it have a certain enlightening significance for policy makers? What are the limitations of the current study? Which directions can we further explore in the future?

When discussing these issues, it is necessary to closely link the current findings to literature, to clarify the connection and difference between the current research and the existing research, and thus more clearly define the contribution of the current research.

1.3.2.6 Thesis writing and revision

The paper writing work should be advanced accompanied by the entire research process. As shown in Figure 1-3, as each research process is completed, the related chapters of the papers

should be written at the same time. However, this process is not completely linear, some the phases may be progressed as a loop. Finally, the whole thesis needs to be systematically revised, thus being improved greatly.

In the revision process, special attention needs to be paid to the following aspects: First, the specification of the document format. To achieve high efficiency, the style functions of Word can be used to set the format of each part of the document in advance according to the specifications of the dissertation and use multiple levels of titles to manage the structure of the document. The second is the reference specification. When using the NoteExpress management references, each reference information should be accurate, the reference style can be formatted in advance according to the norm of the thesis, and then to set the citation in text and the format of the reference list efficiently. The third is about the figures and tables specification. The titles of figures and tables need to be automatically numbered using Word's insert caption function, and strictly formatted according to the given norm.

1.4 Research significance

This study constructs a theoretical model of “Leadership Style—Innovation ambidexterity—Innovation Performance”, thus revealing the linkage mechanism of “Leadership–Innovation Performance” at the organizational level. Meanwhile, to explore important moderators from important organizational and external factors by incorporating environment dynamism and the organizational internal innovation climate into the model. This model provides new research results for revealing the relationship between leadership and innovation performance. At the same time, the results of the study have contributed to a certain extent in the research of leadership style, innovation ambidexterity, and innovation performance research.

The current research may contribute to literature in several ways. First, the current research develops a model which depicts how paternalistic and transformational leadership link to innovation performance, which can enrich the understanding of the “leadership-innovation-performance” process; second, both the internal and external moderator can enrich the understanding of the connections between leaderships and innovation ambidexterity; third, the current research can contribute to the research on innovation at organization-level; fourth, the Chinese research setting can provide culture-specific evidence for the “leadership-innovation-performance” process.

In addition, the results of this study can provide some inspirational suggestions for management practices and policy formulation, thus promoting the progress of enterprise management practices to a certain extent, promoting the improvement of relevant policies in China, thereby enhancing the innovation performance of enterprises, increasing the competitiveness, and promoting the society progress.

1.5 Innovation points

From the perspective of the research framework, the innovation of this paper is shown in two aspects. First, both transformational leadership and paternalistic leadership are included in the research model to study their influence mechanism on innovation performance at the same time. Such models can more accurately describe the process of "leadership -- innovation -- performance". Meanwhile, in the existing literature, most studies only focus on one kind of leadership style and ignore the influence of other leadership styles in the research.

Second, when considering important moderating variables, those important environmental variables both outside the organization and inside the organization are considered. Such model can enable people to fully understand the complex process of leadership style's influence on innovation performance.

In terms of research methods, this article uses the multi-source data to overcome the CMV existed in most researches. From the point of the research object, although there already some research achievements about high-tech enterprises and China's high-tech technology enterprise, few researches focus on Guizhou, a specific province of China, the current research provide the first empirical research results for this subject. This research object may provide people with new knowledge and empirical evidence of cultural background characteristics for the academic field.

1.6 Thesis structure

The structure of this paper is based on the basic paradigm of empirical management research.

Chapter 1 introduces the research background of this article, based on the literature analysis and induction of specific research questions. Then, the research design, the research significance and the innovation points are brief discussed, finally the structure of this article.

Chapter 2 is a literature review. The research situation, main achievements and the limitations of existing research are discussed, to better identify the position of current research in literature, thus providing the latest literature basis for further discussion of the contribution and innovation of the current research.

Chapter 3 is the report of study 1. The input and output of the high-tech enterprises in Guizhou as well as the regional distribution are briefly analyzed, by doing so to explain the research setting in more details, thus providing a good foundation for the following practical suggestions and policy recommendations.

Chapter 4 reports the study 2 which aims to explore the roles of leaderships for organizational innovation. First, based on the theoretical review and existing research achievements, this chapter put forward a series of hypotheses through theoretical deduction, these hypotheses constitute a system which systematically answers the three research questions proposed in the first chapter. Then, the empirical research methods are reported in detail, including variable measurement, questionnaire design, data collection and clean, analysis method. Finally, research results are reported based on the methods described in the previous section. These results provide a scientific and rigorous test of the hypothesis system constructed above and give direct answers to the research questions.

Chapter 5 first makes a simple summary of research findings from both study 1 and study 2, and then discusses theory and practice significance of these findings followed by the deficiencies and limitations, finally the future research direction closely connected with this study are discussed.

Chapter 2: Literature Review

According to the research plan, this chapter reviews the literature on the important concepts in the research. First, the concepts, measurements and related empirical studies about innovation performance, transformational leadership, paternalistic leadership, organizational innovation ambidexterity, organizational innovation climate and environment dynamism is briefly reviewed. Then, several key concepts for the current research are briefly reviewed. Through the literature review, the relevant concepts and related research fields will be better clarified, which will provide a solid theory and literature foundation for the current research, as well as for the discussion of the research significance.

2.1 Innovation and technological innovation

"Innovation" is currently hot word used by media and academic fields with the highest frequency. In literature, it has been used as the synonym for reform and creation, and a series of related words can be found, for example, scientific innovation, technological reform, institution innovation, system innovation, management innovation (Damanpour, 1991; Wang & Zheng, 2000) . Innovation is an important clue in the theoretical works of Schumpeter who believes that innovation is the basic driving force of economic development (Backhaus, 1934; Schumpeter, Opie, & Hansen, 1934). The essence of economic development is a creative process along with destruction, in which the old economic structure is destructed continuously and the new one is continuously created. Based on the idea of Schumpeter, innovations are new combination of production factors, including the following five approaches: (1) the introduction of new products; (2) with new production methods; (3) open up a new market; (4) control the source of raw materials or semi manufactured goods; (5) to achieve a new organization in any new industry (Schumpeter, 1934). We can examine innovation from two different perspectives. One is to see innovation as the important development of science and technology, the other from a broader sense, is to see it as both technological innovation and institutional change (Wang & Zheng, 2000) . Based on the above discussion, several characteristics of innovation can be drawn. First, it can be a kind of behaviors happened in the specific environment and specific group. Second, it can change the existing mode which includes process mode and thinking mode. Third, it should satisfy the demands of the society or the mankind. Fourth, the

existing knowledge, experience and materials are the foundation of innovation. Fifth, the approach of innovation is to create new things, methods, elements, paths and environment. Sixth, it should achieve both profit and benefit effect, both economic and social effect.

Originally, technology is used to discuss art applications. Later, it has been expanded to discuss methods, processes, ideas, tools, and equipment. By the second half of the 20th century, people achieved an agreement that technology itself refers to some useful means or skills by which human beings can improve their living. Schon has reviewed the definitions in literature at that time and concluded that technology can be any tools or skill and addressed that it can be tangible or intangible, hardware or knack. He also addressed that ultimate goal of technology is to extends peoples' capabilities and improve their lives. This definition containing rich meanings was cited by the National Science Foundation of America (NSF). Since then, the definition that Friar and others proposed in 1986 has been recognized by many scholars. According to Ferrier, technology refers to the ability to create reproducible methods or means that can lead to the improvements of products, process and services. The definition of technology abroad is relatively wide even caused many scholars believe that such a wide definition can easily cause confusion between scientific knowledge and technological activities. But others addressed that both natural technologies (including tangible tool equipment and invisible skills and methods) and management related changes should be addressed equally, because they are directly linked to the growth of certain economic benefits in modern society.

The connotation of technological innovation has been recognized gradually. Schumpeter first proposed the idea and concept of technological innovation in 1911, later the word "Innovation" appeared (Schumpeter, 1934). He addressed that innovation is a new combination of production factors and aims to achieve potential profit. At that time, the differences between innovation and technological innovation are that innovation addresses new concept or experimental product but technological innovation addresses the production and commercialization of new products demanded by market and customers, of course such kind of new products should contain new scientific and technological achievements. To 1950s, the rapid development of science and technology led to the fast development of economy and society of every country, technological innovation has been given much attention. From 1960s, the NSF began support those projects related to technology innovation. Its 1969 report Successful Industrial Innovation described innovation as a collection of technological changes and addressed several characteristics. First, innovation should include a series of complex activity starting from new concepts and new ideas; second, innovation should achieve successful

application of some or one outcome of new project; third, both or one of economic and social value should be realized though solving possible problems. At that time, although several scholars discussed the definition of innovation, for example, in Instability of Capitalism, Schumpeter first proposed the concept of innovative which was comprehensively described in Business Cycles in 1939. However, he did not clearly define the concept of technological innovation. In 1970s and1980s, a lot of researchers contributed to this field, a systematic innovation theory was gradually constructed. Since then, the relevant theories made the management of enterprises and government develop fast. However, there was still no a consistent understanding of technological innovation. Then in 1951, based on Schumpeter's idea, Solo first proposed the two prerequisites of technological innovation, including the resource of new ideas and the later stages of practice and development. In the research history of technological innovation, this two-step theory has been regarded as a milestone. In 1962, from the perspective of behavior, Enos first gave explicitly definition of technological innovation in the "Invention and Innovation": the technical innovation is the comprehensive result of a many kinds of behavior patterns. These behavior patterns include the selection of inventions, the formulation of plans, the establishment of organizations, the assurance of capital inputs, the recruitment of workers, and the development of markets. Later, others gave different description from different perspectives. For example, Lynn described technological innovation as a two-phase process which includes the cognition of the commercial potential of the technology at first, and then the commercialization behavioral process; based on mathematic model, Stoneman defined the technological innovation as " those new production process first applied the in economic activities"; taking products as the core, Mansfield proposed that technological innovation should be the whole exploratory process including all possible stages from the new-product idea to the sale and delivery of new-product; in 1970s, Utterback said that innovation means the first time practical application, thus is different from the invention or technology innovation experiment examples; in 1982, from the economic perspective, Freeman suggested that technological innovation means the first conversion of technology to business, including new products, new processes, new systems and new equipment; in the middle of the 1980s, Mueser defined technological innovation as a kind of meaningful discontinuous process with the features of novelty and practicability, which was the whole process of a hierarchy of economic activities from the creative concept of new products to successful marketization, including new ideas, research, development, production, commercialization, and such a series of activities. This definition gives a more systematic conclusion of previous definition, and highlights two aspects: one is that technological innovation includes some unconventional

activities which are always novelty and non-continuity; the other is the activities must be implemented successfully. In August 20, 1999, the CPC Central Committee and the State Council of China released an official document on strengthening technical innovation, developing high technologies and industrializing relevant achievements, in which it was proposed that "technological innovation refers to the process that enterprises use innovation knowledge, technology and process, apply new production and management mode, to improve the quality of products, develop new products, provide new services, occupy the market and achieve market value finally". This definition is the official definition of Chinese government. Concluding from the above discussion, the essence of technological innovation is the effective combination of science and technology and economic activities, and three points need to be addressed: first, the final goal is to satisfy the increasing market demand; second, a series of technical activities are the means; finally, technological innovation can benefit the high-quality economic growth.

Given the above explanation, it is easy to assert that technological innovation requires a specific process. From such process perspective, scholars have given various description to describe the different characteristics and roles of technological innovation. For example, the process of transforming knowledge, skills, and materials into products that the customer is satisfied with; the evolutionary process of knowledge creation, application and application; the process of communicating and processing information; the process of the growth of key sources of funding; the process in which companies increase the added value of technological products and enhance their competitive advantage. It can be summarized as the technological innovation process refers to a series of activities that generate, implement and produce innovation.

There exist several classification methods of technological innovations. The British Science Policy Research Institute (SPRU) has proposed a technology innovation output and application classification method which is a representative macro classification method. Utterback and his colleagues proposed the process innovation and product innovation taxonomy which is a representative microscopic classification. Freeman categorized technological innovation into two types, gradual innovation and fundamental innovation, with the consideration of how intense the innovation activities are. Incremental innovation refers to incremental continuous innovations that result from improvements in existing technologies. While radical innovations imply those critical innovation with major science or tech breakthroughs and revolution changes in relevant industries. Pavitt proposed that different innovation activities may aim at different innovation objects, hence two different types of

technological innovation can be found. First, product innovation implies the emergent of new products with technological changes. For product innovation, there are also two kinds of innovations including a major one which brings totally new products and an incremental one which brings improved products. The latter implies some changes happen in the development or manufacture process. Second, process innovation refers to the transformation of the production technology. It includes new processes, new equipment and new organizational management methods. Process (process) innovations can also be differentiated by major and gradual ones.

2.2 Theories of technological innovation

The theory of technological innovation originated mainly from the Schumpeter's Schumpeter technological innovation model (Schumpeter, 1934). Schumpeter proposed an innovative model in the book "Economic Development Theory" namely the Schumpeter technology innovation model. He believes that technological innovation follows the following a development model of several stages. At first, the potential market demand inspires some scientific achievements and inventions; second, some entrepreneurs aware the potential benefit of such achievements and inventions, and are willing to take any risk brought by the commercialization process; third, the introduction of new and fundamental scientific achievements changes the market structure, transforming an equilibrium market into an unequilibrium one; successful early-entry entrepreneurs get large amount of monopoly profits; more and more followers make the monopoly profits impossible, those early birds are motivated to seek another opportunity. Obviously, in Schumpeter's eyes, entrepreneurs play the most important roles in the described innovation process, while technology has been seen as an external variable. This model reveals the mechanism for how technological innovation happens in society. However, it seems unreasonable to regard technological innovation as a system-exogenous variable. Later in 1943, Schumpeter developed the ideas in the book "Economic Development Theory" and put forward new insights. According to his updated idea, the monopolists are the key factor for technological innovation and they play the roles that were of entrepreneurs in his past idea, and technology has been treated as endogenous variables instead of exogenous variables. The reason is that monopolies know that the success of innovation will obtain huge short-term profits. Under the condition of abundant funds, they will inevitably establish R&D departments. The success of innovation will promote enterprises to pay more attention to R&D thus forming a virtuous circle.

In the book "Technology and Market Structure", Schumpeter's insights have been summarized into Schumpeter's Innovation Model II which emphasizes that technological innovation comes from the company's internal technological innovation department. The success of technological innovation enables companies to obtain excess monopoly profits. Therefore, profit-making companies have been able to develop and grow and form a temporary monopoly in the industry until many imitators involved in weakening this monopoly advantage. Furthermore, the success of technological innovation allows companies to obtain excess monopoly profits while at the same time causing other companies to imitate. The increase in imitation activities further promotes the development of technological innovation and forms a cycle of technological innovation thus contributing to the continuous development of economic development. From this point of view, it can be asserted that economic development is derived from technological innovation and the constant renewal of technological innovation has led to sustained economic development.

The main theoretical basis for innovation is the resource-based view and the basic view of capabilities. The main idea of the resource-based concept is that the scarce, valuable, irreplaceable and hard-to-imitate resources possessed by enterprises can help them obtain sustainable competitive advantages and obtain excess returns (Barney, 2001). The capacity-based view points out that scarce resources are not enough to maintain competitive advantages because the resources themselves are static so companies must have dynamic capabilities to better respond to market fluctuations and maintain their competitive advantages (Teece, Pisano, & Shuen, 1997; Teece, 2009). These theories provide solid theoretical foundations for innovation research.

2.3 Innovation in high-tech enterprises

High-tech enterprises and technological innovation have tight connections. On one hand, high-tech enterprises are the major players of technological innovation. At the same time, technological innovation has important meaning for high-tech enterprises. First, only through technological innovation, can high-tech enterprises achieve sustainable economic development. Second, due to the fierce competition in high-tech industry, only by continuous technological innovation can high-tech enterprises maintain the competitive advantage and obtain high-quality growth; third, only technological innovation can help high-tech enterprises improve both effectiveness and efficiency. With the promotion of innovative technologies，high-tech

enterprises continue to develop and have achieved remarkable results. The proportion of economic benefits generated by high-tech enterprises in the entire national economy is also growing. Therefore, strengthening the construction of technological innovation capabilities has an important role in the rapid development of the entire national economy.

2.4 Innovation performance and internal and external factors

The term performance is often used to describe the results of organizational activities, business activities or individual activities. It is often evaluated in terms of both efficiency and effectiveness (Behn, 2003). Correspondingly, innovation performance is usually defined as the evaluation of the outcome of innovation activities. According to the research levels, innovation performance is also increasingly complex and diverse at several levels, such as employee innovation performance (Huang & Peng, 2015; Qu et al., 2015), team innovation performance (Song & Li, 2018), corporate innovation performance (Alegre, 2008), strategic alliance innovation performance (Chen & Zhang, 2018), industrial innovation performance (Chen, Dai, & Wang, 2018).

At the enterprise or organization level, innovation performance is the evaluation of an organization or a company's innovation activities. It reflects the specific results of the company's innovation activities and is often evaluated by the effectiveness and efficiency of the outcomes of innovation activities (Huang & Chen, 2010). The term "innovation performance" can be understood from both narrow and broad perspectives. In a narrow sense, innovation performance refers to the extent to which companies have pushed inventions into the market such as the rate at which companies introduce new products, new processes and new equipment (Freeman & Soete, 1997). This understanding emphasizes the results of innovative activities, hence, some outcomes can be used as indicators, for example, the release of new products can serve as a good indicator of innovation performance. In a broad sense, innovation performance should include the entire process from the creation of innovation ideas to the successful commercialization of new products and services to the target market, including three major processes such as research and development, patent applications and new products (Ernst, 2001). This understanding not only emphasizes the technological process of innovation but also emphasizes the process of marketization of new products, however it does not emphasize the economic benefits of innovation results (Freeman & Soete, 1997; Hagedoorn & Cloodt, 2003). Although there are some differences in the understanding of the connotation of innovation performance in the literature, but in general, two perspectives are mainly used to examine

innovation performance, one focuses on results and the other focuses on process.

The above-mentioned differences in understanding innovation performance make the measurement methods different (Behn, 2003). At first, some financial indicators are used to measure innovation performance, for example, the number of applied patents, the number of patents citations, R&D investment and number of new products (Hagedoorn & Cloodt, 2003). Then, to measure it in terms of innovation effectiveness and innovation efficiency by five indicators, including success rate of new product, patent application, sales ration of new product sales, new product development speed and new product quantity (Zhang, 2006). Later, scholars believed that some non-financial factors should be used because the data such as sales and profits are only one aspect of innovation performance. For example, some scholars have suggested that innovation performance should be measured from customer satisfaction, service quality and new service performance (Snow & Edgett, 1997). Later, some scholars argued that both financial data and non-financial data should be used to measure innovation performance. For example, some researchers propose to measure innovation performance by three aspects, in terms of financial data, customer feeling and internal management process (Storey & Kelly, 2001); similarly some other scholars measure innovation performance from financial standards, customer standards and opportunity standards (Alam, 2003). Although there are differences in the construct, indicators and tools of these measurement methods, it is not difficult to summarize them into two major categories: the first type emphasizes outcomes and results, and often uses objective indicators for measurement (Liu & Buck, 2007); the second category emphasizes the whole process of innovation and usually uses questionnaires to perform more subjective measurements (Zheng et al., 2009).

Innovation performance is often studied as an important outcome variable. Scholars actively explore those antecedent variables that affect innovation performance including environmental factors, structural factors, organizational factors, and individual factors (Damanpour, 1991; Huang & Chen, 2010; Zhang & Lv, 2013; Cao, Sun, Jiang, & Xiong, 2016; Zheng, Yang, & Ji, 2017). These antecedent factors can be categorized into two categories, i.e. internal factors and external factors. Internal factors refer to those factors within the organization, while external factors mean those outside the organization and the interaction between the organization and its external environment.

Internal factors emphasize the organization itself or some internal features of the organization such as the size of the company, organizational strategy, organizational structure, leadership, organizational learning, organizational management, organization climate (Hung,

Lien, Yang, Wu, & Kuo, 2011; Jantz, 2015). For example, the breadth and depth of inter-organizational research cooperation has more complex links with innovation performance, there is an optimal breadth of cooperation to improve innovation performance, while the depth of cooperation will always contribute to the improvement of innovation performance (Ma, Liu, Jiang, & Wang, 2014). Individual factors are important internal factors, mainly emphasize the characteristics of certain individuals or teams within the organization. The personal characteristics of senior executives and the characteristics of senior management teams are the most typical representatives. For example, the heterogeneity of the senior management team in terms of service age, education background and professional background may have significant effect on innovation performance, and these relationships are regulated by the behavioral integration of high-level management teams (Fuping & Guo, 2010).

Among these internal antecedent factors, organizational leaders have become one of the most important research objects. Related researches can be classified into three categories. The first category focuses on the relationship between the characteristics of top management teams and innovation performance, for example, some of the characteristics of TMT, including knowledge structure, professional background and heterogeneity, are closely linked with innovation performance (Clark & Smith, 2003; Zhao, Ge, & Liu, 2016). The second category focuses on the relationship between leadership style and innovation performance. For example, some studies have found that the CEO's transformational leadership style is closely linked with product innovation performance, enterprise entrepreneurship plays a significant mediating role, and technology orientation regulates the relationship between transformational leadership style and enterprise entrepreneurship (Chen, Tang, Jin, Xie, & Li, 2014) . The third category mainly studies the relationship between team process and innovation performance from the perspective of leadership. For example, a study has found that participatory leadership and guidance leadership influence the innovation performance of the team through influencing the team process (Somech, 2006).

Moreover, organizational climate is another important internal factor. Organizational climate refers to the organization members' common and overall perception of the organizational environment (Thumin & Thumin, 2011; Schneider, Ehrhart, & Macey, 2013). The general factors (such as team cohesion, support, autonomy, rewards, and leadership behaviors) of organizational climate are the key factors which can promote individual behaviors and organizational development (Patterson, Warr, & West, 2004; Patterson, West, Shackleton, Dawson, & Lawthom et al., 2005). Among several kinds of organizational climate, innovation

climate refers to an organizational climate that supports new ideas, new processes and new methods, in such climate, individual and team creativity are recognized, rewarded and given certain autonomy (Duan, Xiao, Xia, & Psychology, 2017). Empirical researchers found that organizational innovation climate is positively related to employees' innovation behavior (Ren & Zhang, 2015)and creative outcomes (Hsu & Fan, 2010), and also an important moderator, for example, it can moderate the process from transformational leadership to team performance through group voice climate (Duan et al., 2017) and the process from innovation ability to innovation performance (Zheng et al., 2009).

External factors mainly emphasize the external environmental factors including macro political, economic, social and technological environment (PEST), industry environment, regional environment and market environment, and the interactions between the organization and external environment. For example, government policies may have a significant impact on innovation performance, and the impact may also be different at different stages of the company's development (Zhang & Lv, 2013). Another research found that high adopters of administrative and technical innovations in public section are more sensitive to environment factors than organizational factors (Naranjo-Gil, 2009). The interactions between companies and external factors are also named structural factors which have important influence on innovation performance. For example, a research found that network dynamics have a positive effect on innovation performance and this effect is regulated by network resources (Yang & Lin, 2012); another research found that those organizations which can maintain close ties with other institution and agencies are likely to have the best innovation performance (Champagne, Leduc, Denis, & Pineault, 1993); another research found the external network strength has a significant positive effect on organizational innovation (Clark & Smith, 2003).

Among these external environmental factors, environment dynamism attracts much attention from scholars (Jansen, Bosch, & Volberda, 2005; Pérez-Luño, Gopalakrishnan, & Cabrera, 2014). Environmental dynamism describes the speed and predictability of changes in the organization's external environment (Dess & Beard, 1984), mainly the changes in technology, customer preferences, product demand and material supply (Jansen, Van Den Bosch, & Volberda, 2006). In strategy literature, environmental dynamism has been found to have great influence on organizational strategy and behavior (Tan & Litsschert, 1994). In innovation literature, environment dynamism has been found as am important contextual factor. For example, a research based on 381 Spanish firms found that whether the radical and internally generated innovations lead to higher performance depends on the environment

dynamism (Pérez-Luño et al., 2014); another research found that the effect of leadership on innovation depends on environment dynamism, which means the environment dynamism plays significant moderating role (Hunt & Ivergard, 2007).

Looking at the recent researches on innovation performance, it is easy to get the following conclusions (Zheng et al., 2017). First, the innovation performance has been paid more and more attention by scholars. Based on the resource-based view, capabilities-based theory and the integration of strategic management theory and competition theory, lots of researches have been carried out to explore the antecedent variables of innovation performance and obtain rich achievements. Second, when studying the antecedent variables of innovation performance, some scholars argue that these antecedents can be divided into environment, structure, organization and individual factors. In fact, these factors can be divided into two more simple categories, namely the extra-organizational factors and the intra-organizational factors. Third, although the measurement of innovation performance has experienced a evolutional process from financial indicators to integrated measurement，most of the existing studies still used some indicators connected with technological innovation and relevant outcomes, the attention paid to non-technical process innovation is still insufficiently. Finally, the relationship between leadership styles and innovation performance needs more in-depth research. Therefore, it is very important to accurately define the connotation of innovation performance. It should be avoided to limit innovation performance to this aspect of technological innovation, then make accurate measurements.

2.5 Transformational leadership and innovation

Transformational leadership may strengthen organizational innovation through several mechanisms (Jansen, Vera, & Crossan, 2009), such as to promote innovation through feedback and learning rooted in effective communication with followers, to mobilized followers' commitment to organizational innovation, to provide ideological explanations for linking individuals' identities to the collective identity through idealized influence and inspirational motivation, to encourage organizational members to think innovatively through intellectual stimulation (Bass & Avolio, 1994; Bass & Riggio, 2006; Jansen et al., 2009). In short words, transformational leadership have tight connection with organizational innovation.

Transformational leadership is one of the hottest topics in leadership research field (Qu et al., 2015; Chen et al., 2016; Schmitt et al., 2016; Zheng et al., 2016; Ng, 2017). At first,

transformational leadership was proposed by Burns in the process of analyzing political leaders, separating transformational leadership from transactional leadership (Tichy & Devanna, 1990). Then, in the 1990s, Bass and his collaborators extended the concept of transformational leadership to managers and army leaders, they believe that transformational leadership and transactional leadership are located at the ends of a continuous line in which there are several breakpoints which represent different leadership styles (Bass, 1996, 1999; Bass & Riggio, 2006).

The theoretical basis of transformational leadership is that leaders have the ability to motivate subordinates to overfulfill their mission, thus this kind of leadership has been described as a number of important factors such as idealized influence (including both the traits and behaviors), inspirational motivation, intellectual stimulation and individualized consideration (Bass, 1996, 1999; Bass & Riggio, 2006). The traits of idealized influence describe a high level of leadership charisma; subordinates establish an emotional connection with leaders because of these positive charisma; leaders and subordinates share risks based on fundamental ethics, principles and values (Bass, 1996, 1999; Bass & Riggio, 2006). The charismatic leadership behavior emphasizes that leaders should be respected and trusted; subordinates identify with leaders and want to imitate them; then it is easy to form a common vision and related values and act accordingly; leaders value the needs of subordinates and get subordinates' respect (Bass, 1996, 1999; Bass & Riggio, 2006). Leadership inspirational motivation emphasizes the stimulus of the vision to subordinates; leaders motivate the striving spirit of individuals and teams by describing an inspiring vision; through their own actions, leaders show a meaningful future to the people around them and encourages subordinates to envision an attractive future which will eventually enable subordinates to look forward to the future for themselves (Bass, 1996, 1999; Bass & Riggio, 2006). Intellectual stimulation emphasizes that leaders should encourage subordinates to become innovative and creative by asking questions, reconstructing problems and using new methods in common situations. In this process, subordinates may propose new ideas and creative solutions (Bass, 1996, 1999; Bass & Riggio, 2006). Individualized consideration describes the leader's role as a mentor and teacher; leaders are highly concerned with the individual's need for success and growth; and they create learning opportunities for subordinates by shaping a supportive atmosphere (Bass, 1996, 1999; Bass & Riggio, 2006).

Transformational leadership has a profound influence on subordinates. It transforms the needs, values, aspirations and preferences based on their personal interests into collective value

and behavior based on collective interests. Under this influence, subordinates will show high commitment to the visions of their own and the organizations, then take extraordinary positive actions (Bass & Avolio, 1994; Bass, 1996, 1999; Bass & Riggio, 2006). Therefore, transformational leadership will have a positive impact on the organizational members and the entire organization.

At the individual level, through five key mechanisms including affective mechanism, incentive mechanism, identification mechanism, social exchange mechanism and fairness mechanism, transformational leadership can influence many outcome variables such as innovation behavior and innovation performance (Ng, 2017; Farh et al., 2000); There are also studies showed that transformational leaders have a significant impact on group-level outcome variables (Bass et al., 2003; Braun et al., 2013) and organizational-level outcome variables (Barrick et al., 2015). For example, a study found that transformational leadership can motivate the whole organization to form positive culture and improve organizational efficiency (Shiva, 2012). Another study found that transformational leadership can increase the passion of subordinates and improve their performance (Judge & Piccolo, 2004); transformational leaders can generate higher level of organizational productivity and job satisfaction and lower level of work pressures, thereby creating higher organizational commitments and team commitments (Hu, Gu, & Chen, 2013).

The measurement of transformational leadership is constantly developing. Initially, Bass and his collaborator (Bass, 1985; Bass & Avolio, 1993) suggested that the same leader may show different leadership styles in different situations and proposed "Multifactor Leadership Questionnaire (MLQ)" to measure transformational leadership and obtain a four-factor model which includes idealized influence, inspirational motivation, intellectual stimulation and individualized consideration. Later based on Bass's foundation, Podsakoff proposed a six-dimension structure model which including Articulating a Vision, Providing an Appropriate Model, Fostering the Acceptance of Group Goals, High Performance Expectations, Individualized Support, and Intellectual Stimulation (Podsakoff, MacKenzie, Moorman, & Fetter, 1990). However, subsequent empirical studies have pointed out that transformational leadership should be a dimension construct rather than a multidimensional construct (Carless, 2004). Overall, for the measurement of transformational leadership, the structure of the transformational leadership should be carefully understood and the appropriate measurement tools should be also carefully selected. At the same time, the features and requirements of the research problem and the particularity of the specific research situation should be taken into

consideration.

Although the existing researches provide many theoretical frameworks and empirical results for understanding transformational leadership, there are still many issues that deserve further study. For example, the early view has overestimated the impact of transformational leadership, in fact, in some cases transactional leadership may be more effective (Yukl, 1999); people are less concerned about how transformational leadership affects group processes or organizations, then affects the outcomes of groups and organizations (Jing & Avery, 2008); a recent meta-analysis-based study pointed out that transformational leadership should receive more research beyond the individual level (Ng, 2017).

2.6 Paternalistic leadership and innovation

Paternalistic leadership is very common in Pacific Asian business context (Dorman & House, 2004). It stems from Chinese culture which emphasizes "Virtue" and "Morality" (Farh & Cheng, 2000). After several decades' research, a consensus has been achieved that paternalistic has three dimensions including morality, benevolence, and authority (Pellegrini & Scandura, 2007; Farh et al., 2008; Wu & Tsai, 2012; Zhang, Zhang, & Zhao, 2017). The morality shows that he is public, has no favoritism, does not use formal power for personal gain, and does not prey on the interests of others, thus making subordinates and organizational members respect and identify with moral leaders (Cheng, Chou, Wu, Huang, & Farh, 2004; Farh et al., 2008), finally lead to higher level of innovation (Yang & Wei, 2012); being benevolent emphasizes that the leader's individual, comprehensive and long-term care given to their followers, and as a response, the followers will show their respect and loyalty to their benevolent leaders in completion of their obligations (Wang & Cheng, 2010), finally to increase organizational innovation; and authoritarian emphasizes more on the shock and mastery of subordinates, thus may decrease organizational innovation (Pellegrini & Scandura, 2007; Farh et al., 2008; Zhang, Tsui, & Wang, 2011b; Wu & Tsai, 2012; Zhang et al., 2017). In short words, it is reasonable to assert that paternalistic leadership should have tight connections with innovation.

In the 1960s, guided by the interest in large enterprises in Taiwan, Silin found that the held theory and behaviors of Taiwanese entrepreneurs were very different from those of American entrepreneurs when they implemented the similar management activities, and summed up that Taiwanese entrepreneurs have several leadership strategies (Silin, 1977) such as didactic

leadership, moral demonstrations and distance keeping. These findings lay the foundation for paternalistic leadership. Redding then recognized the uniqueness of the Chinese family business through the research on 72 entrepreneurs of traditional Chinese family enterprises and found that these entrepreneurs all showed paternalistic leadership with typical traits of being benevolence and applying rule of man (Redding, 1990). After that, scholars explored the patriarchal leadership model in depth, and put forward a dimension division of this style of leadership (Westwood, 1997). Since then, the researches of Zheng and Farh have greatly promoted the development of this research field. Zheng originally presented a two-dimension model which suggests that showing authority and giving benefit were the main behavioral characteristics of paternalistic leadership (Cheng, 1995). Later, the ternary model was proposed, which argued that authoritarianism, benevolence and moral leadership were the three dimensions of paternalistic leadership (Farh & Cheng, 2000). Among them, benevolence emphasizes that leaders show their individuality and care about subordinates and their family happiness; moral leadership emphasizes leadership by demonstrating excellence in character and integrity; authoritarianism emphasizes strong control over subordinates and demands that they must obey orders absolutely. This model lays an important foundation for the follow-up study of paternalistic leadership. In the process of understanding the paternalistic leadership, scholars have also discussed the mechanism and process that this leadership style affects subordinates. It has been found that benevolent leadership can inspire subordinates' gratitude which makes them reward leaders and the organization in return; moral leadership behavior can increase subordinates' respect and identification so that they may perform better; authoritarianism leadership can evoke a subordinate's dependency and obedience which lead to supportive behaviors (Farh & Cheng, 2000). Under the theory framework, paternalistic leadership will be very effective when the leaders and subordinates show a kind of fit characteristics, however, if one side refuses to play the predetermined role, it may lead to the contradiction of the superior and the subordinate.

In addition to the above discussions on the concept and content of paternalistic leadership, relevant research results show that paternalistic leadership is widespread among all types of Chinese organizations. Paternal leadership can influence subordinates, for example, benevolent leaders can receive thanksgiving and virtue from their subordinates, moral leadership can stimulate the identification of subordinates, and authoritarian leadership can make subordinate comply to any rules or orders (Cheng et al., 2004; Chen, Eberly, Chiang, Farh, & Cheng, 2014). The existing empirical research can be summarized into the following two categories. The first

category focuses on the impact of paternalistic leadership on subordinates' attitudes, behaviors and performance, with the intention to examine the effectiveness of paternalistic leadership (Gao, 2013). For the subordinates' attitudes toward leaders, existing studies have found that authoritarian leadership may reduce subordinates' loyalty and trust in leaders, but other studies have found that authoritarian leadership can improve the loyalty of subordinates; whereas benevolent and moral leadership mostly have significant positive effects on subordinates' loyalty and trust (Wu, Huang, Li, & Liu, 2012). About the subordinates' attitudes toward the organization, there are also contradictory findings. Some research results show that authoritarian leadership will reduce the subordinate's organizational commitments but other studies have found that authoritarian power has no significant effect on subordinates' organizational commitments; while the results unanimously support the positive effects of benevolent and moral leadership on subordinates' commitment to organization. In terms of the influence on the behavior and performance of subordinates, the conclusions about benevolent and moral leadership are relatively consistent and the relevant research results support their positive impact on subordinates' performance and behavior; however, the research results on effects of authoritarian leadership are not consistent (Gao, 2013). The second category focuses on the mechanism and process how paternalistic leadership plays its roles. It mainly explores the mediating and moderating factors in the process that paternalistic leadership influences relevant outcomes. For example, based on social exchange theory, it is found that loyalty, satisfaction and sense of equity play an important intermediary role between paternalistic leadership and subordinate work performance and organizational citizenship behavior (Liang, Ling, & Hsieh, 2007; Wu et al., 2012). In conclusion, these researches have helped people understand paternalistic leadership more and more.

The measurement of paternalistic leadership went through a process from "simple" to "complex", then to "simple" again. At first, Zheng's research found that it should be measured from both dimensions, showing authority and giving benefit (*Li Wei* and *Shi En* in Chinese), each dimension includes eight dimensions (Cheng et al., 2004). The first dimension includes monopoly power, confidentiality of information, emphasis on obedience, derogatory contribution, indoctrination and reprimand, demand for excellence, image modification and hidden intentions; the latter dimension includes taking care of subordinates, being approachable, keeping discussing and consultation with subordinates, *Mianzi* maintenance, positive rewards, being a good work example, and being fair and impartial (Cheng, 1995). However, such scales are too complicated and not good enough in psychometric criteria. Later, scholars developed a

measurement based on the three-dimension model, which includes three dimensions and 42 items (Farh et al., 2006). Since the scale has too many items, it has been continuously simplified, for example, Farh and his collaborator obtained a scale of 19 items (Farh et al., 2006; Farh, Cheng, Zhou, & Chu, 2012). From then on, the measure of paternalistic leadership achieved a consistent recognition, to some extent.

Concluding from the above discussion, we have established a more stable understanding of paternalistic leadership, the three-dimension structure of paternalistic leaders has received more consistent approval and has also been supported by the empirical results; extant research supports the impact that paternalistic leadership have on subordinates including their attitudes, behaviors and performance; but how these effects actually occur may need more researches to explore the impact of more contextual factors (Farh et al. 2008); most of existing researches studies the impact of paternalistic leadership on subordinates at individual level, more organizational-level reaches are needed to rich the understanding of paternalistic leadership (Pellegrini et al. 2007; Fang Hui et al. 2017).

2.7 Innovation ambidexterity

The term “ambidexterity” originally means that both hands of a person are very flexible and therefore can accomplish two seemingly contradictory tasks at the same time. Later, the organization researchers used "organizational ambidexterity" to describe an organization with such a feature that it can adapt to gradual changes and adapt to radical changes at the same time and believed that such organizations can be more innovative (Duncan, 1976). The organizational ambidexterity theory emphasizes a balance and coordination which aim at the purpose of gaining a sustainable competitive advantage; for this reason, an organization must make reasonable choices and arrangements between continuing the current model and seizing the opportunity of the future (O'Reilly & Tushman, 2013). However, such kind of pursuing seemingly contradictory goals may be a complex and severe challenge for all organizations (Birkinshaw & Gibson, 2004).

The researches on organization ambidexterity in recent years are mainly based on March's Exploration-Exploitation framework (March, 1991). In this model, the exploration is described as a series of activities related to opportunity search, risk taking, experimentation, invention and innovation, with the intention to find new opportunities; while the exploitation describes from another point of view, refers to some activities related to refinement, choice, efficiency,

carrying out and implementation, with the intention of optimizing and improving existing activities (Raisch & Birkinshaw, 2008). Of course, if an organization attaches too much importance to exploration it may face the risk of ignoring the implementation of its current business and thus face the risk of short-term profit reduction; conversely, if it neglects exploration and places too much emphasis on exploitation, its long-term profits may not be obtained, thus leading to development crisis in the future. Based on this idea, organizational ambidexterity provides a possibility for resolving the innovation paradox and therefore has attracted the attention of many scholars (Shen, 2011; Luo, Guan, Zhong, & Zhao, 2017). Although the original organizational ambidexterity does not specifically refer to exploration and exploitation nor is it specifically linked to innovation, after the publish of March (1991) there seems to be a tendency to use it to specifically describe explore and exploit. Because this article emphasizes the innovation of high-tech enterprises, the term of organizational ambidexterity is used consistent with its connotation related to innovation highlighted in the literature.

The research on innovation ambidexterity involves several fields such as organizational learning, ambidextrous context, technological innovation, strategic fit and organizational design (Shen, 2011; Luo et al., 2017). According to the relationship between related variables and innovation ambidexterity, the extant researches can be divided into two major categories. The first category studied the antecedents of innovation ambidexterity, such as organizational structure, behavioral context, senior management integration. For example, from the perspective of organizational structure, all departments within an organization can be divided, some departments focus on exploratory activities and others focus on exploitative activities, and integrate the two aspects through common strategic goals and values, thereby forming an organizational innovation ambidexterity (Tushman & O Reilly III, 1996); from the perspective of behavioral context, some scholars believe that innovation ambidexterity can be realized within the department through various management measures (e.g. performance management) and create a social environment conducive to the realization of innovation ambidexterity, then to achieve exploration and exploitation simultaneously within the department (Gibson & Birkinshaw, 2004); other studies found that high-performance work systems have a significant positive impact on innovation ambidexterity (Patel, Messersmith, & Lepak, 2013); top executive team may promote the realization of innovation ambidexterity by focusing on resource allocation, conflict resolution and structural optimization (Jansen et al., 2005); recent researches show that some leadership traits or styles can promote innovation ambidexterity, for

example, leadership style may influence innovation ambidexterity (Lin & Iii, 2011).

The second category studied the outcomes of innovation ambidexterity, mainly organizational performance and departmental performance. For example, some studies have found that innovation ambidexterity has a significant positive impact on departmental performance, such that high-level innovation ambidexterity can lead to better performance (Gibson & Birkinshaw, 2004); another homochromous study found that the interaction between exploratory innovation and exploitation innovation is positively correlated with sales growth rates, while relative imbalance of the two is negatively correlated with sales growth (He & Wong, 2004); another study found that the relationship between innovation ambidexterity and performance depends on in the network context (Yang & Demirkan, 2007); a recent meta-analysis-based research indicates that the relationship between innovation ambidexterity and performance may be moderated by many factors including contextual and methodological factors (Junni, Sarala, Taras, & Tarba, 2013).

Although there are many relevant studies (Raisch, Birkinshaw, Probst, & Tushman, 2009; O'Reilly & Tushman, 2011; O'Reilly & Tushman, 2013), the innovation ambidexterity measurement is an critical question but people have not a consistent understanding of it (O'Reilly & Tushman, 2013). The main reason may be that there are big differences among the understanding of the concept. Different understanding lead to different methods of measurement and operation. For example, one operation method is to measure exploration innovation and exploitation innovation separately, and then use the absolute value of the difference between them to catch their imbalance, use the product of the two to catch their balance (He & Wong, 2004); another idea is to use the absolute value of their difference to represent the equilibrium relationship, their interaction is caught by the product of the two (Jansen et al., 2005); in the literature, there is also a single dimension method, all the items measured the exploration and exploitation innovation are combined to measure the innovation ambidexterity, this method can reduce information loss to a minimum, so that the measure result become more accurate (Lubatkin, Simsek, Ling, & Veiga, 2006); another method is to sort out the score of exploration innovation and exploitation innovative in descending order, if both scores are higher than the median, the organization can be identified as a ambidextrous organization (He & Wong, 2004). To sum up, the differences among the above measurements and operation methods lie in the difference between two-dimension and one-dimension, in addition, the operation are different accordingly.

Although the existing researches provide some theoretical and empirical evidence for

innovation ambidexterity, in term of many aspects there are still many questions which deserve more in-depth research (O'Reilly & Tushman, 2013). In briefly words, the first is about the definition of innovation ambidexterity. The general understanding of organizational duality is rather vague, typically it means completing two contradictory things at the same time; also, the definitions of exploration and utilization are also ambiguous; therefore, the relevant concepts need to be clearly defined according to specific research questions. The second is about the measurement of innovation ambidexterity. Most empirical studies use the Likert scale to measure duality. Although these scales have good validity and reliability, the specific meanings of exploration and exploitation have not been fully revealed. The third is about the operation of innovation ambidexterity. There are many different methods of operation in the literature， some use the sum of many questions， some use the product of two dimensions， and some think that it should be a unidimensional construct. This is maybe one reason for those contradictory research results. The fourth is about the relationship between top leadership behavior and innovation ambidexterity. Scholar suggested that more researches are needed for understand how leadership behavior affects innovation ambidexterity (O'Reilly & Tushman, 2013).

2.8 High-tech and high-tech enterprises

In the 21st century, information technology and high and new technology began to develop rapidly. The high and new technology has been widely applied in all walks of life, which has made great progress in all fields of the society. The quality of human life has been greatly improved, and the mankind has been in an ushered time brought by high technology. The development brings a beautiful new era. The term High-tech originates from the English word HIGH-TECHNOLOGY, originally referring to high technology. In China, people usually add the word “new”, may be due to the specific stage of development in China, which leads to the results that many high technologies are new for the whole country. Therefore, both high and new technologies have important implications for the development of China, the juxtaposition of new technologies and high technologies is collectively referred to as high technology.

At present, scholars may give different interpretations for "high technology." Li believes that high technology is not equal to technology, but that high-tech and socio-economic activities should be linked together. The close integration and efficient integration of cutting-edge technology, society and economy constitute high-tech (Li, 1998) . Xing Yiqun believes that

those technologies which have high efficiency, high value, and strong permeability are high-tech, they involve all aspects of the economy and society, and can penetrate all fields of humans (Xing, 2000). Hu believes that the advanced scientific and technological development are the basic foundation of the development of high technology, and it can include several different industries such as optoelectronics, software engineering, space technology, communications technology, computer technology and biotechnology (Hu, 2000). Shi Shipeng thinks that high technology is a combination of high technology and new technology, the term “high-tech refers to those advanced technologies with using or inclusion of cutting-edge methods or instrumentation(Shi, 1999).

Surely, high technology and new technology has close relationship with each other, but they are also different from each other. High technology is usually, if not always, a new technology, but new technology is not necessarily high technology. This is because high technology is those original innovation through which cutting-edge technologies that are different from general technologies are formed; while new technologies may only be from the improvements of the existing technology itself and method, hence are not necessarily advanced. High technology must be an original one. It may put influence on relevant technologies, the reform and innovation of the industry field, even the whole economic system. Therefore, high technology has great and important significance for tech-development, the industry and the economic system. While new technology is only the improvement and innovation of the original technology. It is only limited to the related original technology and cannot change the technical direction of the entire industry. Therefore, the involved scope is narrower. In summary, high-technologies refers to those have profound influence on the political, economic, military, and other aspects of a country or a region, and can form an advanced technology group within one or more industries. Therefore, high-and-new technologies are all given strong support by the government of any country.

Given that high-tech enterprises are the major players in high-tech field, it is important to give a clear definition. From the common sense, high-tech enterprises should be those enterprises which produce high-tech products. High-tech products should have some specific characteristics of which the most important one may be that knowledge and technology are the major part of all cost, far exceeding labor and material costs (Chen & Lan, 1999). More formal statement is that high-tech enterprises are authorized and defined by the state. Due to the distinct history and cultural background, different countries may have different standards to authorized and defined high-tech enterprises.

For instance, in the United States, two indicators are used to measure whether an enterprise is a high-tech enterprise. The first indicator is the proportion of R&D personnel. It is the proportion of all scientists, engineers and technicians to all staff. The second is R&D intensity. It is the proportion of R&D cost to the output product. These two indicators can reflect to what extent technology is emphasized in the enterprise. Therefore, all enterprises in a specific industry can be categorized into different categories according to the comparisons between the two indicators of their own and the average level of the whole industry.

The standards in French are mainly based on the product cycle theory which proposes that any product must go through four stages: (1) early stage at which the main research and development of new products are conducted; (2) growth stage at which the market share of new products expands quickly; (3) mature stage at which the enterprise gradually forms a standardized production line; (4) the recession stage at which the product market demand is gradually reduced or replaced by other products. From such a stage-based perspective, if one enterprise produces products which has developed through such four stages, then had high quality, produced by advanced production line, occupied a certain market share, and formed a new branch, it can be called high-tech enterprise (Schumpeter et al., 1934).

In Japanese, the high-tech enterprises are mainly defined by qualitative criteria. High tech enterprises are defined as those that are "resource-saving, high tech density, high level of technological innovation", and "have some certain market share brought by its strong growth momentum, occupy a certain market scale in the future, and will influence other related industries" (Schumpeter et al., 1934).

While, Canada defines high-tech enterprises based on two main methods: (1) department method. A high-tech enterprise is identified by the question whether an enterprise has some departments in which the level of technology can be reflected by the R&D capability, work quality, and R&D funds; (2) comprehensive method. A high-tech enterprise is identified by a comprehensive consideration of the technological level which is based on the sum and proportion of technical staff, engineers, and production labor.

In China, high-tech enterprises are identified and authorized according to the "National Key High Tech Fields" and "High-Tech Enterprise Management Approach" which was revised jointly by the Ministry of Science and Technology, the Ministry of Finance and the State Administration of Taxation of China in April 2008. In the official document, the high-tech enterprises are defined as the enterprises which constantly conduct new product research and development, as well as commercializing new products, run all production and business

activities based on independent intellectual property rights. They should locate their headquarters in the mainland of China (excluding Hong Kong, Macao and Taiwan) and have registered more than one year. They can be divided into two categories including technology-intensive and knowledge-intensive economic entities. In addition, China's high-tech enterprises must meet the following requirements: (1) being legal person qualification; (2) conducting R&D, manufacturing or providing technical services for one or more high-tech industry and relevant products; (3) the proportion of the R&D staff with college or above degree to all staff should be greater than or equal to 30%, the proportion of those engaged in high-tech product R&D to R&D staff should reach 10% or more; (4) the proportion of R&D input in the mainlined China to the total R&D input should be greater than or equal to 60%. The latter two seem to be the virtual and essential requirements for Chinese high-tech enterprises.

In short words, high-tech enterprises can be described from different perspectives. Generally speaking, they are always knowledge and technology intensive; the scientific and technical personnel are the majority of all staff; to obtain high profit through technological innovation and commercialization of scientific and technological achievements. In China, there are eight industries which have been given strong support, such as aerospace technology, new energy and energy saving technology, resource and environment technology, traditional industry transformed by high technology, electronic and information technology, biology and new medical technology, new material technology and high technology service industry. The enterprises compete in these industries have much opportunity to be authorized to be high-tech enterprises.

2.9 Chapter summary

This chapter briefly introduces the concepts closely related to this article such as innovation, technological innovation, technological innovation, high-tech and high-tech enterprises as well as these four key constructs including innovation performance, transformational leadership, paternalistic leadership and innovation ambidexterity by discussing their concept connotations, development histories, measure methods and empirical findings. The limitations and deficiencies about these key constructs are briefly discussed at the end of each section.

Through literature review, it is found that more and more scholars pay more attention to innovation performance and related researches are increasing more, but insufficient attention is

paid to innovation performance related to non-technical process; at the same time, the relationship between leadership style and innovation performance needs to be further studied; the positive effect of transformational leadership seems to be exaggerated in earlier studies and requires more research beyond individual level to better understand the impact of transformational leadership on group processes and organizational processes; the positive effect of paternalistic leadership, especially benevolent and moral dimensions, are supported, but more researches are needed to understand the influence of contextual factors, moreover, it is very necessary to expand researches on paternalistic leadership at the organizational level; for innovation ambidexterity, we need to accurately define the concept, develop more appropriate measurement methods, and conduct more researches to deeply understand the influence of leadership behavior on innovation ambidexterity. The limitations and deficiencies in these fields make the current research have definite theoretical contributions.

Last but not least, business management is strongly contextual (Rousseau & Fried, 2001; Bamberger, 2008) and cultural (Moran & Volkwen, 1992; Farh, Earley, & Lin, 1997; Farh & Cheng, 2000; Weber & Dacin, 2011). So, when exploring the process "leadership-innovation-performance", we need to pay close attention to those key contextual and cultural factors (Den Hartog et al., 1999; Dorman & House, 2004; Winkler & Bouncken, 2009).

As discussed in previous sections, among those internal factors which influence organizational innovation, organizational climate are critical for understanding organizational process and behavior (James & Jones, 1974; Ekvall, 1996; Scott, 1999; Neal, Griffin, & Hart, 2000; Patterson et al., 2004; Patterson et al., 2005; Hunt & Ivergard, 2007). Theoretically speaking, organizational climate provides a context for all organizational members to understand everything in the organization, hence it may have direct effect at several levels and indirect effect on other relationships (Randhawa & Kaur, 2014). Such kind of direct and moderating effect are also supported by empirical evidences (Wang & Rode, 2010; Randhawa & Kaur, 2014). Innovation climate as a kind of organizational climate has the similar nature and effect (Zheng et al., 2009; Ren & Zhang, 2015).

Also, environment dynamism as a critical factor for understanding organizational process describes the speed and predictability of changes in the organization's external environment (Dess & Beard, 1984). It provides critical context for the whole organization (Tan & Litsschert, 1994) and attracts much attention from scholars (Jansen et al., 2005; Pérez-Luño et al., 2014). According to Evolutionary Leadership Theory (ELT), the effectiveness of leadership and leadership behaviors varies with the environment and that their underlying psychological

mechanisms also change with the environment (Osborn, Hunt, & Jauch, 2002; Vugt & Ronay, 2014). In fact, several empirical evidences support that environment dynamism can moderate the effect of leadership (Ensley, Pearce, & Hmieleski, 2006; Hmieleski & Ensley, 2007; Jansen et al., 2009; Pérez-Luño et al., 2014).

The current research aims to explore the process "leadership-innovation-performance" with the emphasis on how leadership influence innovation performance. Mediators and moderators are most useful to give the answers to the "how" questions (Wu & Zumbo, 2008). Therefore, innovation climate as a critical internal factor and environment dynamism as a critical external factor have been used as moderators in the current research instead of as direct antecedents.

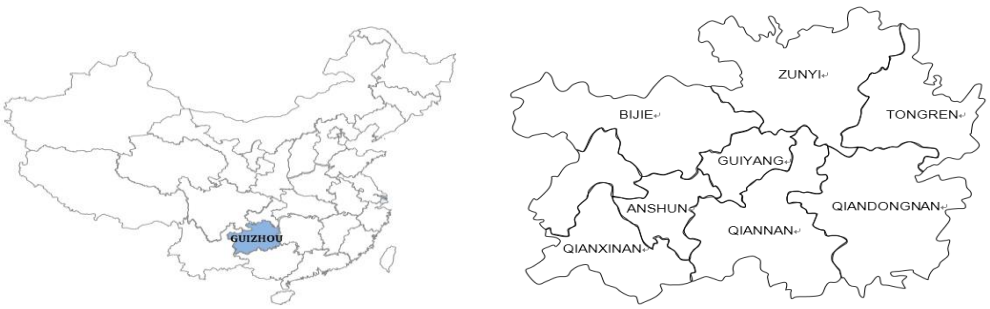
Chapter 3: Study 1: High-Tech Enterprises in Guizhou

This chapter introduces the development of high-tech enterprises in Guizhou province. Comparisons between the high-tech technology enterprises of Guizhou province and the whole country and representative regions are conducted from the angle of input and output of R&D as well as innovation efficiency. On one hand, these analyses can present the context of this current research more comprehensively, which is helpful for readers to understand the research conclusion. On the other hand, these findings inspired a strong motivation for conducting the next study which explore the internal organizational process of organizational innovation.

3.1 Guizhou province

3.1.1 Geographical location

Guizhou, referred to as the "Qian" or "Gui", locates in southwest China, bordering on five provinces including Chongqing, Sichuan, Hunan, Yunnan and Guangxi. Guizhou plays a role of transportation junction for southwest China. In Guizhou, there are nine prefecture-level administrative units including six cities and three autonomous prefectures. The location of Guizhou in China and its nine divisions are described in Figure 3-1. The province's total area is of 176,100 square kilometers. There are 88 county-level administrative divisions. In Guizhou, the west is higher, and the west is lower, the ground surface inclines downward from the central to north, east and south. There are found type of landforms, including plateau, mountains, hills and basins, mostly mountainous plateau, therefore, Guizhou has been known as "plateau accounts for 80%, river 10%, and farmland 10% ". Guizhou is the only province without plain.



Source: Revised based on internet pictures.

Figure 3-1 Guizhou Province of China and Its Nine Prefecture-Level Administrative Divisions

3.1.2 Economic development

According to the statistics of the Guizhou Provincial Economic and Social Development Statistical Communique, an overview of the overall economic development in Guizhou Province can be provided. In 2017 the GDP of Guizhou Province was RMB 1,354.083 billion yuan with an increase of 10.2% over 2016. In terms of different industries, the primary industry added value was RMB 20.078 billion yuan with an increase of 6.7%; the secondary industry added value was RMB 543.963 billion yuan with an increase of 10.1%; the tertiary industry added value was RMB 608.04 billion yuan with an increase of 11.5%. The ratio of the primary industry in the increased GDP is 40.2%; the ratio of the tertiary industry was 44.9%. Per capita GDP of Guizhou was RMB 37,956 yuan with RMB 4,710 more than 2016.

In 2017, Guizhou's fiscal revenue totaled RMB 2,650.02 billion yuan with an increase of 10.1% over 2016. The public budget revenue was RMB 161.364 billion yuan with an increase of 7.2% over 2016. The tax revenue was RMB 117.955 billion yuan with an increase of 10.9%. The public budget expenditure for the year was RMB 460.457 billion yuan with an increase of 8.0% over 2016. Among them education expenditure was RMB 90.351 billion yuan with an increase of 7.1% over 2016; agriculture and forestry water expenditure were RMB 60.126 billion yuan which was 4.5% lower than 2016; social security and employment expenditure was RMB 500.19 billion yuan with an increase of 36.2% from 2016.

In 2017, the number of added employees in urban areas in Guizhou Province was 769,000 with an increase of 1.5% from 2016. Among them, unemployed personnel achieved reemployment of 143,900, and people with difficulty in finding a job reached 78,200. The registered urban unemployment rate was 3.23% at the end of 2017. At the end of the year, 2,495,600 various types of businesses in the market were up 13.4% from the end of 2016. Among them the newly registered businesses were 690,900 were up 89.1% from the end of 2016.

In 2017, the per capita disposable income of all residents of Guizhou Province was RMB 16,704 yuan with a nominal increase of 10.5% from 2016. According to the usual place of residence, the per capita disposable income of urban residents is RMB 29,080 yuan with an increase of 8.7% from the nominal value in 2016; the per capita disposable income of rural residents is RMB 8,869 yuan with a nominal increase of 9.6% from 2016. Per capita consumption expenditure of all residents was RMB 12,970 yuan with an increase of 8.7% over 2016. The per capita living housing space of urban residents is 37.52 square meters and the per

capita living space of rural residents is 34.54 square meters.

3.1.3 High-tech industries

Recent years, the high-tech industries have achieved a constant growth. The number of high-tech enterprises has increased from 382 in 2015, to 478 in 2016, then 826 in 2017. Take the data of 2015 as example to show the development of high-tech industries in Guizhou.

In Guizhou, the high-tech enterprises in aerospace technology and new materials field are relatively concentrated; more investment are put into the Biotechnology field, Aerospace Technology and Electronic and information field; the relative outstanding development is in electromechanical integration, aerospace technology and biological technology field; especially in the optical and electrical integration fields, more patents were authorized.

In the provincial capital (Guiyang city) of Guizhou, approved by the State Council of China, a national high-tech industrial development zone has been established in 1992. In the zone, there are enterprises engaged in optical-mechanical-electronic integration, new energy industry and national pharmaceutical industry. There have built 8 academician workstations, gathered a total of 11 academicians, four "Thousand People Plan" experts, more than 30,000 high-tech employees. Both the zone, these enterprises and these experts construct the important foundation for the development of high-tech enterprises in Guizhou Province.

Although the development of high-tech industry in Guizhou has made some achievements, there are still some problems that cannot be ignored. Such as the ability of independent innovation of high-tech enterprises is not strong, there is still a lack of core technology, the level of comprehensive utilization of resources is not high.

3.2 Input-output analysis of high-tech enterprise in Guizhou

To achieve a clear and complete understanding of the high-tech enterprises in Guizhou and its position in China, comparisons of the numbers of high-tech enterprises and R & D institutions among Guizhou province, western region and the whole country have been conducted at first.

Considering the data integrity, taking 2015 as an example because the data of 2016 and 2017 are incomplete, based on the data of the 31 provincial-level administrative regions in mainland and those 10 provincial-level administrative regions in western region, we can see that there is a great different between Guizhou and the provincial either of the mainland China

or of other regions. The below results in this chapter are all based on the data of 2015.

In term of the number of high-tech enterprises, there are 29,631 high-tech enterprises in the mainland of China, with the provincial average of 955.84; and 3,104 high-tech enterprises in the western region, with the provincial average of 310.4; while in Guizhou, there are only 226 which is much lower than the average either of mainland or of western region.

In term of the number of R&D institutions, there are 11,265 R & D institutions in the mainland of China, with the provincial average of 363.39; there are 824 R & D institutions in the western region, with the provincial average of 82.4; while in Guizhou, there are only 63 which is much lower than the average of mainland, and obviously lower than the average of western region.

Technological innovation cannot be achieved without a certain amount of resources. The most input resources may include human and capital input, while the output may include patents and relevant indicators.

3.2.1 Input analysis

The input of innovation resources mainly includes two types, human input and capital input.

3.2.1.1 Human input

Human input is usually indicated by full time equivalent of R&D personnel, that is the sum of the full-time equivalent of R&D project staff and the full-time equivalent of the R&D project managers and direct service. The full-time equivalent of R&D project staff is the sum of three types of participants including basic researchers, applied researchers and experimental researchers; the full-time equivalent of the R&D project managers and direct service should be assessed according to the ratio of the full-time equivalent of R&D project staff to the full-time equivalent of all people. The unit of full-time equivalent is per person per year.

The comparison among the full-time equivalent (one year) of R&D personnel of Guizhou, the provincial average of mainland China and the provincial averages of four regions of China are depicted in Figure 3-2. The provincial average of mainland China was 23,451, the provincial average of four regions are 60,937 in eastern region, 10,531 in middle region, 6,317 in western region, 6,867 in northeast region, and 6,372 for Guizhou. The data show that full-time equivalent (one year) of R&D personnel of Guizhou just over the western region, but lower than the average level of all other regions as well as the provincial average of mainland China.

The provincial average of the eastern region is the highest, obviously higher than other regions. There is a big difference between eastern region and other regions, in terms of the input of R&D personnel.

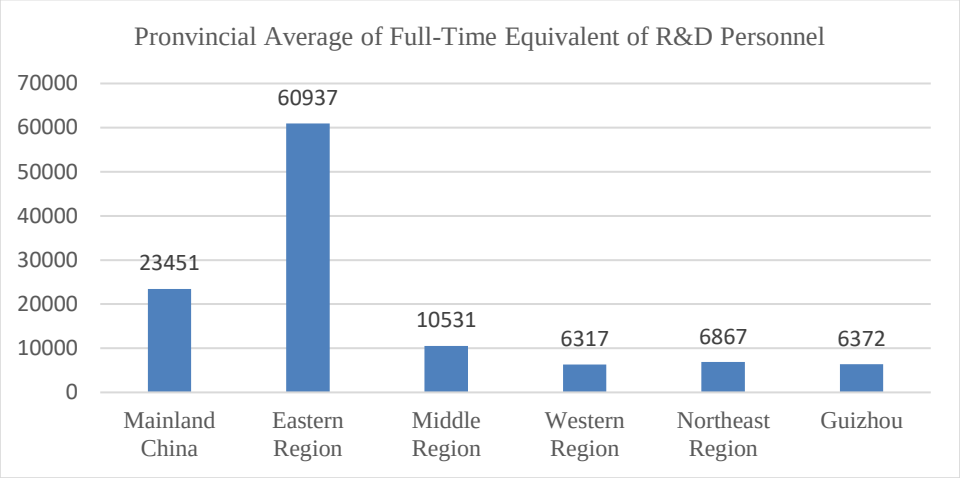


Figure 3-2 The Provincial Average of Full-Time Equivalent of R&D Personnel of Guizhou, Mainland China and Other Regions

The comparison between Guizhou and the other 30 provinces is shown in Figure IV-1 in Appendix IV. Guangdong Province has the highest level of the equivalent of personnel, while Guizhou ranks twentieth, at relatively low level.

3.2.1.2 Capital investment

Capital investment is mainly high-tech enterprises R&D funding. The following is a comparison of the provincial average R&D among mainland China, four regions and Guizhou (see Figure 3-3).

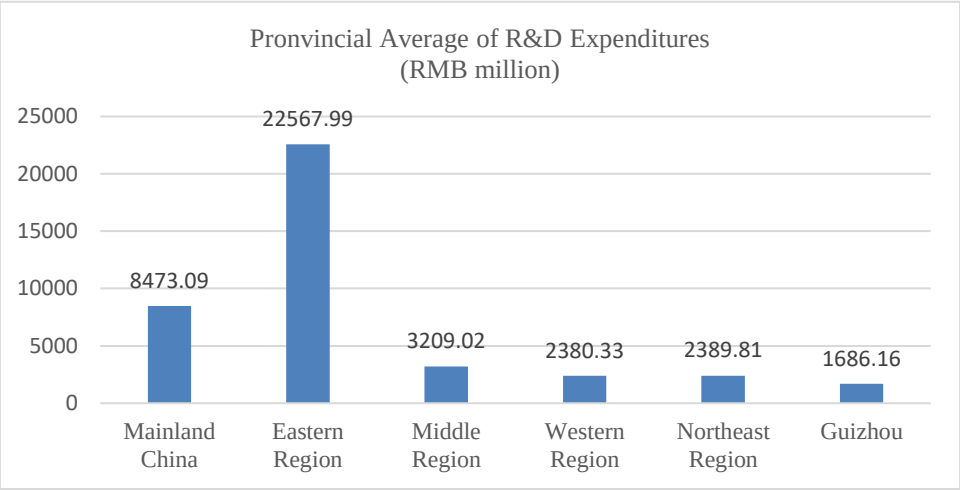


Figure 3-3 The Provincial Average of R&D Expenditures of Guizhou, Mainland China and Other Regions

We can see from Figure 3-3, the provincial R&D expenditure of mainland China is about 8,473 million, about 22,567 million in eastern region, 3,209 million in middle region, 2,380 million in western region, 2,390 million in northeast region, 1,686 million of Guizhou. Obviously, the capital investment of Guizhou is the lowest one, much lower than the provincial average of eastern region as well as the provincial average of mainland China.

The comparisons among Guizhou and other 30 provinces are depicted in Figure IV-2 in Appendix IV. The first is Guangdong province in terms of R&D expenditure, while Guizhou is the twentieth one at a relatively low level.

3.2.2 Output analysis

The technological innovation achievement of a region can be described by the output indicators which are also external performance of technological innovation ability. The common indicators include the number of authorized patents, the number of effective patents and new product sales revenue.

3.2.2.1 The number of authorized patents and effective invention patents

The patent numbers are important indicators to measure technological innovation output of high-tech enterprises. The number of authorized patents refers to the patents which have passed the examination of administrative department, then to be granted the patent right, patent certificate. Effective patents are those authorized patents which have been paid for the normal maintenance in a timely manner and have not exceeded the legal protection period.

The comparisons among the number of authorized patents of Guizhou and other regions are shown in Figure 3-4. Obviously, the provincial average number of authorized patents of eastern region is the highest one (13617) which is much higher than the average of mainland China (5112), while the number of Guizhou is only 1122, far below the average of mainlined China and the average of eastern region, and a little lower than the separate averages of middle, western and northeast regions.

The comparisons among Guizhou with the other 30 provinces are shown in Figure IV-3 in Appendix IV, which indicates that the number of authorized patents of Guizhou province ranks nineteenth in the 31 provinces, at a very low level.

The comparison among the number of effective patents of Guizhou and other regions are shown in Figure 3-5. Provincial averages of effective patents of mainland China is 7787. The eastern region is the highest, with the provincial average of 22649. While Guizhou is 1645,

much lower than the average of eastern region and mainland China, and similar with western and northeast regions.

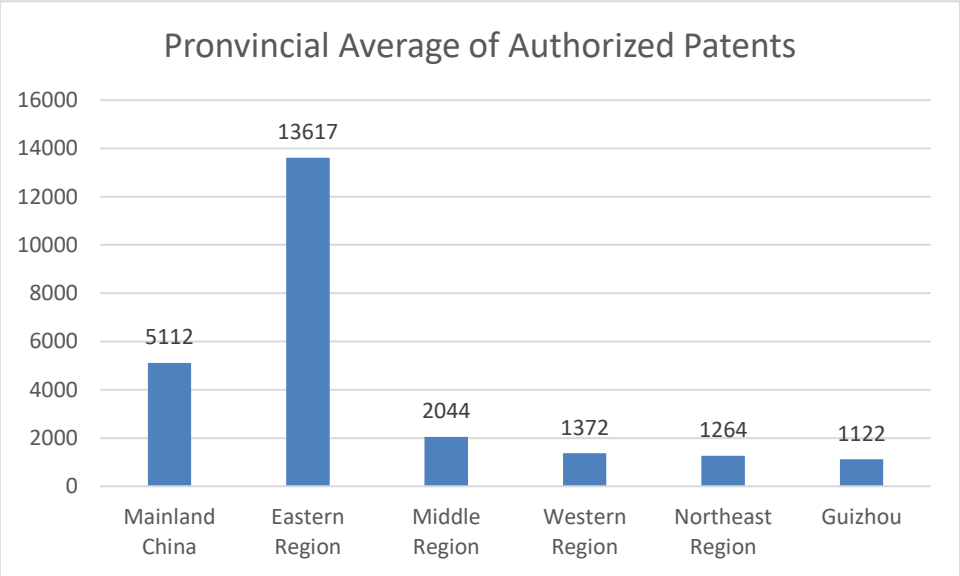


Figure 3-4 The Provincial Average of Authorized Patents of Guizhou, Mainland China and Its Regions

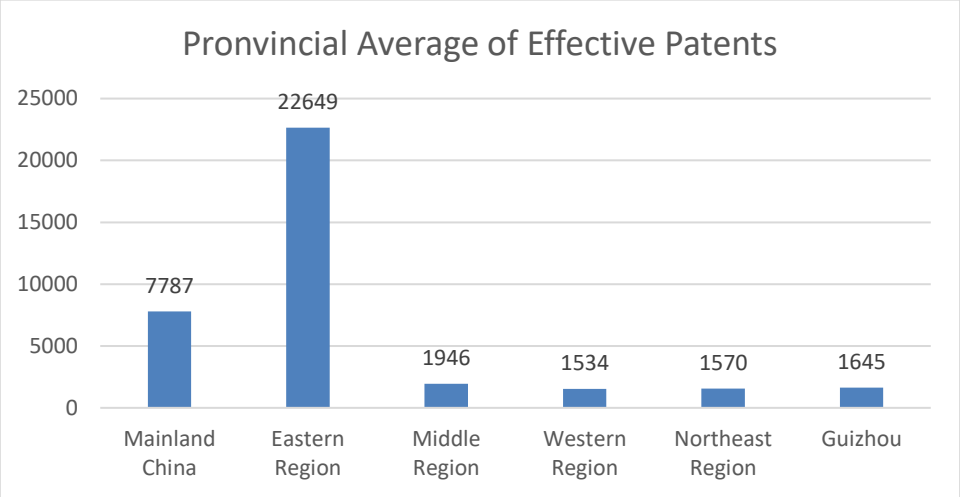


Figure 3-5 The Provincial Average of Effective Patents of Guizhou, Mainland China and Its Regions

The results of comparisons among the number of effective patents of Guizhou and those of other 30 provinces are shown in Figure IV-4 in Appendix IV. The number of effective patents of Guangdong province ranks the first, while Guizhou ranks the seventeenth. Compared with the first one, the number of effective invention patents of Guizhou is very small.

3.2.2.2 Sales revenue of new products

New product sales revenue refers to how much the enterprise gets the sale from sales of new products in the main businesses and other businesses. The addressed point is that the sales

revenue should from new products.

The comparisons among the new products sale revenue (RMB, 10,000) of Guizhou and the provincial average of other regions are shown in Figure 3-6. It shows that new product sales of Guizhou are much smaller that the provincial average of mainland China, eastern region and middle region. In terms of provincial average, Guizhou lags of all the regions.

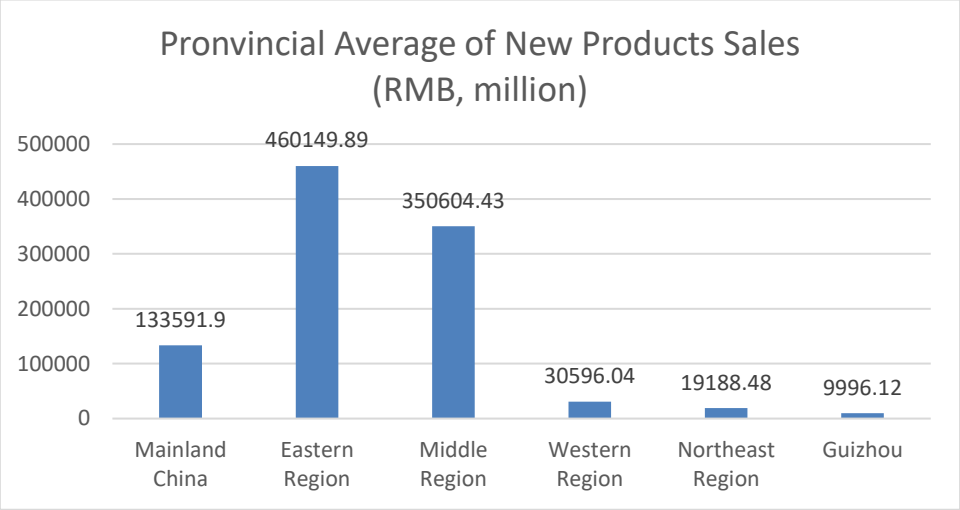


Figure 3-6 New Products Sales Revenue of Guizhou and Provincial Average of Other Regions

The comparisons among the new product sales revenue of Guizhou and those of other provinces are shown in Figure IV-5 in Appendix IV. Although Guizhou ranked in the twentieth in 31 provinces, the value is very low.

In concluding, the development of high-tech in Guizhou is still relatively underdeveloped, which are demonstrated by comparisons between relevant indicators of Guizhou and the provincial average of other regions and comparison between relevant indicators of Guizhou and other 30 provinces. Therefore, much attention needs to be paid to the development of high-tech enterprises of Guizhou.

3.3 Innovation efficiency analysis

In this section, several ratios will be compared among Guizhou and the provincial average of mainland China and other regions. Based on the available data, four rations are analyzed to find out the position of Guizhou in terms of innovation efficiency. The four rations are Patents/RD expenditure, Patents/RD personnel, Sales/ RD expenditure and Sales/Patents.

3.3.1 Patents/RD expenditure

The above analyses show that both R&D input and output are at relatively lower level comparing with the provincial average levels of mainland China and other regions. However, the ratios of patents/R&D expenditure (see Figure 3-7) show some interesting and important results. The ratio of patents/R&D expenditure reflects how many effective patents a million of R&D expenditure can produce.

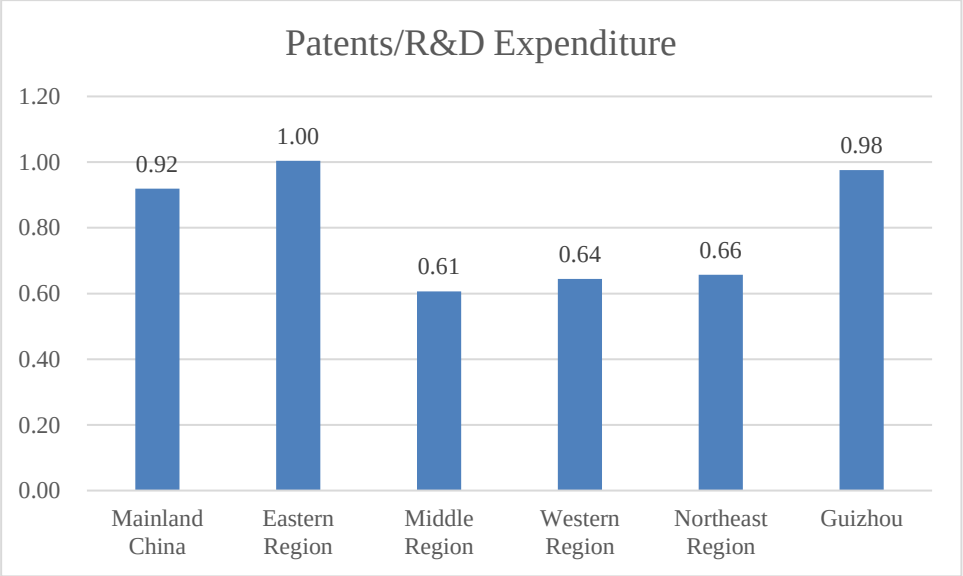


Figure 3-7 Patents/R&D Expenditure of Guizhou and Provincial Average of Other Regions

Eastern region has the highest ratio (1.00) of patents/R&D expenditure. The ratios of patents/R&D expenditure of Guizhou is 0.98 which is a little higher than the provincial average in mainland China with the ratio of 0.92, only a little lower than that of eastern region with the ratio of 1.00. The ratios of patents/R&D expenditure of Guizhou is much higher than the other three regions with the ratios of 0.61, 0.64 and 0.66 respectively. The ratio of patents/R&D expenditure reflects that how many patents a unit of R&D expenditure can produce. So, the above results show that the use of R&D expenditure in Guizhou has high level of efficiency, even next to the provincial average of eastern region of China. In fact, these results show a surprise, therefore, more deeper analyses are needed.

3.3.2 Patents/RD personnel

The ratio of patents/R&D personnel describes how many effective patents a unit of human input can produce. The results are presented in Figure 3-8. Similarly, the ratios of patents/R&D personnel show similar results as those reported in previous section.

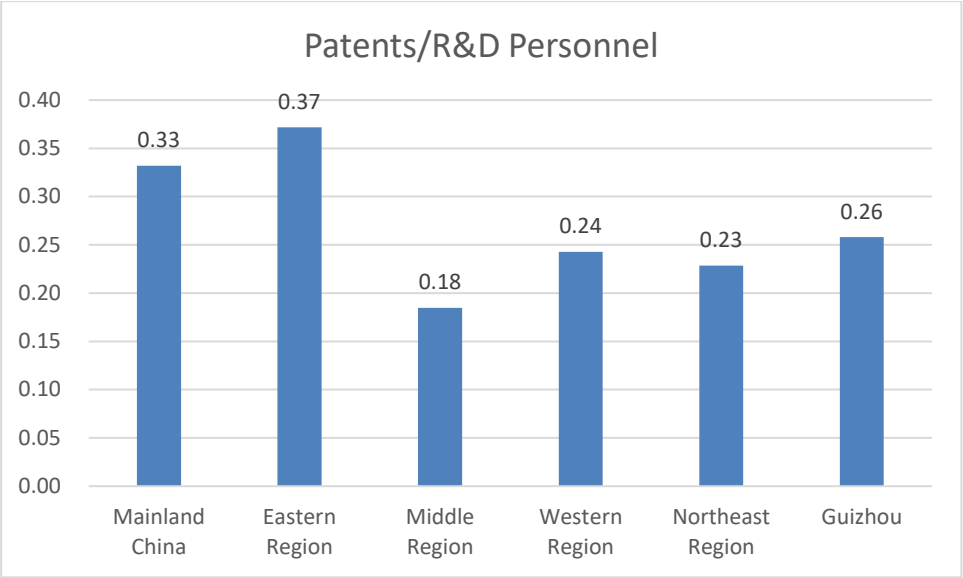


Figure 3-8 Patents/R&D Personnel of Guizhou and Provincial Average of Other Regions

Eastern region has the highest ratio of 0.37, followed by the mainland China with the ratio of 0.33. The ratio of patents/R&D personnel of Guizhou is 0.26 which is lower than the provincial average in mainland China and the provincial average of eastern region. However, the ratio of Guizhou is higher than the provincial average of western and northeast region with the ratios of 0.24 and 0.23 respectively, and much higher than the average of middle region with the ratio of 0.18. So, the above results show that the use of R&D human in Guizhou also has higher level of efficiency.

3.3.3 Sales/ RD expenditure

The ratio of sales/R&D expenditure reflects how much sales from new products a unit of R&D expenditure can produce. Of course, there is a long process from the R&D expenditure to the sales from new products. Based on the results from the above two sections (3.3.1 and 3.3.2), the comparisons of the ratios of sales/R&D expenditure can demonstrate more about the innovation efficiency differences among different regions of China.

The comparison results are depicted in Figure 3-9. The middle region has the highest ratio of 109.26, which means that a million R&D expenditure can produce 109.26 million sales from new products. While, the ratios of other regions are much lower with 17.16 for mainland China, 20.32 for eastern region, 19.95 for western region, 12.22 for northeast region and 6.08 for Guizhou. The ratio of Guizhou is the lowest one among the six, much lower than the highest one.

To here, people may be wondering why Guizhou has so high ratios of patents/R&D

expenditure and patents/R&D personnel, but has so low level of ratio of sales/R&D expenditure. Keep this in mind, the ratios of sales/patents are compared.

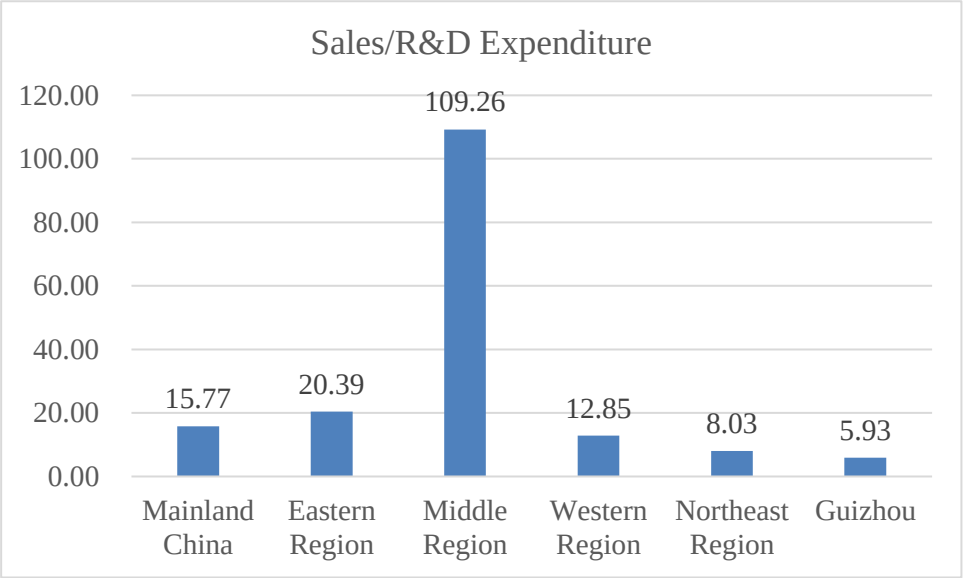


Figure 3-9 Sales/R&D Expenditure of Guizhou and Provincial Average of Other Regions

3.3.4 Sales/patents

The ratio of sales/patents reflects how much sales from new products can one effective patent can produce. The comparison results are presented in Figure 3-10.

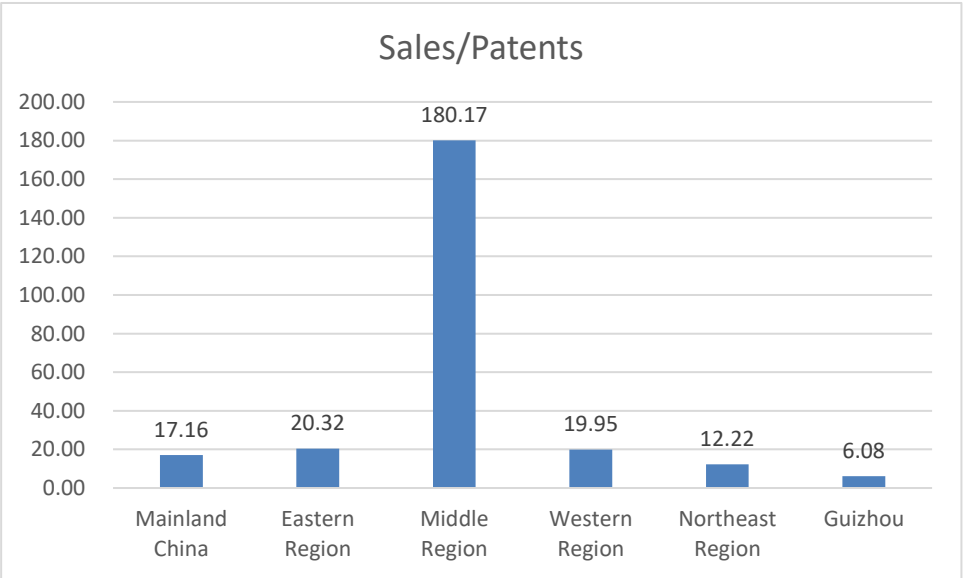


Figure 3-10 Sales/Patents of Guizhou and Provincial Average of Other Regions

Again, the middle region has the highest ratio of 180.17, which means one effect patent can produce 180.17 million sales from new products. The ratio is 17.16 for mainland China, 20.32 for eastern region, 19.95 for western region, 12.22 for northeast region, and 6.08 for

Guizhou. Obviously, Guizhou has the lowest ratio of sales/patents, which is only about one thirtieth of middle region and about a third of mainland China.

3.4 Summary of this chapter

In this chapter, the brief introduction of Guizhou is given at first, including its geographical location, economic development, and overview development of high-tech enterprises. Then, from the aspects of input, output and innovation efficiency, the relevant data of Guizhou Province are compared with those provincial averages of the Chinese mainland, eastern region, middle region, northeast region and western region. At the same time, if available, the relevant data of Guizhou Province are compared with those of other 30 provinces. These comparisons describe the development situation of high-tech enterprises in Guizhou and inspire people to think more about the innovation of high-tech enterprise in Guizhou.

The data demonstrate some interesting and important results. In terms of R&D input and output, Guizhou positions at a relatively low level among the compared regions. The R&D personnel is very close to the lowest one, just a little higher than the lowest of western region. The R&D expenditure is the lowest one. Both the authorized patents and the effect patents of Guizhou take a very low position in the comparisons among the six different regions. Unexpectedly, the sales from new products of Guizhou is still the lowest one in the six.

The results about input and output are all about the absolute figures without taking different data into consideration together. Then, the comparisons among these four ratios including Patents/RD expenditure, Patents/RD personnel, Sales/ RD expenditure and Sales/Patents provide unexpected, interesting and important results. Guizhou has relatively high ratios of patents/R&D expenditure and patents/R&D personnel. However, it has the lowest level of ratios of sales/R&D expenditure and sales/patents. As reviewed in chapter 2, organizational innovation is a complex process from the innovation idea to the final market success. From this process perspective, we can see the transformation from R&D input to output as process which includes two stages, the one is from R&D personnel and expenditure to patents, the other is from patents to new products and relevant sales. According to March's Exploration-Exploitation framework (March, 1991) in which the exploration emphasizes the process of seeking new opportunities while the exploitation addresses the optimization and improvement of existing activities (Raisch & Birkinshaw, 2008), the process from R&D input to new patents is a kind of exploration, while the process form patents to the sales of new products is a kind of

exploitation. From this perspective, obviously, Guizhou has a higher efficiency at the first process, while has a very low efficiency at the second process. Referencing to the original meaning of ambidexterity, innovation ambidexterity means the organization which can conduct both exploration and exploitation equally well at the same time. If one organization just can perform exploration or exploitation, its innovation ambidexterity should be at low level. Therefore, at the provincial level, the high-tech enterprises of Guizhou show a lower level of innovation ambidexterity.

On one hand, these results demonstrate that development of high-tech enterprises of Guizhou province is far lower than the average level of mainland China and the provincial average level in all regions. The high-tech enterprises in Guizhou Province have a large catch-up space. And much more attention should be given to the development of high-tech enterprises of Guizhou. On the other hand, these results inspire people to know more about the internal organizational process among those high-tech enterprises in Guizhou. Based on the previous discussion in chapter 1 and literature in chapter 2, the next study aims to explore more deeply into the internal organizational process.

Chapter 4: Study 2: The Role of Leadership in Innovation

4.1 Theory and hypotheses

Based on literature review about paternalistic leadership, transformational leadership, innovation ambidexterity, innovation climate, environment dynamism and innovation performance, the research model (see Figure 4-1) has been proposed. The basic paradigm for the framework is the Leadership-Conduct-Performance paradigm, and the hypotheses are drawn from the framework and based on relevant literature.

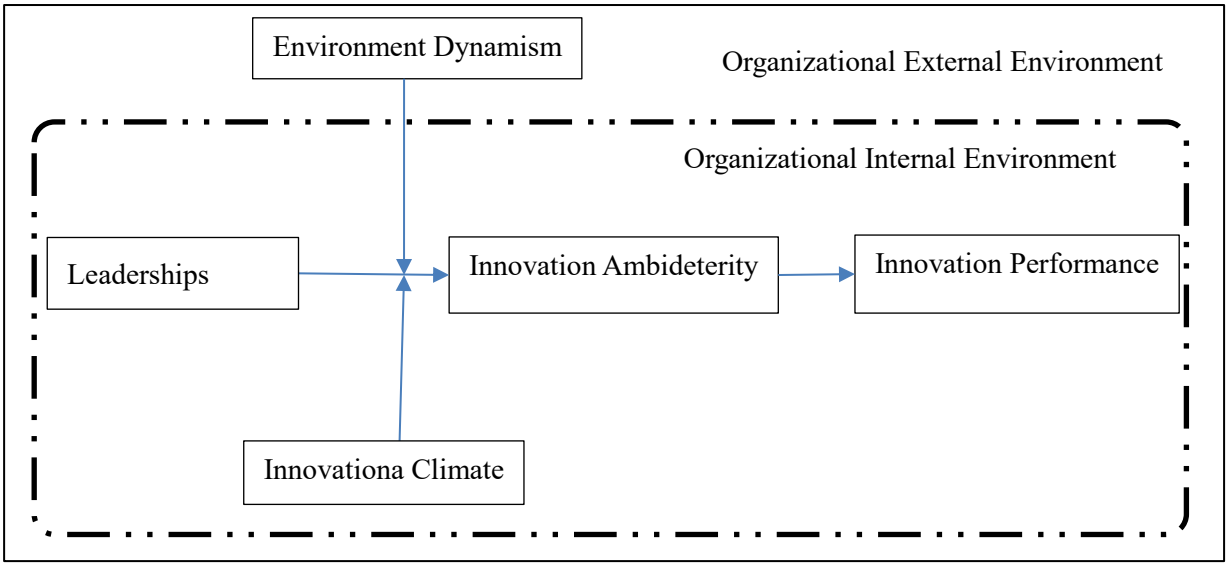


Figure 4-1 The Research Model

4.1.1 Leadership and innovation ambidexterity

The innovation behaviors of enterprises can be divided into two categories, exploratory innovation and exploitative innovation, or development-based innovation and utilization-based innovation. Exploratory innovation is to acquire and create new knowledge without relying on the existing knowledge. The exploitative innovation emphasizes the integration, adjustment and change of existing knowledge existing in the enterprise (He & Wong, 2004). Research on innovation has found many factors that affect innovation (Damanpour, 1991; Mumford, Scott, Gaddis, & Strange, 2002). For example, the organizational members' personalities, their technical knowledge, their expertise and motivation at individual level, the task structure, the

type of communication and the extent of autonomy at the team level, as well as the strategy structure, organizational culture and organizational climate at the organization level. In an environment where the complexity of the work process has increased and external competition has become more intense the influence of organizational top leaders on organizational innovation has become increasingly prominent (Dess & Picken, 2000). From the systematic perspective of organizational theory, any organization is a subsystem of a more macro system (Scott & Davis, 2007). The leaders of the organization understand environmental information and adjust internal organizational activities, thus acting as important mediators for internal and external exchanges of information and energy (Hambrick, 2007). Therefore, different leadership styles have important influence on the internal activities of the organization, including but not limited to innovative behavior (Zheng et al., 2016). Leadership is one of the important factors that influence employees' innovation behaviors and innovation performance (Jung, 2001). Leaders can improve employees' innovation through various direct or indirect ways, and finally to promote the innovation across the organization. For example, some studies have found that leaders can inspire employees' intrinsic motivation and high-level needs, and the both are important sources of innovation (Tierney, Farmer, & Graen, 2010a); other studies have found that leaders can shape a kind of organizational climate conducive to innovation that allows organizational members to try new ideas without worrying about possible failures and penalties, thereby promoting innovation behaviors of both of the organizational members and the organization as a system (Amabile, Conti, Coon, Lazenby, & Herron, 1996). As mentioned above, transformational leadership and paternalistic leadership are the two most prominent leaderships in leadership research field today, but they all require more in-depth researches at the organizational level, especially their relationships with organizational innovation (Diliello & Houghton, 2006; Bouhali, Mekdad, Lebsir, & Ferkha, 2015; Zacher & Rosing, 2015; Alhusseini & Elbeltagi, 2016; Schuckert, Kim, Paek, & Lee, 2018).

4.1.1.1 Transformational leadership and innovation ambidexterity

In recent decades, much attention has been given to transformational leadership in leadership research(Qu et al., 2015; Chen et al., 2016; Schmitt et al., 2016; Zheng et al., 2016; Ng, 2017). The main characteristics of transformational leadership or its connotation includes leadership traits and behaviors, such as idealized influence (including both the traits and behaviors), inspirational motivation, intellectual stimulation and individualized consideration. These can directly or indirectly increase the creativity of employees and then increase organizational innovation. Extant researches indicate that transformational leadership may have

effect on outcomes at several levels. At the individual level, transformational leadership influences many outcome variables including innovation behavior and innovation performance through five key mechanisms, including affective mechanisms, incentive mechanisms, identification mechanisms, social exchange mechanisms, and justice enhancement mechanisms (Ng, 2017).

Transformational leadership guides organizational members to define work goals, identify problems and propose solutions by defining a work environment (Amabile, 1998). In the process, leaders describe the vision of long-term growth rather than short-term benefits to motivate individual employees to engage in the innovation process and create a collaborative effort to innovate (Amabile et al., 1996; Amabile, 1998). Leaders are the creators of organizational culture (Schein, 1985, 1996), so transformational leaders can promote organizational innovation by creating an organizational culture that stimulates learning and innovation (Yukl, 2006). Leaders are the designers and executive supervisors of the organization system, transformational leaders may inspire the intrinsic motivation needed for innovation through the establishment of favorable and innovative management systems such as human resource management systems and reward systems, finally to strengthen the innovation at both employees levels and the organizational level (Mumford & Gustafson, 1988; Mumford et al., 2002; Mumford & Hunter, 2005).

Based on this micro-mechanism at the individual level, it is reasonable to speculate that at the organizational level, transformational leadership has an important influence on organizational innovation process and innovation performance. Lots of researches indicated that there should be tight connection between leaders (including leadership behaviors and styles) and organizational innovation (Mumford et al., 2002). Empirical research findings indicate that transformational leadership has a significant effect on innovation ambidexterity (Zheng et al., 2016) and can strengthen organizational innovation through social capital (Chen et al., 2016). So, it can be assumed that:

H1: Transformational leaders have a positive effect on innovation ambidexterity.

4.1.1.2 Paternalistic leadership and innovation ambidexterity

Paternalistic leadership is based on the Confucian idea embedded in Chinese cultural background and consists of three dimensions: morality, benevolence and authority (Farh & Cheng, 2000). This three-dimensional structure is also supported by many empirical studies (Pellegrini & Scandura, 2007). Farh and Cheng's research pointed out that Chinese culture

emphasizes “Virtue” and “Morality” (Farh & Cheng, 2000). The leader’s morality shows that he is public, has no favoritism, does not use formal power for personal gain, and does not prey on the interests of others. Benevolent emphasizes that the leader’s individual, comprehensive and long-term care given to their followers. Authoritarian emphasizes more on the shock and mastery of subordinates. The existing literature on paternalistic leadership and the relevant empirical results show that the morality and benevolence usually have positive effects on many individual and organizational outcomes, while authoritarian may have negative effect or an insignificant effect (Pellegrini & Scandura, 2007).

The benevolent leadership emphasized the leader's concern and support for subordinates' work and life (Farh & Cheng, 2000; Farh et al., 2008). An important value of Chinese traditional culture is the ideology of reciprocity and retribution, and this is the ideological foundation of the effectiveness of benevolent leadership (Cheng, 1995; Farh & Cheng, 2000). Judging from the social exchange theory (Emerson, 1976) the concern of the benevolent leadership to subordinates can inspire subordinates' trust and gratitude to the leaders and increase their satisfaction with the leadership and organization so that the members of the organization can better concentrate their energy on their work. Therefore, it has a significant effect on improving the attitude of subordinates and improving their work performance (Farh et al., 2008). The benevolent leadership will also help the subordinates beyond work affairs. Such kind of social interactions usually make employees reward with concrete practical actions. They will be more responsible and more willing to invest time in the work. Their work skills and work experience are thus getting better improvement (Deci & Ryan, 1985). Under the context, they are more likely to produce innovative thinking results driven by internal motivation. All in all, the gratitude for benevolence, the trust in leaders and the appreciate feeling for the leaders, the satisfaction with the organization, and the focus on work are positive factors for positive innovation, therefore, the positive effects of benevolent leadership at the individual level will accumulate and will eventually produce positive results for the organization and organizational innovation. Empirical research results also support this logic, for example, a study based on 159 companies found that benevolent leadership has a significant positive effect on innovation ambidexterity (Fu et al., 2012).

The moral leadership emphasizes that leaders should be as an example, and the positive influence of moral leadership on subordinates and the organization was supported by many empirical studies (Liang et al., 2007; Fu et al., 2012; Gao, 2013; Chen et al., 2014; Zhang et al., 2017). In traditional Chinese thought, morality is very respected. A person with a noble morality

is more likely to be respected by people around them. Morality's constraining force on people is even stronger than the law's mandatory force. The respect for leadership based on leaders' virtue can awaken the moral perception of subordinates and organizational members, thus allowing them to deal with work and organization at a higher moral level. This is already a high level of social exchange (Gao, 2013). The moral leadership reflect the excellent qualities of leaders such as being example and impartiality. These qualities make it easier for subordinates and organizational members to respect and identification to leaders (Cheng et al., 2004; Farh et al., 2008). The moral leadership helps to establish a good leadership image for the organizational members so that the organization can avoid authoritarian suppression and private favoritism (Farh & Cheng, 2000), then the organizational members will have higher level of satisfaction, trust and loyalty with the leadership and organization, which leads to higher organizational commitment. Under the influence and aspiration of the virtues of the moral leadership, the members of the organization will be willing to engage in work tasks, not even considering whether they are within their responsibilities and whether they can be rewarded (Niu, Wang, & Cheng, 2010). The above discussion shows that the moral leadership can motivate the organizational members to invest more in their work to promote the favorable factors of the innovation ambidexterity. Some empirical studies also support this inference. For example, a study based on 159 companies found that the moral leadership has a significant positive effect on innovation ambidexterity (Fu et al., 2012).

Authoritarian leadership emphasizes the absolute authority and the rigorous control over subordinates and demands absolutely obedience, and the mechanism may include control, derogatory, image modification and monopoly rights (Cheng et al., 2004). The effectiveness of authoritarian leadership is based on traditional Chinese culture (Schwartz, 2003), including respect for authority in traditional Chinese society, acceptance of hierarchical management monarchy and three-obedience and four-virtues (San Cong Si De in Chinese) (Zhang, 2004). However, due to the influence of western culture and socialist ideology, the traditional Chinese traditional ideology has been undermined and authoritarian leadership may have lost its ideological foundation for effectiveness (Tsui, Wang, Xin, Zhang, & P. P., 2004). Authoritarian leadership seems to be no longer welcome in modern Chinese society (Farh et al., 2008). Judging from the intrinsic connotation of authoritarian leadership, its effect is based on possible rewards from obedience or possible punishment from disobedience, but there is a lack of emotional communication (Wu et al., 2012). Under such an action mechanism, authoritarian leadership may undermine the satisfaction of subordinates and members of the organization,

and reduce the level of their organizational commitment (Farh & Cheng, 2000; Wu et al., 2012) and organizational citizenship (Zhang & Huai, 2012), ultimately having a negative impact on organizational innovation ambidexterity. The sense of fear caused by authoritarian leadership is incompatible with the tolerance and freedom required for innovation (Farh & Cheng, 2000). Under authoritative leadership, the harsh and obedient pressure made organizational members not dare to try new methods to avoid the potential troubles, following rules and regulations becomes the best choice under such circumstances, finally becoming lazy to innovate (Farh & Cheng, 2000). Considering that the current research situation is in high-tech enterprise, the employees are mostly highly educated intellectuals and even include many highly educated talents such as masters and doctors. The above process may be more pronounced. The cumulative effects from individuals will eventually weaken the organizational innovation ambidexterity. In fact, the negative relationship between authoritarian leadership and innovation has also been supported by some relevant empirical results, for example, a study in the context of China found that authoritarian leadership hinders product innovation (Fu et al., 2012).

According to the leadership (Tierney, Farmer, & Graen, 2010b), the nature of paternalistic leadership, and the research results of related to paternalistic leadership and innovation (Fu et al., 2012), we can make assumptions:

H2: Paternalistic leadership has significant effect on organizational innovation ambidexterity. Specifically:

H2a: Benevolent leadership has positive effect on organizational innovation ambidexterity.

H2b: Moral leadership has positive effect on organizational innovation ambidexterity.

H2c: Authoritarian leadership has negative effect on organizational innovation ambidexterity.

4.1.2 Innovation ambidexterity and innovation performance

Organizational innovation ambidexterity describes the characteristics of organizations that can simultaneously implement progressive and breakthrough changes (Duncan, 1976). The relationship between innovation ambidexterity and innovation performance can be understood from two closely related but different aspects. First, exploration and exploitation innovation should have positive effect on organizational innovation performance. Exploitative innovation focuses on the creative combination and use of existing knowledge, and can fully improve the efficiency of resource use (Atuahenegima & Murray, 2007), it can usually produce immediate

and deterministic innovation performance (March, 1991). Exploratory innovation enables companies to quickly understand potential market needs, application of new technologies and new market dynamics, and to deepen understanding of these information, to develop new markets, new patents, and market segments, adopt new business management technologies, finally to gain competitive advantage in market competition (March, 1991; Atuahenegima & Murray, 2007). This view is also supported by many empirical results, for example, a study based on 33590 corporate data found that exploratory and exploitative innovations have a significant positive effect on organizational innovation performance (Popadić Černe and Milohnić 2015).

Second, as an integrated system innovative ambidexterity should have a significant positive effect on organizational innovation performance. From this perspective, scholars have studied the binary dimension equilibrium (BD) and the combined dimension of ambidexterity (CD) (Cao, Gedajlovic, & Zhang 2009). The innovation dualistic equilibrium describes the organization's ability to maintain a relatively balanced relationship between exploration and exploitation in order to avoid a huge gap resulting from a kind of situation in which one factor greatly exceeds another; otherwise, when the organization places too much emphasis on exploitation it may become trapped in so-called the trap of success which are not conducive to future development; on the contrary, if too much emphasis is placed on exploration the organization is easy to fall into the so-called failure trap. Scholars tend to think that the equilibrium or balance of innovation ambidexterity is positively correlated with innovation performance, while the imbalance is negatively correlated with innovation performance (He et al. 2004). The combined ambidexterity describes the state that exploratory and exploitative innovation supplement and promote each other. Starting from the original definition of innovation ambidexterity, the balanced perspective is a more reasonable; but as a description of organizational characteristics, the combined perspective also has its own rationality.

Concluding from the above discussion, one hypothesis has been proposed:

H3: Innovation ambidexterity has positive effect on organizational innovation performance.

4.1.3 Moderating roles of innovation climate

As an important internal factor, organizational climate refers to the organization members' common and overall perception of the organizational environment (Thumin & Thumin, 2011; Schneider et al., 2013). The general factors (such as team cohesion, support, autonomy, rewards, and leadership behaviors) of organizational climate are the key factors which can promote

individual behaviors and organizational development (Patterson et al., 2004; Patterson et al., 2005). Organizational climate is a kind of common and overall perception and experience of the organization's important environment in which it is located (Schneider et al., 2013; Randhawa & Kaur, 2014). In the organization, all members tend to understand the surrounding environment in a way that is most meaningful to themselves, including idiosyncratic interpretations, generalizations, and inferences (Duan et al., 2017). The environment that individuals “know” is a result of their own psychological cognition and construction, which reflect various forms of filtration, absorption, interpretation, and generalization, therefore organizational climate can be seen as the result of these complex psychological processes (Duan et al., 2017).

Once formed, the organizational climate will affect the motivation and behavior of the organization members (Wang, Yu, & Li, 2012), and has great impact on lots of individual and organizational process (Mahal, 2009; Noordin, Omar, Sehan, & Idrus, 2010). This perception of the climate can point to specific goals and form unique evaluation results, such as the atmosphere of innovation (Liu, Wang, & Li, 2010), safety climate (Neal et al., 2000), and the atmosphere of care (Fu & Deshpande, 2014). The innovation climate is defined as an organizational climate that supports new ideas, new processes and new methods, in such climate, individual and team creativity are recognized, rewarded and given certain autonomy (Duan et al., 2017).

The definition and connotation of organizational climate implies that organizational climate is not automatically generated but the result of the interaction between the organization members and the environment. Therefore, while being constrained by environmental factors, it in turn provides important priori environmental information for the organization members to understand what has happened, what is happening and what will happen in the organization (James & Jones, 1976), thus affecting the relationship between many variables and demonstrating strong moderating effect (Barnett & Vaicys, 2000; Probst, Brubaker, & Barsotti, 2008; Bos-Nehles & Veenendaal, 2017).

As a specific kind of organizational climate, organizational innovation climate reflects a common cognition of the organization members to their working environment and is an important situational variable that affects their attitudes and behaviors (Pfeffer & Salancik, 1977). The organizational innovation climate conveys a signal to all organizational members that innovation is valued by the organization, positive innovation-related attitudes and behaviors are consistent with organizational norms, and the organization can tolerate risks and

failures related to innovation, thus encouraging organization members to produce and implement more and more timely new ideas (West, 1990). When the members of the organization perceive a strong organizational climate that actively supports innovation, they will understand all the innovation-related antecedent factors from a more positive perspective and thus demonstrating the effect of strengthening the positive effect of antecedent factors, meanwhile weakening the negative effect of some antecedents. The moderating effects of innovation climate are also supported by relevant empirical research results (Duan et al., 2017).

Therefore, we propose a general hypothesis one the moderating effect of organizational innovation climate.

H4: Organizational innovation climate has significant moderating effect on the relationship between these two leaderships and innovation ambidexterity.

At individual level, transformational leadership may influence organizational members through several mechanisms, such as affective mechanisms, incentive mechanisms, identification mechanisms, social exchange mechanisms, and justice enhancement mechanisms (Ng, 2017). At organizational level, transformational leadership may influence organizational process and outcomes through changing work environment (Amabile, 1998), organizational culture (Schein, 1985, 1996) and learning process (Yukl, 2006). Such kind of mechanisms may be enforced in higher level of innovation climate. In higher level innovation of climate, organizational members have a consistent perception that any mistakes or failures related to innovation can be tolerated, thus they need not worry about encouraging organization members to produce and implement more and more timely new ideas (West, 1990). Therefore, organizational members may perceive their organization as open to change and supportive of innovation and adequate resources will be provided. In short words, higher level of innovation climate will be perceived as a kind of internal support for innovation (Gumusluoğlu & Ilsev, 2009b) which in turn will encourage organizational members to take more innovation behavior and make them respond better to transformational leadership, finally strengthen the effect of transformational leadership on organizational innovation (Gumusluoğlu & Ilsev, 2009b). So, innovation climate can be an enhancer on organizational innovation (Woodman, Sawyer, & Griffin, 1993). Empirically, some research found that innovation climate may moderate the effect of transformational leadership on organizational performance (Howell & Avolio, 1993). Therefore:

H4a: Organizational innovation climate has a positive moderating effect on the relationship between transformational leadership and organizational innovation ambidexterity.

Similarly, higher level of innovation climate plays the role of enhancer which makes organizational members respond better to paternalistic leadership (Gumusluoğlu & Ilsev, 2009b). As discussed previously, benevolent leadership, moral leadership and authoritarian leadership may have different effect on innovation ambidexterity, accordingly, the moderating effect of innovation climate will be different for them. On one hand, the positive effects of benevolence and moral will be strengthened since the higher level of innovation climate provides a sate and good environment for innovation, and the negative effects of authority will be weakened on the other hand. Empirically, one research based on Chinese data found that the relationship between paternalistic leadership and employee creativity was moderated by the perceived job security (Wang, Tang, Naumann, & Wang, 2017). Another research found that interaction of paternalistic leadership and ethic climate may influence organizational commitment (Erben & Güneşer, 2008) which is an important antecedent of organizational innovation (Han, Yang, & Zhang, 2011; Yang & Yang, 2016). Therefore:

H4b: Organizational innovation climate has a positive moderating effect on the relationship between benevolent leadership and organizational innovation ambidexterity.

H4c: Organizational innovation climate has a positive moderating effect on the relationship between moral leadership and organizational innovation ambidexterity.

H4d: Organizational innovation climate has a negative moderating effect on the relationship between authoritarian leadership and organizational innovation ambidexterity.

4.1.4 Moderating roles of environment dynamism

As mentioned earlier, organizational leaders must catch and understand the environmental information, then adjust the internal organizational activities accordingly, thus serving as an important intermediary for information and energy exchanges between internal system and external environment (Hambrick, 2007). The Evolutionary Leadership Theory (ELT) argues that the effectiveness of leadership and leadership behaviors varies with the environment and that their underlying psychological mechanisms also change with the environment (Osborn et al., 2002; Vugt & Ronay, 2014). Therefore, it is reasonable to assert that external environment will put great influence on organizational innovation through affecting the understanding of both leaders and organizational members (Garg, Walters, & Priem, 2003). Environment dynamism describes the speed and predictability of changes in the organization's external environment (Dess & Beard, 1984). It is often demonstrated in changes in technology, customer preferences, product demand and material supply (Jansen et al., 2006).

Environmental dynamism is an important aspect of one organization's external environment and has an important influence on the organization's strategy and behavior (Tan & Litsschert, 1994). A dynamic environment means that the external environment changes frequently and it is not easy to predict its trend (Dess & Beard, 1984). When the environmental dynamism is at higher level, the organizations are in an environment full of stress, anxiety and risk (Waldman, Ramirez, House, & Puranam, 2001). In this situation, members of the organization are more receptive to leadership styles and behaviors that can give them more help to cope with outside pressure (Vera & Crossan, 2004). When facing a lighter level of environment dynamism, both the leaders with different leadership styles and the organizational members may have different understanding. One may see it as opportunity, one may see it as stress, one may feel easy, one may feel stressful. Such kind of different understanding may finally influence the relationships between leaderships and organizational process, such as innovation ambidexterity.

Therefore, we propose one general hypothesis one the moderating effect of environment dynamism.

H5: Environmental dynamism plays a significant role in moderating the relationship between leaderships and organizational innovation ambidexterity.

Transformational leaders is such kind of leaders (Waldman et al., 2001) who can more accurately understand the emotions of others and take qualified actions (Bass & Riggio, 2006) to help members of organizations better respond to environmental pressures. In a stronger dynamic situation, transformational leadership will affect the organizational members more effectively by invoking the emotional center of the brain (Osborn et al., 2002). Transformational leadership can stimulate a strong collective identity and positive interpersonal relationships, create a good climate for innovation and reduce the impact of negative information on organizational members (Pirola-Merlo, Härtel, Mann, & Hirst, 2002). In this situation, transformational leaders will be more inclined to regard external dynamics as an opportunity for innovation and development, and to inspire all members to seize possible opportunities. Therefore, exploratory innovation will receive more attention. Conversely, when the dynamism is weak, it is difficult for people to challenge existing recognition and extant knowledge, the impact of transformational leadership will be relatively weakened and the organizations will tend to focus on exploitative innovation. When the dynamism is stronger, the transformational leadership will have weaker positive effect on the innovation ambidexterity because too much emphasis is placed on exploration to seize future opportunities. From a resource-constrained

and resource-based view, when environmental dynamism is at a high level, a rapidly changing environment will make new products, new technologies and new services change faster (Lakemond & Detterfelt, 2013). Transformational leaders see the strong environment dynamism as an opportunity (Jansen et al., 2009) which needs to use more resources to respond, and all employees need to be motivated to carry out exploratory innovation to capture possible explosive opportunities. Therefore, the simultaneously achieving exploratory and exploitative innovation is constrained by limited resources (Zheng et al., 2016).

H5a: Environmental dynamism negatively moderates the positive link between transformational leadership and organizational innovative ambidexterity.

In term of paternalistic leadership, the relationship between its three dimensions and organizational innovation ambidexterity may also be different due to environmental dynamism. As mentioned earlier, the ideological foundation of benevolent leadership is reciprocity and gratitude, the ideological foundation of the moral leadership is a model demonstration, the ideological foundation of the authoritarian leadership is reverence and obedience. According to evolutionary psychology and evolutionary leadership theory, individual psychology is the result of a natural selection of evolutionary processes (Vugt & Ronay, 2014). Therefore, the imprinted impressions formed by the paternalistic leaders mentioned above are also the result of an evolutionary process and will be influenced by environmental changes. When environmental dynamism is at higher level, environmental factors are changing more quickly and their predictability is lower (Dess & Beard, 1984), the organizations and the organizational members will be in a state of stress, anxiety and risk (Waldman et al., 2001). Under the context, the reliance of the organizational members on leadership will be significantly enhanced, which will amplify the positive effects of benevolent leadership and moral leadership on innovation ambidexterity. At the same time, the higher environment dynamism will make the organizational members more receptive to leadership styles and behaviors that help them to better cope with outside pressure (Vera & Crossan, 2004). Authoritarian leaders emphasize obedience and efficiency, strict rules and clear rewards and penalties make management more precise, and organizational resource allocation efficiency will be higher (Farh & Cheng, 2000; Farh et al., 2008), thus coping the environment dynamisms more easily. In such a context, the members of the organization will be identification to the authoritarian leaders more, thus weakening the negative impact of authoritarian leadership on innovation ambidexterity. Some researchers also believe that when the reliance of members on authoritarian leadership increases the negative influence of authoritarian leadership may weaken (Gao, 2013). Therefore:

H5b: Environmental dynamism positively moderates the positive link between benevolent leadership and organizational innovation ambidexterity.

H5c: Environmental dynamism positively moderates the positive link between moral leadership and organizational innovative ambidexterity.

H5d: Environmental dynamism negatively moderates the negative relationship between authoritarian leadership and organizational innovative ambidexterity.

4.2 Empirical research method

4.2.1 Questionnaire design

4.2.1.1 Plan

In questionnaire design process, close attention needs to be paid to the structure, layout, words and expression, these are likely to affect the respondents' cognition and thinking, and then affect the data quality, ultimately affect the reliability and validity of the findings. Therefore, the following aspects need to be paid special attention to in the design of the questionnaire.

First, the structure of the questionnaire. The questionnaire is made up of two parts, the first part is the greeting and instructions, to completely explained the purpose and significance of this research, make "confidentiality commitment" to respondents, and express sincere thanks to the them. The wording of this part needs to be paid close attention to "make the respondent feel happy and secure and be glad to fill with his/her true feelings". Among them, confidentiality commitment is an indispensable content, which can minimize the respondents' concern that the content will affect their own or the company's interests. The second part is the main part of the questionnaire, arranged in logical order from "general" to "specific". General questions in the questionnaire will be the front part of the main body, and the items about the company and the respondents themselves will be the last part. By doing so, to make the respondents relax, and let them complete the questionnaire following an "inertia" psychological trend.

Second, questionnaire layout design. Different questionnaire survey forms have different requirements, which needs to be revised according to the suggestions of potential respondents. The current research mainly adopts two approaches, one is through the network (including the way of social platform and the way of mailbox and web page), the other is the traditional paper question. Network way needs the simple and neat layout, at the same time take the differences

of different display devices into account. For example, mobile phones users may want to see each option as a single line, while in the paper-questionnaire readers may want see that the choices following the question. Print the questionnaire can use tables to present all items, set the background of two adjacent two rows into "a gray and a white", thus make it seem to be clear at a glance, which can also help respondents to match item and its answer quickly and correctly.

Third, the statements of the items. There are three types of questions in the main part of the questionnaire. One is to refer to the scales in foreign literature, the other is to refer to the scales in domestic literature, and the third is to write the questions by researcher. For the first type of scale, the "Back translation" program is used to ensure the exact and same meaning between the two languages and to pay attention to the expressions of different languages. For the second type of scale, although there is no problem in language translation, the attention needs to paid to make them more relevant to research setting and more conducive to the understanding of the respondents. For the third class, you will need to base on the theory, literature, and on the investigation of potential respondents to write item, and carefully review, pay attention to the language expression, carefully thinking about how the respondents understand, and pay attention to the mutex and end principle.

4.2.1.2 Design

According to the general process of questionnaire design in management research, the questionnaire was designed through six steps (see Figure 4-2) to provide high-quality measurement tools for subsequent studies.

Step 1: According to the research question and research design, the survey respondents should be accurately defined, including their cultural background, education level, cognitive ability and make more accurate judgment. For some uncertain but very important factor, try to make them clear through a brief telephone interview.

Step 2: To determine the constructs and variables to be measured in the questionnaire according to the research framework proposed above. Some key questions need to be clarified, such as the boundary of the concept to be measured, how wide scope is the application range, at what level it should be measured, and what is its theoretical structure.

Step 3: determine the measurement tools for all constructs and variables. In this process, it is possible to use the appropriate scale in the existing literature. First, it can ensure better validity and reliability, and second, it can make the work efficiency step higher.

Step 4: review all the questions, make them conform to the basic principles of questionnaire design, and invite potential respondents and experts in relevant fields to propose suggestions. Through the iteration of this process, high quality items are obtained.

Step 5: make the questionnaire layout. In this step, according to the characteristics of different survey channels, different versions of questionnaire should be prepared. The printed version needs to be proofread to find out the errors as much as possible. And high-quality printing and binding are needed for the paper version of the questionnaire.

Step 6: The researchers try to fill out questionnaires from various channels to find out the obvious mistakes and omissions. Then, several questionnaires were sent to the more familiar qualified respondents through various survey channels, and the results of questionnaire design were preliminarily verified by the returned results.

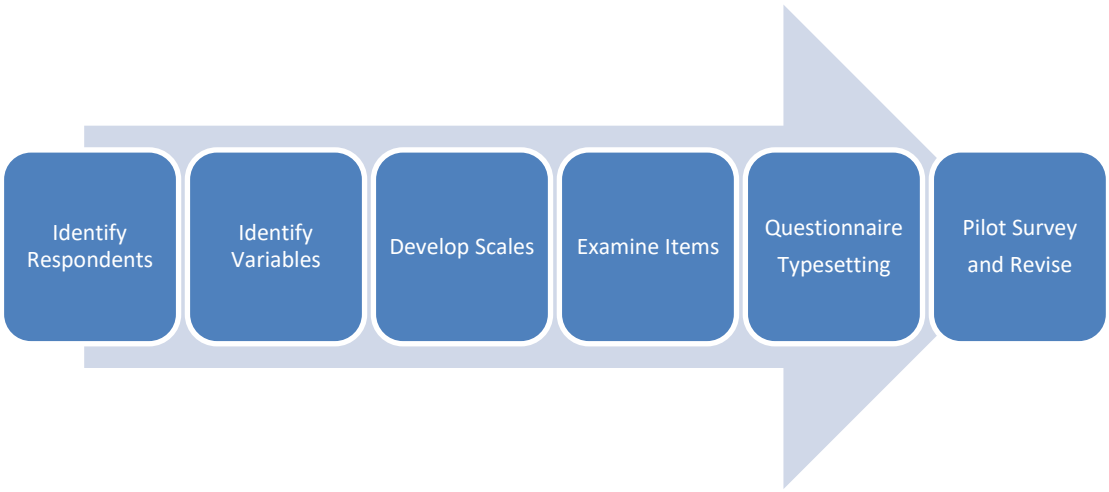


Figure 4-2 The Questionnaire Design Process

4.2.1.3 Questionnaire

To avoid the common method variance (CMV) caused by the data homology, the data should be collected from multiple sources. For the specific survey plan and the design process, please refer to this section (4.2.2.2 Survey program, page 75). Therefore, the final revised questionnaire includes three types, each of them is applicable to middle managers (questionnaire I), senior managers 1 (questionnaire II) and senior Managers 2 (questionnaires III). And each type of questionnaire has been prepared in three forms according to the three different survey approaches in terms of "Computer interface, mobile phone interface and paper version".

The questionnaire includes two main parts. The first part is the description of the questionnaire. The concrete content is mainly about the greetings and gratitude for respondents.

Then the purpose and significance of the research are briefly explained. A confidential commitment is presented in bold, its content is as below paragraph.

“This questionnaire survey is anonymous and the survey results will be kept strictly confidential. The data you provide will not be disclosed to any third party. In addition, the research will be based on statistical results from all the data. The data of any organization or individual will not be reported. Therefore, you need not have any concerns or worries! Please choose the best one for each item according to your organization and your own situation. All the information you provide is only for academic research, will not be used for any commercial purposes.”

How to fill has been given clear explanation and the gratitude has been expressed again.

The second part is the items used to measure the relevant constructs. One question needs to be written down the answer, the other items are multiple choice questions in a sequential numbered order. To avoid the influence of social approbation there is no paragraph segmentation based on the measurement scale and no further description of related topics. This can better capture the true feelings of the respondents.

Because this study is at the corporate level, it is necessary to match questionnaires from the same company through one item. The last question of each questionnaire is used to achieve this purpose. The respondents are asked to fill in the blank with the first letter of the pinyin for each word in the company name. An example (as shown in below paragraph) is given to help the respondents to understand this question correctly.

“If the company name is 'Dajiang Technology Corporation (大江科技公司 in Chinese, and the PINYIN is Da Jiang Ke Ji Gong Si)', please write down 'DJKJGS' here .”

The reason for this question has been given detailed explanation.

“The purpose of this code is simply to identify what questionnaires are from the same company and not to identify the real company names!”

The reason for this approach is that the numbers of the characters of most business names are more than five Chinese characters, therefore the possibility that the code are the same for two different enterprises will be very little. So, it is very useful to match the questionnaires from the same company. At the same time, it is difficult to infer the real company names through this code especially when the code is a little long (e.g. more than 5 letters). By doing so, the respondent will agree with this kind of anonymity approach, thus feeling free and safe to give the true code.

4.2.2 Data collection

4.2.2.1 Respondents

The current study is at enterprise level. According to the research framework (see Figure 4-1) and the survey plan, the managers at middle and top levels will be proper respondents. The respondents will be located through two major approaches. First, the EMBA students of one university will be asked to take part in the research and fill the questionnaire. EMBA students are mostly the middle or top managers who are the appropriate respondents for the current survey (Zheng et al., 2016).

Second, through the cooperation with the Entrepreneur Association of Guizhou and the third-part consultation companies, the possible respondents are identified and contacted. Those who are willing to take part in the research will be asked to fill the questionnaire.

4.2.2.2 Survey plan

When designing a survey plan, it is necessary to take common method variance (CMV), sample size, and cost into account. Among them, the common method bias is the most important issue that needs to be considered (Lindell & Whitney, 2001; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Chang, van Witteloostuijn, & Eden, 2010; Conway & Lance, 2010; Podsakoff, MacKenzie, & Podsakoff, 2012). Common method bias (Variance) refers to the artificial covariation trend between measurement results caused by the same data sources or raters, the same measurement environment, project context, and the characteristics of the project itself. The theoretical root may be the individual's maintenance of internal consistency (Chang et al., 2010). This covariant feature may have an impact on the results of the study and may even result in serious errors. It is a systematic error that undermines the rigor of the research results. Common method biases are more common in psychology, behavioral sciences, and management studies, especially in studies that use questionnaires to collect data. In general, pre-design and post-processing methods may be used to reduce the impact of CMV on research results (Podsakoff et al., 2003; Chang et al., 2010; Podsakoff et al., 2012), including the following methods (Podsakoff et al., 2003; Podsakoff et al., 2012).

First, when collect data from the same respondent, time-lag-design will be employed following the example (Zheng et al., 2016). Second, try to collect data about each enterprise from different persons. Third, back-translate process will be conducted on all scales, by doing so to guarantee their content validity. Fourth, pilot study will be conducted to test the reliability and validity of all scales using a small sample before collecting data for hypothesis testing.

Fifth, all respondents will be promised that all survey would be conducted anonymously, all the data will be kept strictly confidential and only the analysis results will be reported and published. Sixth, online-survey will be employed as a high-efficiency method which also can assure the anonymous commitment.

Among all possible approaches, the best one suggested by scholars (Chang et al., 2010) is to collect key data for different constructs from different sources. Others may be the questionnaire design and administration, and different scale points and formats (Chang et al., 2010). Based on the above discussion, possible pre-design and post-processing methods are applied to avoid CMV as much as possible. The pre-design approach is considered in the survey design and the questionnaire design, while the post-processing approach includes several statistical analyses for CMV detection and control (see 4.2.4 for details).

To achieve the balance between time-saving and CMV-avoidance, the data are collected from multiple sources. The survey plan can be seen from Table 4-1. Because the research is at enterprise level, the emphasized leaderships refers specifically to the leadership style of the senior management team. The middle managers should be the best respondents because they have rich work experience with top managers and have deep understanding of their leadership styles. Therefore, the data about the two leadership styles are obtained through the middle-level managers' response to the questionnaire.

Table 4-1 Survey Plan with Multiple Data Resources

Constructs	Respondents	Level	Questionnaire Type
Transformational leadership Paternalistic leadership Innovation climate Relevant controls	3 Middle managers	Middle	I
Environment dynamism Innovation ambidexterity Objective innovation performance Relevant controls	Top manager 1	Top	II
Subjective Innovation performance Relevant controls	Top manager 2	Top	III

The top level is the best representation of the entire enterprise, so the data from senior executives can be applied directly to the enterprise level (Hambrick & Mason, 1984; Hambrick, 2007). The data from middle managers can be aggregated to the enterprise level as a measurement of related concepts at enterprise level. Of course, it is necessary to check the *rwg*,

ICC1 and ICC2 of the relevant scale to test whether it is suitable for aggregating to a higher level (Liao & Chuang, 2007).

The arrangement about construct-respondent match is according to the relationship between concepts and the roles of different organization members. A principle is that there should not be obvious links between the concepts to be tested in the same questionnaires to avoid that the respondents may give answers based on their guesses about the research intention. The main considerations are as follows:

First, the leaderships and innovation climate are key internal construct, but we do not care their direct relationship, and it is not easy to assume a simple relationship between leaderships and innovation climate. Therefore, we can collect the relevant data from the same respondents. To avoid possible individual subjective evaluation, 3 middle managers will be the respondents.

Second, environment dynamism is out of the enterprises, only top managers are responsible for scanning environment and make important decisions (including innovation decisions and others). Therefore, one top manager will be the respondent for environment dynamism. Innovation ambidexterity is a synthesis evaluation of the whole enterprise, only top managers can be good respondents, by doing so can avoiding the limitations that middle managers and common employees may take the perspective of their own department and own position to understand the whole organization. Because we do not care the direct relationship between environment dynamism and innovation ambidexterity, and their relationship are difficult to be assumed, the data from the same respondent will not a serious problem.

Third, the concept of innovation performance is closely related to the innovation ambidexterity and the innovation climate. To avoid the subjective bias, both objective and subjective innovation performance are measured in the current research. Therefore, one top managers (top manager 1) is asked to report objective innovation performance, while another one (top manager 2) reports subjective innovation performance.

4.2.2.3 Data collection

All the respondents from the surveyed companies were informed about both the survey purpose and the survey plan. The data collection process includes three major phases. One is the questionnaire distribution and collect the returned data; the second is data input; and the third is data clean.

(1) Questionnaire distribution and collect returned data

Questionnaire were distributed in two waves, naming the pilot study and the main study.

The purpose of pilot study is to test the quality of related scale, and to modify the related scale. Through e-mail, WeChat and interviews, each of three types of questionnaires has been sent to 50 respondents. The returned valid questionnaire I is 37 with the valid rate of 74%; Questionnaire II is 33, with the valid rate of 66%; questionnaire III is 32, with the valid rate of 64%. The data will be used to test the questionnaire.

The purpose of main study is to test the proposed hypotheses. In the second wave, the respondents are from 100 enterprises. The questionnaire I was distributed to 300 respondents, questionnaire II to 100 top managers and questionnaire III to another 100 top managers. After matched the returned valid questionnaires, the nested data for a sample of 53 enterprise were obtained. The valid match ratio is 53%, which is a relatively good results, considering the data are nested match.

(2) Data input

Internet-based questionnaires (including questionnaires sent via e-mail and questions sent via the WeChat platform) can be set to "must have" attributes, and the data can be saved automatically, therefore, the data will be more accurate.

For data collected using paper questionnaires, special attention should be paid to data entry to avoid possible errors. Fortunately, only a small number of paper questionnaires were used to collect the data. Therefore, the entry process was relatively simple and convenient. Two research assistants input the data independently, then to detect the possible input mistakes by comparing the two data file. If they are the same, no problem; or the differences will be found out and the mistakes will be corrected according to the original paper questionnaires.

(3) Data clean

Data cleanup is a prerequisite for the next step of analysis, and it is also a prerequisite for ensuring accurate research results. First, a descriptive analysis of each item is performed to see if there are outliers and missing values. The online survey data will not have any outliers or missing values. It is mainly to check the manually entered paper questionnaire data. For the problems found, check and verify by checking the original questionnaires.

4.2.3 Measurement

This section describes the measurement tools for the important variables involved in the study and reports the results based on pilot data. The revised scales base on pilot data will be used for the main study as the tools for subsequent data collection for hypotheses test. All scales

to measure the constructs are 5-point Likert scales.

4.2.3.1 Transformational leadership

When transformative leadership was first proposed as a theory, scholars believed that it would motivate employees to achieve better job performance by influencing employees' values, fostering their awareness, and motivating their employees to establish high standards of self-pursuit (Bass, 1985). According to the principle of reflective measurement, the first widely used scale is called Multifactor Leadership Questionnaire (MLQ). The factor analysis result of this questionnaire presents four dimensions, namely personal care, intelligence stimulation, influence ability, and leadership charisma (Bass & Avolio, 1993). Since then, the measurement of transformational leadership has attracted more attention. Some scholars have proposed a six-dimension model of transformational leadership (Podsakoff et al., 1990). Although the MLQ concept was supported by empirical evidence, it was also questioned and criticized (Li & Shi, 2005). For example, scholars have suggested that transformational leadership should not be divided into four dimensions (Den Hartog, Van Muijen, & Koopman, 2011). In this context, a new transformational leadership questionnaire was developed (Alimo-Metcalfe & Alban-Metcalfe, 2001). A more plausible view is that leadership as a social influence process may be influenced by cultural backgrounds (Hofstede, 2001; Hofstede, Hofstede, & Minkov, 2010). Based on the above-mentioned controversy over the transformational leadership structure and the importance of the cultural background in understanding and measuring this concept, the current research finds a more reliable way that is to find the transformational leadership scale from the recently published article completed in the context of China (Zheng et al., 2016). Therefore, this article uses eight items to measure transformational leadership (Zheng et al., 2016). In Zheng et al.'s research, this scale has good reliability in the context of China (α = 0.75).

The Confirmatory factor analysis (CFA) results (χ 2 =24.81, df = 20, χ^2/df = 1.24, CFI = 0.99, TLI = 0.98, $SRMR$ = 0.03, $RMSEA$ = 0.04) indicate that the model fits the data well. All paths are significant ($P < 0.001$), The standardized path coefficients are distributed between 0.59 and 0.77 (see Table II-1 in Appendix II). In the pilot test, the scale has good reliability (α = 0.79). Therefore, the 8-item scale was use in the main study.

4.2.3.2 Paternalistic leadership

The original parental leadership scale was developed by Taiwan scholar Cheng Bor–Shiuan, including two dimensions of Authority and Benevolence (*Li Wei* and *Shi En* in Chinese).

Each dimension includes eight sub-dimensions; thus, it is a total of 16 sub-dimension scale. Then, this scale was further developed and the moral dimension was added to form a widely used three-dimension paternalistic leadership scale (Cheng et al., 2004; Pellegrini & Scandura, 2007). In fact, there are several scales to measure the three-dimension paternalistic leadership in literature (Farh & Cheng, 2000; Cheng et al., 2004; Pellegrini & Scandura, 2007). Considering the culture elements of the leaderships, one scale which has been tested in Chinese context (Zhang et al., 2017) was used in the current study. In the scale, 5 items are used to measure morality（$\alpha = 0.845$），5 items to measure benevolence（$\alpha = 0.828$），and 5 items to measure authority（$\alpha = 0.870$）.

Based on the pilot data, CFA is conducted separately for three dimensions. The results of the benevolent dimension (χ 2 = 10.48, $df = 5$, $\chi^2/df = 2.10$, $CFI = 0.86$, $TLI = 0.71$, $SRMR = 0.07$, $RMSEA = 0.11$) indicate that the fit between the data and the model is acceptable, with all the path coefficients were significant ($P < 0.01$), the standardized path coefficients were distributed between 0.51 and 0.78. In the pilot test, the benevolent subscale ($\alpha = 0.75$) has good reliability. The results of the moral dimension (χ 2 = 9.67, $df = 5$, $\chi^2/df = 1.93$, $CFI = 0.93$, $TLI = 0.87$, $SRMR = 0.07$, $RMSEA = 0.10$) indicate that the fit between the data and the model are acceptable when considering all the fit indicators comprehensively. The standardized path coefficients are significant ($P < 0.05$) and distributed between 0.40 and 0.72. The moral subscale has an acceptable reliability ($\alpha = 0.71$). Taking all the fit indices into consideration, the CFA results of the authoritarian dimension (χ 2 = 7.69, $df = 5$, $\chi^2/df = 1.54$, $CFI = 0.92$, $TLI = 0.84$, $SRMR = 0.08$, $RMSEA = 0.10$) indicate that the fit between the data and the model are acceptable. The model shows significant path coefficients ($P < 0.01$), and the standardized path coefficients are distributed between 0.45 and 0.73. The authoritarian subscale has acceptable reliability ($\alpha = 0.63$).

For the whole scale of paternalistic scale, the CFA results of the three-factor model (χ 2 =100.28, $df = 87$, $\chi^2/df = 3.51$, $CFI = 0.92$, $TLI = 0.90$, $SRMR = 0.07$, $RMSEA = 0.10$) indicate that the data and model fit well, the scale has discriminatory power. The standardized path coefficients are distributed between 0.38 and 0.83 (see Table II-2 in Appendix II) with low P-value ($P < 0.05$).

4.2.3.3 Innovation ambidexterity

In literature, several scales have been used to measure innovation ambidexterity (Zhang et al., 2017). Zheng and Liu et al. (2016) developed a two-dimension scale to measure this

construct, each dimension has 7 items and has good reliability, with a Cronbach's Alpha of 0.80 for exploration innovation and 0.71 for exploitation innovation, 0.86 for the whole scale.

In the pilot test, CFA and reliability analysis were first performed for two dimensions, and then the relationship between these two dimensions was examined with reference to the method of Zheng et al. (2016).

For the exploratory innovation dimension, the CFA of 7-item model (χ 2 =21.02, df = 14, χ^2/df = 1.50, CFI = 0.87, TLI = 0.81, $SRMR$ = 0.10, $RMSEA$ = 0.21) show that the fit between the data and the model is acceptable. However, there is an item with no significant path coefficient (γ = 0.10, P > 0.05). The item is "Our company commercializes products or services that are new to us." After discussions with experts and potential respondents, the understanding of the term "commercialization" may be very various, and even many people may have not clear understanding, so this item was deleted. After the deletion, the CFA results of the six items (χ 2 =10.56, df = 9, χ^2/df = 1.17, CFI = 0.96, TLI = 0.94, $SRMR$ = 0.10, $RMSEA$ = 0.19) show that the data fits the model much better. The standardized path coefficients were distributed between 0.42 and 0.68 (P < 0.01). The reliability of the six items is also good (α = 0.71). Therefore, the remaining 6 entries are used for the main study.

For the exploitation innovation, the sub-dimension includes 7 items, the CFA results (χ 2 =16.78, df = 14, χ^2/df = 1.20, CFI = 0.93, TLI = 0.90, $SRMR$ = 0.11, $RMSEA$ = 0.08) indicate the fit between the data and the model is good, all path coefficients are significant (P < 0.01), and the standardized path coefficients were distributed between 0.45 and 0.79. The reliability of this scale is acceptable (α = 0.68). Therefore, these 7 items are used for the main study.

At the same time, the two-dimension model was analyzed. The CFA results (χ 2 =71.35, df = 64, χ^2/df = 1.12, CFI = 0.92, TLI = 0.90, $SRMR$ = 0.06 $RMSEA$ = 0.06) indicate that the data fit well with the model. All the path coefficients were significant (P < 0.01), and the standardized path coefficients were distributed between 0.45 and 0.79 (see Table II-3 in Appendix II). The scale eventually has 13 items which were used for the main study.

4.2.3.4 Innovation performance

Adams et al. (2008) proposed to measure the innovation performance of high-tech companies from five aspects, including product advantages, the degree of innovation support for the strategy, innovation novelty, innovation financial performance, and innovation business performance. In literature, two approaches are employed to measure innovation performance. The one is to use objective indicators, such as the number of patent application and authorized

patent, the number of new products (services), the proportion of new products (services) (Adner & Kapoor, 2010). This approach addresses the tech innovation and innovation outcomes but neglects the innovation which cannot be observed easily. The other one is to use questionnaire, addressing innovation process, such as management innovation, process innovation, information seeking and acquisition (Ritter & Gemünden, 2004; Bell, 2005). The two approaches are used in the current research.

(1) Objective performance

Some objective indicators were used measure objective innovation performance, such as the number of new products and the proportion of new product revenue. Based on the suggestions from experts, the interviews with focused enterprises, and the team-discussion, six items (see Table II-4 in Appendix II for details) were designed to measure objective performance.

In the pilot test, the CFA results (χ 2 =20.49, df = 9, χ^2/df = 2.28, CFI = 0.91, TLI = 0.84, $SRMR$ = 0.11, $RMSEA$ = 0.20) is acceptable. But one item, "In 2017, our company's new products increased the number of customers:", has insignificant path coefficient (γ = 0.13, P > 0.05). After discussions with experts and potential respondents, it was agreed that the question may require more calculation and thinking before it can be answered. However, most people do not pay too much attention to the relevant data and may cause the respondent to give answers at random. Therefore, the item should be deleted. After the deletion, the CFA results of the five-item (χ 2 =7.46, df = 5, χ^2/df = 1.49, CFI = 0.98, TLI = 0.96, $SRMR$ = 0.06, $RMSEA$ = 0.12) show that the data fits the model much better, the loadings are distributed between 0.48 to 0.98 (see Table II-4 in Appendix II). The five items have good reliability (α = 0.73). therefore, these 5 items will be used in the main study to measure objective innovation performance.

(2) Subjective performance

Based on literature (Ritter & Gemünden, 2004; Bell, 2005), one 5-itme scale which has high reliability (α = 0.924）(Qian et al., 2010) were used to measure innovation performance.

For the five items to measure innovation performance, the CFA results (χ 2 =3.15, df = 5, χ 2 /df =0.63， CFI = 1.00, TLI = 1.44, $SRMR$ = 0.06, $RMSEA$ = 0.00) indicate that the model fit the data very well. Two points may deserve attention: First, the TLI is greater than 1. In the relevant literature, scholars suggested that in some cases TLI may be greater than 1(Wu, 2010: 49); second, there is one item whose path coefficient is not significant (γ = 0.29, P > 0.05), while the remaining path coefficients are significant (P < 0.001), and the standardized path

coefficients are distributed between 0.46 and 0.64 (see Table II-5 in Appendix II). The reliability coefficient of 5 items (α = 0.60) is still acceptable.

After deleting items with insignificant path coefficients, the CFA results for 4 items (χ 2 =0.45, *df* = 2, χ 2 /*df* =0.23， *CFI* = 1.00, *TLI* = 1.56, *SRMR* = 0.02, *RMSEA* = 0.00) show that the model and the data are well-fitted, all path coefficients are significant ($P < 0.05$), the standardized path coefficients are distributed between 0.45 and 0.64, and the reliability (α = 0.62) is a little better.

Comparing the results of the above two models, the fit indices and the reliability coefficients have changed after deleting one item; but considering χ^2, the corresponding change of the 3 degrees of freedom is 2.7, and this change is not significant ($P > 0.10$); other fitting indices also have only little change; the change in reliability coefficient is not very great. Therefore, it was finally decided to retain this item in the main study.

4.2.3.5 Innovation climate

Either construct-based-on-theory or data-driven based has been employed to develop the scale for innovation climate. There are four representative, tested and reliable scales, including CCQ (Creative Climate Questionnaire), SOQ (Situational Outlook Questionnaire), KEYS (Assessing the Climate for Creativity) and TCI (Team Climate Inventory). Since climate is deeply embedded in social and culture background, so one scale which has been developed based on literature and tested in Chinese background will be employed to measure innovation climate (Zheng et al., 2009). This scale has been developed based on the in-depth investigation and relevant scales in literature, it has 7 dimensions and 23 items, with high reliability (α = 0.99). As the reverse-item often increases the understanding difficulty of the respondent in the Chinese language context, the reversed items were changed to positive direction. The specific words and expressions of each item have been revised based on the communication with the potential survey respondents.

In the pilot study, the CFA results (χ 2 =235.25, *df* = 209, χ^2/*df* = 1.13, *CFI* = 0.92, *TLI* = 0.90, *SRMR* = 0.08, *RMSEA* = 0.06) show that the data fit the model very well, all path coefficients are significant ($P < 0.05$), and the standardized path coefficients are distributed between 0.41 and 0.91 (see Table II-6 in Appendix II). The reliability of this scale is good (α = 0.82). Therefore, these 23 items were used for main study.

4.2.3.6 Environment dynamism

It is easy to find environment dynamism scale in literature (Tan & Litsschert, 1994). A 3-

item scale from literature (Zheng et al., 2016) is used to measure this construct (α= 0.70). Since the three items can only provide enough degree of freedom for the estimated parameters, some indices in the CFA results cannot be estimated (χ 2 =0, *df* = 0, *CFI* = 1.00, *TLI* = 1.00, *SRMR* = 0, *RMSEA* = 0). But still, the path coefficients of the models are all significant ($P < 0.001$), and the standardized path coefficients are distributed between 0.56 and 0.68 (see Table II-7 in Appendix II). In the pilot-test, the reliability of this scale is OK (α = 0.62). Taking the above results together, these three items were used for the main study.

4.2.3.7 Controls

The controls will be chosen following literature (e.g. Zheng et al., 2016). Combined with relevant empirical research results, the following variables were controlled. If the controls demonstrate a kind of state related to time, the time point was set as December 2017. All information about the controls of the main study sample is in Table II-8 and Table II-9 in Appendix II. In below paragraphs, relevant percentages are presented.

(1) Ownership structure

The different ownership structure may mean different internal management system and organizational culture. According to the ownership structure, the enterprises are divided into four major categories: the central-state-owned enterprises, the provincial-state-owned enterprises, private companies, and joint venture enterprises. The percentages for the four types are respectively 9.4%, 13.2%, 56.6% and 20.8%. Three dummy variables were used to represent the different properties of these categories.

(2) Industry

The industry may have an important influence on the innovation process and innovation performance. According to the relevant documents of the Chinese government, domestic high-tech enterprises can be categorized into eight industries, including electronic information technology (18.9%), biology and new medical technology (9.4%), aerospace technology, new materials technology (3.8%), high-tech service industry (9.4%), new energy and energy-saving technologies (20.8%), resources and environment technology (18.9%), advanced manufacturing and automatic technology (13.2%). 7 dummy variables were used to represent these different industries.

(3) Company size

The size of the company means the difference in possessed resources. At the same time, the size may also be closely related to the organizational inertia. Therefore, it may have some

influence on the innovation process and innovation results. Use two possible indicators to test the size of the company. First, the number of subordinate companies, because to a certain extent, the number of subordinate companies represents the size of the company. According to the interviews with respondents in pilot study and other experts' opinions, an ordinal variable was used to represent the different of the number of subordinate companies, with five categories, such as 3 or less (50.9%), 3-6 (30.2%), 7-11 (13.2%), 12 -20 (1.9%), more than 20 (3.8%). The second indicator is the number of employees in the company. This indicator is more commonly used to measure the size of the company. An ordinal variable was used to represent the number of employees, with six categories, namely, 20 or less (1.9%), 21-50 (1.9%), 51-100 (17.0%), 101-200 (18.9%), 201-500 (28.3%), 501-1000 (17.0%), 1001-2000 (9.4%), 2001-50000 (1.9%), and more than 5000 employees (3.8%).

(4) The total sale

This indicator reflects the company's competitiveness and may have a certain influence on the innovation process and innovation results. An ordinal variable was used to measure the total sale, including the following 7 categories, that is, below 0.5 million yuan (0%), 0.5-5 million yuan (11.3%), 5-10 million yuan (24.5%), 10-100 million yuan (28.3%), 100-500 million yuan (22.6%), 500-2000 million yuan (7.5%), more than 2000 million yuan (5.7%).

(5) The total exports

This indicator reflects the competitiveness of the company's products in the international market, may have a certain impact on the innovation process and innovation results. An ordinal variable was used to measure the total exports sale, including the following 7 categories, that is, below 0.5 million yuan (11.3%), 0.5-5 million yuan (30.2%), 5-10 million yuan (9.4%), 10-100 million yuan (37.7%), 100-500 million yuan (7.5%), 500-2000 million yuan (1.9%), more than 2000 million yuan (1.9%).

(6) Age of the company

The company's age is closely related to the organizational culture, which may affect all aspects of organizational innovation. Use the number of years the company continues to operate to measure this variable.

In addition, some demographic variables of the respondent at the individual level were collected, including gender, age, length of service from the first job, length of service in the company, education, hierarchy, and department.

Gender is tested with a dummy variable, 1 for males and 0 for females; age and length of

service are expressed in years; education was measured by an ordinary variable with four categories, below bachelor, undergraduate, master and doctorate, the hierarchy is represented by a dummy variable, with 1 representing the top managers and 0 representing the middle managers; according to the structure of the general organization, the departments are divided into seven categories, including R&D, marketing, human resources, finance, customer service, manufacturing, and others, using six dummy variables to describe the different departments.

4.2.4 Data analysis method

The purpose of data analysis is to test theoretical hypotheses and provide rigorous research results, mainly involving validity, reliability, and hypothesis testing. In the research process, SPSS and Mplus are mainly used as data analysis software tools. SPSS is used for preliminary data processing and some descriptive, while Mplus is mainly used for confirmatory factor analysis and hypotheses test based on the structural equation model. According to the different data used, the data analysis involved in this paper can be divided into two stages, namely pilot test analysis and main study data analysis.

4.2.4.1 Validity

The so-called validity refers to the degree to which the measurement tool can correctly measure the construct to be measured. Therefore, the validity analysis is to confirm whether the collected data can obtain the desired conclusions, and whether the conclusions can answer the questions to be studied. The validity should be thought as a comparative indicator which can be measured from several aspects, such as content validity, criterion validity, construct validity and re-test validity. Among them, the most frequently reported is content validity and construct validity. Content validity is generally ensured in the scale development and questionnaire design process by using a variety of methods, such as expert consultation method, group discussion, two-way translation method. While structural validity is usually tested using CFA.

In the CFA process, χ^2/df, RMSEA, CFI, TLI, SRMR were selected as the major indicators for testing the fit goodness of the model and the data. There is no consistent understanding of the criteria used for these indicators, and whether accept the model depends on the comprehensive consideration based on multiple indicators and specific circumstances (Maccallum, Browne, & Sugawara, 1996; Hu & Bentler, 1998; Hu & Bentler, 1999; Ullman & Bentler, 2003; Hou, Wen, & Cheng, 2004). For $\chi 2/df$, some scholars suggested that less than 4 is better (Hu & Bentler, 1998), but other scholars believe that it is better between 1 and 3 (Hou et al., 2004); RMSEA less than 0.1 is acceptable criteria (Maccallum et al., 1996); generally,

CFI to be greater than 0.9, TLI greater than 0.9, and SRMR less than 0.08 indicate good fit.

In addition, these fitting indexes are greatly affected by the sample size. When the sample size is small (e.g. less than 150), the criteria should be appropriately less strict and the significance level should be set to 0.01 (Wen, Hau, & Herbert, 2004). Based on the above discussion, the acceptable criteria used in this paper are: $\chi 2$/df less than 4, RMSEA less than 0.10, CFI greater than 0.9, TLI greater than 0.9, and SRMR less than 0.10. In addition, when the two models are carried out, whether the change of $\chi 2$ is significant is a major criterion for judgment. In short words, the above fit indexes should be considered together.

4.2.4.2 Reliability

The so-called reliability refers to the degree of consistency or stability of the measurement results. For two times of measurement of the same object, the two measurement results should be consistent, which indicates that the measurement result is stable and reliable. Reliability mainly tests the how reliable the collected data are. It is a comparative criterion and can be represented by several indicators, such as stability, equivalence, and internal consistency. Among them, internal consistency is the most commonly reported reliability index. Internal consistency coefficient, also known as Cronbach's Alpha coefficient, is an indicator of test reliability. It is a widely used reliability index in the social sciences and in various empirical researches based on scales. Generally, if the coefficient is above 0.6, it is highly reliable, and if it is above 0.8, it is very high. In addition, this coefficient should be used for single-dimensional scale factor analysis and not for multi-dimensional scales (Sijtsma, 2009).

4.2.4.3 Common method variance

Common Method Variance (CMV), also known as common method deviance, is an issue that must be considered in questionnaire surveys (Lindell & Whitney, 2001; Richardson, Simmering, & Sturman, 2009; Chang et al., 2010; Podsakoff et al., 2012). The solution usually consists of two categories. The one is to control CMV during the research design and data collection process, such as collecting data from multiple sources, paying attention to the questionnaire design, paying attention to the item description. The other is to test CMV after collecting the data. If a significant CMV is found, the method factor can be placed as a control variable in the model to exclude the influence of CMV (Podsakoff et al., 2012).

In this article, a variety of methods was comprehensively adopted to avoid the influence of CMV on the research results. During the research process, close attention was paid to various aspects. Details can be found in Section 4.2.1 and Section 4.2.2. In the data analysis process,

the single-factor model is compared with the hypothesized model based on the CFA technique, if the fitting result of the single-factor model and the data is better than the hypothesized model, or if there is no difference, then there is CMV that needs to be dealt with (Harris & Mossholder, 1996).

4.2.4.4 Hypotheses test

Hypothesis testing is a method of inferring population using sample data based on certain assumptions. The specific idea is a 3-step process. First, based on the theory and the existing research results, an assumptions on the overall research issues involved is proposed as H0, namely the null hypothesis; second, to select the appropriate statistic which should be selected based on the criterion that when the hypothesis H0 is established, its distribution is already known; third, based on the sample data to calculate the value of the statistic and test it according to the pre-specified level of significance, and make a decision to reject or accept the hypothesis H0.

Commonly used hypothesis test methods include μ-test method, *t*-test method, χ^2-test method (chi-square test), *F*-test method, and rank sum test. In management studies, *t*-test is often used to test the path coefficient to see whether it equals to zero, thus testing the hypotheses about the relationship between the two variables; *F*-test is usually used to test the overall explanatory power of a single model; using multiple indicators such as $\chi 2/df$, RMSEA, CFI, TLI and SRMR (Maccallum et al., 1996; Hu & Bentler, 1998; Hu & Bentler, 1999; Ullman & Bentler, 2003; Hou et al., 2004) to test the structural equation model and examine the *t*-test results of the path coefficients based on the accepted model, and finally to determine if the relevant hypotheses are supported. The criteria for the model fit indexes are the same as described above (section 4.2.4.1, p.86).

4.2.4.5 Analyses in pilot survey

The data collected in the pilot-survey is mainly used to test and revise the scale. The analysis of the pilot data mainly includes the following two major aspects. (1) Confirmatory factor analysis (CFA). Because most of the used scales were from the literature, each of the scales was mainly analyzed using CFA techniques to test whether the relationship between the items and the measured construct was consistent with the hypotheses. (2) Analysis of internal consistency factors. The test of the measurement model is mainly performed by CFA and Cronbach's Alpha coefficients.

4.2.4.6 Analyses in main study

The data for main study is mainly used to test hypotheses. The analysis includes descriptive analysis, measurement model tests, correlation analysis, hypothesis testing, and robustness testing.

(1) Descriptive analysis

The main purpose of which is to present the characteristics of sample data to test whether the current sample is representative.

(2) Measurement model

In this process, CFA is mainly used to test whether the measurement model fits the data well, Cronbach's Alpha is calculated for each scale to test its internal consistency, *rwg*, ICC(1) and ICC(2) are computed to test whether the data at individual level can be aggregated to the enterprise level, and the discrimination and CMV are tested for the data from the same respondents.

(3) Correlation analysis

This is a preliminary analysis of the relationships between variables involved in the study, providing preliminary evidence for hypothesis testing.

(4) Hypothesis testing

First, the main effects between key variables are tested, then all hypotheses are tested by the full model including control variables and interaction effects, and finally the robustness test based on objective performance data. If the results show insignificant different with the previous results, the hypotheses test results are reliable.

4.3 Results

4.3.1 The sample

The matched valid sample includes 53 enterprises. The relevant descriptive information is shown in Table 4-2. The data in the table shows some important features that reflect the important guiding role of Chinese government policies and are consistent with some of the existing findings (Bai, Duarte, & Guo, 2016).

From the perspective of the ownership structure, private companies account for 56.6%. The sample companies are dispersed in several industries, most of them are in high-tech

services, electronic information technology and new energy and energy-saving technology industries with the respective percentage of 20.8%, 18.9% and 18.9%, followed by the advanced manufacturing and automation industry (13.2%).

Table 4-2 The Sample Information and the Provincial Data of Guizhou

Nature	Category	Frequency	Percent (%)	Data of Guizhou (%)
Ownership structure	central-state-owned	5	9.4	5.2
	provincial-state-owned	7	13.2	14.5
	private owned	30	56.6	58.1
	joint venture	11	20.8	22.2
Industry	electronic information tech.	10	18.9	17.7
	biology & new medical tech.	5	9.4	14.9
	aerospace tech.	2	3.8	2.4
	new materials tech.	5	9.4	9.0
	high-tech service industry	11	20.8	35.0
	new energy & energy-saving tech.	10	18.9	10.6
	resources & environment tech.	3	5.7	5.3
	advanced manu. & automatic tech.	7	13.2	14.9
Subsidiaries	1. Less than 3	27	50.9	21.15
	2. 3-6	16	30.2	25.00
	3. 7-11	7	13.2	32.69
	4. 12-20	1	1.9	12.46
	5. More than 20	2	3.8	7.69
Employees	1. Less than 20	1	1.9	10.23
	2. 21-50	1	1.9	15.01
	3. 51-100	9	17.0	17.09
	4. 101-200	10	18.9	18.65
	5. 201-500	15	28.3	20.58
	6. 501-1000	9	17.0	5.79
	7. 1001-2000	5	9.4	4.66
	8. 2001-5000	1	1.9	4.99
	9. Over 5000	2	3.8	3.00
Sale of 2017	below 0.5 million yuan	0	0	5.02
	0.5-5 million yuan	6	11.3	23.55
	5-10 million yuan	13	24.5	11.78
	10-100 million yuan	15	28.3	36.68
	100-500 million yuan	12	22.6	16.02
	500-2000 million yuan	4	7.5	4.05
	more than 2000 million yuan	3	5.7	2.90
Export of 2017	below 0.5 million yuan	6	11.3	Missing
	0.5-5 million yuan	16	30.2	Missing
	5-10 million yuan	5	9.4	Missing
	10-100 million yuan	20	37.7	Missing
	100-500 million yuan	4	7.5	Missing
	500-2000 million yuan	1	1.9	Missing
	more than 2000 million yuan	1	1.9	Missing

Notes: The data of Guizhou in the table are collected from the interment, especially the web site of Innovation Company (http://www.innocom.gov.cn/). Because there are some missing data, the results just provide as references.

For the number of subordinate companies, most of the sample enterprise (50.9%) have very few subordinate companies (less than 3), the proportion of the enterprise with 12 subordinates or more to the sample is only 5.7%. The enterprises with employees from 201 to 500 accounts for the largest proportion of enterprises, reaching 28.3%, followed by those with 101-200 employees accounted for 18.9%, then those with 51 to 100 employees account for the same proportion as those with 201-1000 employees, both accounted for 17.0 %. These characteristics indicate that most of the sample companies have reached a certain scale, which is determined by China's policies on the authorized criterion of high-tech companies. At the same time, the number of large-scale high-tech companies is little, this characteristic is consistent with that of Guizhou Province, and it seems to be consistent with the common impression of the whole country.

The characteristics of total sales in 2017 are consistent with the distribution characteristics of the above-mentioned. There are a few enterprises with more than 500 million yuan, only 7%; and those with less than 5 million are also very few, only 6%. In 2017, the exports of sample companies are generally not high. The enterprises with export value less than 0.5 million account for 50.9%, and those with export value of more than 500 million only account for 3.8%.

By the end of 2017, there were 826 high-tech enterprises in Guizhou Province, their distribution is shown in the rightmost column of Table 4-2. Comparing the sample data with the distribution data of high-tech enterprises across the province, it is easy to conclude that their distributions are similar, to some extent. This result shows that the current sample could be a good representative sample.

4.3.2 Measure model test

4.3.2.1 Individual-level data

The individual-level data comes from the Type I questionnaire. The respondents are middle managers. The involved constructs are transformational leadership, paternalistic leadership, and organizational innovation.

For transformational leadership, the data fit well with the model (χ 2 =30.88, df = 20, χ^2/df = 1.54, CFI = 0.92, TLI = 0.89, $SRMR$ = 0.06, $RMSEA$ = 0.06), all paths coefficients are significant ($P < 0.01$), and the standardized path coefficients are distributed between 0.53 and 0.81, and the reliability of this scale is very good ($\alpha = 0.82$).

The three-factor model of paternalistic leadership fits the data well (χ 2 =122.99, df = 87,

χ^2/df = 1.41, *CFI* = 0.90, *TLI* = 0.88, *SRMR* = 0.07, *RMSEA* = 0.05), and all path coefficients are significant ($P < 0.01$), the standardized path coefficients are distributed between 0.43 and 0.79. The three dimensions, benevolence (α = 0.78), morality (α = 0.73), and authoritarian (α = 0.65) all have good reliabilities.

Further, compare the proposed model of paternalistic leadership with another competitive models. The results are shown in Table 4-3. The proposed three-factor model has a better fitting effect than the one-factor model. The change of χ2 is 9.86 ($P < 0.01$, $\Delta df = 3$) corresponding to the change of three degrees of freedom, so it is more appropriate to accept the three-factor model. There is no difference in the fitness between the second-order factor model and the three-factor model. Considering that the three dimensions of paternalistic leadership tend to describe the paternalistic leadership style from three different aspects, and in the literature, paternalistic leadership is usually studied as three dimensions (Pellegrini & Scandura, 2007; Zhang et al., 2017). Therefore, this paper separates the three dimensions of paternalistic leadership into the model during hypothesis testing.

Table 4-3 Comparison of Three Models of Paternalistic Leadership

Models	χ2	df	χ2/ df	RMSEA	CFI	TLI	SRMR	Δχ2	Δdf
M1	132.85	90	1.48	0.05	0.88	0.87	0.07	--	--
M2	122.99	87	1.41	0.05	0.90	0.88	0.07	9.86**	3
M3	122.99	87	1.41	0.05	0.90	0.88	0.07	9.86**	3

Notes: N=159； * P < 0.05; ** P < 0.01； M1: all items belong to one factor; M2: proposed three-factor model; M3: a second-order factor model based on three first-order factors; Δ*χ2* and Δ*df* are from the comparison between the model and M1.

The reliability of the innovation climate is very good (α = 0.83). The comparisons of the three competitive models of the innovative climate are shown in Table 4-4. The three measurement models fit the data well. Among them, model M2 show the best fit indexes. Compared with M1, CFI and TLI increased, while SRMR decreased, and the degree of freedom decreased by 21, and the corresponding chi-square value decreased significantly (Δχ2 = 59.27, $P < 0.001$). Compared with M3, M2 has increased CFI and TLI while the SRMR has decreased, the degree of freedom has decreased by 14, and the corresponding chi-square value has decreased significantly (Δχ2 = 43.63, P < 0.001). Therefore, it can be considered that the proposed M2 fits the data the best. For M2, the path coefficients are significant ($P < 0.01$), and the standardized path coefficients are distributed between 0.45 and 0.89. According to the methods in the literature, the average of these seven factors has been computed as the value of the innovation climate for subsequent analysis (Hsu & Fan, 2010).

Table 4-4 Comparisons among Three Models of Innovation Climate

Models	χ2	df	χ2/ df	RMSEA	CFI	TLI	SRMR	Δχ2	Δdf
M1	426.92	230	1.86	0.07	0.88	0.87	0.07	--	--
M2	367.65	209	1.76	0.07	0.90	0.88	0.06	–59.27***	21
M3	411.28	223	1.84	0.07	0.89	0.87	0.07	–15.64*	7

Notes: N=159； * P < 0.05; ** P < 0.01; M1：all items form one factor; M2: seven-factor model is the proposed model; M3: a second-order factor model based on seven first-order factors; Δ*χ2* and Δ*df* are from the comparison between the model and model M1.

Since the data of transformational leadership, paternalistic leadership, and innovative climate come from the same respondents, it is necessary to test their discriminatory validity and CMV. The discriminant validity was tested by comparing the proposed model with four competitive models (results are shown in Table 4-5). As the number of factors decreases, the increase in freedom brings about a significant $\Delta\chi^2$ ($P < 0.001$). The proposed 12-factor model (M1) fits the data the best. The proposed model shows significant path coefficients ($P < 0.01$), and standardized path coefficients are distributed between 0.41 and 0.87.

Table 4-5 Discriminant Validity Test for Leadership and Innovation Climate

Models	χ2	df	χ2/ df	RMSEA	CFI	TLI	SRMR	Δχ2	Δdf
M1	2008.23	923	2.18	0.09	0.91	0.90	0.06	--	--
M2	2815.41	961	2.93	0.11	0.84	0.83	0.07	807.18***	38
M3	3045.29	979	3.11	0.12	0.82	0.81	0.07	1037.06***	56
M4	3685.28	988	3.73	0.13	0.77	0.76	0.08	1677.05***	65
M5	3784.94	989	3.83	0.13	0.76	0.75	0.08	1776.71***	66

Notes: N=159； * P < 0.05; ** P < 0.01; M1：12-factor model, one transformational leadership factor, three paternalistic factors and seven innovation climate factors; M2: 8-factor model, one leadership factor, seven innovation climate factors; M3: 5-factor model, one transformational leadership factor, three paternalistic factors and one innovation climate factor; M4: 2-factor model, one leadership factor and one innovation climate factor; M5: 1-factor model.

According to the CMV test method described above, comparing the one-factor model (M5) with the proposed model (M1), the fitness indexes significantly changed ($\Delta\chi^2 = 1776.71$, $df = 66$, $P < 0.001$). Therefore, there is no serious CMV in the data of the current study. At the same time, considering the small sample size ($N = 53$), the method factor will not be considered in the subsequent analysis.

4.3.2.2 Aggregate validity test

Because the current research is at enterprise level, the transformational leadership, paternalistic leadership, and innovation climate reported by middle managers, thus needing to be aggregated from the individual level to the enterprise level. The intra-group consistency of relevant scales needs to be tested. Only when the intra-group consistency is high, but the inter-organizational differences are large enough, individual data can be aggregated to the

organizational level. This intra-group consistency test is judged by three indicators, namely *rwg*, ICC1 and ICC2, where *rwg* is generally required to be bigger than 0.7, the recommended standard for ICC1 is greater than 0.12, and ICC2 is greater than 0.7 (Liao & Zhuang, 2007).

The results of the aggregate validity test of transformational leadership, paternalistic leadership and innovative climate are shown in Table 4-6

. The *rwg* of the transformational leader has a median of 0.93 with a mean value of approximately 0.90 (S.D. = 0.33), which is bigger than the suggested standard (0.7); ICC1 is approximately 0.55, which is greater than the suggested standard of 0.12; ICC2 is approximately 0.79, which is greater than the suggested standard of 0.70; these results are combined to support that transformational leadership can be aggregated to the enterprise level.

For the benevolent dimension of the paternalistic leadership, the *rwg* had a median of 0.91, with a mean of approximately 0.89 (S.D. = 0.32) which is bigger than 0.7; ICC1 was approximately 0.58, greater than the proposed criterion of 0.12; ICC2 was approximately 0.81, greater than the proposed standard of 0.70. The moral dimension *rwg* has a median of 0.95, with a mean value of approximately 0.94 (S.D. = 0.26) which is bigger than 0.70; ICC1 is approximately 0.65, which is greater than the proposed standard value; ICC2 is approximately 0.85, which is greater than the proposed standard. For the authoritarian dimension, its *rwg* has a median of 0.94, with a mean value of approximately 0.92 (S.D. = 0.32) which is bigger than the suggest standard; ICC1 is approximately 0.62, which is greater than the proposed criterion; ICC2 is approximately 0.83, which is greater than the proposed standard. Therefore, the three dimensions of paternalistic leadership can be aggregated to the enterprise level.

Table 4-6 Aggregate Validity of Individual Data

Scales	rwg Median	rwg Mean	rwg S.D.	ICC1	ICC1 Standard	ICC2	ICC2 Standard	Individual (N)	Enterprise （N）
TL	0.93	0.90	0.33	0.55		0.79			
BP	0.91	0.89	0.32	0.58		0.81			
MP	0.95	0.94	0.26	0.65	>0.12	0.85	>0.7	159	53
AP	0.94	0.92	0.32	0.62		0.83			
IC	0.91	0.88	0.35	0.74		0.90			

Notes: N=159 at individual level；N=53 at enterprise level; TL：transformational leadership; BP: benevolent leadership; MP: moral leadership; AP: authoritarian leadership; IC: innovation climate.

For the organizational innovation climate, *rwg* has a median of 0.91, with a mean value of approximately 0.88 (S.D. = 0.35) which is bigger than 0.70; ICC1 is approximately 0.74, which is greater than 0.12; ICC2 is approximately 0.90, which is greater than 0.70. Therefore, the organizational innovation climate can be aggregated to the enterprise level.

4.3.2.3 Enterprise-level data

Enterprise-level data (also in terms of organization-level data) includes organizational innovation ambidexterity, environment dynamism, and organizational innovation performance. The organizational innovation ambidexterity, environment dynamism and objective innovation performance come from the same questionnaire, and the subjective innovation performance comes from another questionnaire.

First, CFA is conducted on the two dimensions of organizational innovation ambidexterity. For the exploratory innovation, the CFA results (χ 2 =12.36, df = 9, χ^2/df = 1.37, CFI = 0.95, TLI = 0.92, $SRMR$ = 0.08, $RMSEA$ = 0.09) show the data and the model fit well. The standardized path coefficients are distributed between 0.42 and 0.68 ($P < 0.01$). The reliability of the six items is also good ($\alpha = 0.72$).

CFA results of exploitative dimension (χ 2 =15.79, df = 14, χ^2/df = 1.13, CFI = 0.93, TLI = 0.90, $SRMR$ = 0.08, $RMSEA$ = 0.05) indicate that the data fit the model well. All path coefficients are significant ($P < 0.01$), and the standardized path coefficients are distributed between 0.39 and 0.81. This scale has good reliability ($\alpha = 0.73$).

Referring to the method of Zheng et al. (2016), the three competitive models are compared to determine the best measurement model. From the comparisons of fitting indexes, the M1 model fits the data the best (Table 4-7). This result is consistent with the results in the literature (Zheng et al., 2016). Therefore, as similar as the literature (Zheng et al., 2016), the organizational innovation ambidexterity was treated as a single-dimension construct in the subsequent analysis. In model M1, all path coefficients are significant ($P < 0.01$), standardized path coefficients are distributed between 0.37 and 0.86. The scale ha good reliability ($\alpha = 0.83$).

Table 4-7 Comparisons among Three Models of Innovation Ambidexterity

Models	χ2	df	χ2/ df	RMSEA	CFI	TLI	SRMR	Δχ2	Δdf
M1	72.23	65	1.11	0.05	0.92	0.90	0.06		
M2	71.35	64	1.11	0.05	0.91	0.89	0.06	0.88	1
M3	70.08	62	1.13	0.06	0.91	0.88	0.06	2.15	3

Notes: N = 53; * P < 0.05; ** P < 0.01; M1: 1-factor model; M2: 2-factor model, exploration factor and exploitation factor; M3: 1-second-order factor model, the exploration and exploitation factors as the first-order factors; $\Delta\chi 2$ and Δdf are from the comparisons between the model and model M1.

Since the three items can only provide enough degree of freedom for the estimated parameters, some indices in the CFA results cannot be estimated (χ 2 =0, df = 0, CFI = 1.00, TLI = 1.00, $SRMR$ = 0, $RMSEA$ = 0). But the path coefficients are all significant (P < 0.001), and the standardized path coefficients are distributed between 0.55 and 0.72. The reliability of

this scale is acceptable (α = 0.68).

The CFA results of objective innovation performance (χ 2 =12.87, df = 5, χ^2/df = 2.57, CFI = 0.95, TLI = 0.90, $SRMR$ = 0.08, $RMSEA$ = 0.17) indicate that the model fits the data well. Path coefficients are all significant (P < 0.01). The standardized path coefficients were distributed between 0.39 and 0.93. The reliability of this scale was good (α = 0.85).

The CFA results of subjective performance (χ 2 =1.11, df = 5, χ^2/df = 0.22, CFI = 1.00, TLI = 1.39, $SRMR$ = 0.03, $RMSEA$ = 0.00) indicate that the model fits the data well. However, there is a path coefficient is not significant (γ = 0.20, P > 0.10), the standardized path coefficients for the remaining items ranged from 0.53 to 0.61. After deleting the item with insignificant path coefficient, the CFA results (χ 2 =0.12, df = 2, χ^2/df = 0.06, CFI = 1.00, TLI = 1.26, $SRMR$ = 0.01, $RMSEA$ = 0.00) indicate a better fitness, all path coefficients are significant (P < 0.001), the standardized path coefficients are distributed between 0.54 and 0.63. In terms of the reliability coefficient, the reliability of the four items (α = 0.66) is obviously higher than that of the five items (α = 0.61). Therefore, only 4 items will be remained in the subsequent analysis.

4.3.3 ANOVA analyses

Before further analyses, ANOVA analyses have been conducted to examine whether innovation ambidexterity, innovation performance and environment dynamism are different when using ownership structure, industry, subsidiaries and number of employees as factors. Post hoc contrast has been employed to test the possible differences. Moreover, to get briefer results, the number of subsidiaries was aggregated in to just 3 classes (less than 3; 3-6; more than 7), and the number of employees into just 4 classes (less than 50; 51-200; 201-1000; more than 1000). Before reporting the analysis results, one point should be kept in mind that we should be cautious when explain these results because of the small sample size and the imbalance distribution of the relevant groups.

4.3.3.1 ANOVA of innovation ambidexterity

For the innovation ambidexterity with the factor of ownership structure, the between group variance is not significant (F = 2.15, P > 0.10), the detailed results (see Table III-1 in Appendix III) show that private companies have the highest mean, following by joint venture, then by central SOE, regional SOE has the lowest mean. The results are consistent with the common sense of the innovation ambidexterity of the four type of companies. However, the mean differences are not significant (P > 0.05). In conclusion, the innovation ambidexterity is not different among the four type of enterprises, when taking the ownership structure as factor.

For the innovation ambidexterity with the factor of industry, the between group variance is not significant ($F = 2.30$, $P > 0.05$). the detailed results (see Table III-2 in Appendix III) show that all the mean differences among each two industries are not significant at the level of 0.05 ($P > 0.05$). In conclusion, the innovation ambidexterity is not different among the eight industries, when taking the industry as the ANOVA factor.

For the innovation ambidexterity with the factor of the number of subsidiaries, the between group variance is not significant ($F = 0.25$, $P > 0.10$). the detailed results (see Table III-3 in Appendix III) show that all the mean differences among each two kinds of companies (in terms of the number of subsidiaries) are very small, even close to zero, and are all not significant at the level of 0.05 ($P > 0.05$). In conclusion, the innovation ambidexterity is not different among the three type of enterprises, when taking the subsidiaries number as the ANOVA factor.

For the innovation ambidexterity with the factor of the number of employees, the between group variance is not significant ($F = 1.41$, $P > 0.10$). The detailed results (see Table III-4 in Appendix III) show that all the mean differences among each two kinds of companies (in terms of the number of employees) are very small, and are all not significant at the level of 0.05 ($P > 0.05$). In conclusion, the innovation ambidexterity is not different among the three type of enterprises, when taking the employee number as the ANOVA factor.

4.3.3.2 ANOVA of innovation performance

For the innovation performance with the factor of ownership structure, the between group variance is not significant ($F = 0.91$, $P > 0.10$), the detailed results are shown in Table III-5 in Appendix III. These results show that central SOEs have the highest mean, following by joint venture, then by regional SOE, and private companies have the lowest mean. The results are consistent with the common sense of the innovation performance of the four type of companies. However, the mean differences are not significant ($P > 0.05$). In conclusion, the innovation performance is not different among the four type of enterprises in terms of the ownership structure.

For the innovation performance with the factor of industry, the between group variance is not significant ($F = 1.16$, $P > 0.10$). The detailed results (see Table III-6 in Appendix III) show that all the mean differences among each two industries are not significant at the level of 0.05 ($P > 0.05$), when taking the industry as the ANOVA factor. In conclusion, the innovation performance is not different among the eight industries.

For the innovation performance with the factor of number of subsidiaries, the between

group variance is not significant (F = 1.48, P > 0.10). the detailed results (see Table III-7 in Appendix III) show that all the mean differences among each two kinds of companies (in terms of the number of subsidiaries) are very small, even close to zero, and are all not significant at the level of 0.05 (P > 0.05), when taking the subsidiaries number as the ANOVA factor. In conclusion, the innovation performance is not different among the three type of enterprises.

For the innovation performance with the factor of the number of employees, the between group variance is not significant (F = 0.95, P > 0.10). The detailed results (see Table III-8 in Appendix III) show that the mean differences among each two kinds of companies (in terms of the number of employees) are very small, and not significant at the level of 0.05 (P > 0.05), when taking the employee number as the ANOVA factor. In conclusion, the innovation performance is not different among the four type of enterprises.

4.3.3.3 ANOVA of environment dynamism

The detailed results of ANOVA of environment dynamism can be found in Appendix III. For the innovation dynamism with the factor of ownership structure, the between group variance is not significant (F = 0.23, P > 0.10). These results (see Table III-9 in Appendix III) show that joint ventures and private companies have the highest mean, following by central SOE, regional SOE has the lowest mean. However, the mean differences are not significant (P > 0.05), when taking the ownership structure as factor. In conclusion, the environment dynamism is not different among the four type of enterprises.

For the environment dynamism with the factor of industry, the between group variance is not significant (F = 0.60, P > 0.05). the detailed results (see Table III-10 in Appendix III) show that all the mean differences among each two industries are not significant at the level of 0.05 (P > 0.05), when taking the industry as the ANOVA factor. In conclusion, the innovation dynamism is not different among the eight industries.

For the environment dynamism with the factor of the number of subsidiaries, the between group variance is not significant (F = 0.43, P > 0.10). the detailed results (see Table III-11 in Appendix III) show that all the mean differences among each two kinds of companies (in terms of the number of subsidiaries) are very small, even close to zero, and are all not significant at the level of 0.05 (P > 0.05) when taking the subsidiaries number as the ANOVA factor. In conclusion, the innovation dynamism is not different among the three type of enterprises.

For the environment dynamism with the factor of the number of employees, the between group variance is not significant (F = 0.41, P > 0.10). The detailed results (see Table III-12 in

Appendix III) show that all the mean differences among each two kinds of companies (in terms of the number of employees) are very small and not significant at the level of 0.05 ($P > 0.05$). In conclusion, the innovation dynamism is not different among the four type of enterprises.

4.3.4 Correlations

The mean, standardized deviation (S.D.), and correlation coefficients of the critical variables are shown in Table 4-8. The mean values of these variables are distributed between 3.351 and 3.998. Considering these five-point scales, they are slightly higher than the median value. The standard deviations of these important variables ranged from 0.206 to 0.532, and the ratios of the means to the standard deviations are all greater than 3, ranged from 6.36 to 18.25, indicating that the data do not deviate significantly from the normal distribution. Therefore, in the subsequent analysis process, it is reasonable to use maximum likelihood estimation (ML).

The mean of organizational innovation performance is only 3.741, which means that the average innovation performance of the sample is not high. This result seems consistent with the statistical results of the high-tech enterprises in Guizhou province. The mean of environment dynamism is 3.811, which shows that the top leaders of sample companies perceive that the industry and the external environment are changing a little rapidly. This result is in line with the reality of the “high-tech enterprise”. The binary correlations among these variables are at a medium level, indicating that the multi-source data collection plan used in the data collection process to a certain extent avoids the common method variance. The medium level of correlations also indicates that there will be not serious multicollinearity among these variables.

Examining the pairwise correlations between each two variables can get some preliminary evidence for the proposed hypotheses. Transformational leadership and innovation ambidexterity show a significant positive correlation ($r = 0.52$, $P < 0.01$), providing preliminary supportive evidence for hypothesis H1. In the three dimensions of paternalistic leadership, benevolent leadership and innovation ambidexterity show a significant positive correlation ($r = 0.50$, $P < 0.01$), providing a preliminary supportive evidence for the hypothetical H2a; the moral leadership and the innovation ambidexterity show a significant positive correlation ($r = 0.54$, $P < 0.01$), which provides a preliminary supportive evidence for hypothesis H2b; authoritarian leadership and innovation ambidexterity show a significant negative correlation ($r = -0.45$, $P < 0.01$), providing preliminary support evidence for hypotheses H2c. There was a significant positive correlation between innovation ambidexterity and innovation performance ($r = 0.58$, $P < 0.01$), providing preliminary supportive evidence for hypothesis H3.

Table 4-8 The Mean, Standardized Deviation and Correlations of Key Variables

Constructs	Mean	S.D.	TL	BE	MO	AU	IA	IC	ED
TL	3.882	.520							
BE	3.351	.504	.319**						
MO	3.898	.525	.406**	.456**					
AU	3.385	.532	-.389**	-.343**	-.347**				
IA	3.998	.403	.515**	.495*	.542**	-.454**			
IC	3.760	.206	.437**	.349*	.417**	-.450**	.516**		
ED	3.811	.457	.292*	.352**	.284*	-.360**	.208	.421**	
IP	3.741	.401	.405**	.415**	.438**	-.277	.584**	.483**	.351**

Notes: N=53; * P < 0.05; ** P < 0.01; TL: Transformational Leadership; BE: Benevolent Paternalistic Leadership; MO: Moral Paternalistic Leadership; AU: Authoritarian Paternalistic Leadership; IA: Organizational Innovation Ambidexterity; IC: Organizational Innovation Climate; ED: Environmental Dynamism; IP: Organizational Innovation Performance.

4.3.5 Hypotheses test

To make the hypothesis test more rigorous and ensure the reliability of the obtained conclusions, the relevant methods in the literature are used to test the hypotheses. The step-by-step test method were conducted, which mainly includes three steps, such as main effects test, full model test, and robustness test.

Considering that the sample size is relatively small, if the latent variable modeling method is used, the required sample size will be much larger than the current sample size. Cause of the small sample size, the model may not converge or increase the standard error of the estimate. Therefore, the path analysis is conducted instead of the latent variable model. Borrowing from the practices in the literature (Zheng et al., 2016), 1000 samples were extracted using the Bootstrapping program in Mplus to get more stably estimation for the path coefficients.

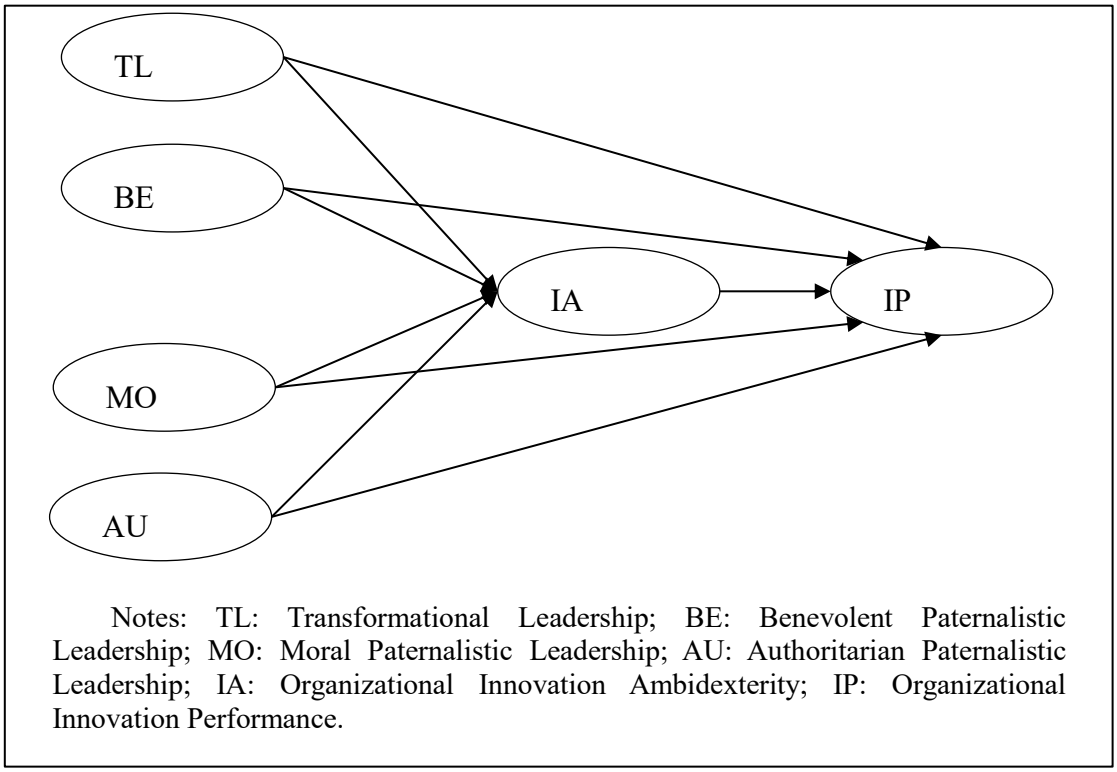
4.3.5.1 Main effects test

There are five hypotheses about the main effect proposed in the previous section. The model shown in Figure 4-3 was used to test the main effects, at the same time to provide support for the construction of subsequent full model. In this model, the effects of the four leadership variables on the organizational innovation ambidexterity and innovation performance are also considered. Because there are too many parameters to be estimated, the degree of freedom of the model is zero, so the fit indexes lose its significance. The relevant path coefficients are shown in Table 4-9.

As can be seen from Table 4-9, transformational leadership has a significant positive effect on organizational innovation ambidexterity ($\beta = 0.26$, $P < 0.05$). This result supports hypothesis H1. Benevolent leadership has a significant positive effect on organizational innovation ambidexterity, the result ($\beta = 0.23$, $P < 0.05$) supports the hypothesis H2a. The moral leadership has a significant positive effect on organizational innovation ambidexterity ($\beta = 0.27$, $P < 0.05$). This result supports the hypothesis H2b. Authoritarian leadership has a negative effect on organizational innovation ambidexterity ($\beta = -0.18$, $P > 0.05$), but not significant, therefore, hypothesis H2c is not supported. Organizational innovation ambidexterity has a significant positive effect on organizational innovation performance ($\beta = 0.41$, $P < 0.01$). This result supports hypothesis H3.

In addition, transformational leadership ($\beta = 0.12$, $P > 0.05$), benevolent paternalistic leadership ($\beta = 0.13$, $P > 0.05$), moral paternalistic leadership ($\beta = 0.12$, $P > 0.05$) and

authoritarian paternalistic leadership (β = 0.03, P > 0.05) have no significant effect on organizational innovation performance. Therefore, these effects can be ignored in the subsequent construction of the full model, to make the model more concise, while reducing the possible impact of the relatively small sample size on the estimation results.



Notes: TL: Transformational Leadership; BE: Benevolent Paternalistic Leadership; MO: Moral Paternalistic Leadership; AU: Authoritarian Paternalistic Leadership; IA: Organizational Innovation Ambidexterity; IP: Organizational Innovation Performance.

Figure 4-3 The Model for Main Effect Test

Table 4-9 Results of Main Effect Test

Independent	Dependent	Path Coefficient	T-value	P-value	Hypotheses	Proposed Direction	Support or Not
TL	IA	0.263*	2.338	0.019	H1	Positive	Yes
BE	IA	0.226*	1.984	0.047	H2a	Positive	Yes
MO	IA	0.269*	2.306	0.021	H2b	Positive	Yes
AU	IA	-0.181	-1.611	0.107	H2c	Negative	No
IA	IP	0.407**	2.855	0.004	H3	Negative	Yes
TL	IP	0.116	0.894	0.371	--		
BE	IP	0.132	1.022	0.307	--		
MO	IP	0.120	0.896	0.370	--		
AU	IP	0.030	0.240	0.810	--		

Notes: Notes: N=53; * P < 0.05; ** P < 0.01; TL: Transformational Leadership; BE: Benevolent Paternalistic Leadership; MO: Moral Paternalistic Leadership; AU: Authoritarian Paternalistic Leadership; IA: Organizational Innovation Ambidexterity; IP: Organizational Innovation Performance.

4.3.5.2 Full model test

The main effect test only considers the relationship between the six main variables, ignores the relationship between other variables, and the effect of other variables on the relationships

among these six major variables. Therefore, it is necessary to add the control variables, moreover, the interactions between relevant variables should be added to test the proposed moderating effect. Base on the above consideration and the results of main effect test, the full model has been constructed as shown in Figure 4-1. The full model includes 6 main variables, 2 moderators and 8 interaction items. For constructing the interaction items, the four related explanatory variables and two moderators are mean-centered at first, and then, the mean-centered values are multiplied to obtain the interaction items which are used to test the moderating effect. A total of eight interaction items are obtained. The control variables in the model include three dummy variables that represent the ownership structure (OS1-OS3), seven dummy variables that represent the industry (IND1-IND7), an ordinal variable that measures the number of years since the company has operated (ORGAGE), an ordinal variable that measures the number of employees (NOEMP), an ordinal variable that measures the company's total sale (SALES) and another ordinal variable that measures the company's annual exports (EXPORT).

Five nested models were tested. These models are:

(M1) The empty model where you put all variables but without relations;

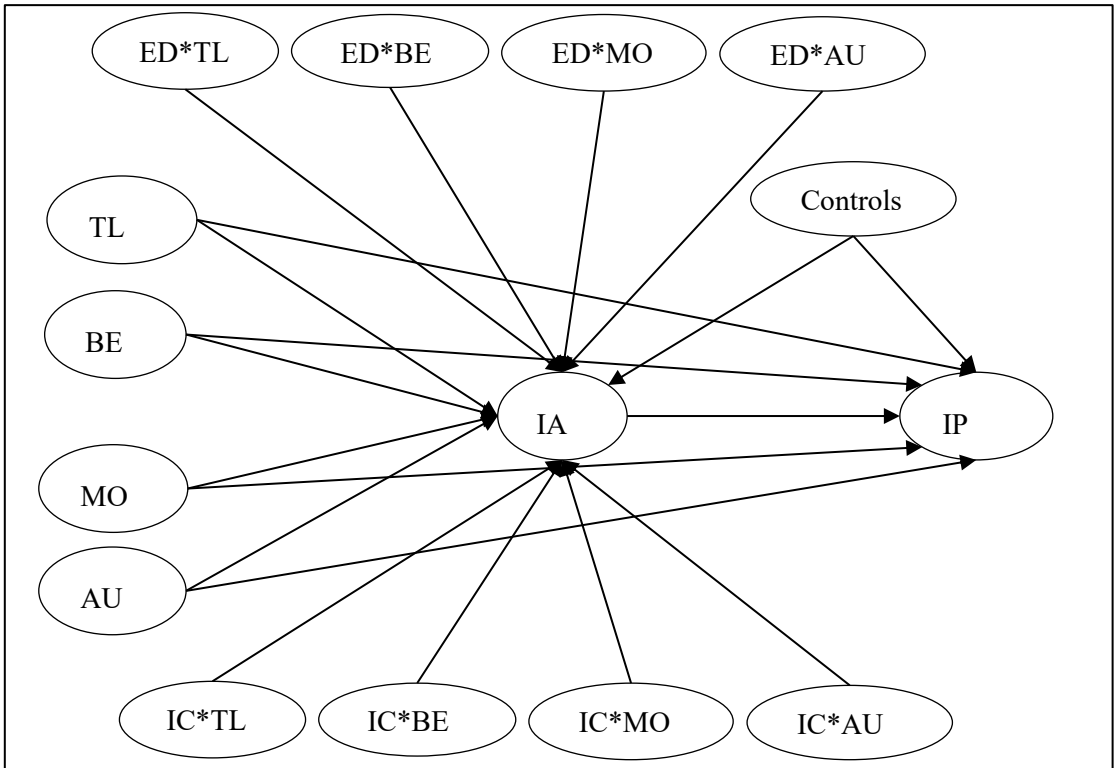
(M2) The direct model where all the variables have direct effects over IP;

(M3) The first mediation model with the independent variables (TL, BE, MO, AU), and the moderator variables (IC, ED) with effects on the mediator (IA) which then has effect on the dependent variable (IP). No effects of TL, BE, MO, AU, IC and ED exist over IP;

(M4) The second mediation model with the dependent variables (TL, BE, MO, AU) with effects on the mediator (IA). The IA and the moderator variables (IC, ED) with effects on the Dependent (IP);

(M5) The full model with all the relations (see Figure 4-4).

The fit indexes of these five models are reported in Table 4-10. Based on the discussion about the model comparison and technical cutoffs criteria in section 4.2, these models are compared with each other. Model M2 is a saturated model which cannot provide fit indices, and the χ^2 comparisons is meaningless. The other three models (M3, M4 and M5) are better than M1 with lower values of χ^2/df, RMSEA and SRMR, and higher values of CFI and TLI. Obviously, M5 is the best model which has the lowest values of χ^2/df, RMSEA and SRMR, while the highest CFA and TLI, the $\Delta\chi^2$ is significant ($P < 0.001$) no matter which model (M1, M3, M4) is compared.



Notes: TL: Transformational Leadership; BE: Benevolent Paternalistic Leadership; MO: Moral Paternalistic Leadership; AU: Authoritarian Paternalistic Leadership; IA: Organizational Innovation Ambidexterity; IP: Organizational Innovation Performance; ED: Environment Dynamism; IC: Innovation Climate.

Figure 4-4 The Full Model with All Relations

Table 4-10 Comparisons Among the Five Nested Models

Models	χ2	df	χ2/ df	RMSEA	CFI	TLI	SRMR	Δχ2	Δdf
M1	680.39	253	2.69	0.18	0.000	0.000	0.22	--	--
M2	0.00	0	--	0.00	1.00	1.00	0.00	-658.92***	-247
M3	21.47	6	3.58	0.22	0.69	0.33	0.09	-659.15***	-247
M4	21.24	6	3.54	0.22	0.69	0.34	0.07	-668.47***	-245
M5	11.92	8	1.49	0.10	0.99	0.93	0.01	-658.92***	-247

Notes: $N = 53$； * P < 0.05; ** P < 0.01； *** P < 0.001; Δ: The baseline model is the M1.

For the fit indexes for model M5 ($\chi 2 = 11.92$, df = 8, $\chi 2/df = 1.49$, CFI = 0.99, TLI = 0.93, SRMR = 0.01, RMSEA = 0.10), except that RMSEA reaches 0.10, the other indices are all acceptable. This model is acceptable especially the current sample size is relatively small. The path coefficients are shown in Table 4-11. Transformational leadership has a significant positive effect on organizational innovation ambidexterity ($\beta = 0.23$, $P < 0.05$). This result supports hypothesis H1. Benevolent leadership has a significant positive effect on organizational innovation ambidexterity ($\beta = 0.24$, $P < 0.05$). This result supports the hypothesis H2a.

Table 4-11 Results of Full Model Test

Independent	Dependent	Path Coefficient	T-value	P-value	Hypothesis	Proposed Direction	Support or Not
TL	IA	0.23*	2.05	0.046	H1	+	Yes
BE	IA	0.24*	2.12	0.039	H2a	+	Yes
MO	IA	0.24*	2.06	0.045	H2b	+	Yes
AU	IA	−0.16	−1.38	0.174	H2c	-	No
IA	SIP	0.40**	2.74	0.008	H3	+	Yes
IC	IA	0.23*	1.98	0.049	Null	Null	Null
ED	IA	−0.16	−1.49	0.142	Null	Null	Null
IC*TL	IA	−0.26*	−2.32	0.024	H4a	+	No
IC*BE	IA	−0.33*	−2.47	0.017	H4b	+	No
IC*MO	IA	−0.38*	−2.51	0.015	H4c	+	No
IC*AU	IA	0.34*	2.45	0.018	H4d	-	Yes
ED*TL	IA	−0.28*	−2.47	0.017	H5a	-	Yes
ED*BE	IA	0.25**	2.97	0.005	H5b	+	Yes
ED*MO	IA	0.19*	2.35	0.023	H5c	+	Yes
ED*AU	IA	0.28*	2.24	0.029	H5d	-	Yes
OS1	SIP	0.06	0.27	0.79	--		
OS2	SIP	0.14	0.78	0.44	--		
OS3	SIP	-0.11	-0.63	0.53	--		
IND1	SIP	0.10	0.51	0.61	--		
IND2	SIP	-0.10	-0.45	0.65	--		
IND3	SIP	-0.22	-1.47	0.14	--		
IND4	SIP	-0.05	-0.23	0.82	--		
IND5	SIP	0.09	0.49	0.63	--		
IND6	SIP	0.13	0.77	0.44	--		
IND7	SIP	0.14	1.27	0.20	--		
NOSUB	SIP	0.09	0.48	0.64	--		
ORGAGE	SIP	0.12	0.51	0.61	--		
NOEMP	SIP	-0.03	-0.11	0.92	--		
SALES	SIP	0.02	0.10	0.92	--		
EXPORT	SIP	0.21	0.90	0.37	--		
OS1	IA	0.22	0.20	0.84	--		
OS2	IA	-0.19	-0.21	0.83	--		
OS3	IA	0.24	0.31	0.75	--		
IND1	IA	-0.27	-0.32	0.75	--		
IND2	IA	-0.26	-0.24	0.81	--		
IND3	IA	-0.65	-0.46	0.65	--		
IND4	IA	-0.30	-0.30	0.76	--		
IND5	IA	-0.11	-0.13	0.90	--		
IND6	IA	-0.23	-0.29	0.77	--		
IND7	IA	0.08	0.07	0.94	--		
NOSUB	IA	-0.04	-0.11	0.91	--		
ORGAGE	IA	-0.01	-0.02	0.98	--		
NOEMP	IA	0.07	0.37	0.71	--		
SALES	IA	-0.01	-0.04	0.97	--		
EXPORT	IA	0.00	0.01	0.99	--		

Notes: Notes: $N = 53$; * $P < 0.05$; TL: Transformational Leadership; BE: Benevolent Paternalistic Leadership; MO: Moral Paternalistic Leadership; AU: Authoritarian Paternalistic Leadership; IA: Organizational Innovation Ambidexterity; IC: Organizational Innovation Climate; ED: Environmental Dynamism; IP: Organizational

Innovation Performance; OS1-OS3: Dummy variables for ownership structure; IND1-IND7: Dummy variables for industries; NOSUB: Number of Subsidiaries; ORGAGE: Organizational Age; NOEMP: Number of Employees; SALES: Total Sale; EXPORT: Annual Exports.

Moral leadership has a significant positive effect on organizational innovation ambidexterity (β = 0.24, P < 0.05). This result supports the hypothesis H2b. Authoritarian leadership has a negative effect on organizational innovation ambidexterity (β = –0.16, P > 0.05), but not significant, so hypothesis H2c is not supported by the result. Organizational innovation ambidexterity has a significant positive effect on organizational innovation performance (β = 0.40, P < 0.01). This result supports hypothesis H3.

The organizational innovation climate shows significant moderating effect. The interaction between organizational innovation climate and transformational leadership has a significant negative effect on innovation ambidexterity (β = – 0.26, P < 0.05). Combined with the significant positive effect of transformational leadership on innovation ambidexterity, the organizational innovation climate negatively moderates the positive relationship between transformational leadership and innovation ambidexterity. Specifically, when the organizational innovation climate is strong, the positive effect of transformational leadership on innovation ambidexterity is relatively weaker than when the organizational innovation climate is weak. Hypothesis H4a is not supported by the result.

To further illustrate the above-mentioned moderating effect, the moderating picture can be drawn by reference to literature (Ren & Zhang, 2015). By adding or subtracting a standard deviation from the mean value, the high and low levels of the corresponding independent variable and the moderator are calculated. The moderating effect is presented by two lines with different slopes (see Figure V-1 in Appendix V). As can be seen, the slope of the dotted line representing the high organizational innovation climate is smaller than the solid line representing the low organizational innovation climate, indicating that when the organizational innovation climate is at a high level, the impact of transformational leadership on innovation ambidexterity is weaker.

The interaction between organizational innovation climate and benevolent leadership has a significant negative effect on innovation ambidexterity (β = –0.33, P < 0.05). Combined with the significant positive effect of benevolent leadership on innovation ambidexterity, it is easy to find out that the organizational innovation climate negatively moderates the positive link between benevolent leadership and innovation ambidexterity. Specifically, when the organizational innovation climate is strong, the effect of benevolent leadership on innovation ambidexterity is relatively weaker than when the organizational innovation climate is weak.

Therefore, hypothesis H4b is not supported by the result. The moderating effect is shown in Figure V-2 in Appendix V. The slope of the dotted line representing the high organizational innovation climate is smaller than the solid line representing the low organizational innovation climate. Obviously, when the organizational innovation climate is at high level, the influence of benevolent leadership on the innovation ambidexterity is relatively weak.

The interaction between the organizational innovation climate and the moral leadership has a significant negative effect on the innovation ambidexterity (β = –0.38, $P < 0.05$). Combined with the significant positive effect of the moral leadership on the innovation ambidexterity, the organizational innovation climate negatively moderates the positive link between moral leadership and innovation ambidexterity. Specifically, when the organizational innovation climate is strong, the effect of the moral leadership on innovation ambidexterity is relatively weaker than when the organizational innovation climate is weak. So, hypothesis H4c is not supported by the result. The above moderating effect is shown in Figure V-3 in Appendix V. The slope of the dashed line representing the high organizational innovation climate is smaller than the solid line representing the low organizational innovation climate. It shows that when the organizational innovation climate is at a high level, the influence of the moral leadership on the innovation ambidexterity is relatively weak.

Although authoritarian leadership had no significant effect on innovation ambidexterity (β = –0.16, $P > 0.05$), the interaction between organizational innovation climate and authoritarian leadership has a significant positive effect on innovation ambidexterity (β = 0.34, $P < 0.05$). This result shows that when the organizational innovation climate is strong, the negative effect of authoritarian leadership on innovation ambidexterity is relatively weaker than when organizational innovation climate is weak. Therefore, the organizational innovation climate has a significant negative moderating effect, and hypothesis H4d is supported by the data results. The moderating effect is shown in Figure V-4 in Appendix V. The slope of the dashed line representing the high organizational innovation climate is smaller than the solid line representing the low organizational innovation climate. It clearly shows that when the organizational innovation climate is at a relatively low level, the negative influence of authoritarian leadership on the innovation ambidexterity is relatively greater.

The environment dynamism shows significant moderating effects. The interaction between environment dynamism and transformational leadership has a significant negative effect on innovation ambidexterity (β = – 0.28, $P < 0.05$). Combined with the significant positive effect of transformational leadership on innovation ambidexterity, it is easy to know that environment

dynamism negatively moderates the positive link between transformational leadership and innovation ambidexterity. Specifically, when the environment dynamism is strong, the effect of transformational leadership on innovation ambidexterity is relatively weaker than when the environment dynamism is weak. Therefore, hypothesis H5a is supported by the results. The moderating effect is shown in Figure V-5 in Appendix V. The slope of the dashed line representing high environment dynamism is smaller than the solid line representing low environment dynamism, indicating that when environment dynamism is at a relatively low level, the impact of transformational leadership on innovation ambidexterity is relatively stronger, and when environment dynamism is at a high level, the impact of transformational leadership on innovation ambidexterity is relatively weak.

The interaction between environment dynamism and benevolent leadership has a significant negative effect on innovation ambidexterity ($\beta = 0.25$, $P < 0.01$). Combined with the significant positive effect of benevolent leadership on innovation ambidexterity, the environment dynamism positively moderates the positive link between benevolent leadership and innovation ambidexterity, when environment dynamism is strong, the effect of benevolent leadership on innovation ambidexterity is relatively stronger than when the environment dynamism is weak. Therefore, hypothesis H5b is supported by the result. The above-mentioned moderating effect are shown in Figure V-6 in Appendix V. The slope of the dashed line representing high environment dynamism is greater than the solid line representing low environment dynamism, indicating that when environment dynamism is at a relatively high level, benevolent leadership has relatively less impact on innovation ambidexterity; and when environment dynamism is at a low level, the influence of benevolent leadership on innovation ambidexterity is relatively weak.

The interactions between the environment dynamics and the moral leadership has a significant positive effect on the innovation ambidexterity ($\beta = 0.19$, $P < 0.05$). Combined with the significant positive effect of the moral leadership on innovation ambidexterity, the environment dynamism positively moderates the positive linkage between moral leadership and organizational innovation ambidexterity, so that when the environment dynamism is strong, the effect of D&D leadership on innovation ambidexterity is relatively stronger than when the environment dynamism is weak. Hence, hypothesis H5c is supported by the result. The above-mentioned regulatory effect is shown in Figure V-7 in Appendix V. The slope of the dashed line representing high environment dynamism is greater than the solid line representing low environment dynamism, indicating that when environment dynamism is at a relatively high

level, the influence of the moral leadership on the innovation ambidexterity is relatively low; and when environment dynamism is at a low level, the influence of the moral leadership on innovation ambidexterity is relatively weak.

Although authoritarian leadership has no significant effect on innovation ambidexterity (β = –0.16, $P > 0.05$), the interaction between environment dynamism and authoritarian leadership has a significant positive effect on innovation ambidexterity ($\beta = 0.28$, $P < 0.05$). This result shows that when the environment dynamism is strong, the negative effect of authoritarian leadership on innovation ambidexterity is relatively weaker than when the environment dynamism is weak, so it can be understood as that there is a significant negative moderating effect. Therefore, hypothesis H5d is supported by the data results. The above discussed moderating effect is shown in Figure V-8 in Appendix V. The slope of the dashed line representing high environment dynamism is smaller than the solid line representing low environment dynamism, indicating that authoritarian leadership has a relatively weaker impact on innovation ambidexterity when environment dynamism is at a lower level; and when environment dynamism is at a relatively high level, the influence of authoritarian leadership on innovation ambidexterity is relatively weak. Environment dynamism, to some extent, weaken the negative effects of authoritarian leadership on innovation ambidexterity. This result may be helpful to understand the result that authoritarian leadership has no significant effect on innovation ambidexterity (β = –0.16, $P > 0.05$). Because the research objects are all high-tech enterprises which are in a relative high level of environment dynamism which makes the effect of authoritarian leaderships on innovation ambidexterity so weak that the coefficient becomes insignificant.

4.3.6 Robustness test

Since innovation performance comes only from a top manager's questionnaire, which may lead to measurement errors, it is necessary to use different performance data to perform robustness tests on the above hypothesis test results. The robustness test model is similar with the model shown in Figure 4-1. The difference is that objective performance indicators are used instead of the subjective innovation performance evaluation.

The robustness test model was estimated using the same method as the full model test. The results (χ 2 =13.86, $df = 8$, $\chi^2/df = 1.73$, $CFI = 0.98$, $TLI = 0.89$, $SRMR = 0.01$, $RMSEA = 0.12$) indicate good fit between the model and the data. The relevant path coefficients are shown in Table 4-12. The path coefficient based on 1000 Bootstrapping is consistent with the result of

the previous model full-model analysis. Only the path coefficient between innovation ambidexterity and innovation performance has changed, but it still shows a significant positive effect ($\beta = 0.36$, $P < 0.05$). Therefore, the full model test results are reliable.

Table 4-12 Results of Robustness Test

Independent	Dependent	Path Coefficient	T-value	P-value	Hypothesis	Proposed Direction	Support or Not
TL	IA	0.23*	2.05	0.046	H1	Positive	Yes
BE	IA	0.24*	2.12	0.039	H2a	Positive	Yes
MO	IA	0.24*	2.06	0.045	H2b	Positive	Yes
AU	IA	-0.16	-1.38	0.174	H2c	Negative	No
IA	OIP	0.36*	2.58	0.013	H3	Positive	Yes
IC	IA	0.23*	1.97	0.054	Null	Null	Null
ED	IA	-0.16	-1.49	0.142	Null	Null	Null
IC*TL	IA	-0.26*	-2.32	0.024	H4a	Positive Moderating Effect	No
IC*BE	IA	-0.33*	-2.47	0.017	H4b	Positive Moderating Effect	No
IC*MO	IA	-0.38*	-2.51	0.015	H4c	Positive Moderating Effect	No
IC*AU	IA	0.34*	2.45	0.018	H4d	Negative Moderating Effect	Yes
ED*TL	IA	−0.28*	−2.47	0.017	H5a	Negative Moderating Effect	Yes
ED*BE	IA	0.25**	2.97	0.005	H5b	Positive Moderating Effect	Yes
ED*MO	IA	0.19*	2.35	0.023	H5c	Positive Moderating Effect	Yes
ED*AU	IA	0.28*	2.24	0.029	H5d	Negative Moderating Effect	Yes

Notes: Notes: N=53; * P < 0.05; TL: Transformational Leadership; BE: Benevolent Paternalistic Leadership; MO: Moral Paternalistic Leadership; AU: Authoritarian Paternalistic Leadership; IA: Organizational Innovation Ambidexterity; IC: Organizational Innovation Climate; ED: Environmental Dynamism; OIP: Objective Organizational Innovation Performance.

4.4 Chapter summary

This chapter includes two main sections. This first section Based on relevant theories and literature, this chapter discusses the relevant assumptions in the model shown in Figure 4-1. These assumptions provide answers to the previous research questions. The hypothesis of direct effects describes the linkage mechanism of "leadership style-innovative performance",

emphasizing the important role of innovation ambidexterity in it, and directly answers research question one and research question two. The hypothesis of moderating effect explores two regulatory variables that have an important influence on the relationship between "leadership style-innovation ambidexterity" from the perspective of internal and external organizations, namely, the internal innovation climate and environment dynamism, and the assumptions about moderating effect. Study question three provided the answer. The method, process, and result of rigorous scientific examination of the above assumptions will be discussed later.

The second section discusses in detail the method of empirical research, especially some technical details of questionnaire design, data collection process, variable measurement, and data analysis. These methods are the basis for getting rigorous research results.

For the questionnaire design, some necessary considerations are discussed, and the design process is given a more detailed description. Because of the multi-source data survey scheme, a corresponding data collection plan was carefully designed based on the characteristics of the respondents.

In the variable measurement section, the sources of relevant measurement methods and measurement tools are discussed, and the results of the pilot test are reported. Finally, a brief description of the data analysis method is reported as the methodological foundation for the following chapter.

This second section first describes the sample information. Based on the test of the measurement model, three main steps are used to test the hypotheses presented in the previous section. The relevant results can be summarized as shown in Table 4-13. Some hypotheses are supported by data and others are not supported. However, these results provide instructive answers for the research questions, and at the same time have a certain contribution and significance to related research fields. In the next chapter, they will be further discussed.

Table 4-13 Summary of Hypotheses Test Results

Hypotheses	Correlation	Main effect test	Full model test	Robustness test	Concluded result
H1: TL have a positive effect on IA.	Yes	Yes	Yes	Yes	
H2: PL has significant effect on IA.					Partial Yes
H2a: BE has positive effect on IA.	Yes	Yes	Yes	Yes	
H2b: MO has positive effect on IA.	Yes	Yes	Yes	Yes	
H2c: AU has negative effect on IA.	Yes	Yes	No	No	
H3: IA has positive effect on IP.	Yes	No	Yes	Yes	
H4: IC moderates the relationship between these two leaderships and IA.					Partial Yes
H4a: IC positively moderates the relationship between TE and IA.	N.M.	N.M.	No	No	
H4b: IC positively moderates the relationship between BL and IA.	N.M.	N.M.	No	No	
H4c: IC positively moderates the relationship between MO and IA.	N.M.	N.M.	No	No	
H4d: IC negatively moderates the relationship between AU and IA.	N.M.	N.M.	Yes	Yes	
H5: ED moderates the relationship between tow leaderships and IA					Yes
H5a: ED negatively moderates the positive link between TL and IA.	N.M.	N.M.	Yes	Yes	
H5b: ED positively moderates the positive link between BE and IA.	N.M.	N.M.	Yes	Yes	
H5c: ED positively moderates the positive link between MO and IA.	N.M.	N.M.	Yes	Yes	
H5d: ED negatively moderates the negative link between AU and IA.	N.M.	N.M.	Yes	Yes	

Notes: N = 53; TL: Transformational Leadership; BE: Benevolent Paternalistic Leadership; MO: Moral Paternalistic Leadership; AU: Authoritarian Paternalistic Leadership; IA: Organizational Innovation Ambidexterity; IC: Organizational Innovation Climate; ED: Environmental Dynamism; IP: Organizational Innovation Performance; N.M.: not mention.

Chapter 5: Discussion and Conclusion

5.1 Major findings

The main findings of the first study can be summarized as two major points. First, in terms of absolute provincial average values, Guizhou has the very low levels of R&D input and output. This result shows us that the development of high-tech enterprises of Guizhou province is far lower than the average level of mainland China and the provincial average level in all regions, at least in terms of scale. For Guizhou, this means the high-tech enterprises in Guizhou Province have a large catch-up space, meanwhile, the government and the policy makers should pay more attention such kind of differences. Second, Guizhou has relatively high ratios of patents/R&D expenditure and patents/R&D personnel, but the lowest ratios of sales/R&D expenditure and sales/patents. These results reveal three important characteristics of the high-tech enterprises in Guizhou at provincial level. They have higher efficiency at the process from R&D input to patents output; but lower efficiency at the process form patents to sales of new products; they have low level of innovation ambidexterity. Keep these in mind, the internal organizational process may reveal something important for understanding these results.

The main findings of the second study can be summarized from the main effects and moderating effects of related variables. From the main effect point of view, the research found that transformational leadership and paternalistic leadership (except for authoritarian leadership) have significant positive impact on organizational innovation ambidexterity, and further influence organizational innovation performance through organizational innovation ambidexterity.

Hypothesis H1 proposes that transformational leadership has a significant positive effect on organizational innovation ambidexterity. The results of the study show that, under the control of the influence of other variables, the transformational leadership style has a significant positive effect on the dual performance of organizational innovation. Therefore, H1 is supported by the data results. This result is consistent with the findings in the existing literature on the relationship between transformational leadership and organizational innovation ambidexterity (Zheng et al., 2016).

Hypothesis H2 discusses the relationship between paternalistic leadership and

organizational innovation. The study finds that the three dimensions of paternalistic leadership have different effects on organizational innovation ambidexterity. Benevolent leadership and moral leadership have significant positive effects on organizational innovation ambidexterity, and the hypotheses H2a and H2b proposed in this paper are supported by the results. This result is consistent with the results in the existing literature (Pellegrini & Scandura, 2007; Fu et al., 2012; Gao, 2013). However, the negative effect of authoritarian leadership on innovation ambidexterity is not significant. The hypothesis H2c proposed in this paper is not supported by the results. In literature, it is common to see that the conclusions about authoritarian leadership are inconsistent. Some studies have found that authoritarian leadership has a significant negative effect, and some have no significant effect (Pellegrini & Scandura, 2007; Fu et al., 2012; Gao, 2013). Such kind of results may be understood from the ideological foundation of paternalistic leadership.

The three dimensions of paternalistic leadership have different ideological foundation. The ideological foundation of benevolent leadership is reciprocity and gratitude. The ideological foundation of the moral leadership is example and exemplary. The ideological foundation of authoritarian leadership is reverence and obedience. Among them, the effect of authoritarian leadership may be influenced by context factors much more. For example, some researchers believe that when the member reliance on authoritarian leadership is high, their negative influence may be weakened to a certain extent (Gao, 2013). Another reason may be derived from the characteristics of the research objects. The research objects of the current research are all high-tech enterprises, their organization members are very different from those manufacturing enterprises (Yuen, 1990). The members of the studied organizations have a relatively higher level of education and their work is highly technical, innovative, and independent. For such kind of knowledge-type employees, authoritarian leadership may be not an effective leadership. Concluding from the above findings hypothesis H2 is partially supported by the results.

Hypothesis H3 believes that there is a significant positive link between organizational innovation ambidexterity and organizational innovation performance. The current result supports this assumption. Whether to see innovation ambidexterity as two dimensions, or to see it from the perspective of the balance of the two (Cao, Gedajlovic, & Zhang, 2009), this result is reasonable, and the results can be supported by the results in literature (Popadić, Černe, & Milohnić, 2015b). This result shows that the organization's focus on improving the innovation ambidexterity is conducive to improving the level of innovation performance.

From the perspective of moderating effect, this paper finds that the organizational innovation climate and environment dynamism plays a complex and important moderating role in the relationship between leadership and organizational innovation ambidexterity.

Hypothesis H4 discusses the moderating role of organizational innovation climate. Hypotheses H4a, H4b, and H4c assume that the organizational innovation climate can positively moderates the positive relationships between transformational leadership, benevolent leadership and moral leadership and organizational innovation ambidexterity. Specifically, the organizational innovation climate can strengthen these relationships. However, the research results show that the organizational innovation climate does not have positive moderating effect on these relationships, but has negative moderating effect, so that the organizational innovation climate weakens the above positive relationships. Therefore, the assumed H4a, H4b, and H4c are not supported. While hypothesis H4d proposes that the organizational innovation climate will weaken the negative effect of authoritarian leadership on organizational innovation ambidexterity. This hypothesis is supported by the research result. Although H4a, H4b, and H4c are not supported and only H4d is supported, these findings can be understood from several theoretical aspects.

According to the Conservation of Resources Theory (Hobfoll, 2011), psychological resources are precious and anyone's psychological resources are limited, there is a mechanism to keep the psychological resources at a certain level to avoid exhaustion, or one may collapse as his/her psychological resources exhaust. To understand the organizational environment, people must expend certain psychological resources. When the limited psychological resources are distributed among different cognitive objects, more psychological resources are expended on this one means less psychological resources on others. Therefore, when the innovation climate is strong enough to attract the organizational members, they will pay less attention to the effect of leadership, so that the effects of leaderships decrease. In addition, this result can also be understood as a substitution effect between the leadership style and the innovation climate, for their connection to organizational innovation ambidexterity. Due to such kind of substitution effect, the effect of innovation climate plays the role of a kind substitution of the effect of leaderships on innovation ambidexterity. In the above discussion, the hypothesis 4 is partially supported, but the relevant results have important theoretical and practical significance which will be discussed in subsequent section.

Hypothesis H5 discusses the moderating effect of environment dynamism. Hypothesis H5a proposes that environment dynamism will weaken the positive effect of transformational

leadership on organizational innovation ambidexterity. This hypothesis is supported by the findings. This result is consistent with a study conducted in a Chinese company and both support the negative moderating effect of environment dynamism on the relationship between transformational leadership and organizational innovation (Zheng et al., 2016). Hypothesis H5b and H5c assume that environment dynamism will positively moderate the positive effects of benevolent leadership and moral leadership on organizational innovation, while H5d assumes that the environment dynamism will negatively moderate the authoritarian leadership and organizational innovation ambidexterity. These hypotheses are supported by the research results. Taken together, hypothesis H5 is supported by the results of the study.

In study 2, the ANOVA results are deserver our attention. When using ownership structure, industry, subsidiaries and number of employees as factors, the results show that innovation ambidexterity, innovation performance and environment dynamism are not significantly different among relevant groups. These results can be explained from different perspectives. First, no significant difference means these factors are not the critical antecedents for innovation ambidexterity, innovation performance and environment dynamism. The results in section 5.2.5 are consistent with the ANOVA results Therefore, the internal organizational process may be critical for understanding high-tech enterprises in Guizhou. Second, as mentioned in section 5.2.3, the sample size is relatively small, especially comparing with the number of all high-tech enterprises in Guizhou. Therefore, we should be very cautious when explain these results. This point will be discussed more in section 6.5.

We may reach more deep and complete understanding of the high-tech enterprises in Guizhou when taking the above discussed findings from both studies together. First, the findings of study 1 describes the true situation of the high-tech enterprises in Guizhou. Three important findings demonstrated by the study, such as (1) the R&D input and output are at low level; (2) the ratios of patents/R&D input are at high level; (3) the ratios of sales/R&D expenditure and sales/patents are very low. These findings reveal that internal innovation process play more important roles for those enterprises. Second, if study 1 examines the high-tech enterprises in Guizhou at more macro level, study 2 help people go deeper into the internal organizational innovation process. The findings of study 2 reveal the internal influence process from leaderships to innovation performance. Both transformational leadership and two dimensions of paternalistic leadership have positive effect on innovation ambidexterity through which to influence innovation performance, but the authoritarian dimension of paternalistic leadership does not have significant effect on innovation ambidexterity. Moreover, the effect of

leaderships has been moderated by both innovation climate and environment dynamism. Such kind of findings can help people know more about the internal innovation process of high-tech enterprises in Guizhou. Third, when taking all finding together, more useful practice suggestions can be provided, for both policy makers and business managers. This point will be detailed in section 6.3.

5.2 Theoretical contributions

The above researches provide new insights and relevant empirical evidence for research fields related to leadership and innovation, helping people to better understand the process of "leadership-innovative performance".

5.2.1 For leadership field

In the current study, a model has been developed based on relevant theories and literatures of transformational leadership, paternalistic leadership, organizational innovation ambidexterity and organizational innovation performance. It reveals how transformational leadership and paternalistic leadership influence organizational innovation ambidexterity through which to influence organizational innovation performance finally at organizational level. Meanwhile, the model addresses the important moderating roles of organizational innovation climate and environment dynamism.

Although there are so many researches on transformational leadership (Chen et al., 2016; Schmitt et al., 2016; Zheng et al., 2016; Duan et al., 2017; Ng, 2017), how transformational leadership affects the organizational process and organizational outcomes requires more researches (Jing & Avery, 2008). Recently, some scholars have also called for the study of transformational leadership beyond the individual level (Ng, 2017). The study in this paper serves as a strong response to the above-mentioned appeal, constructing a mechanism model to explore the role of transformational leadership at the organization level, and revealing the process of "transformation leadership—organizational innovation ambidexterity—organizational innovation performance".

There is also a large amount of research on paternalistic leadership (Chen et al., 2014; Cheng & Wang, 2015; Tang & Naumann, 2015; Zhang et al., 2017). The existing research results consistently support the positive effect of benevolent leadership and moral leadership, but there is no consensus on the effect of authoritarian leadership (Gao, 2013), so more research

is needed to explore in depth the different roles of these three dimensions, especially the influence of important contextual factors (Farh et al., 2008). Some scholars also call for more organizational-level research to increase the understanding of the impact of paternalistic leadership on organizational processes and organizational outcomes (Pellegrini & Scandura, 2007; Fang, Bin, & Zhang, 2017). As a feedback to the above appeal, this study supports the positive effects of benevolent leadership and moral leadership on the organizational innovation ambidexterity but did not find that authoritarian leadership has a negative effect on organizational innovation ambidexterity. The possible reason may be that the current research context that all research objects are high-tech enterprises. This result gives strong support for the contextual perspective of authoritarian leadership in literature (Farh et al., 2008).

Besides, the research results about the moderating effect of organizational innovation climate and environment dynamism are of good enlightening significance, revealing the complex relationship between both leaderships and organizational innovation ambidexterity. This article focuses on internal and external organizations and studies two important contextual variables, namely, organizational innovation climate and environment dynamism. The results show that the three-dimensionality of paternalistic leadership and the organizational innovation climate play the roles of mutual replacement when discuss their effects on organizational innovation ambidexterity. Environment dynamism, on the other hand, can amplify the positive impact of benevolent and moral leadership on organizational innovation ambidexterity, while also weakening the negative impact of authoritarian leadership. These findings provide important empirical evidence for enriching people's understanding of the relationships between paternalistic leadership and innovation ambidexterity. For the academic controversies in literature that whether or not the authoritarian leadership have significant impact and what direction the impact is if it has significant impact, the current research results can provide some inspiration that one possible reason for these controversies may be that different studies are conducted under different internal and external organizational environments, but did not take suck kind of environmental factors into account, so get different or contrary conclusions. In other words, such seemingly contrary findings are just from the missing of critical environmental factors which are important moderators for the studied relationships. In fact, as discussed by some scholars (Farh & Cheng, 2000; Cheng et al., 2004; Farh et al., 2008), authoritarian leadership may be a very effective leadership in a specific context. Following this logic, if the contextual factors are excluded in the equation, the estimations may be greatly different.

In addition, leadership styles cannot be studied without cultural background (Den Hartog et al., 1999), and organizational innovation process is also influenced by cultural background (Alam, 2011). The results of this study on leadership style and organizational innovation ambidexterity provide empirical evidence in Chinese cultural context for a deeper understanding of the role of leaderships in the organizational innovation process. At the same time, the current research provides empirical research results based on the data from high-tech enterprises in Guizhou Province, China, thus providing comparative research results for studying the effectiveness of leadership styles in different cultural backgrounds and different kinds of organizations.

5.2.2 For innovation field

The research on the antecedents of organizational innovation ambidexterity is one of the focuses of innovation scholars. Extant researches show that some leadership can promote innovation ambidexterity, such as leadership style (Lin & Iii, 2011), but how leaderships and relevant behaviors affect innovation ambidexterity needs more in-depth research (O'Reilly & Tushman, 2013).

The research results of the current research reveal the impact mechanism through which transformational leadership and paternalistic leadership influence organizational innovation ambidexterity and organizational innovation performance, thus providing empirical evidences for understanding the relationships among them. The results on the moderating roles of innovation climate and environment dynamism show that we cannot simply understand the formation of organizational innovation ambidexterity. We should consider the internal and external environmental factors of the organization, to more accurately describe the formation mechanism of organizational innovation ambidexterity.

The current results provide empirical evidence for understanding the relationship between organizational innovation ambidexterity and organizational innovation performance and reveal a possible path to promote organizational innovation performance from the perspective of leaderships. These results provide the mechanism and empirical evidence concerning the link between leaderships as key organizational factors and innovation performance, thereby enriching people's understanding of the antecedent variables of innovation performance (Damanpour, 1991; Huang & Chen, 2010; Zhang & Lv, 2013; Cao et al., 2016; Zheng et al., 2017).

5.2.3 Leadership and innovation climate for innovation

As discussed above, both leadership and innovation climate are important for innovation process and innovation performance. Leadership is critical for organizational innovation process and performance, because leaders are responsible for both setting the strategic innovation goals and activity patterns (Drazin, Glynn, & Kazanjian, 1999) and constructing the environment for organizational innovation process and ultimately innovation performance (Hemlin, Allwood, & Martin, 2008). Since leaders cannot work in a vacuum or get the innovation outcomes directly, scholars tried to reveal when (Bass & Riggio, 2006) and how (Schuckert et al., 2018) leadership influence innovation process and innovation performance. The relevant mechanisms include those at several levels, such individual level (Gong, Huang, & Farh, 2009), team level (Hülsheger, Anderson, & Salgado, 2009), and organizational level (Yuan & Woodman, 2010). Following this stream, some debates about the roles of climate (e.g. team climate or innovation climate) emerges, some people think that climate may mediate the effect of leadership on innovation, others may hold that climate should be a moderator (Denti & Hemlin, 2012).

Though extant literature provides empirical evidences supporting the important influence of leadership on innovation, the current research not only provide evidences in high-tech enterprises in Guizhou to support the important influence of leadership, but also reveal “when” the effect is stronger through testing the moderating effect of innovation climate and environment dynamism. For the above-mentioned debate, the current research indicates that innovation climate moderates the relationship between leadership and innovation ambidexterity. However, the moderating effect is different for relationship between different leaderships and innovation ambidexterity.

Meanwhile, innovation climate is another critical factor for organizational innovation process and innovation performance (Scott & Bruce, 1994). Two streams of literature discuss the roles of innovation climate for innovation process and innovation outcomes. The first stream is about the direct effect of innovation climate. For example, some researchers found that innovation climate can directly influence individual or organizational innovation outcomes (Hsu & Fan, 2010; Ren & Zhang, 2015). Similarly, the current research found that there is a positive relationship between innovation climate and innovation ambidexterity. The second is about the moderating effect of innovation climate. For example, one research found that innovation climate can enhance the relationship between leadership and adaptive performance as a kind of innovation performance (Charbonniervoirin, El Akremi, & Vandenberghe, 2010).

But this research is at individual level, differently, the current research supports the moderating effect of innovation climate on leaderships and innovation ambidexterity at organizational level. From this perspective, the current research help people understand more about the moderating effect of innovation climate.

5.3 Practical suggestions

The above findings can bring some inspiring suggestions to both the policy makers of Guizhou and all business managers. These suggestions will be helpful to improve organizational innovation performance, and thus contribute to the innovation and development of high-tech enterprises.

5.3.1 For policy makers

For policy makers especially those of Guizhou, suggestions can be drawn from the projects. First, they should pay close attention to the big differences between Guizhou and other regions. Except the influence of geographical differences, what kind of policies may be effective to improve the innovation of high-tech enterprises need more consideration.

Second, the R&D input including expenditure and personnel should be increased to improve the innovation outcomes at provincial level. The findings of study 1 show that the ratios of patents/R&D expenditure and patents/R&D personnel are at really high level, but the absolute values of patents are at very low level. It is reasonable to assert that to increase the input will lead to high level output, especially when have higher level of patents/R&D expenditure and patents/R&D personnel.

Third, the government should take the responsibility to create good institutional market environment for enterprises to apply or exchange their patents. Although, there is no findings about how market environment will influence the innovation process and innovation performance, the current findings that the ratios of sales/R&D expenditure and Sales/patents are very low but the patents/R&D expenditure and patents/R&D personnel are very high can give reasonable assertation that to improve the ratio of sales/patents is one of the key factors to improve the development of high-tech enterprises in Guizhou. For this process, the government is a key player in both institutional and market field.

Fourth, close attention should be given to the selection and training of top managers of state-owned enterprises (SOEs). The findings of the current project demonstrate that internal

organizational process is critical for explaining organizational innovation performance, and leaders play critical roles in internal organizational innovation process. Different from traditional perspective that those with strong authoritarian style are not good choices for top managers of high-tech enterprises because such kind of leadership may cause negative effect on innovation process and innovation performance, the findings of current research show that authoritarian style will not harm the innovation ambidexterity at all especially in those enterprises with high level of innovation climate and located in high level of environment dynamism.

5.3.2 For business managers

For business managers, three suggestions can be drawn from the current project. First, senior managers should deeply understand the relationship between leaderships and innovation performance, and deeply understand the different effects of different leaderships in different contexts, to adjust their own leaderships and relevant leadership behaviors and strategies according to the characteristics of the intra-organizational environment and the characteristics of the external environment.

Second, leaders should strengthen their comprehensive leadership ability, to form a kind of contradictory-thinking habits, and form multiple leadership to better achieve the organizational stability and promote innovation coordination at the same time. The effectiveness of leadership is greatly influenced by the internal and external environment of the organization, as shown in the current research. Therefore, the leaders should use dynamic and evolutionary perspectives to observe its own leadership and the fit between the leadership and environment, to make necessary adjustments to achieve the best leadership results (Vugt & Ronay, 2014).

Third, leaders should pay attention to the understanding of the internal and external environmental factors of the organization and are accustomed to thinking about environmental features with dynamic thinking. The results on the moderating role of organizational innovation climate and environment dynamism inspired us that, at some times, environmental factors can be utilized as a lever to offset the limitations of certain leadership styles. Managers should assess the situation, accurately determine the internal and external important environmental characteristics of the organization and try to make environmental factors help to avoid the negative influence of the inherent leadership style, and thus becoming a facilitative force to better improve innovation performance. For example, if you have strong authoritarian

leadership and are very difficult to change in a short term, you can weaken the negative impact of authoritarian leadership by shaping a strong organizational climate.

5.4 Innovation points

The innovation points of the current research can be summarized as the following points. The first is the innovation one theoretical model. Most existing researches on “leadership-innovation-performance” only considers a kind of leadership (Zheng et al., 2016; Duan et al., 2017; Zhang et al., 2017). In the current research, both transformational leadership and paternalistic leadership are included in the research model. In fact, different leaderships only observe leaders in the real world from different perspectives. For leaders who are observed, there should not be a clear distinction between transformational leadership and paternalistic leadership. Therefore, the research framework of this paper can provide a more comprehensive theoretical explanation for "leadership-innovation-performance" and provide more rigorous research results on transformational leadership and paternalistic leadership research fields.

Second, when considering important contextual variables, both important internal and external organizational variables are taken into consideration. Innovation climate as an internal moderator and environment dynamism as an external moderator are added into the model which can describe the process of “leadership-innovation-performance” more comprehensively and accurately. By doing so, to give a positive feedback to the appeal to value contextual variables (Farh et al., 2008).

Third, in terms of research methods, a multi-source data research design has been employed to avoid the influence of CMV to the greatest extent, thus ensuring the reliability of the research results. In addition, when studying organizational innovation performance, most of existing researches only employed objective or subjective performance (Zheng et al., 2017), both subjective performance evaluation and objective performance indicators were used in the current research to test relevant hypotheses, which provides more rigorous and reliable research conclusions.

Fourth, from the perspective of the research objects, although there are already some research results on high-tech enterprises and Chinese high-tech companies, the current research focuses on those a special province of China—Guizhou Province. This research objects may provide people with new insights, and at the same time provide the academic community with empirical evidence based on specific research context for comparison with other and future

research results.

Fifth, the current research fills several gaps in literature. For example, most of extant researches on innovation adopted economic research perspectives and paradigms, the differences among the enterprises were neglected to some extent, no empirical research on innovation of high-tech enterprises of Guizhou, China.

5.5 Limitations

The research also has some limitations, as most of management researches. First, the sample size seems a little small, especially for the full model test in which there are so many variables in the model that the number of covariances cannot provide enough degree of freedom to estimate the parameters. A relatively small sample size may bring bias to the variances of the estimated parameters, so that the estimated variance may become greater than the true value, thus may leading to rejecting assumptions that should have been accepted. Second, the sample data were only collected from high-tech enterprises in a province. The sample data is similar with the distribution of high-tech enterprises in Guizhou province, therefore the sample is a good representative sample for Guizhou. However, whether the findings based on the sample can be extended to a wider range depends on future test based on bigger samples. Third, although the method of data collection can avoid CMV as much as possible, the specific questionnaire distribution channels may lead to selective bias. In the above section, we see that from the perspective of many controls, their distributions of the sample data are similar with those of the whole province. But the assumption of random sampling has not been satisfied strictly. Due to these limitations, we should be highly cautious about explaining the results and generalizing the conclusions.

5.6 Future research directions

Where possible, the future research can be based on random samples, using a larger-scale sample data from larger regions to test the hypotheses to provide more robust and reliable research results. Moreover, the findings of study 1 reveal significant differences between Guizhou and other regions (in terms of provincial average), study 2 reveals that internal organizational factors and process may be critical for understanding the innovation process of high-tech enterprises. Taking them together, people may wonder what will be found if the current project is conducted in other provinces, other regions, or even other countries. Therefore,

one possible future direction may be to examine the research questions in other contexts. Such kind of research may provide more solid scientific evidence for understanding the innovation process of high-tech enterprises.

Another very interesting and instructive result from the current research is that, although the hypothesis of the moderating role of the organizational innovation climate has not been supported, the organizational innovation climate in fact plays a significant moderating role. This paper finds that the organizational innovation climate plays a negative moderating role; but there are also findings in the literature that the organizational innovation climate has a positive moderating effect (Zheng et al., 2009). Although these two different results can be reasonably explained in the specific research situation, in the end how to understand such different moderating effect, whether there is a general rule, or whether there is a theory framework which can explain the differences, such kind of question are worthy of further exploring in the future. Moreover, this topic is closely related to organizational climate, so relevant researches can advance the understanding of organizational climate as well, thus having more theoretical significance. In the future, a possible promising direction may be that to construct a third-order moderating model to explore the conditions in which the organizational innovation climate produces different moderating effect. Such kind of researches are very helpful for deep understanding how innovation climate plays its roles in organizational innovation process.

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Appendix I: Introduction of Questionnaire

Survey on High-Tech Enterprises

Dear Madam or Sir,

At first, thank you very much for your attention and support for this survey!

The purpose of this questionnaire survey is to collect data for a scientific research project on high-tech enterprise innovation, to explore the rules of innovation in high-tech enterprises.

We promise to you: This questionnaire survey is anonymous and the survey results will be kept strictly confidential. The data you provide will not be disclosed to any third party. In addition, the research will be based on statistical results from all the data. The data of any organization or individual will not be reported. Therefore, you need not have any concerns or worries! Please choose the best one for each item according to your organization and your own situation. All the information you provide is only for academic research, will not be used for any commercial purposes. So, please answer all questions based on your real feelings!

The information you provide is of great significance for obtaining scientific research results! Thank you for your help!

If you want to know the relevant research results, please contact the research team, we will inform you the first time. If you have any questions during the filling process, please contact us!

Our contact information is as follows:

Tel：139-8408-5452

Email: 529528592@qq.com

Appendix II: Scales Used in Main Study

Notes: The scales used in main study are listed below. In the actual used questionnaires, the items are not differentiated according to concepts. Instead, all items are numbered in a sequenced order in each questionnaire. So, it is difficulty for the respondents to find out or guess which items belong to which construct.

Table II–1 Transformational Leadership

Item	Loading
The top management team can make everyone around me enthusiastic about assignments.	0.70***
The top management team can manage to make my followers go beyond their own self-interests for the good of the organization.	0.68***
The top management team often articulate a compelling vision of the future for my followers.	0.61***
The top management team often inspire the followers.	0.65***
The top management team tend to motivate my followers to seek differing perspectives when solving problems.	0.68***
We are often forced by the ideas from the top management team to rethink some of our ideas which we had never questioned before.	0.71***
The top management team always treat each of the followers as individuals with different needs, abilities, and aspirations.	0.59***
The top management team often find out what my employees want and try to help them get it.	0.77***

Table II–2 Paternalistic Leadership

Benevolent Leadership	Loading
He/She cares about my private life and living.	0.41**
He/She usually greets me warmly.	0.67***
When I was in trouble, he/she would help me in time.	0.79***
He/She will take meticulous care of the longer-term subordinates.	0.51***
His/Her care for me will be extended to my family.	0.38*
Moral Leadership	**Loading**
He/She is decent and will not practice jobbery.	0.52***
He/She treats us fair and unselfishly.	0.83***
He/She will not do anything about "Guanxi" or pull strings because of his/her personal interests.	0.47**
He/She is a good example for me to follow, for both being a man and doing things.	0.39**
He/She can set himself/herself as an example to others.	0.38*
Authoritarian Leadership	**Loading**
He/She did not disclose the organizational information to us.	0.38*
All decisions including those important ones and less important ones were made by himself/herself alone.	0.38*
At the meeting, he/she made the final decision according to his intentions.	0.41**
He/She brought me great pressure when working with him.	0.72***
He/She will rebuke us when the task goal cannot be achieved.	0.55***

Table II–3 Organizational Innovation Ambidexterity

Exploratory innovation	Loading
Our unit accepts demands that go beyond existing products and services.	0.45**

We invent new products and services.	0.54***
We experiment with new products and services in our local market.	0.58***
We frequently utilize new opportunities in new markets.	0.56***
Our unit regularly uses new distribution channels.	0.47**
We regularly search for and approach new clients in new markets.	0.68***
Exploitative innovation	Loading
We frequently refine the provision of existing products and services.	0.79***
We regularly implement small adaptations to existing products and services.	0.67***
We introduce improved versions of existing products and services for our local market.	0.51***
We improve our provision's efficiency of products and services.	0.79***
We increase economies of scales in existing markets.	0.56***
Our unit expands services for existing clients.	0.69***
Lowering costs of internal processes is an important objective.	0.55***

Table II–4 Objective Organizational Innovation Performance

Item	Loading
In 2017, we have authorized patents of: □under5, □6-10, □11-20, □21-50, □51-100, □101-500, □over 500	0.94
In 2017, we have new products of: □under5, □6-10, □11-20, □21-50, □51-100, □101-500, □over 500	0.85
In 2017, we have new product launches of: □under5, □6-10, □11-20, □21-50, □51-100, □101-500, □over 500	0.98
In 2017, the proportion of sales from new products is: □under5%, □6-10%, □11-20%, □21-50%, □51-90%, □over 90%	0.52
In 2017, the proportion of profits from new products is: □under5%, □6-10%, □11-20%, □21-50%, □51-90%, □over 90%	0.48

Table II–5 Subjective Organizational Innovation Performance

Item	Loading
We often take the lead in launching new products (including new services) in the industry.	0.64**
We often take the lead in applying new technologies in the industry more quickly.	0.48*
Our product improvement and innovation have a better market response.	0.59**
Our products contain first-rate advanced technologies and processes.	0.46*
The success rate of our new products (including new services) development is higher.	0.29

Table II–6 Organizational Innovation Climate

Item	Loading
The reward system of our enterprise makes everyone enthusiastic about innovation.	0.50**
All employees are encouraged to come up with creative ideas.	0.47**
The reward system of our enterprise effectively promotes job innovation.	0.48**
Employees who have reasonable and innovative ideas will be awarded by our enterprise.	0.78***
The leaders of our enterprise often carry out work plan creatively.	0.79***
The leaders of our enterprise are hands-on to promote innovation.	0.48**
The leaders of our enterprise demonstrate good communication and coordination skills in the work process.	0.52**
My colleagues will help me to complete my work creatively.	0.45*
My colleagues often communicate and discuss problems in their work.	0.48**
My colleagues often feel the support and concern of their colleagues.	0.41**
Our innovative work ideas can be supported by leaders.	0.41**
The leaders of our enterprise often appropriately empower their followers.	0.41**
When we encounter difficulties, we can get support from my leader.	0.41**
The leaders of our enterprise encourage new ideas to get work done.	0.41**

My job is often stagnant due to the lack of resources.	0.61***
My talent has not been limited due to resource constraints.	0.41*
The enterprise cannot provide enough resources to support my work.	0.91***
The enterprise creates an atmosphere for employees so that they can communication and exchange ideas with each other freely.	0.54**
We are encouraged to solve problems with new methods.	0.55**
Innovation is encouraged in our enterprise.	0.78***
I can decide for myself how to implement the work plan.	0.51**
To some extent, I have some discretion for my own work.	0.84***
I can set my own work schedule.	0.44*

Table II–7 Environment Dynamism

Item	Loading
The technology in our industry is changing rapidly.	0.56
The market requirements in our industry are changing rapidly.	0.61
In our target market, the volumes of products and services to be delivered often change fast.	0.68

Table II–8 Controls at Organizational Level

Item	Choices		
Till December of 2017, our company is a:	□central SOE □regional SOE □private company □joint venture		
Till December of 2017, the major business of our company belongs to:	□electronic information technology □biology and new medical technology □aerospace technology □new materials technology □high-tech service industry □new energy and energy-saving technologies □resources and environment technology □advanced manufacturing and automatic technology		
Till December 2017, we have subsidiaries of:	□under 3	□3-6	□7-11 □12-20 □over 20
Till December 2017, we have employees of:	□less than 20	□21-50	□51-100 □101-200 □201-500 □501-1000 □1001-2000 □2001-5000 □over 5000
In RMB 1,000,000 yuan (million), the amount of sales of 2017 is:	□less than 0.5	□0.5 to 5	□5-10 □10-100 □100-500 □500-2000 □over 2000
In RMB 1,000,000 yuan (million), the amount of sales of 2017 is:	□less than 0.5	□0.5 to 5	□5-10 □10-100 □100-500 □500-2000 □over 2000

Table II–9 Controls at Individual Level

Item	Choices
My gender is:	□Male □Female
My age is:	□under25 □26-35 □36-45 □46-55

	□over 55
From my first full-employment work to December 2017, I have worked for：	□less than 5 years □6-10 years □11-15 years □16-20 years□21-30 years □more than 31 years
My tenure is:	□under 5 □6-10 □11-15 □16-20 □21-30 □over 30
My education experience:	□under bachelor's degree □bachelor's degree □master's degree □doctor's degree
In the organizational hierarchy system, I am a:	□Middle manager □Top manager
In November 2017, my department is:	□R&D □Marketing □HRM □Financial □Customer service □Manufacture □Other
Firm code: Please write down the first letter of the Pinyin for each word in your company name:	_____ An example: if the company name is "大江科技公司（Da Jiang Ke Ji Gong Si）", please write down "DJKJGS" here. The purpose of this code is simply to identify what questionnaires are from the same company and not to identify the real company names! It cannot be used to identify the real company name.

Appendix III: Post Hoc Test for Key Constructs with Different Factors

Table III–1 Post Hoc Test for Innovation Ambidexterity with Factor of Ownership

Ownership (I)	Ownership (J)	Mean (I) - Mean (J)	S. E.	Sig.	Lower (95%)	Upper (95%)
1	2	0.42	0.26	0.66	-0.29	1.12
	3	-0.04	0.21	1.00	-0.62	0.54
	4	-0.02	0.24	1.00	-0.67	0.63
2	1	-0.42	0.26	0.66	-1.12	0.29
	3	-0.46	0.18	0.10	-0.97	0.05
	4	-0.44	0.21	0.26	-1.02	0.14
3	1	0.04	0.21	1.00	-0.54	0.62
	2	0.46	0.18	0.10	-0.05	0.97
	4	0.02	0.15	1.00	-0.40	0.45
4	1	0.02	0.24	1.00	-0.63	0.67
	2	0.44	0.21	0.26	-0.14	1.02
	3	-0.02	0.15	1.00	-0.45	0.40

Notes: $N = 53$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; Ownership: 1 = central SOE, 2 = regional SOE, 3 = private company, 4 = joint venture.

Table III–2 Post Hoc Test for Innovation Ambidexterity with Factor of Industry

Industry (I)	Industry (J)	Mean (I) -Mean (J)	S. E.	Sig.	Lower (95%)	Upper (95%)
1	2	-0.24	0.23	1.00	-1.00	0.52
	3	0.50	0.32	1.00	-0.58	1.58
	4	-0.26	0.23	1.00	-1.02	0.50
	5	-0.30	0.18	1.00	-0.91	0.31
	6	0.00	0.19	1.00	-0.62	0.62
	7	-0.52	0.28	1.00	-1.43	0.39
	8	-0.49	0.21	0.60	-1.18	0.19
2	1	0.24	0.23	1.00	-0.52	1.00
	3	0.74	0.35	1.00	-0.42	1.90
	4	-0.03	0.26	1.00	-0.90	0.85
	5	-0.06	0.23	1.00	-0.81	0.69
	6	0.24	0.23	1.00	-0.52	1.00
	7	-0.28	0.31	1.00	-1.30	0.73
	8	-0.25	0.24	1.00	-1.07	0.56
3	1	-0.50	0.32	1.00	-1.58	0.58
	2	-0.74	0.35	1.00	-1.90	0.42
	4	-0.76	0.35	0.97	-1.92	0.40
	5	-0.80	0.32	0.46	-1.87	0.27
	6	-0.50	0.32	1.00	-1.58	0.58
	7	-1.02	0.38	0.29	-2.29	0.25
	8	-0.99	0.34	0.14	-2.10	0.12
4	1	0.26	0.23	1.00	-0.50	1.02
	2	0.03	0.26	1.00	-0.85	0.90

	3	0.76	0.35	0.97	-0.40	1.92
	5	-0.04	0.23	1.00	-0.79	0.71
	6	0.26	0.23	1.00	-0.50	1.02
	7	-0.26	0.31	1.00	-1.27	0.76
	8	-0.23	0.24	1.00	-1.04	0.58
5	1	0.30	0.18	1.00	-0.31	0.91
	2	0.06	0.23	1.00	-0.69	0.81
	3	0.80	0.32	0.46	-0.27	1.87
	4	0.04	0.23	1.00	-0.71	0.79
	6	0.30	0.18	1.00	-0.31	0.91
	7	-0.22	0.27	1.00	-1.12	0.68
	8	-0.19	0.20	1.00	-0.86	0.48
6	1	0.00	0.19	1.00	-0.62	0.62
	2	-0.24	0.23	1.00	-1.00	0.52
	3	0.50	0.32	1.00	-0.58	1.58
	4	-0.26	0.23	1.00	-1.02	0.50
	5	-0.30	0.18	1.00	-0.91	0.31
	7	-0.52	0.28	1.00	-1.43	0.39
	8	-0.49	0.21	0.60	-1.18	0.19
7	1	0.52	0.28	1.00	-0.39	1.43
	2	0.28	0.31	1.00	-0.73	1.30
	3	1.02	0.38	0.29	-0.25	2.29
	4	0.26	0.31	1.00	-0.76	1.27
	5	0.22	0.27	1.00	-0.68	1.12
	6	0.52	0.28	1.00	-0.39	1.43
	8	0.03	0.29	1.00	-0.93	0.99
8	1	0.49	0.21	0.60	-0.19	1.18
	2	0.25	0.24	1.00	-0.56	1.07
	3	0.99	0.34	0.14	-0.12	2.10
	4	0.23	0.24	1.00	-0.58	1.04
	5	0.19	0.20	1.00	-0.48	0.86
	6	0.49	0.21	0.60	-0.19	1.18
	7	-0.03	0.29	1.00	-0.99	0.93

Notes: $N = 53$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; Industry: 1 = electronic information technology, 2 = biology and new medical technology, 3 = aerospace technology, 4 = new materials technology, 5 = high-tech service industry, 6 = new energy and energy-saving technologies, 7 = resources and environment technology, 8 = advanced manufacturing and automatic technology.

Table III–3 Post Hoc Test for Innovation Ambidexterity with Factor of Subsidiaries Number

Subsidiaries (I)	Subsidiaries (J)	Mean (I) - Mean (J)	S. E.	Sig.	Lower (95%)	Upper (95%)
1	2	0.09	0.15	1.00	-0.27	0.45
	3	0.09	0.17	1.00	-0.33	0.51
2	1	-0.09	0.15	1.00	-0.45	0.27
	3	0.00	0.19	1.00	-0.46	0.46
3	1	-0.09	0.17	1.00	-0.51	0.33
	2	0.00	0.19	1.00	-0.46	0.46

Notes: N = 53; * P < 0.05; ** P < 0.01; *** P < 0.001; Number of Subsidiaries: 1: less than 3 subsidiaries; 2: 3 to 6 subsidiaries; 3: more than 7 subsidiaries.

Table III–4 Post Hoc Test for Innovation Ambidexterity with Factor of Number of Employees

Employees (I)	Employees (J)	Mean (I) - Mean (J)	S. E.	Sig.	Lower (95%)	Upper (95%)

1	2	0.51	0.33	0.81	-0.41	1.42
	3	0.59	0.33	0.48	-0.32	1.49
	4	0.36	0.35	1.00	-0.61	1.33
2	1	-0.51	0.33	0.81	-1.42	0.41
	3	0.08	0.14	1.00	-0.30	0.46
	4	-0.15	0.19	1.00	-0.67	0.37
3	1	-0.59	0.33	0.48	-1.49	0.32
	2	-0.08	0.14	1.00	-0.46	0.30
	4	-0.23	0.18	1.00	-0.73	0.27
4	1	-0.36	0.35	1.00	-1.33	0.61
	2	0.15	0.19	1.00	-0.37	0.67
	3	0.23	0.18	1.00	-0.27	0.73

Notes: $N = 53$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; Number of employees: 1: less than 50; 2: 51-200; 3: 201-1000; 4: more than 1000.

Table III–5 Post Hoc Test for Innovation Performance with Factor of Ownership

Ownership (I)	Ownership (J)	Mean (I) - Mean (J)	S. E.	Sig.	Lower (95%)	Upper (95%)
1	2	0.13	0.38	1.00	-0.91	1.16
	3	0.33	0.31	1.00	-0.52	1.19
	4	0.02	0.35	1.00	-0.94	0.97
2	1	-0.13	0.38	1.00	-1.16	0.91
	3	0.20	0.27	1.00	-0.54	0.95
	4	-0.11	0.31	1.00	-0.96	0.74
3	1	-0.33	0.31	1.00	-1.19	0.52
	2	-0.20	0.27	1.00	-0.95	0.54
	4	-0.32	0.23	1.00	-0.94	0.31
4	1	-0.02	0.35	1.00	-0.97	0.94
	2	0.11	0.31	1.00	-0.74	0.96
	3	0.32	0.23	1.00	-0.31	0.94

Notes: $N = 53$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; Ownership: 1 = central SOE, 2 = regional SOE, 3 = private company, 4 = joint venture.

Table III–6 Post Hoc Test for Innovation Performance with Factor of Industry

Industry (I)	Industry (J)	Mean (I) -Mean (J)	S. E.	Sig.	Lower (95%)	Upper (95%)
1	2	0.18	0.35	1.00	-0.98	1.33
	3	0.75	0.49	1.00	-0.88	2.38
	4	0.08	0.35	1.00	-1.08	1.23
	5	-0.28	0.28	1.00	-1.20	0.64
	6	-0.23	0.28	1.00	-1.17	0.72
	7	-0.46	0.42	1.00	-1.84	0.93
	8	-0.30	0.31	1.00	-1.34	0.73
2	1	-0.18	0.35	1.00	-1.33	0.98
	3	0.58	0.53	1.00	-1.19	2.34
	4	-0.10	0.40	1.00	-1.43	1.23
	5	-0.46	0.34	1.00	-1.60	0.68
	6	-0.40	0.35	1.00	-1.55	0.75
	7	-0.63	0.46	1.00	-2.17	0.90
	8	-0.48	0.37	1.00	-1.71	0.75
3	1	-0.75	0.49	1.00	-2.38	0.88
	2	-0.58	0.53	1.00	-2.34	1.19
	4	-0.68	0.53	1.00	-2.44	1.09

	5	-1.03	0.49	1.00	-2.65	0.59
	6	-0.98	0.49	1.00	-2.61	0.66
	7	-1.21	0.58	1.00	-3.13	0.71
	8	-1.05	0.51	1.00	-2.74	0.64
4	1	-0.08	0.35	1.00	-1.23	1.08
	2	0.10	0.40	1.00	-1.23	1.43
	3	0.68	0.53	1.00	-1.09	2.44
	5	-0.36	0.34	1.00	-1.50	0.78
	6	-0.30	0.35	1.00	-1.45	0.85
	7	-0.53	0.46	1.00	-2.07	1.00
	8	-0.38	0.37	1.00	-1.61	0.85
5	1	0.28	0.28	1.00	-0.64	1.20
	2	0.46	0.34	1.00	-0.68	1.60
	3	1.03	0.49	1.00	-0.59	2.65
	4	0.36	0.34	1.00	-0.78	1.50
	6	0.06	0.28	1.00	-0.86	0.98
	7	-0.17	0.41	1.00	-1.55	1.20
	8	-0.02	0.31	1.00	-1.04	1.00
6	1	0.23	0.28	1.00	-0.72	1.17
	2	0.40	0.35	1.00	-0.75	1.55
	3	0.98	0.49	1.00	-0.66	2.61
	4	0.30	0.35	1.00	-0.85	1.45
	5	-0.06	0.28	1.00	-0.98	0.86
	7	-0.23	0.42	1.00	-1.62	1.15
	8	-0.08	0.31	1.00	-1.12	0.96
7	1	0.46	0.42	1.00	-0.93	1.84
	2	0.63	0.46	1.00	-0.90	2.17
	3	1.21	0.58	1.00	-0.71	3.13
	4	0.53	0.46	1.00	-1.00	2.07
	5	0.17	0.41	1.00	-1.20	1.55
	6	0.23	0.42	1.00	-1.15	1.62
	8	0.15	0.44	1.00	-1.30	1.61
8	1	0.30	0.31	1.00	-0.73	1.34
	2	0.48	0.37	1.00	-0.75	1.71
	3	1.05	0.51	1.00	-0.64	2.74
	4	0.38	0.37	1.00	-0.85	1.61
	5	0.02	0.31	1.00	-1.00	1.04
	6	0.08	0.31	1.00	-0.96	1.12
	7	-0.15	0.44	1.00	-1.61	1.30

Notes: $N = 53$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; Industry: 1 = electronic information technology, 2 = biology and new medical technology, 3 = aerospace technology, 4 = new materials technology, 5 = high-tech service industry, 6 = new energy and energy-saving technologies, 7 = resources and environment technology, 8 = advanced manufacturing and automatic technology.

Table III–7 Post Hoc Test for Innovation Performance with Factor of Subsidiaries Number

Subsidiaries (I)	Subsidiaries (J)	Mean (I) - Mean (J)	S. E.	Sig.	Lower (95%)	Upper (95%)
A	B	-0.23	0.20	0.79	-0.72	0.27
	C	-0.37	0.24	0.36	-0.96	0.21
B	A	0.23	0.20	0.79	-0.27	0.72
	C	-0.15	0.26	1.00	-0.78	0.49
C	A	0.37	0.24	0.36	-0.21	0.96
	B	0.15	0.26	1.00	-0.49	0.78

Notes: $N = 53$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; Number of Subsidiaries: A: less than 3 subsidiaries;

B: 3 to 6 subsidiaries; C: more than 7 subsidiaries.

Table III–8 Post Hoc Test for Innovation Performance with Factor of Number of Employees

Employees (I)	Employees (J)	Mean (I) - Mean (J)	S. E.	Sig.	Lower (95%)	Upper (95%)
1	2	-0.07	0.48	1.00	-1.38	1.25
	3	-0.38	0.47	1.00	-1.67	0.92
	4	-0.31	0.51	1.00	-1.71	1.08
2	1	0.07	0.48	1.00	-1.25	1.38
	3	-0.31	0.20	0.74	-0.85	0.23
	4	-0.25	0.27	1.00	-0.99	0.50
3	1	0.38	0.47	1.00	-0.92	1.67
	2	0.31	0.20	0.74	-0.23	0.85
	4	0.06	0.26	1.00	-0.66	0.78
4	1	0.31	0.51	1.00	-1.08	1.71
	2	0.25	0.27	1.00	-0.50	0.99
	3	-0.06	0.26	1.00	-0.78	0.66

Notes: $N = 53$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; Number of employees: 1: less than 50; 2: 51-200; 3: 201-1000; 4: more than 1000.

Table III–9 Post Hoc Test for Environment Dynamism with Factor of Ownership

Ownership (I)	Ownership (J)	Mean (I) - Mean (J)	S. E.	Sig.	Lower (95%)	Upper (95%)
1	2	0.07	0.33	1.00	-0.85	0.98
	3	-0.11	0.28	1.00	-0.87	0.65
	4	-0.12	0.31	1.00	-0.96	0.73
2	1	-0.07	0.33	1.00	-0.98	0.85
	3	-0.18	0.24	1.00	-0.83	0.48
	4	-0.18	0.28	1.00	-0.94	0.58
3	1	0.11	0.28	1.00	-0.65	0.87
	2	0.18	0.24	1.00	-0.48	0.83
	4	0.00	0.20	1.00	-0.56	0.55
4	1	0.12	0.31	1.00	-0.73	0.96
	2	0.18	0.28	1.00	-0.58	0.94
	3	0.00	0.20	1.00	-0.55	0.56

Notes: $N = 53$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; Ownership: 1 = central SOE, 2 = regional SOE, 3 = private company, 4 = joint venture.

Table III–10 Post Hoc Test for Environment Dynamism with Factor of Industry

Industry (I)	Industry (J)	Mean (I) - Mean (J)	S. E.	Sig.	Lower (95%)	Upper (95%)
1	2	0.00	0.31	1.00	-1.04	1.04
	3	0.33	0.44	1.00	-1.14	1.81
	4	-0.27	0.31	1.00	-1.31	0.77
	5	-0.09	0.25	1.00	-0.92	0.74
	6	-0.27	0.26	1.00	-1.12	0.58
	7	-0.33	0.38	1.00	-1.58	0.92
	8	-0.33	0.28	1.00	-1.27	0.60
2	1	0.00	0.31	1.00	-1.04	1.04
	3	0.33	0.48	1.00	-1.26	1.92
	4	-0.27	0.36	1.00	-1.47	0.94
	5	-0.09	0.31	1.00	-1.12	0.93

	6	-0.27	0.31	1.00	-1.31	0.77
	7	-0.33	0.42	1.00	-1.72	1.05
	8	-0.33	0.34	1.00	-1.45	0.78
3	1	-0.33	0.44	1.00	-1.81	1.14
	2	-0.33	0.48	1.00	-1.92	1.26
	4	-0.60	0.48	1.00	-2.19	0.99
	5	-0.42	0.44	1.00	-1.88	1.04
	6	-0.60	0.44	1.00	-2.07	0.87
	7	-0.67	0.52	1.00	-2.40	1.07
	8	-0.67	0.46	1.00	-2.19	0.86
4	1	0.27	0.31	1.00	-0.77	1.31
	2	0.27	0.36	1.00	-0.94	1.47
	3	0.60	0.48	1.00	-0.99	2.19
	5	0.18	0.31	1.00	-0.85	1.20
	6	0.00	0.31	1.00	-1.04	1.04
	7	-0.07	0.42	1.00	-1.45	1.32
	8	-0.07	0.34	1.00	-1.18	1.05
5	1	0.09	0.25	1.00	-0.74	0.92
	2	0.09	0.31	1.00	-0.93	1.12
	3	0.42	0.44	1.00	-1.04	1.88
	4	-0.18	0.31	1.00	-1.20	0.85
	6	-0.18	0.25	1.00	-1.01	0.65
	7	-0.24	0.37	1.00	-1.48	1.00
	8	-0.24	0.28	1.00	-1.16	0.68
6	1	0.27	0.26	1.00	-0.58	1.12
	2	0.27	0.31	1.00	-0.77	1.31
	3	0.60	0.44	1.00	-0.87	2.07
	4	0.00	0.31	1.00	-1.04	1.04
	5	0.18	0.25	1.00	-0.65	1.01
	7	-0.07	0.38	1.00	-1.32	1.18
	8	-0.07	0.28	1.00	-1.00	0.87
7	1	0.33	0.38	1.00	-0.92	1.58
	2	0.33	0.42	1.00	-1.05	1.72
	3	0.67	0.52	1.00	-1.07	2.40
	4	0.07	0.42	1.00	-1.32	1.45
	5	0.24	0.37	1.00	-1.00	1.48
	6	0.07	0.38	1.00	-1.18	1.32
	8	0.00	0.39	1.00	-1.31	1.31
8	1	0.33	0.28	1.00	-0.60	1.27
	2	0.33	0.34	1.00	-0.78	1.45
	3	0.67	0.46	1.00	-0.86	2.19
	4	0.07	0.34	1.00	-1.05	1.18
	5	0.24	0.28	1.00	-0.68	1.16
	6	0.07	0.28	1.00	-0.87	1.00
	7	0.00	0.39	1.00	-1.31	1.31

Notes: $N = 53$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; Industry: 1 = electronic information technology, 2 = biology and new medical technology, 3 = aerospace technology, 4 = new materials technology, 5 = high-tech service industry, 6 = new energy and energy-saving technologies, 7 = resources and environment technology, 8 = advanced manufacturing and automatic technology.

Table III–11 Post Hoc Test for Environment Dynamism with Factor of Subsidiaries Number

Subsidiaries (I)	Subsidiaries (J)	Mean (I) - Mean (J)	S. E.	Sig.	Lower (95%)	Upper (95%)
1	2	-0.16	0.18	1.00	-0.60	0.28

	3	-0.05	0.21	1.00	-0.56	0.47
2	1	0.16	0.18	1.00	-0.28	0.60
	3	0.12	0.23	1.00	-0.45	0.68
3	1	0.05	0.21	1.00	-0.47	0.56
	2	-0.12	0.23	1.00	-0.68	0.45

Notes: $N = 53$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; Number of Subsidiaries: 1: less than 3 subsidiaries; 2: 3 to 6 subsidiaries; 3: more than 7 subsidiaries.

Table III–12 Post Hoc Test for Environment Dynamism with Factor of Number of Employees

Employees (I)	Employees (J)	Mean (I) - Mean (J)	S. E.	Sig.	Lower (95%)	Upper (95%)
1	2	0.43	0.42	1.00	-0.73	1.59
	3	0.35	0.42	1.00	-0.80	1.49
	4	0.29	0.45	1.00	-0.94	1.52
2	1	-0.43	0.42	1.00	-1.59	0.73
	3	-0.08	0.17	1.00	-0.56	0.40
	4	-0.14	0.24	1.00	-0.79	0.52
3	1	-0.35	0.42	1.00	-1.49	0.80
	2	0.08	0.17	1.00	-0.40	0.56
	4	-0.06	0.23	1.00	-0.69	0.58
4	1	-0.29	0.45	1.00	-1.52	0.94
	2	0.14	0.24	1.00	-0.52	0.79
	3	0.06	0.23	1.00	-0.58	0.69

Notes: $N = 53$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; Number of employees: 1: less than 50; 2: 51-200; 3: 201-1000; 4: more than 1000.

Appendix IV: Some Indicators about R&D in Chinese Provinces

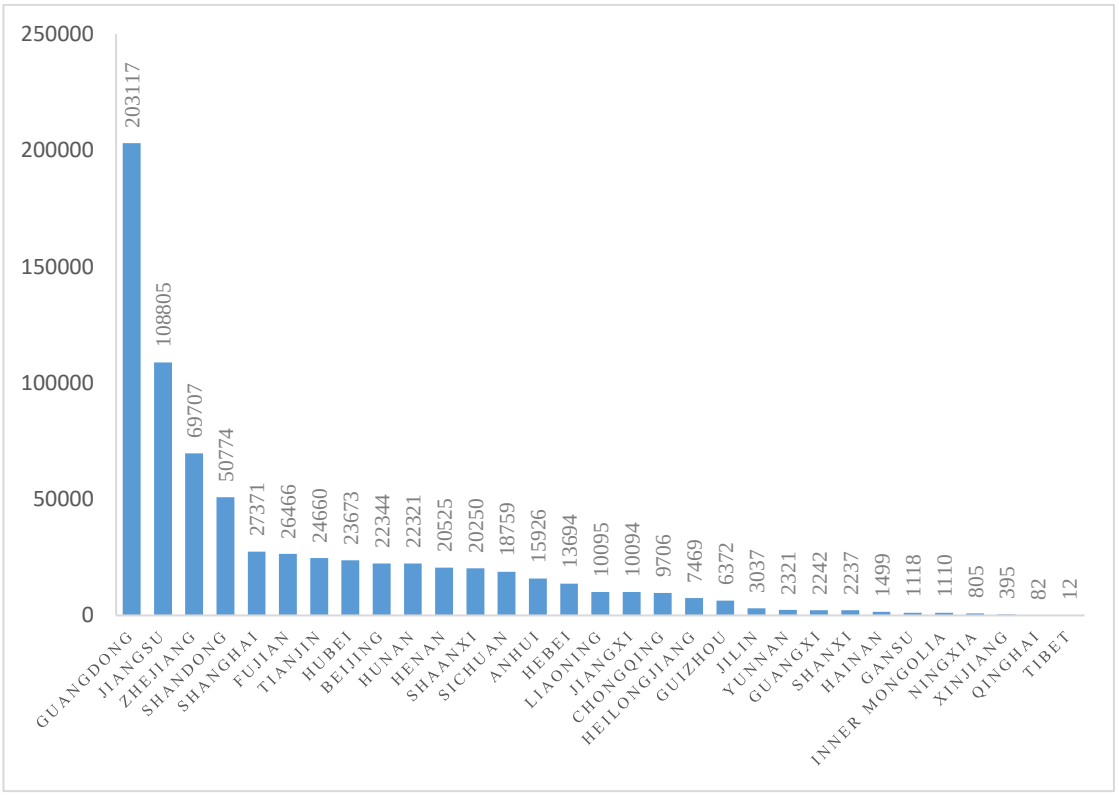

Figure IV–1 The Full-time Equivalent of R&D Personnel of Guizhou and Other Provinces

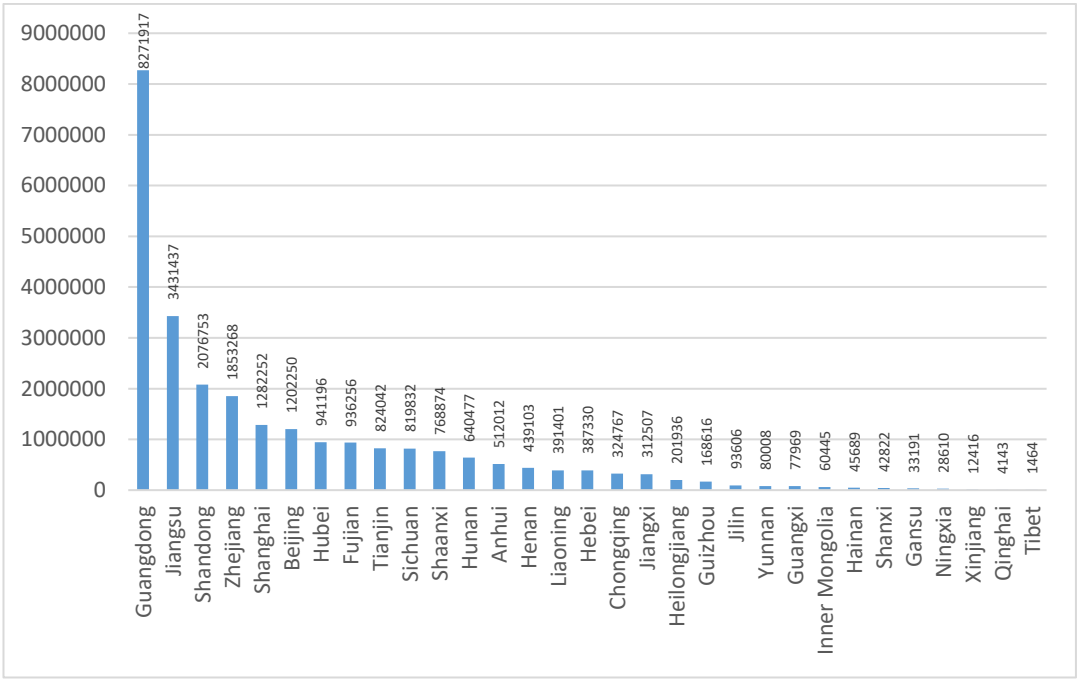

Figure IV–2 Guizhou's R&D Expenditure (RMB 10,000) and Those of Other Provinces

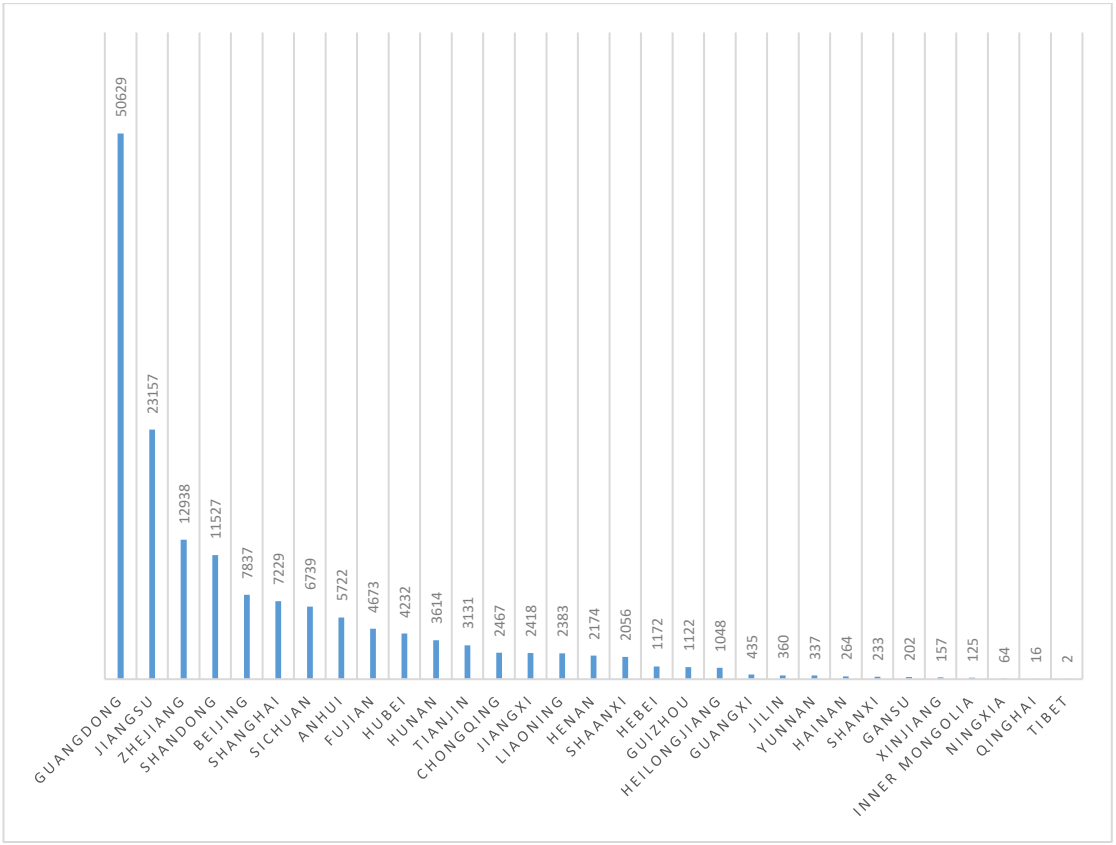

Figure IV–3 Authorized Patents of Guizhou and Those of Other Provinces

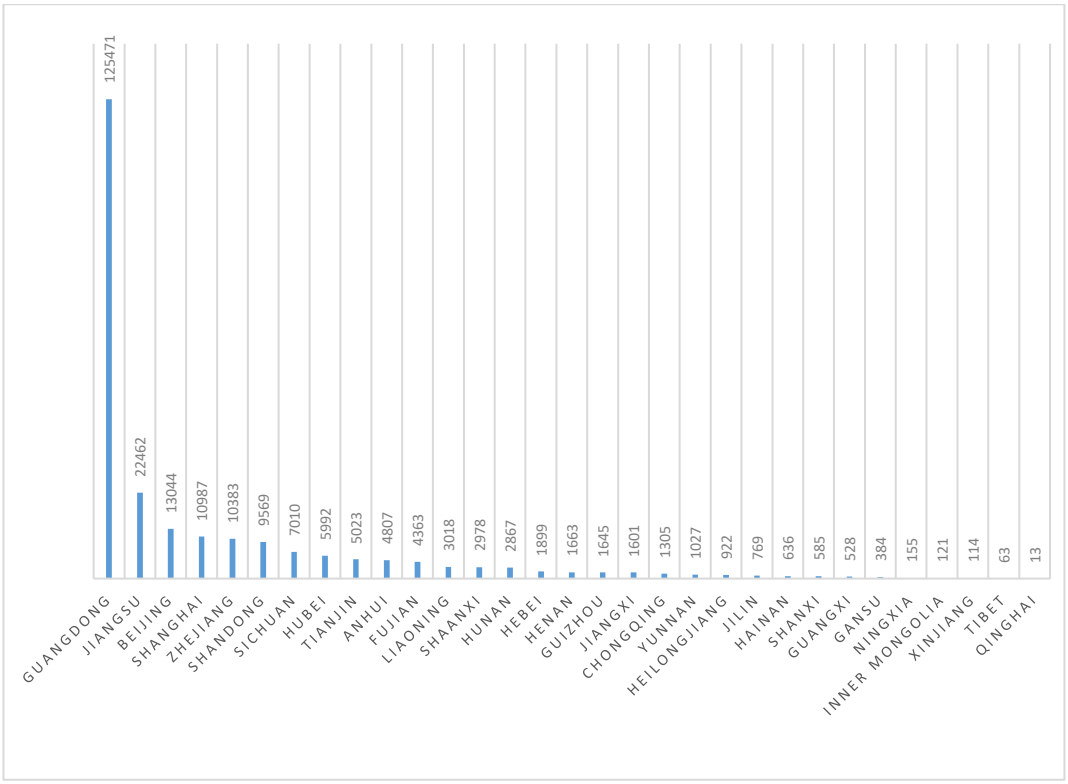

Figure IV–4 Effective Patents of Guizhou and Those of Other Provinces

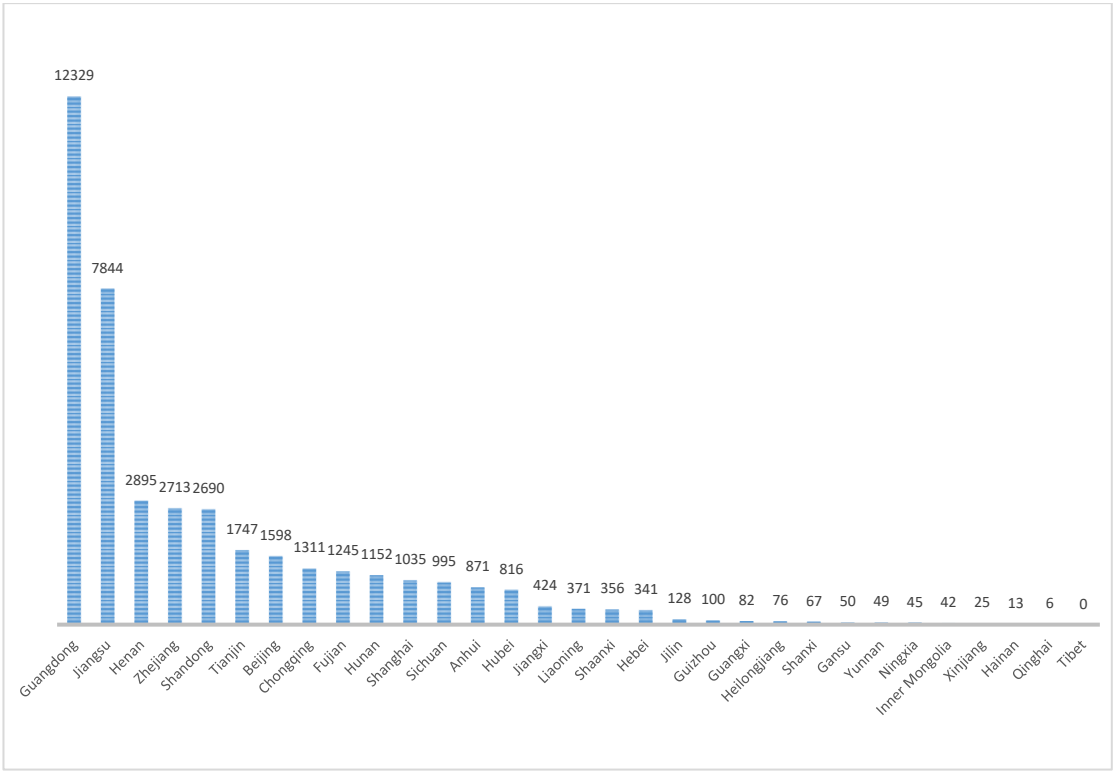

Figure IV–5 Sales Revenue of New Products of 31 provinces in china

Appendix V: Figures about Moderating Effect

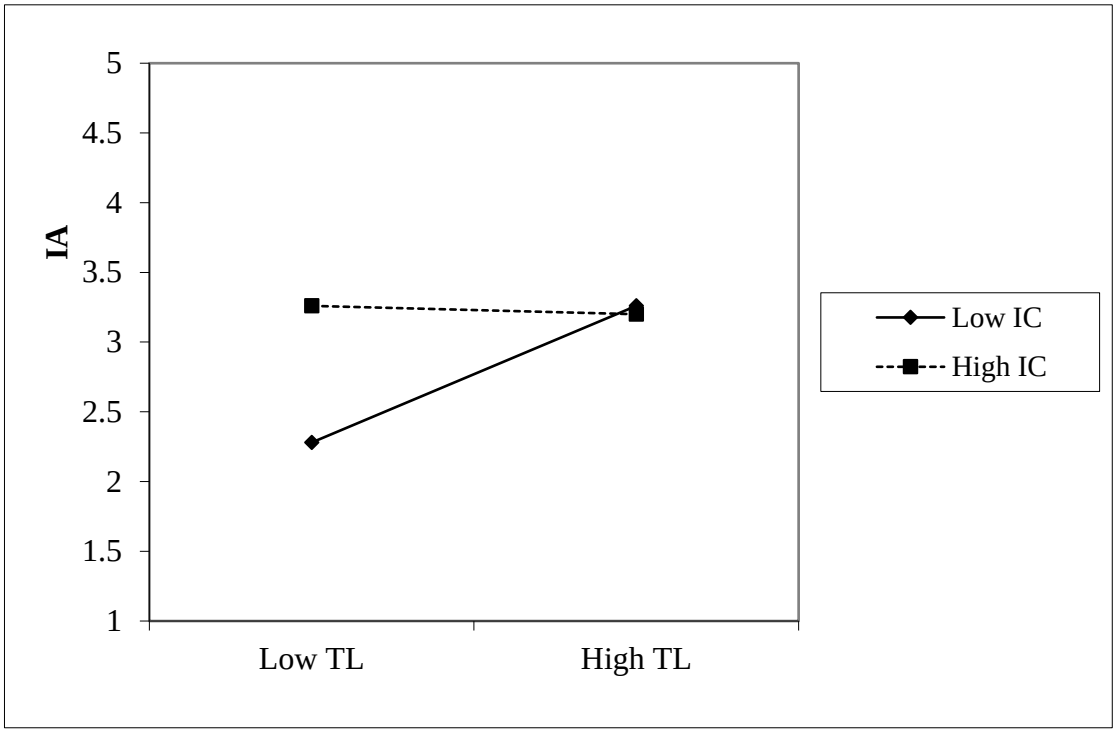

Figure V–1 Organizational Innovation Climate Moderates the Relationship between Transformational Leadership and Innovation Ambidexterity

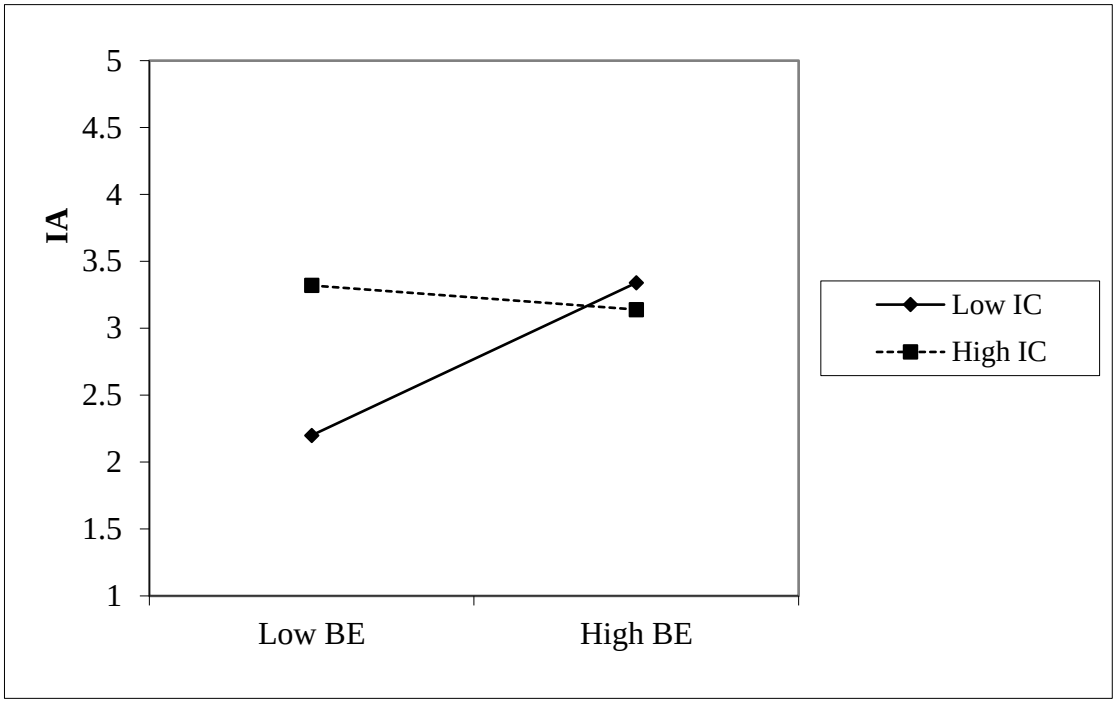

Figure V–2 Organizational Innovation Climate Moderates the Relationship between Benevolent Leadership and Innovation Ambidexterity

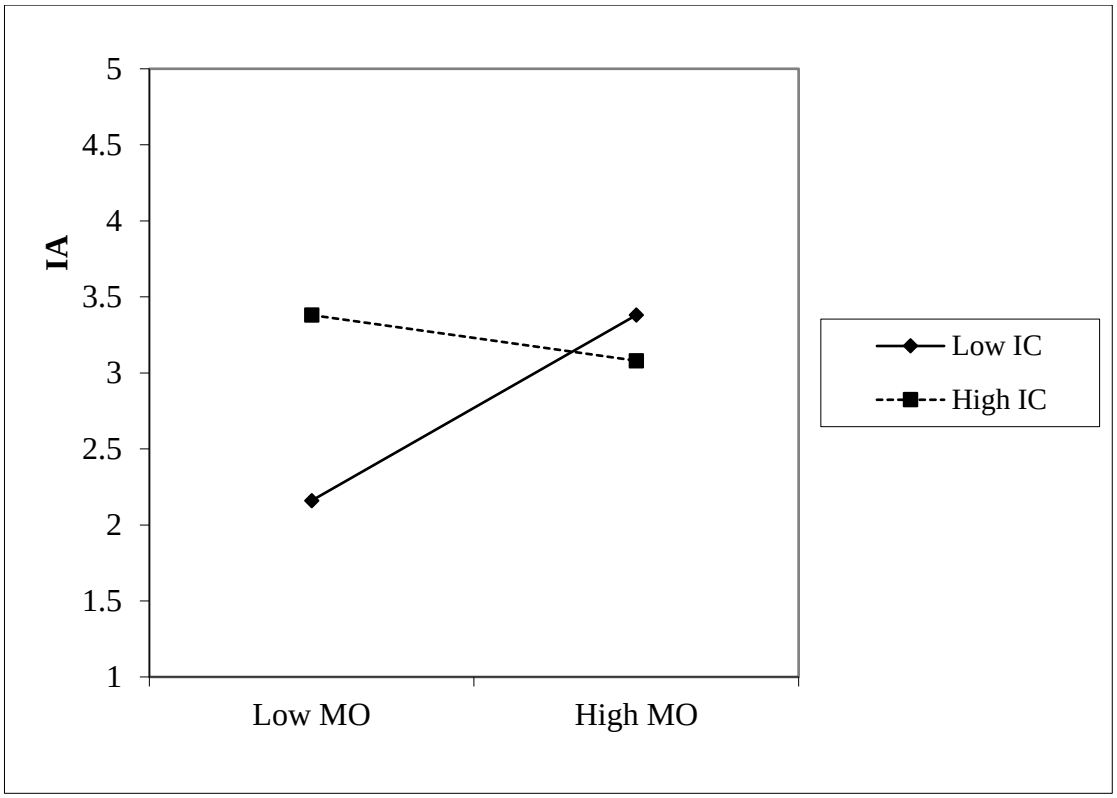

Figure V–3 Organizational Innovation Climate Moderates the Relationship between Moral Leadership and Innovation Ambidexterity

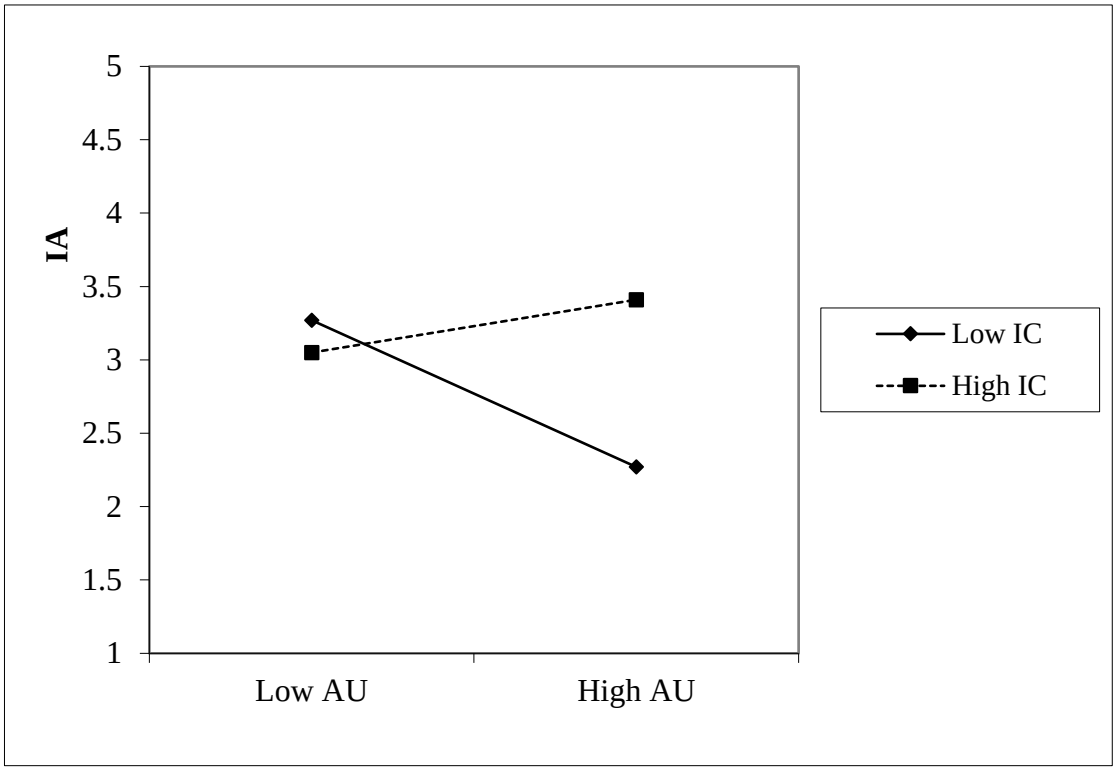

Figure V–4 Organizational Innovation Climate Moderates the Relationship between Authoritarian Leadership and Innovation Ambidexterity

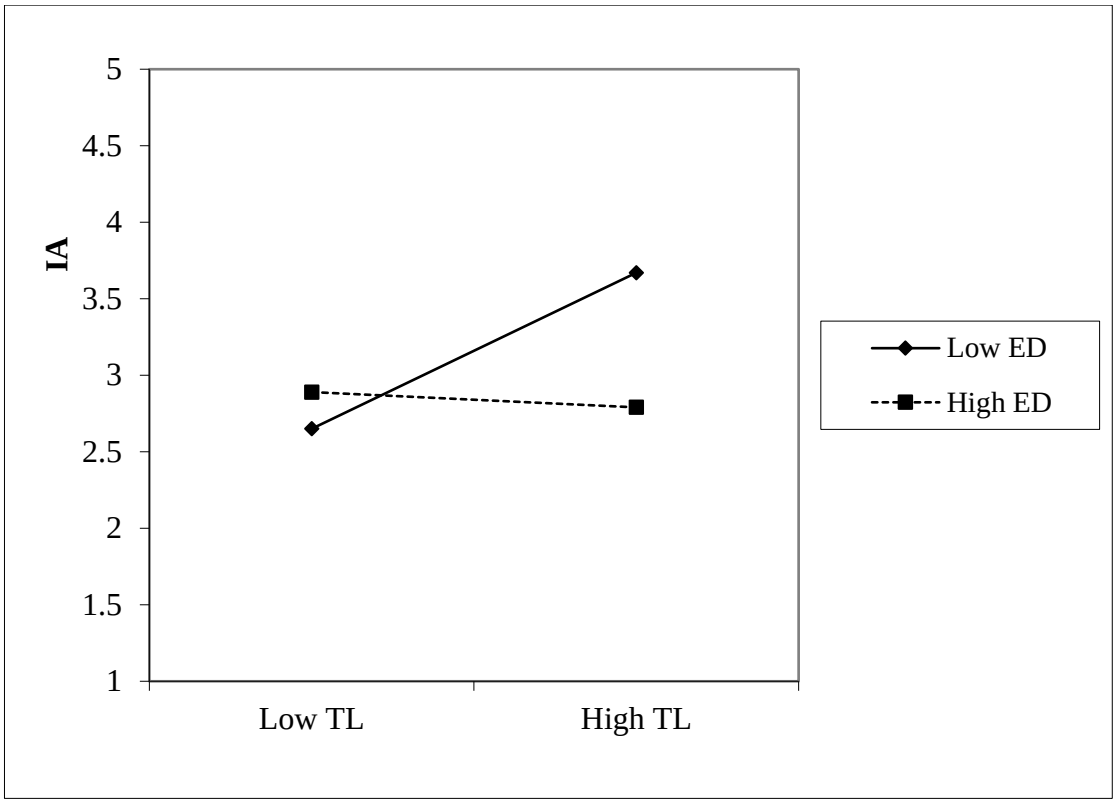

Figure V–5 Environment Dynamism Moderates the Relationship between Transformational Leadership and Innovation Ambidexterity

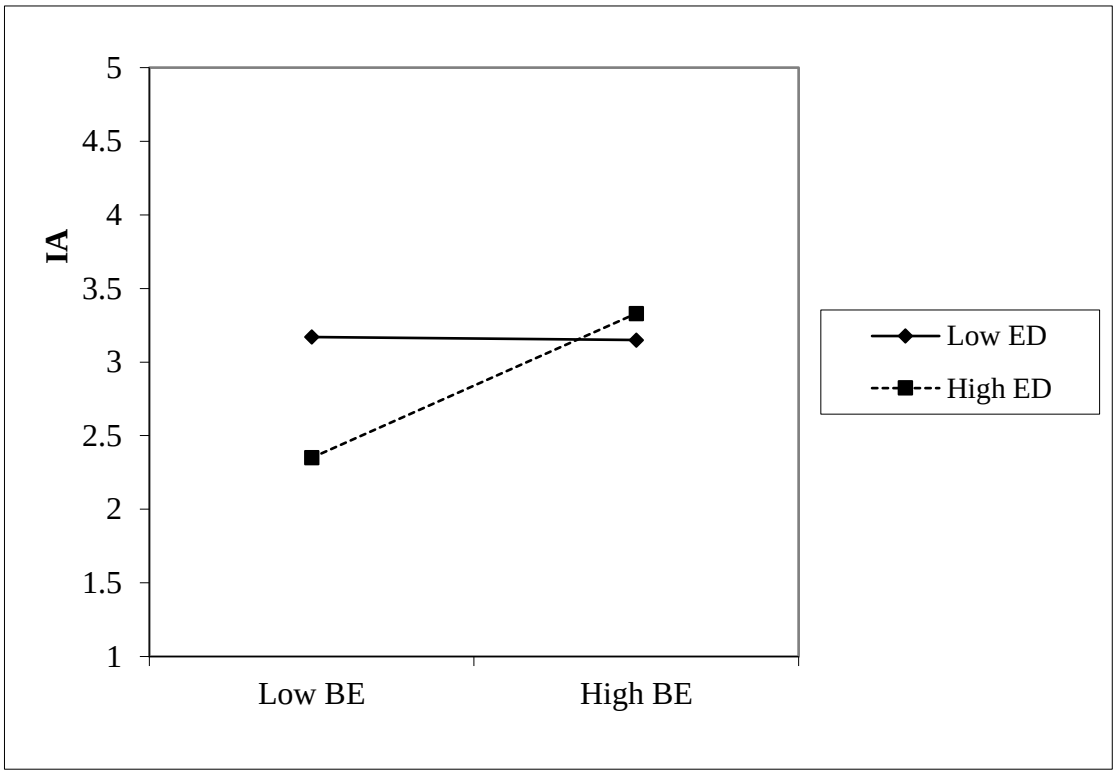

Figure V–6 Environment Dynamism Moderates the Relationship between Benevolent Leadership and Innovation Ambidexterity

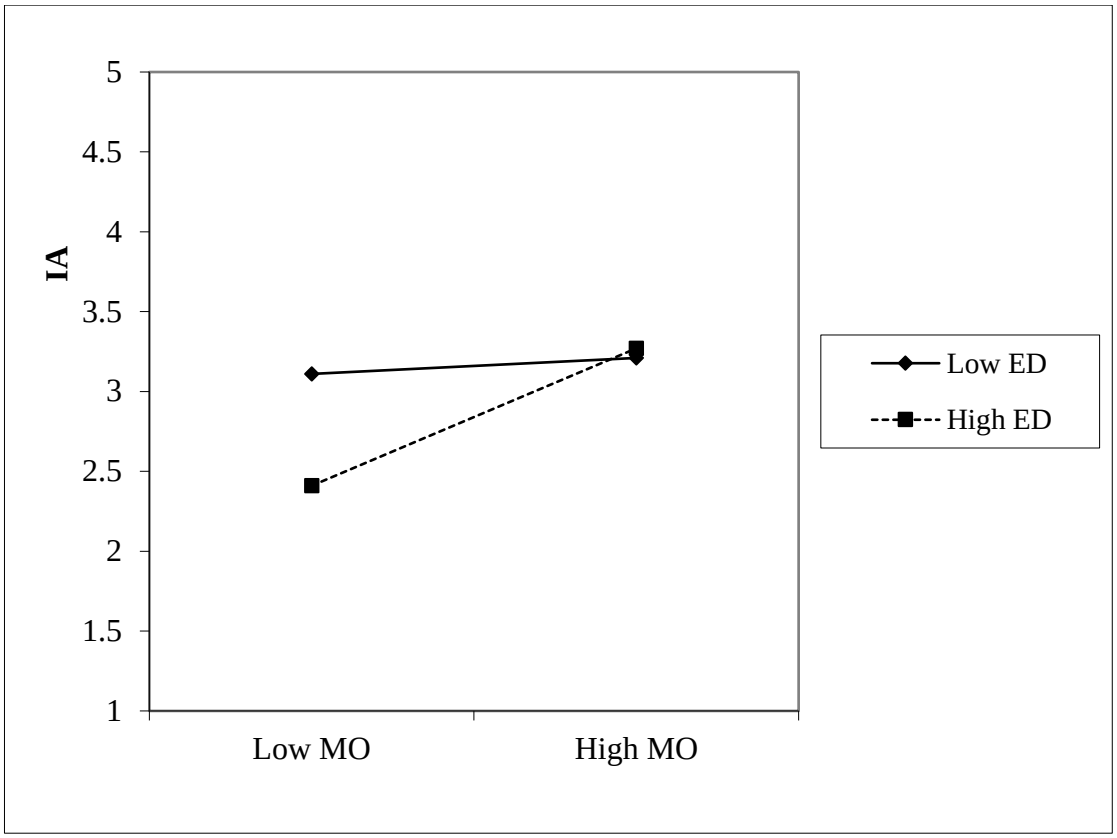

Figure V–7 Environment Dynamism Moderates the Relationship between Moral Leadership and Innovation Ambidexterity

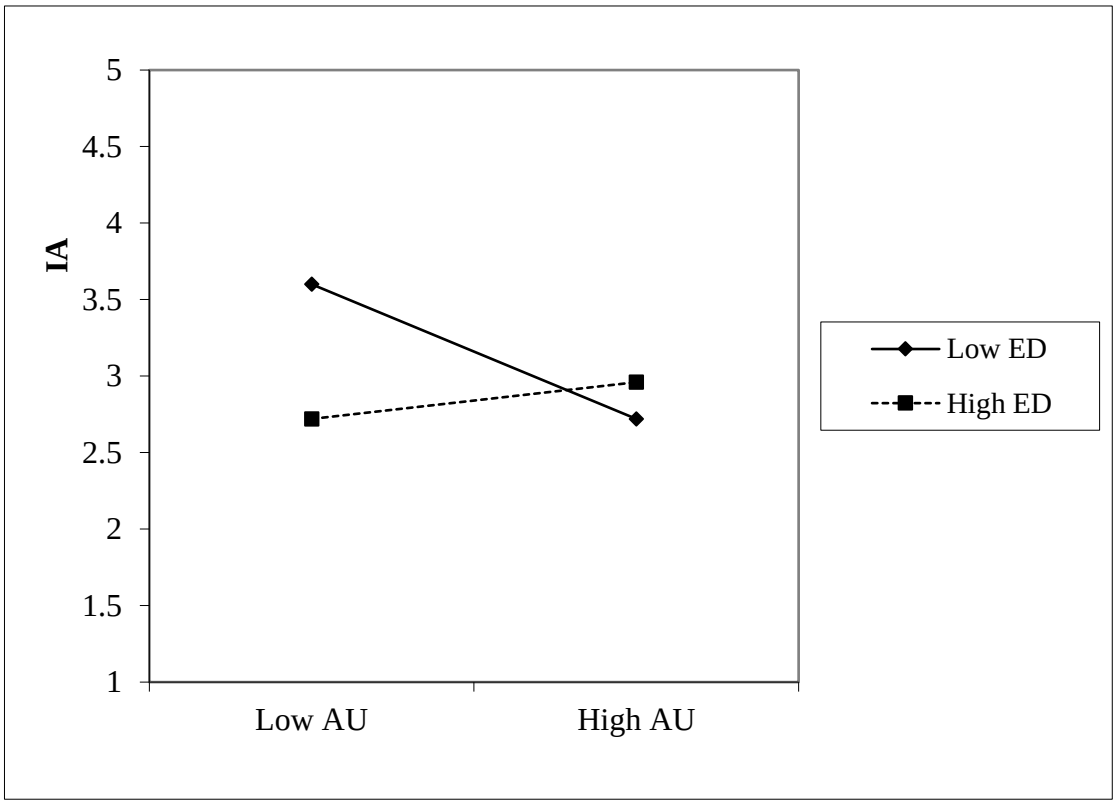

Figure V–8 Environment Dynamism Moderates the Relationship between Authoritarian Leadership and Innovation Ambidexterity