Doctor of Economics

The Impact of Business Environment Uncertainty on Enterprise Innovation in China -A Dual Perspective Based on Economic Policy Uncertainty and Changes in Local Officials

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Abstract

"Innovation is the first driving force leading development and a strategic support for building a modern economic system." At the present stage, China is in the offensive period of transforming the development mode, optimizing the economic structure and transforming the growth momentum, and innovation is the key factor to achieve leapfrog and high-quality development. When enterprises increase their investment in independent innovation, the speed of product renewal of enterprises is further accelerated in order to better meet the needs of market competition. At present, there is still a big debate on whether uncertainty in business environment "promotes" or "inhibits" enterprise innovation during China's economic transition.

In this paper, we distinguish the uncertainty of business environment faced by enterprises into macroeconomic uncertainty and local policy uncertainty, and analyze the impact of these two types of uncertainties on enterprise innovation in combination with micro-level enterprises based on the data of Chinese listed companies from 2000-2017. This paper uses stata17.0 to conduct an empirical regression using fixed effects on a sample of A-share listed companies from 2000 to 2017, and finds that: macroeconomic uncertainty positively affects corporate innovation, in which the growth option effect plays a dominant role; local policy uncertainty generally does not affect corporate innovation, and only when targeting high-tech enterprises, compared to other enterprises, changes in local officials will Negatively affects firm innovation. The real option effect plays a dominant role. At the same time, the competitive incentive of the industry in which the firm is located will promote the positive impact of EPU on innovation. The findings have some policy implications: economic policy uncertainty is both a challenge and an opportunity for firms, so the impact on high-tech firms needs to be treated with particular caution. Technological innovation is crucial for enterprises to cope with uncertainty shocks such as global trade frictions. At the same time, building a service-oriented government and creating a favorable business environment can address the "uncertainty" of the macroeconomic environment by providing "certainty" of local policies.

Therefore, the government must fully consider the impact of the environment on enterprises when formulating economic policies; strengthen innovation support for high-tech enterprises; in addition, with the support of the government, enterprises themselves need to correctly view uncertainty, reasonably grasp the timing, and gain competitive advantage; improve their own risk prevention and control mechanisms; and strengthen internal corporate governance. Sorting out these issues helps us scientifically judge the impact of uncertainty in business environment on enterprise innovation, which

has strong practical significance.

KEY WORDS: EPU, changes in local officials, enterprise innovation

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Chapter1 Introduction

1.1 Research Background and Significance

1.1.1 Research Background

Over the past decade or so, the global economy has developed unsteadily and China's economy has entered a new normal. However, the current poor global growth expectations, coupled with the impact of the global epidemic, have further increased uncertainty. This has significant implications for the Chinese economy, including uncertainty in the real estate market, the effectiveness of monetary policy, and the expansion of domestic consumer demand. It should be noted that residential leverage is already at a high level, and the impact of the excessive boom in the real estate market on residential consumption needs to be contained. At the same time, the effectiveness of the implementation of monetary policy needs to be further observed and measures taken to promote the expansion of domestic demand.

Innovation is the key to the country's economic growth and competitiveness, and the Chinese government is actively promoting the policy of "innovation for all". However, new economic policies can be highly volatile, which can increase economic policy uncertainty and affect firms' investment behavior, especially in the area of innovation.

Economic development has become a top priority for the central government, and in order to incentivize local governments to develop their economies, the central government has delegated many affairs and fiscal powers to local governments, giving them considerable decision-making autonomy in resource allocation and policy formulation. Although this flexibility facilitated the achievement of growth goals during the reform period, differences in economic development strategies and regulatory approaches among successive local government administrations led to differences in policy interpretation and implementation, which contributed to policy uncertainty and thus affected business decisions. Personnel changes among local government officials are often accompanied by policy disruptions and the implementation of new policies. This policy uncertainty can lead firms to make strategic decisions such as increasing tax avoidance, focusing more on profit management, increasing non-productive spending, and reducing investment spending.

At the same time, as China's economy enters a new normal phase, the primary means of economic growth has changed. In the past, economic growth relied mainly on inputs of production factors and increased investment, but with the transformation of the economic structure, this approach is no longer applicable. Nowadays, economic growth relies more on innovation as the primary driver. Innovation is a decisive factor

in a country's economic growth and competitiveness, and the key to achieving and maintaining a long-term competitive advantage. At the same time, innovation for economic development is a common trend among countries around the world. Although China is steadily increasing its investment in innovation, there is still room to improve the overall innovation level.

In addition, enterprises, as the main force of innovation activities, play a key role in China's innovation. The willingness and ability of enterprises to take high risks to innovate is related to their own development and the level and quality of the country's economic growth. Frequent policy launches and changes make it difficult for firms to anticipate future policy directions, which in turn affects their business activities and investment and financing decisions, especially innovation decisions. There are different views on how economic policy uncertainty affects innovation, and there is no unanimous conclusion yet, and further in-depth research is needed. In addition, the impact mechanism and heterogeneous impact of economic policy uncertainty on innovation also need to be further expanded. Based on the above research background, this paper mainly uses the Chinese economic policy uncertainty index constructed by Baker et al. (2016) to empirically analyze the following issues: (1) how economic policy uncertainty affects firm innovation; (2) how the effects of economic policy uncertainty and local official changes on innovation differ across different types of firms; and (3) how different degrees of market competition affect firm innovation.

1.1.2 Research Significance

In the process of building an innovative society and achieving industrial transformation and upgrading, innovation is the key to the core competitiveness of enterprises. However, in the current era of universal innovation, economic policy uncertainty and changes in local officials tend to influence firms' innovative activities. Therefore, we need to recognize whether this influence promotes or inhibits innovation. There is also a need to understand the factors that influence the relationship between economic and policy uncertainty and innovation. Both the theoretical and practical implications of these issues are important.

(1)Theoretical significance

Innovation is critical for both countries and firms. For countries, innovation is a major driver of economic growth, and for firms, it is a key means to maintain and improve their competitive position. However, existing studies on the impact of economic policy uncertainty on innovation are inconsistent, and in-depth studies on its impact mechanisms and heterogeneous effects are still lacking. The research in this paper enriches the theoretical study of how economic policy uncertainty affects firm innovation. At the same time, this paper also examines the effects of changes in local government officials on firm innovation and explores the heterogeneous effects of economic policy uncertainty and official changes on firm innovation

from the perspectives of the nature of firm property rights, different degrees of competition, and the degree of market competition, which have some theoretical implications.

(2)Practical significance

Innovation is not only about the future growth of companies, but also an important driver of national economic growth. When economic growth is slowed down by external shocks, governments need to respond with a series of economic policies, which, however, can also increase economic policy uncertainty. Against this background, an in-depth analysis of how economic policy uncertainty affects innovation can help remind policymakers to take into account the effects of the policies themselves when formulating relevant policies and to avoid ignoring the impact of policy instability on market economic agents. In-depth exploration of the mechanism of the impact of economic policy uncertainty on innovation is of great practical significance for the government to improve the financial system and financial market, and to promote enterprises to accelerate the pace of innovation and improve their innovation capacity, as well as to guide policy makers to formulate more reasonable and effective policies.

1.2 Research Methodology and Content Structure

1.2.1 Research Methodology

The normative analysis method is employed to examine the existing literature related to economic policy uncertainty, firm innovation, and turnover of local officials. Through extensive reading and review of the literature, you have identified gaps and deficiencies in the existing research, which have provided insights and ideas for the current study. This normative analysis helps establish a foundation for the research and contributes to the development of research hypotheses.

The empirical analysis method is then utilized to test the research hypotheses derived from the normative analysis. Empirical analysis involves collecting and analyzing data to evaluate the relationship between economic policy uncertainty, firm innovation, and the turnover of local officials. This method allows for the examination of real-world data and provides evidence to support or refute the proposed hypotheses. By employing empirical analysis, the study ensures the soundness and validity of its content structure.

(1)Normative analysis method

Before formally starting to write, I collected a large amount of literature related to the research content of this paper through the Internet, and first read it in general to find the most relevant and authoritative literature for close reading and sorting out. In the process of writing the paper, when I encountered problems, I immediately looked for possible solutions from existing literature or books to ensure the authenticity and

validity of the research content of this paper. By reviewing the existing literature and combining the relevant studies of domestic and foreign scholars, we explain the impact of economic uncertainty and local official turnover on corporate innovation from a theoretical perspective and propose three research hypotheses in this paper.

(2)Empirical Analysis Method

This paper uses fixed effects for group regression analysis and then adds moderating variables as interaction terms for regression analysis. This paper focuses on A-share listed companies in Shanghai and Shenzhen from 2000 to 2017 as the research subjects to investigate the relationship between business environment uncertainty and corporate innovation, as well as its underlying mechanisms. The Chinese economic policy uncertainty index, developed by Baker et al, is utilized to measure economic policy uncertainty. Additionally, the turnover of local officials is incorporated as a binary variable to capture its impact, and the analysis takes into account heterogeneity across different firms. The Herfindahl-Hirschman Index (HHI) is employed to assess the level of market concentration, thereby examining the combined effects of economic policy uncertainty and market competition on innovation. The level of innovation is measured using the number of patents filed by firms. Furthermore, a robustness test is conducted using the number of invention patents. The data is processed and analyzed using Stata 17.0.

1.2.2 Content Structure

This paper investigates the impact of economic policy uncertainty and local key official turnover on corporate innovation using data from A-share listed companies from 2000 to 2017. Based on the benchmark regression, the sample data are tested for different groupings of ownership and industry, and the HHI is added to assess market concentration, so as to test the combined effect of economic policy uncertainty and market competition on innovation. A fixed-effects model is also used to empirically investigate the impact of economic policy uncertainty and official changes on firm innovation and the mechanism of the impact.

Chapter 1, Introduction. It first introduces the research background and significance of this paper. Next, the research framework and the research methodology of this paper are introduced. Finally, the possible innovations and shortcomings of this paper are elaborated, and the future directions of micro-firm behavior research are foreseen.

Chapter 2, literature review. This chapter reviews the existing literature by sorting out the current status of domestic and foreign research. This part mainly composes and summarizes the literature related to economic policy uncertainty, firm innovation, and local government official turnover from three broad aspects.

Chapter 3, theoretical analysis and research hypotheses. The concepts of technological innovation and business environment uncertainty are explained, and three research hypotheses are proposed by reviewing technological innovation theory, growth option theory, real option theory, and information asymmetry theory.

Chapter 4, the current situation is analyzed. The current situation of uncertainty and corporate innovation in the business environment is analyzed. It mainly includes two aspects, one is the analysis of the current situation of economic policy uncertainty; the other is the analysis of the current situation of enterprise patent quantity, including the comparison of the current situation of enterprise innovation and the current situation of patent quantity of enterprises with different ownership and different industrialization levels, and exploring the reasons.

Chapter 5, the empirical analysis of the impact of business environment uncertainty on enterprise innovation. The selection and treatment of sample variables in this paper are introduced, a regression model is established according to the research hypothesis, and descriptive analysis, main regression analysis, heterogeneity analysis are conducted, and finally robustness tests are performed to prove the unbiasedness of the conclusions.

Chapter 6, Conclusion and Recommendations. The main conclusions drawn from the empirical study of this paper are summarized, and some suggestions are given for the government to maintain the stability and consistency of policies when formulating economic policies and for high-tech enterprises to make corresponding decisions when facing economic policy uncertainty with their own actual situation.

1.3 Innovation points and shortcomings

1.3.1 Innovation Points

Key innovations:

（1） In terms of research perspective, this paper enriches the existing literature by applying growth option theory to study the relationship between the two in the context of Chinese reality; through literature combing, it is found that existing studies do not strictly distinguish between macroeconomic uncertainty and local policy uncertainty, and even confuse the concepts of the two. Some studies have also conducted robustness tests by treating the two types of uncertainty as proxy variables for each other in order to obtain consistent conclusions, without realizing the possible heterogeneous effects of the two on the behavior of micro firms. This paper introduces the variable of local official changes, a new perspective that distinguishes between the two types of uncertainty and incorporates both into the analytical framework,

which can further enrich the existing research on the relationship between business environment and firm innovation.

（2） In terms of research methodology: by directly introducing the indicator of HHI market concentration, which is used to assess the degree of firm competition within a given industry, the HHI is used to produce interaction effect plots, where dy/dx shows the marginal effect of the amount of change in EPU on innovation, and each HHI level corresponds to a dy/dx value. These values reflect the trend of the effect of EPU on innovation as the level of HHI changes.

1.3.2 Shortcomings

The central question of this paper is how uncertainty in the business environment affects firm innovation and its mechanisms of action. Although efforts have been made to address this issue, there are some limitations and areas for improvement that should be considered in future research. The main elements that need further attention are as follows:

（1）sample size: The population of this paper is non-financial companies listed in the A-share market with full disclosure of patent data. However, this may limit the generalizability of the study results, as non-listed companies account for a large proportion of the market. Future studies may consider including data on non-listed companies to improve the broad applicability of the findings.

（2） measurement of economic policy uncertainty: This paper relies on the Baker 2016 index of economic policy uncertainty in China based on an article in the English newspaper South China Morning Post. Only one newspaper, the South China Morning Post in Hong Kong, is referenced, which is not broad enough and may be biased due to the subjective factors of the newspaper, and may not truly reflect the economic situation in China. It would be valuable for future research to explore more appropriate measures of uncertainty in China's economic policies, which is a common challenge for researchers.

（3）Selection of control variables: The accounting standards currently adopted in China do not require listed companies to disclose R&D investment, so it is difficult to obtain data on R&D investment, and we can only use financial data related to innovation at the micro level of enterprises as the subject of analysis. The selection of control variables plays a crucial role in research design, and there are opportunities for improvement in this area. Since the disclosure of R&D investment data is not mandatory for listed companies in China, it becomes challenging to include R&D investment as a control variable. Future studies could explore alternative proxies for innovation-related variables or seek ways to obtain more comprehensive and accurate data on R&D investment to enhance the robustness and validity of the findings.

In summary, Future research should consider expanding the sample size, using more appropriate measures of economic policy uncertainty, exploring alternative proxies for innovation-related variables, and enhancing the theoretical analysis. By addressing these limitations, future studies can provide more robust and comprehensive insights into the relationship between uncertainty and firm innovation, contributing to both theory and practice in the field.

Chapter2 Literature Review

2.1 Business Environment Related Studies

The term "business environment" was first introduced in 2002 with the launch of the survey project of the Doing Business report of the International Finance Corporation of the World Bank Group, and at present, there are many discussions on the definition of business environment in academic circles, and it is basically agreed that the business environment consists of many elements and involves a wide range of fields, including institutional, social and economic aspects that affect the activities of enterprises. It is a systematic project; Zheng, Guonan and Liu, Cheng, 2021; Li, Zhijun et al. Combined with the progress of academic research, this paper considers that the business environment is a comprehensive ecosystem of the region in which the business subject is located, and is a comprehensive development environment containing multiple elements of market, system, politics, and infrastructure environment throughout the whole life cycle of the business subject, i.e., from the establishment, operation to bankruptcy of the enterprise. A good business environment is not only an important strategic solution to break administrative monopoly and improve the creativity and market vitality of enterprises, but also an important reflection of comprehensive strength and competitiveness.

At present, domestic and foreign scholars have also accumulated a certain amount of research on the economic effects of business environment. From the perspective of impact dimensions, business environment is mainly divided into those that affect enterprises at macro level and micro level.

2.1.1 Macro-level

At present, domestic and foreign scholars' research on the economic effects of business environment is mainly divided into exploring its effects at macro and micro levels. From the macro level, as a comprehensive environment affecting the activities of market players in the region, a good business environment can significantly reduce the institutional costs existing in the market, promote fair access to production factors by different market players, and realize the market-oriented allocation of production factors (Li et al., 2021) Business environment optimization is an important initiative to improve total factor productivity (TFP) and promote economic development, and improving the business The conclusion that improving the business environment can significantly increase TFP and promote economic growth has been widely accepted by the academic community (Dong et al. 2012). Since there are many components of the business environment, this paper summarizes them into four aspects based on existing research: institutional environment, market environment, infrastructure environment, and political environment. Existing studies

confirm that the institutional environment is crucial to the transformational development of the economy and profoundly affects the economic growth of less developed regions (2001). And a fully competitive, perfect and effective market environment is not only conducive to improving the entry and exit mechanisms of enterprises, but also can guide enterprises to choose industries and technologies according to their respective comparative advantages, promote the effective flow and allocation of resources, avoid blind investment and overproduction, and thus achieve improved market competitiveness (Lin, 2017, Jiang, Haining et al., 2020). In terms of political environment, existing studies have mainly focused on exploring the impact of rent-seeking on economic development in resource-based regions due to unclear property rights of public resources (Krenz, 2016; Zhao, Weiwei et al., 2020). Although a small number of scholars have found no negative relationship between resources and economic growth and corruption by testing most scholars tend to believe that corruption hinders economic growth (Alexeev and Conrad, 2009)

2.1.2 Micro Level

At the micro level, the existing literature analyzes the impact of optimizing the business environment on various aspects of the life of a firm, mainly based on the life cycle of the firm. First, in terms of entrepreneurial innovation spirit or firm establishment, scholars have found that innovation is an important force for regional development (Zheng Xin et al., 2019; Du Yunzhou et al., 2020), while optimization of the business environment is not only an important means to motivate entrepreneurs to innovate and start up (Braunerhjelm, 2015), but also an important means to break administrative monopolies and improve the creativity and market vitality of enterprises strategic solutions (Xia Houxue et al., 2019). Second, in terms of enterprise operation and resource allocation, a quality business environment is crucial to the positive development of enterprises, which can significantly reduce the systemic transaction costs faced by enterprises, reduce the non-productive activities of market players, and allow them to spend more time on their business activities. It can significantly reduce the institutional transaction costs faced by enterprises, reduce the non-productive activities of market players, and give them more time and energy to devote to their business activities.

Finally, an optimized business environment also implies an improved corporate bankruptcy system, which not only drives enterprises to reduce the cost of debt, but also has a positive impact on reducing their bankruptcy rate and strengthening their economic activities (Xiaowei Liang et al., 2020)

2.2 Economic Policy Uncertainty and Enterprise Innovation

2.2.1 Literature Review in Economic Policy Uncertainty

The impact of uncertainty on enterprise innovation has been partially studied by domestic and foreign scholars, but no consistent conclusion has been reached yet, and earlier studies have mostly focused on the impact of uncertainty on enterprise investment. Through the study of the Great Depression, Keynes pointed out that firms would be cautious about investing due to increased macroeconomic volatility, and the riskier the investment then the lower the demand for investment (Keynes ;1936). Also, assuming that investment is irreversible, then under conditions of uncertainty, agents must make investment timing decisions, and elevated uncertainty delays agents' investment decisions and retards the current rate of investment (Bernanke; 1983). Some scholars have studied the relationship between uncertainty and investment in the context of real options theory and have argued that many investment behaviors share three important characteristics. First, most investments are fully or partially irreversible and cannot be returned to their initial state once the decision is made, even if the intention is changed. Second, the future return on investment is uncertain. Third, companies are free to choose the timing of their investments and can actively delay their current investment decisions if they want to obtain information about the future. Therefore, investment decisions can be delayed due to uncertainty, thus discouraging investment (Dixit & Pindyck; 1994). After the global financial crisis in 2008, business investment in the United States decreased significantly, and two-thirds of the decrease in business investment was due to increased economic policy uncertainty (Gulen & Ion; 2016). Some domestic scholars have reached similar conclusions, using a GARCH (1, 1) model with conditional variance of GDP as a measure of economic uncertainty, where external demand decreases due to increased uncertainty and the amount of corporate investment increases with increased long-term funding needs and liquidity funds (Wang, Yizhong, and Song, Min; 2014). Enterprises' investment is affected by economic policy uncertainty, especially after the 2008 subprime mortgage crisis, and the higher the policy uncertainty, the lower the investment of enterprises, while the nature of ownership, learning ability, and the degree of investment retraction all affect the inhibitory effect of policy uncertainty on investment (Li, Fengyu, and Yang, Mochu; 2015). However, the channels of this inhibitory behavior are not yet known, so the academic community has conducted further in-depth studies and found that the main channels through which enterprise investment decreases due to increased uncertainty are higher cost of capital and diminishing marginal returns to capital (Chen, Guojin, and Wang, Shaoqian; 2016). If investment efficiency is measured using investment residuals and investment opportunity sensitivity, firms consider policy fluctuations from a macroeconomic perspective, which leads to higher investment efficiency, and this is more prominent in firms that are highly influenced by policies (Rao, Pingui, Yue, Heng, and Jiang; 2017). Exploring from the perspective of asset nature, it is found that

firms in industries with stronger asset transformation ability are more resistant to uncertainty because they have the flexibility to dispose of their assets, and this phenomenon is more pronounced in firms with high financing constraints (Liu Guanchun, Duan Yuzhu; 2019). However, some scholars argue that rising economic uncertainty promotes business investment. Under a perfect competition scenario, where product price instability is the main source of demand uncertainty, total returns rise when uncertainty rises. Therefore, a competitive firm prefers the "high uncertainty" of price instability and invests more in order to maximize profits (Oi et al, 1961).

After a careful study of the relationship between uncertainty and investment, in recent years scholars have begun to study uncertainty in relation to other firm behaviors. The increased number of uncertainties associated with firms under conditions of uncertainty makes it more difficult for managers to obtain accurate information, which leads them to generally adopt similar cash asset management strategies. In contrast, if the macroeconomic picture is clearer, managers are free to plan and adjust the firm's liquid assets according to their own judgment, further improving the efficiency of asset management (Talavera & Baum et al., 2005). From the perspective of firms' cash holdings, there is evidence that firms tend to hold more cash under policy uncertainty, mainly because they also have a precautionary demand for money, while rising uncertainty leads firms to postpone investments and hold more cash on a wait-and-see basis. The relationship between policy uncertainty and cash holdings is more pronounced for firms that rely on government spending and goes beyond business cyclicality. Further analysis suggests that the impact of policy uncertainty on firms' cash holdings differs from the impact of political, market, or other economic uncertainty (Hieu & Nam et; 2019). Research from the perspective of uncertainty and corporate cooperation in technological innovation has found that competitive pressure and uncertainty are the main drivers of corporate innovation (Junyi Weng; 2002). Economic uncertainty affects banks' investment behavior, and if uncertainty rises banks are motivated to lend less out of prudence, and loan volatility declines relative to assets, while easily inducing synchronous and consistent behavior of other banks (Qiu Zhaoxiang, Liu Yuanliang; 2010). In the inventory buffer model, the higher the economic uncertainty, the higher the level of cash holdings, and the two are significantly positively correlated, and the positive relationship is more pronounced for firms with high financing constraints than for firms with low financing constraints, as cash holdings of firms with high financing constraints are more sensitive to economic uncertainty (Liang, Quanxi, Tian, Cunzhi, Zhan, 2012). Meanwhile, from the perspective of the marketization process, the sensitivity of firms' cash holding levels to uncertainty is more sensitive in regions with lower marketization, and in general the marginal value of cash decreases under uncertainty (Wang, Hongjian et al.; 2014). Also, it is

more difficult for firms to obtain loans when economic uncertainty rises, and this effect is more pronounced in high-growth firms (Liu, H., Cao, T. K.; 2015). At the same time, the stock price responsiveness of listed firms also decreases due to increased policy uncertainty, which causes resource misallocation within firms and a consequent decrease in efficiency (Chen, Deqiu, Chen, Yansen, and Dong, Zhiyong; 2017). The increase in credit supply has a negative impact on firms' investment efficiency, but this negative impact is reduced accordingly under uncertainty (Liu, H., Cao, T.; 2017). Meanwhile, it has been pointed out that the business credit that firms can provide decreases due to elevated uncertainty, and important channels for this effect are external financing and internal environmental uncertainty (Chen, Shenglan, and Liu; 2018). From the perspective of corporate lending, higher uncertainty leads banks to tighten their lending behavior, and MSMEs with higher financing constraints themselves face higher financing costs (Song, Quan-Yun, Li, Xiao, and Qian, Long; 2019). Further, this suggests that economic policy uncertainty is positively related to corporate gearing (Gong, Rukai, Xu, and Wang, Dazhong; 2019).

2.2.2 Literature Review in Enterprise Innovation

A large number of articles have been published on enterprise innovation from different perspectives. From the perspective of firm size, some scholars have pointed out that firm size positively promotes firm innovation in China, but mainly in non-state enterprises, and the innovation capability of state-owned enterprises does not increase with firm size (Zhou, Li-An, and Luo, Kai; 2005). Later, a recent study shows that innovation and size of firms have an inverted U-shaped structure, i.e., innovation increases with firm size in the initial stage, but inhibits R&D innovation capacity as firm size increases to a certain extent (Nie Huihua, Tan Songtao, Wang Yufeng; 2008). The increase of per capita income and basic factor income will stimulate the increase of national innovation capacity and further expand the scale of effective demand (Fan, Hongzhong; 2007). In order to obtain government subsidies, some firms may choose to provide inaccurate "innovation signals" that are substandard, and if the production cost of such "innovation signals" is low, the government subsidies may reverse the speculative behavior of firms, thus inhibiting their innovation capacity (An, T.; 2008). In an empirical analysis of the data of listed companies in the 2003-2015 sample, we find that government innovation subsidies can positively promote firms' R&D investment, and there is a positive relationship between the two (Xie Weimin, Tang Qingquan, Lu Shanshan; 2009). From the perspective of ownership and CEO incentives, the more pronounced CEO incentives, the more innovative firms are, and the greater the R&D investment and innovation output of SOEs compared to non-SOEs, the key role of SOEs in innovation (Li, Chuntao, Song, Min; 2010). In terms of innovation output efficiency, Chinese high-tech enterprises have low innovation efficiency in front of them, and the actual utilization

rate of patent applications is low, but the innovation output efficiency of enterprises has been gradually increasing in recent years, and the R&D efficiency varies greatly among enterprises of different sizes and competitive degrees (Zhu Youwei, Xu Kangning; 2006). From the perspective of financing constraints, since firms with external financing difficulties have less funds available for R&D investment, the right to internal financial consolidation is particularly important, which allows firms to avoid the additional costs caused by external financing through endogenous financing (Ju, Lu, Di, Yu, Yihua; 2013). At the same time, the firm's innovation is influenced by the market-oriented reform of banks and the degree of financial openness of its location (Xie, Weimin, Fang, Hongxing; 2011)

2.2.3 Uncertainty and Enterprise Innovation

The focus of this paper is on the impact of economic uncertainty on firm innovation. domestic and international research on this relationship has mainly been conducted from the perspective of economic policy uncertainty, with little perspective on economic uncertainty itself, and research on the relationship between uncertainty and firm innovation is currently focused on economic policy uncertainty. baker et al (2016) construct an index of economic policy uncertainty (EPU), which contains two main components of quantity: 1. News reports of policy-related uncertainty. The index is constructed quantitatively by searching for terms such as "uncertainty", "economy", and "policy" in newspapers through textual analysis.2. Forecast disagreements among economists. In terms of innovation, most of the existing studies focus on innovation inputs and outputs, with the input perspective being mainly the R&D inputs of enterprises, and the output perspective being mostly portrayed by the number of patent applications. Some foreign scholars hold different views on the impact of economic policy uncertainty on firm innovation. Both policy and market uncertainty may have a negative impact on firm innovation, while policy uncertainty has a greater impact on innovation of politically connected firms (Yizhong Wang & Yueling Wei et;2016). A further study of listed companies in China from 2000-2007 found that economic policy uncertainty negatively affects innovation, and this negative relationship is particularly pronounced for firms in competitive industries. However, in concentrated industries, the negative impact of uncertainty is relatively small for large firms with more internal resources and easier access to external financing (Muhammad & Xue et;2019). The same applies to real options theory in the analysis of innovation in Chinese industrial firms, and the negative relationship between uncertainty and firm innovation is found to vary across firm types (Hao, Wei, Wei, and Wen, Jun; 2016). From the perspective of product innovation and service transformation, rising economic policy uncertainty inhibits firm innovation and leads to the transformation of manufacturing firms to service firms (Zhang, Feng, Liu, Xiyuan, Wu, Lidong, Yin, Xile; 2019). However, some scholars have

the opposite opinion, using stochastic dynamic models to find that the higher the uncertainty of economic policies, the stronger the willingness of firms to innovate, and under the uncertainty condition firms are more willing to find new directions and increase their innovation; however, if firms are affected by uncertainty too much this incentive to innovate will be weaker; on the contrary, the stronger the risk tolerance and the higher the expected return on innovation, the stronger the economic policy uncertainty on their innovation behavior. The greater the positive impact of policy uncertainty on their innovation behavior (Meng Qingbin, Shi Qian; 2017). Further research shows that economic policy uncertainty in general positively promotes firms' R&D investment, and the effect varies by firm variability (Xia-Ming Gu, Yong-Min Chen, Shi-Yuan Pan; 2018).

Firm size also affects the innovative activities of firms to some extent. Compared with small firms, large firms have more advantages and are more inclined to carry out corporate innovation activities (Shefer, 2005). If firms are divided into state-owned and non-state-owned enterprises, it can be found that the promotion effect of firm size on firm innovation is more pronounced in non-state-owned enterprises (Zhou (Li-An, 2005). However, some scholars hold a different view that the relationship between firm size and firm innovation is not only positive, but also negative and non-linear. Small and medium-sized firms are more likely to engage in innovative activities and are able to invest more in R&D in their business operations than larger firms (Ren, 2015).

In addition, the degree of marketization also has an impact on the innovation activities of firms. Arrow (1962) found that competition in marketization can promote firms' innovative activities compared to monopoly in marketization. Weimin Xie and Hongxing Fang (2011) used the factor market development score of the Fan Gang marketization index to measure financial marketization and investigated the impact of financial development on firm innovation, showing that with the deepening of marketization reforms and the rapid development of the financial sector, firms' innovation activities would increase, and the promotion effect was found to be more pronounced in small-scale firms and non-state enterprises.

2.3 Changes in Local Official and Enterprise Innovation

2.3.1 Changes in Local Official and Policy Uncertainty

Policy uncertainty refers to the uncertainty of the government introducing new policies or changing existing policies in the future, and market agents often cannot accurately predict if, when, and how the government will change existing economic policies in the future (Yang, Yafang, 2018) The government mainly influences the external environment in which companies live through the implementation and enforcement

of policies, and when implementing new policies the government has to When implementing new policies, the government has to consider the development of various factors and aspects of the whole region in a holistic manner, and will not only consider how the new policies will benefit the development of enterprises. On the contrary, some policies may have a crowding-out effect on the development of enterprises. For enterprises, government actions are highly unpredictable. For enterprises, government actions are highly unpredictable, especially for new officials, which will bring greater policy uncertainty. The uncertainty of the external environment for enterprise innovation and development will also increase.

In foreign countries, there are more studies on government turnover because of the rotation of different political parties. Government change The concept of government change refers to a change in the ruling leader or group. For example, the leader, or ruling group consisting of ruling party, military, economic elite ruling group, or the leader of an elected party and a coalition of elected parties. If a leader or leadership team replaces another leader or leadership team, a change of leadership is considered to have occurred. On the one hand, the term of office of a leader is on the other hand, a leader may be replaced during his or her term by another leader whose policy preferences are completely different from his or her own. The new leader's policy preferences are completely different from his or her own. The outcome of a leadership election can have a significant impact on business decisions, as the new policy may As new policies may change existing tax, monetary and trade policies, as well as industry regulation, in more extreme cases, they may affect changes in the nature of the business. The policy uncertainty associated with a change in government is unavoidable because of the different The policy uncertainty associated with a change in government is unavoidable because different candidates have different governing philosophies, and in order to gain votes, candidates will deliberately use certain policies to bring in certain groups. This is because different candidates have different philosophies, and in order to get votes, candidates will deliberately use certain policies to attract a certain group, and the expected policies of different candidates are likely to be different. Especially in the campaign process, the campaign results are uncertain and no one can accurately judge the future political direction. This includes key issues such as future fiscal, tax, and social security policies (Andrea Mattozzi, 2008)

This is also the case in China, where local officials hold the power to decide on regional economic policies and the allocation of government funds, such as deploying economic development tasks, compiling financial budgets, approving investment projects and approving the use of large sums of money. A policy is difficult to implement without deviation, but it is easy to terminate. Our law stipulates that a However, statistics show that the average term of office of local officials is only five years, and economic development

plans are made for five years. However, statistics show that the average term of office of local officials is only three years, which indicates that a large number of officials leave before their term expires. The current system of official promotion makes it impossible for local officials to predict their actual tenure, so new officials are eager to Therefore, new officials are eager to realize their political ambitions and expect their planned projects to be effective in a short period of time, so they can easily choose to terminate the policies of their predecessors Therefore, it is easy for new officials to choose to terminate the policies of their predecessors and introduce new policies of their own. Since the appraisal system of officials does not involve the handover of work with their predecessors, it results in policy discontinuity, and even radical actions such as expanding government spending and fiscal deficits to meet one's planning, over-investing limited resources in the direction of their own work, resulting in over-investment and the waste of resources unfavorable phenomenon (Yang, Haisheng, 2015).

In the Chinese context, scholars generally agree that the existing mechanism for changing local officials in China creates uncertainty in the local political environment and policies, again this is more of an empirical intuition and lacks empirical testing. Unlike in Western countries, in China there is no political volatility due to changes in the ruling party, although periodic changes in the party and government can still have some impact on the overall environment. Four peaks in the growth rate of state-defined asset investment occurred in the second year after the 13th, 14th, 15th, and 16th Party Congresses, respectively (Xu Qinghai et al., 2006; Wen Yanbing, 2014). China does have a political-economic cycle brought about by the change of government, but it is also important to see that there are very many factors influencing the change of economic situation, and it is still an unresolved issue through which political uncertainty has an impact on the economy (Chen, Weidong, 2010).

The main theory of our scholars' research on the change of local officials is the "promotion tournament" theory, that is, new officials this mentality can easily lead to policy uncertainty. Because it is difficult to break through by continuing the policies of a predecessor, and even if good results are achieved, they may be attributed to the previous leader who initiated the policy.

Proposed policy of the previous leader, the role of limited to enhance their own performance, and if there are problems with the previous policy If the former policy has problems, to others "clean up the mess" may also affect their own term of office of the local economic growth, to their own political experience brought The negative impact on their own political experience. Therefore, incoming officials will often introduce their own new policies, their own new priorities or slogans to differentiate themselves from their predecessors. This is why incoming officials often introduce their own new policies and slogans to

differentiate their policies and plans from those of their predecessors. The former official's policies and plans are forced to end, and the promises made by the former official may disappear. This is also an undesirable result of competition among officials (the "new policy"). This is also the undesirable result of competition among officials (Yang et al., 2015). Officials need to write work reports to review the previous year's government work, i.e., tasks accomplished and achievements, and to make future work plans, in order to quickly To achieve political performance quickly during the term of office, it may cause officials' short-sighted behavior, and they will use some policy instruments to tilt their work For example, if a new official takes infrastructure development as a breakthrough in performance, he or she will often tilt limited For example, if a new official takes infrastructure development as a breakthrough in performance, he or she will tend to tilt limited resources toward social infrastructure development, while other areas with high externalities or equally beneficial to regional development but not as promotion appraisals will be set aside. Other areas that have higher externalities or are also beneficial to regional development but are not considered as promotion indicators will be set aside (Yang et al., 2015). In addition, each official has different educational backgrounds and political experiences. It is inevitable that each official has different educational backgrounds and political experiences, and there are differences in development concepts and priorities. Some officials attach importance to industrial development, while others attach more importance to people's livelihood projects, and officials naturally differ in the direction of policy inclination and allocation of government resources. Naturally, they will differ in the direction of policies and allocation of government resources. For example, in the urban development plan of tapping tourism resources, creating a tourist-oriented city and developing a science and technology industrial park, the government's direction of work is different. For example, in the urban development planning of tapping tourism resources, creating a tourist-oriented city and developing a science and technology industrial park, the direction of government work and the way government resources are used differ greatly, and the related policies involve different industries and enterprises. The industries and enterprises affected by these policies are also different, and it is difficult to predict these affected enterprises before the change of local officials.

2.3.2 The impact of changes in local officials on innovation

The impact of officer change on innovation is also a hotly debated topic in academia and has yet to be unified. Real options theory suggests that when the uncertainty of the environmental environment increases, firms will be more inclined to wait and see and postpone the occurrence of investment, delaying the occurrence of investment, applied to the topic of official changes and corporate innovation, that is, when firms face policy uncertainty, they will reduce R&D investment, negatively affecting firm innovation.

Bhattacharya et al. (2017), using multiple countries' data for empirical studies and found that policy uncertainty inhibits firm innovation and has a higher inhibitory effect on industries with high R&D intensity. The inhibitory effect is stronger for industries with high R&D intensity. Xu (2016) studied more than six thousand firms in the United States and found that a change in president leads to an increase in firm Thornhill (2006) studied over 6,000 firms in the U.S. and found that the change in president led to an increase in the cost of capital, which had a negative impact on firm innovation, manufacturing firms, the efficiency of firm innovation decreases with the increase of uncertainty in the external political environment. In contrast, the classical Knight's theory (Knight 1921) argues that corporate profits arise from uncertainty, and it is the unpredictability of the future that makes entrepreneurs Atanassov (2015) examines the impact of a change of governor on firms in the United States. Atanassov (2015) studied the impact of governorship on firm innovation in the United States and found that policy uncertainty associated with governorship is positively related to firm innovation, especially in the case of He finds that policy uncertainty brought about by the change of governor is positively related to firm innovation, especially in industries with high competition and more politically sensitive industries, where policy uncertainty has a greater effect on In particular, policy uncertainty has a greater effect on business innovation in industries that are more competitive and politically sensitive. Other scholars argue that changes in officials have no effect on firm innovation. For example, Pindyck (1993) argues that changes in the external political environment do not change the difficulty of R&D and the technology needed. Nor does the fact that firms wait and see eliminate the risk of R&D activity itself. It is always better for firms to start R&D as soon as possible, because they can get the output earlier, while waiting and waiting will miss the opportunity to do so.

Scholars in China have studied the impact of policy uncertainty caused by official changes on firms' innovation and have achieved certain research results. The study of Chen, Deqiu, Jin, Yaling and Dong, Zhiyong (2016) found that the policy uncertainty caused by the change of municipal party secretary would reduce the innovation efficiency of firms, and the number of patents of firms would be lower, and for firms with political.

The adverse effects of policy uncertainty are more pronounced for firms with political affiliations, and since firms with political affiliations normally rely on political affiliations to help with business activities, it is possible that the government may no longer be helpful to firms after a change in the political environment. Wang Quanjing (2018) also argues that local official changes significantly reduce the level of firm innovation, but the inhibitory effect of official changes on firm innovation is weakened in regions with higher marketization, in industries with higher market competition, in firms with less financing constraints,

and in state-owned enterprises. Qian Aimin and Yu Zhi (2017) found that local governments increasing the intensity of environmental regulations can induce high-polluting firms to increase their innovation investment; the impact of local governments' environmental regulation intensity on firm innovation is constrained by the pressure from officials' promotion, i.e., higher promotion pressure weakens the impact of local governments' environmental regulation intensity on firm technological innovation. Wang Yizhong and others (2014) found that policy uncertainty.

Uncertainty affects firms' innovation investment through the channel of external demand, liquidity funding demand. Hao Weiya et al. (2016) used real options theory as a basis to explain the mechanism of the impact of policy uncertainty on corporate innovation, and he argued that corporate R&D activities are highly irreversible, and policy uncertainty reduces the value of corporate innovation investment and affects entrepreneurs' motivation to innovate. Li Fengyu et al. (2015) also proposed, based on real options theory that the negative impact of policy uncertainty on firm innovation is positively related to the degree of investment irreversibility, and the optimal investment behavior in the face of uncertainty is to reduce investment. However, a study by Qingbin Meng et al. (2017) found that policy uncertainty instead increased firms' R&D expenditures and patent output and responded to the crisis generated by uncertainty in this way, and a study by Xiaoming Gu et al. (2018) also found that policy uncertainty showed that positive relationship with firm innovation. According to Xiangjun Li (2019), this is due to the "preemptive" effect of innovation, which can enhance the competitiveness of firms to capture the first opportunity in an uncertain market and gain greater profits.

Policy shocks bring negative shocks to GDP, investment, etc. through the expectations channel, and demand is similarly reduced by policy shocks (Xu, C.W., Wang, W.F.; 2019). Measuring policy uncertainty through changes in local officials, if firms anticipate a transfer of officials in their location, their investment behavior will also decline accordingly in the current year, and this investment decline behavior is more pronounced among state-owned enterprises with provincial holdings (Jia Qian, Kong Xiang, and Sun Zheng; 2013). From a tax avoidance perspective, firms can use official reassignments to gauge policy uncertainty and strengthen tax avoidance incentives, a phenomenon that is more pronounced in regions with strict tax governance (Chen, Deqiu, Chen, Yansen, and Dong, Zhiyong; 2016).

In summary, Uncertainty in the business environment mainly includes uncertainty in economic policies and changes in key local officials. For business innovation, this uncertainty may have positive or negative effects. On the one hand, firms may gain a higher value of rights as a result, thus suggesting to postpone or reduce some innovation activities. On the other hand, firms may also capture market share, gain return on

investment, and actively pursue innovative activities.

the impact of economic policy uncertainty and official changes on firm innovation is analyzed from two main perspectives: macroeconomic and micro-firm. The impact of factors such as industry characteristics is focused on from the perspective of real options and growth options. The above literature is summarized and reviewed, and the direction of further research is pointed out to pave the way for the subsequent theoretical derivation and empirical testing.

Chapter3 Theoretical analysis and research hypothesis

3.1 Theoretical Analysis

Economist Knight argues that uncertainty is difficult to describe in terms of probability, arguing that "risk" is measurable uncertainty with a known probability and an unknown outcome. Uncertainty, on the other hand, is not measurable and its probability is unknown. He also pointed out that uncertainty comes from people's knowledge structure, cognitive ability and other factors.

Keynes believed that uncertainty exists without any probability analysis, is closely related to expectations, and cannot be classified as a probability problem.

The Austrian school considers uncertainty as a dynamic cognitivist view that includes both the meaning of ignorance such as the unsoundness of the knowledge system and the limitations of cognition, and the subjective uncertainty that exists when people act.

These three economic ideas differ in their interpretation of uncertainty, but essentially share the same understanding: first, uncertainty cannot be measured by probability and cannot be observed and analyzed ex ante; second, uncertainty originates from factors such as people's knowledge structure and cognitive ability.

The uncertainty studied in this paper refers to the uncertainty embodied by the government in changing policies or introducing new policies in the future, which is manifested by the inability of market participants to understand the timing, specific content and actions of government decisions in a timely manner. It is difficult for firms to predict information about new policies and their implementation, and it takes time for the impact of economic policies on firms to manifest after government policies are introduced (Baker, 2016)

3.1.1 Theory of technological innovation

In 1912, Schumpeter put forward the theory of technological innovation in his Theory of Economic Development, arguing that technological innovation plays a positive role in economic development, creating new values and promoting changes in the way of economic development. He defined technological innovation as the establishment of a brand-new production function and the combination of brand-new production factors and production conditions, including the production of new products, changing production methods, opening up new areas of the market, changing the material sources required for production, and creating new organizational forms, among other five aspects.

Technological innovation needs a certain economic environment to achieve development, such as a good market system, a perfect credit system, sufficient market scale and market demand, etc. can provide the soil

for innovation. Entrepreneurs play an important role in innovation activities and can play the role of decision makers in resource allocation, helping enterprises to achieve optimal resource allocation and gain profit margin.

Schumpeter's theory of technological innovation has provided a solid foundation for later scholars, and subsequent scholars have formed and developed the economics of technological innovation and the economics of institutional innovation on this basis. The economics of technological innovation takes technological change as the main object of study, and considers innovation as the key to achieving economic development. Institutional innovation economics, on the other hand, believes that innovation in institutions can also promote economic growth.

Therefore, it is important to continue to study the promotion factors of enterprise innovation on the basis of Schumpeter's technological innovation theory.

3.1.2 Real Options Theory

Real options theory introduces the idea of options into the investment decision of enterprises, and regards the investment opportunities owned by enterprises as the call options held by them. The rising uncertainty faced by enterprises will raise the value of the option and increase the opportunity cost of investment, thus discouraging enterprises from investing. The real option effect also explains the inhibiting effect of uncertainty on corporate investment from the perspective of financial frictions, the greater the uncertainty, the greater the risk faced by investors, and financial institutions will generally require companies to pay higher interest rates and defaults as risk compensation in order to avoid risk, leading to an increase in external financing costs; uncertainty also leads to a shrinkage of corporate balance sheets, thus reducing the value of collateral value and reduce the amount of corporate loans. Higher financing costs and a reduction in the size of financing can increase the cost of corporate investment, forcing firms to cut back on current investments. Real options assume that firms can exercise their investment rights in future periods by waiting for the best investment opportunities. Real options assume that uncertainty contains "bad news" and that the appearance of bad news will increase the value of the option, which in turn will cause the firm to delay its investment;

3.1.3 Growth Options Theory

Growth option theory suggests that uncertainty will motivate firms to invest if uncertainty can increase the future returns of the investment, the reason being that a failed investment will at most lose the cost of the investment and a successful investment will result in a greater return. Therefore, venture investors tend to

prefer projects that have high uncertainty about future growth but where the gains from a successful investment are much greater than the losses resulting from a failed investment. The growth option effect is often used to explain the Internet boom of the 1990s, when companies were uncertain about the future of Internet development, but it was uncertainty that spurred Internet investment. Bar-Ilan and Strang note that if an investment requires a long construction cycle, rising uncertainty provides an incentive for firms to invest sooner, and being first to market will give them a first-mover The first to enter the market will give companies a first-mover advantage, taking advantage of the opportunity to prioritize development to prevent other companies from entering.

Most of the existing literature analyzing the impact of uncertainty on corporate investment concludes that uncertainty discourages corporate investment and points to the dominant role of the real options effect in corporate investment decisions. What about the impact of uncertainty on corporate innovation, which has longer cycles, higher risks, and more unpredictable outcomes than conventional investment? This paper analyzes the impact of uncertainty on corporate innovation in more detail and systematically at two levels: macroeconomic uncertainty and local policy uncertainty faced by the business environment in which firms operate, examines how the growth option effect and the real option effect work under different uncertainty environments, and identifies and verifies the transmission mechanism.

3.2 Research Hypothesis

3.2.1 Economic Policy Uncertainty and Enterprise Innovation

Since the outbreak of the financial crisis in 2008, the global economic trend is already unpredictable, and with the frequent global trade frictions in recent years, the economic outlook and direction have become even more uncertain. Along with increased production costs, increasingly sluggish internal and external demand, and growing business risks, companies are facing rising macroeconomic uncertainty. Many studies point out that rising uncertainty will increase the investment cost of enterprises, and enterprises usually choose to delay their investments and wait for the investment environment to become clearer before making investments. However, unlike conventional investment, corporate R&D innovation is exploratory and developmental in nature. The rising uncertainty in the external economic environment will make it difficult to forecast the market and for firms to capture complete information about market demand, but it also means that the market landscape is facing reshuffling. Companies can effectively capture or even lead the market demand by increasing exploratory innovation expenditures, and thus capture the market to gain first-mover advantage. Moreover, the rise in economic policy uncertainty leads to greater volatility in enterprise value,

which means that enterprises may experience serious value declines in the future, prompting them to seek self-improvement and development through innovation activities to escape from market difficulties and enhance their competitive advantages and viability. In addition, the duration of economic policy uncertainty is unpredictable, and the global economy has not yet emerged from the recession brought about by the 2008 financial crisis, which will undoubtedly increase the opportunity cost of waiting, and corporate innovation activities are characterized by long cycles, high risks and unpredictable results. In summary, this paper argues that the growth option effect plays a dominant role in firms' innovation decisions when economic policy uncertainty rises。

Based on this, this paper proposes Hypothesis 1: Economic policy Uncertainty has a positive effect on enterprise innovation, i.e., rising uncertainty promotes enterprise innovation.

3.2.2 High-tech Enterprises are More Dependent on Changes in Local Officials

Innovation is an internal decision and action of the firm. Although a change in government officials may bring about some sort of policy fine-tuning or adjustment, most local governments' policies and support in innovation are usually relatively stable and continuous. Innovation activities are primarily driven and executed by the firm's internal management and employees. Changes in local government officials usually do not directly interfere with a firm's internal operations and innovation processes. Compared to other firms, high-tech firms are usually more dependent on government support and policy stability and more sensitive to changes in the policy environment, as they face more challenges in technological innovation, intellectual property protection, and market access.

Changes in local officials can create uncertainty in the implementation of policies related to high-tech industries, such as research funding, intellectual property protection, and industry-specific regulations. This uncertainty can negatively impact innovation by destabilizing and supporting the innovation activities of high-tech companies. The unique nature of high-tech industries: High-tech industries such as information technology, biotechnology, and advanced manufacturing are often at the forefront of technological development. These industries face unique challenges and require a favorable policy environment to drive innovation. Changes in local officials can lead to shifts in policy priorities, reductions in funding for high-tech projects, or changes in regulations that directly affect the ability of high-tech companies to innovate. High-tech companies typically engage in long-term R&D projects that require significant investment of time, resources, and capital. Changes in local officials can undermine the continuity and stability of these programs and affect the ability of firms to effectively execute their innovation strategies. High-tech firms may be more vulnerable to changes in local officials because their long-term planning and investment

decisions depend on consistent policy support. High-tech industries rely heavily on a skilled and specialized workforce. Changes in local officials can affect the availability of talent through policy changes related to education, immigration, and workforce development. High-tech companies may face challenges in attracting and retaining skilled professionals if there is uncertainty or inconsistency in policies related to talent management, which may hinder their ability to innovate.

Based on this, Hypothesis 2 is proposed in this paper. H2: Changes in local officials can have a significant negative impact on high-tech enterprises compared to other enterprises

3.2.3 Competition and Economic Policy Uncertainty Promote Enterprise Innovation

First, enterprises in highly competitive industries often need to continuously innovate to maintain their competitiveness and market position. This need to innovate enterprises to be more courageous in taking certain risks, including those arising from economic policy uncertainty, in order to drive innovative activities.

Second, in a competitive industry, enterprises may face greater market pressures and therefore have a greater need to undertake innovative activities to adapt to market demands and changes. This market pressure may also make enterprises more willing to take certain risks associated with economic policy uncertainty to achieve innovation.

Third, in highly competitive industries, enterprises may have more opportunities and resources to cope with economic policy uncertainty. For example, they may have more financial resources to deal with risk, or they may be able to partner with other firms to share risk and share costs. These factors may make firms more able to cope with the effects of economic policy uncertainty.

The intensity of the growth option effect of economic policy uncertainty on innovation will show differences depending on the heterogeneity of industries or enterprises. High-tech industries are characterized by high technology intensity, high revenue, high competitiveness and fast product renewal, which require high-tech enterprises to pay attention to changes in the market environment at all times and have the ability to respond quickly to changes in the market environment, otherwise they will be eliminated because their products cannot meet the market demand. We compare the effects of macroeconomic uncertainty on innovation of enterprises in different groups and verify the dominant role of macroeconomic uncertainty on the option effect of innovation growth of enterprises by grouping enterprises according to the degree of competition in their industries and whether they belong to high-tech industries.

It is pointed out that economic policy uncertainty increases the potential investment returns of innovation investment in the future, and the higher the degree of competition in the industry where the firm is located,

the shorter the investment opportunity left for the firm to obtain excess returns and the greater the opportunity cost of delaying innovation investment. In highly competitive industries, the impact of macroeconomic uncertainty on firm innovation becomes more pronounced. Economic policy uncertainty increases the potential returns to future innovation investments. However, in highly competitive industries, the window of opportunity to earn excess returns through innovation is shorter and the opportunity cost of delaying innovation investment is greater.

In such a competitive environment, firms are incentivized to be first movers to gain a competitive advantage and take advantage of growth opportunities. They recognize that delaying innovation investments may result in missed opportunities as their competitors may be the first to capture the market and establish themselves as leaders. As a result, companies operating in highly competitive industries are more likely to increase their innovation investments in response to macroeconomic uncertainty. Therefore, in order to enter the market first in time to gain first-mover advantage and growth opportunities, firms will increase their innovation investment. Accordingly, the following hypothesis is proposed:

H3: The higher the degree of competition in a firm's industry, the greater the role of economic policy uncertainty in promoting enterprise innovation.

Chapter4 Analysis of uncertainty and the current state of enterprise innovation

4.1 Current Analysis of Economic Policy Uncertainty

Scott R. Baker, Nicholas Bloom, and Steven J. Davis co-authored an academic paper entitled "Political Uncertainty and Economic Activity" in 2016. The paper was published in the 《American Economic Review》, the official journal of the American Economic Association, and has been widely cited and used in related research. By combing through the economic policy uncertainty measures used by domestic and foreign scholars, this paper obtains data on economic policy uncertainty indicators in China as measured by Baker et al. (2016).

Figure 4-1 shows the change of China's economic policy uncertainty index between 2000 and 2020. As can be seen from the figure, the uncertainty of China's economic policy has been increasing in recent years. Before 2010, the policy changes were stable and fluctuating within a certain range, but after 2010, with the rapid development of China's economy, the uncertainty of economic policy has also increased significantly. The average value of this indicator was only 55.69 in 2000.

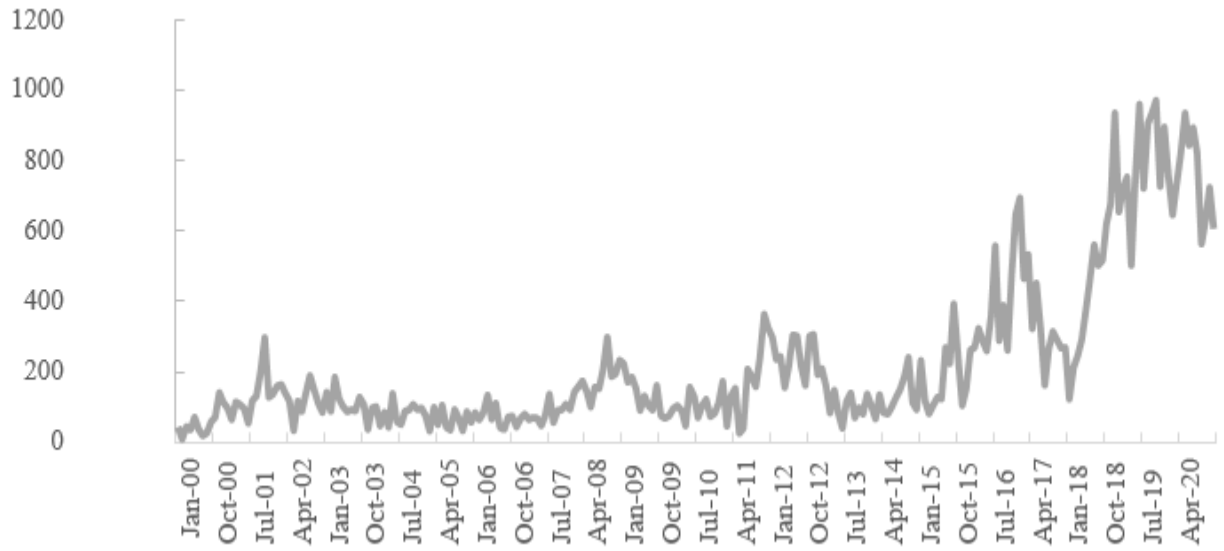


Figure 4-1. 2000-2020 China Economic Policy Uncertainty Index

Data source： https://economicpolicyuncertaintyinchina.weebly.com/

4.2 Analysis of current state of innovation

4.2.1 The current situation of the number of patents of Chinese enterprises

In this paper, we obtain the number of patents of Chinese A-share listed companies from CSMAR database

and China National Intellectual Property Office (CNIPA), and use the number of corporate patent applications in the current year as a measure of corporate innovation, the reason is that when the value of patents is greater than the cost of application, companies will use the results to apply for patents, and its more reflective of corporate innovation ability. To measure the innovation ability and level of enterprises. In this paper, the data of A-share listed companies in this period are summarized to derive the number of patents of Chinese companies and plotted in Figure 4-2.

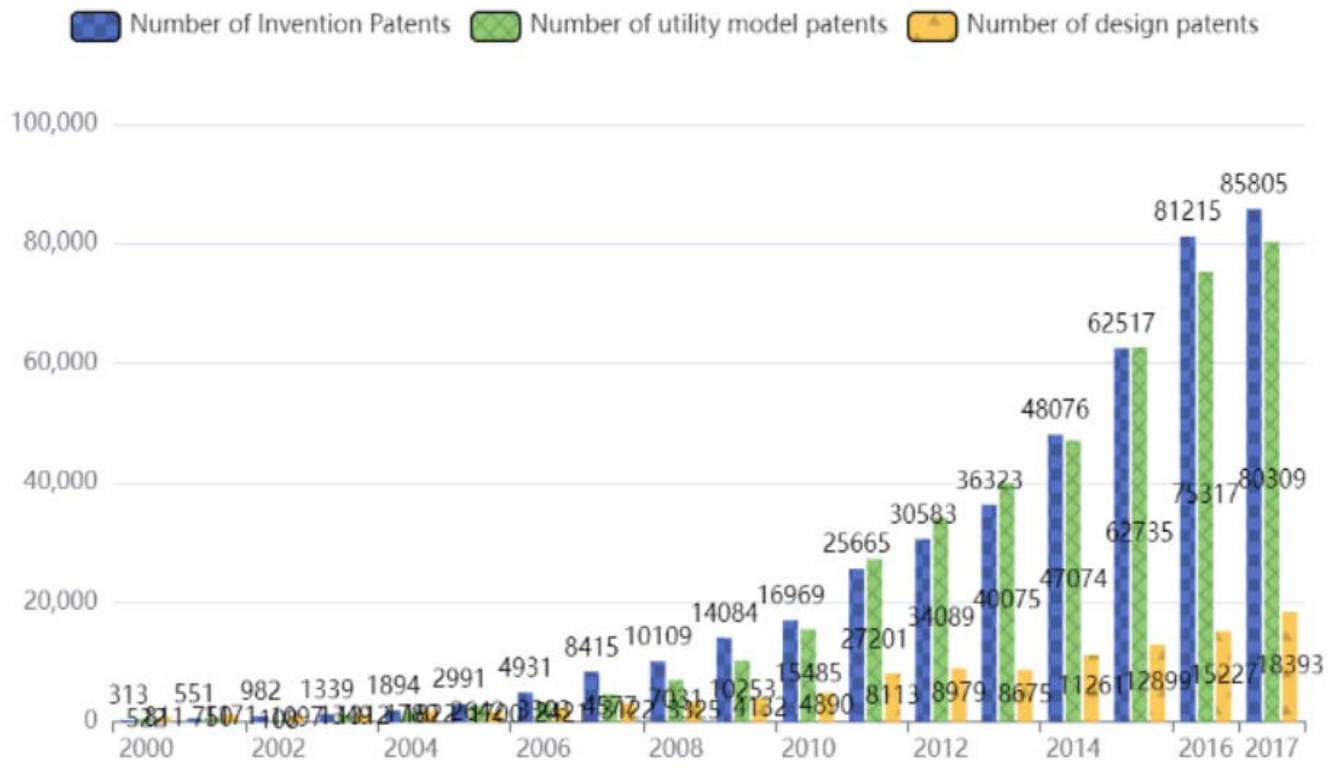


Figure 4-2: Statistics on the number of patents granted to enterprises from 2000-2017

According to the trend shown in the figure, the number of patents granted to Chinese A-share listed companies showed a rapid increase within the period 2000-2017. The number of patent grants can be further subdivided into three types: the number of invention patent applications (Invent), the number of utility model patent applications (Utili) and the number of design patent applications (Design).

Firstly, the number of invention patent applications shows a clear trend of growth. This indicates that Chinese A-share listed companies have made active investment and efforts in innovation. The growth of invention patents, which protect inventive technological solutions such as new technologies, products and processes, shows the activities of these companies in R&D and innovation.

Second, the number of utility model patent applications also showed an upward trend. Utility model patents involve improvements and innovations in the appearance, structure or combination of products. This trend indicates that Chinese A-share listed companies are actively exploring product design and improvement in

order to enhance the competitiveness of their products and meet market demand. The presence of the number of design patent applications indicates that China A-share listed companies also place emphasis on product appearance innovation and protection.

The growth in the number of these different types of patent applications demonstrates the combined efforts of China's A-share listed companies in IP protection and innovation. By filing different types of patents, these companies are able to ensure the legitimacy and uniqueness of their innovations, while enhancing their competitiveness and brand value in the marketplace.

Several factors may be driving this trend, including the government's emphasis on IP protection, the increased awareness of innovation among companies, and the push for technological development. The Chinese government's proposed policy measures such as innovation-driven development strategy, strengthening IPR protection and providing incentives may be closely related to this trend.

In conclusion, according to the trend shown in the figure, the number of patents granted to Chinese A-share listed companies has grown rapidly over the past period, with the number of invention patent applications and utility model patent applications dominating, reflecting the active efforts of these companies in IPR protection and innovation.

4.2.2 Comparison of the current situation of different types of enterprises

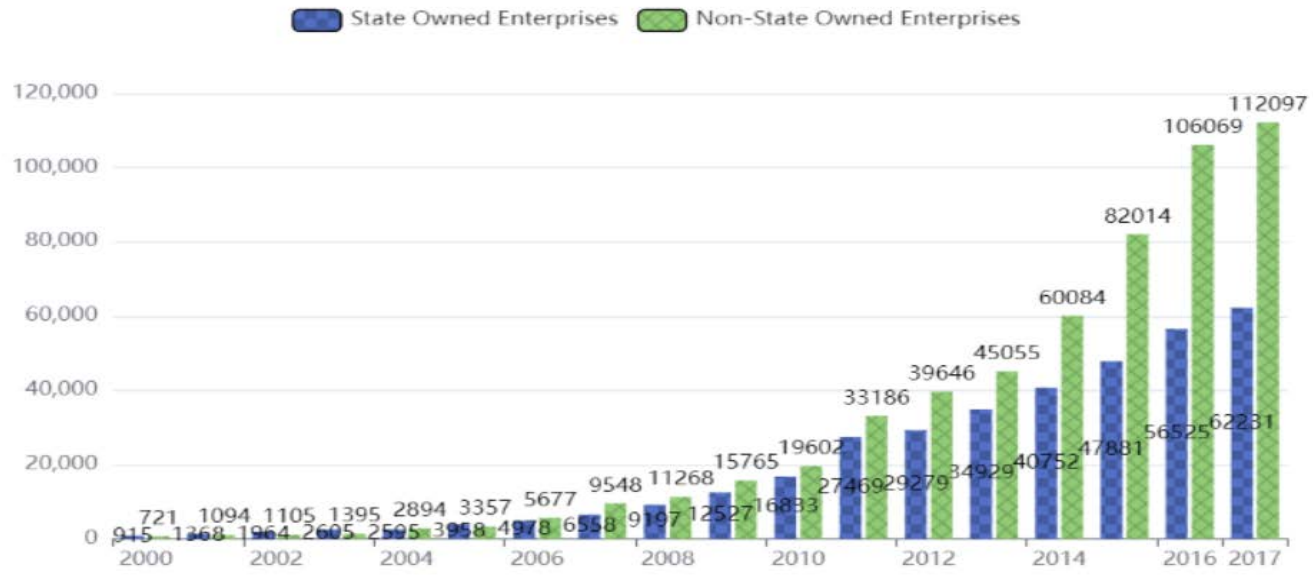


Figure 4-3 Number of patents for state-owned enterprises and non-state-owned enterprises, 2000-2017 (pieces)

Based on Figure 4-3, enterprises have been divided the listed companies into two categories: state-owned enterprises (SOEs) and non-state-owned enterprises (non-SOEs), based on the nature of enterprise

ownership. The data from the chart shows that both types of enterprises have experienced an overall increase in the number of patents granted.

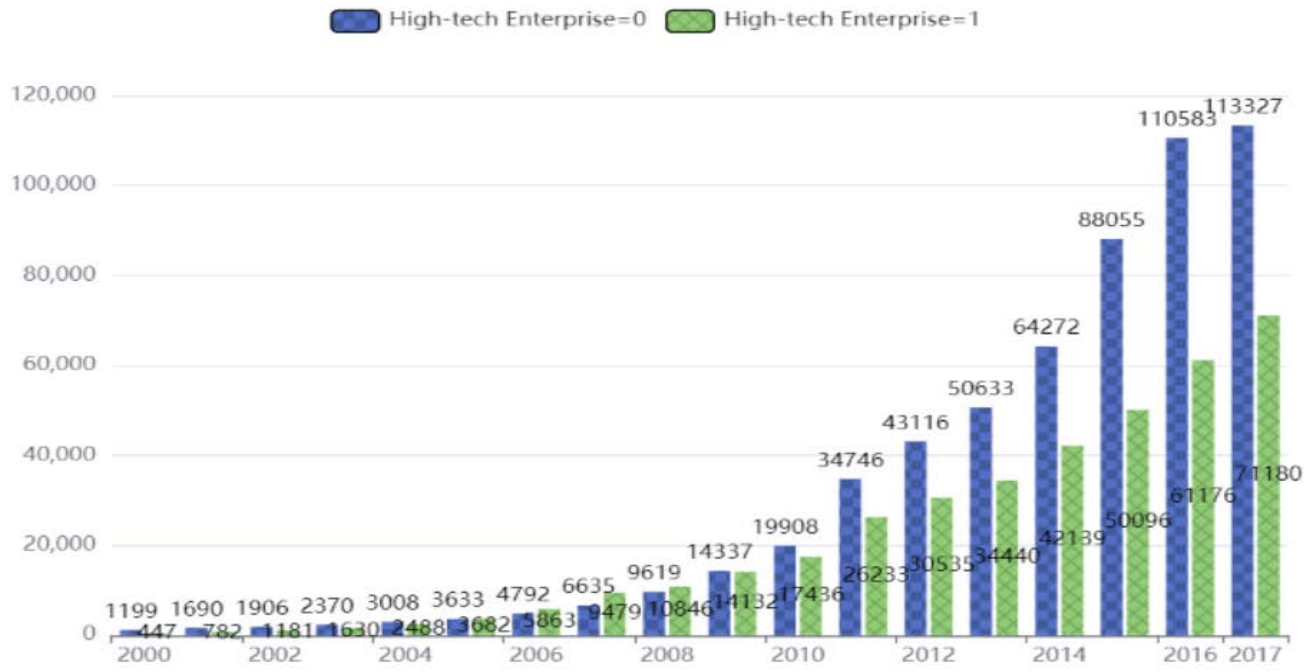
Specifically, during the period from 2010 to 2017, the number of patents granted to state-owned enterprises is significantly higher than that of non-state-owned enterprises. This can be attributed to several factors.

Firstly, state-owned enterprises have certain advantages that contribute to their higher number of patents. They often have access to government support, which includes financial resources and timely access to information. This support enables state-owned enterprises to allocate more resources to research and development activities and innovative projects, leading to a higher output of patents. Additionally, state-owned enterprises may benefit from specific policies and incentives that are designed to promote innovation and technological advancement in key industries.

Secondly, the larger sample size of state-owned enterprises in the study might contribute to the higher number of patents granted. If there are more state-owned enterprises included in the dataset, it increases the likelihood of observing a larger number of patents from this group compared to non-state-owned enterprises.

State-owned enterprises, in addition to their economic objectives, often have political and social responsibilities. They play a crucial role in stabilizing economic growth and facilitating the transformation and upgrading of industrial structure. The combination of government support, policy advantages, and their broader societal role may give state-owned enterprises an advantage in terms of innovation output compared to non-state-owned enterprises.

Figure 4-4 Number of patents for high-tech enterprises and non-high-tech enterprises, 2000-2017 (pieces)



High-tech enterprise = 1 belongs to high-tech enterprise,

High-tech enterprises = 0 belong to non-high-tech enterprises

Based on Figure 4-4, the data indicates that the number of patents granted to non-high-tech enterprises exceeded that of high-tech enterprises during the period from 2000 to 2017. There are several potential reasons for this observation.

Firstly, non-high-tech enterprises often have larger sizes and greater resources, including R&D budgets and facilities. These enterprises may have more extensive R&D activities and dedicated teams focused on innovation, which can result in a higher number of patent applications and grants. Their larger scale and resources provide them with the ability to invest in R&D programs and establish partnerships or collaborations to support their innovation efforts.

Secondly, non-high-tech enterprises may have a stronger emphasis on practical applications and the implementation of technological innovations. They may focus on developing and improving existing products or processes, which are often more directly applicable in the market. This practical orientation increases their likelihood of obtaining patent licenses related to product improvements or specific applications. In contrast, high-tech enterprises may prioritize investing in fundamental research and cutting-edge technologies, which may require more time and resources to yield tangible results and obtain patent grants.

It is also worth noting that the number of patents granted does not necessarily reflect the level of technological advancement or innovation capability of high-tech enterprises. High-tech companies may focus on developing core technologies and maintaining technological leadership, which may not always result in a high number of patent grants in the short term. Their innovation efforts may be more concentrated on protecting intellectual property through trade secrets or proprietary knowledge rather than seeking patent protection.

Overall, the higher number of patents granted to non-high-tech enterprises compared to high-tech enterprises during the specified period may be attributed to their larger size, greater R&D resources, emphasis on practical applications, and the nature of their innovation strategies.

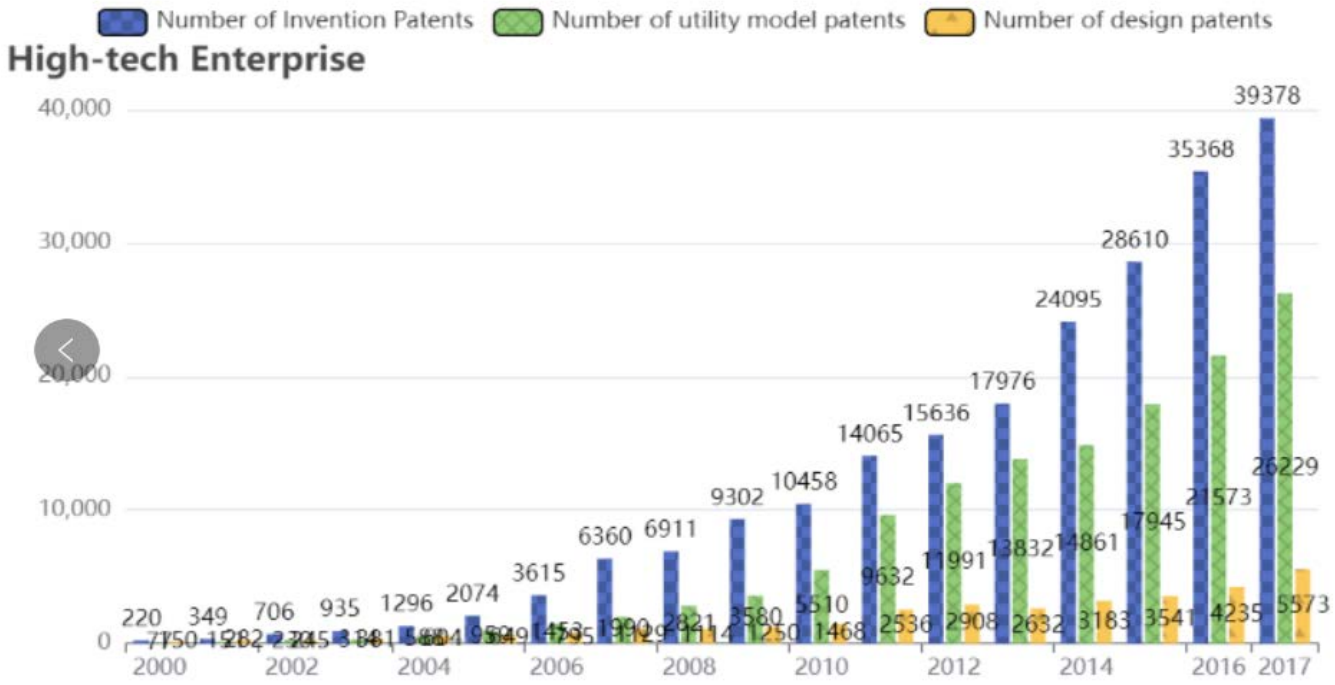


Figure 4-5 Number of various patents for high-tech enterprises, 2000-2017 (pieces)

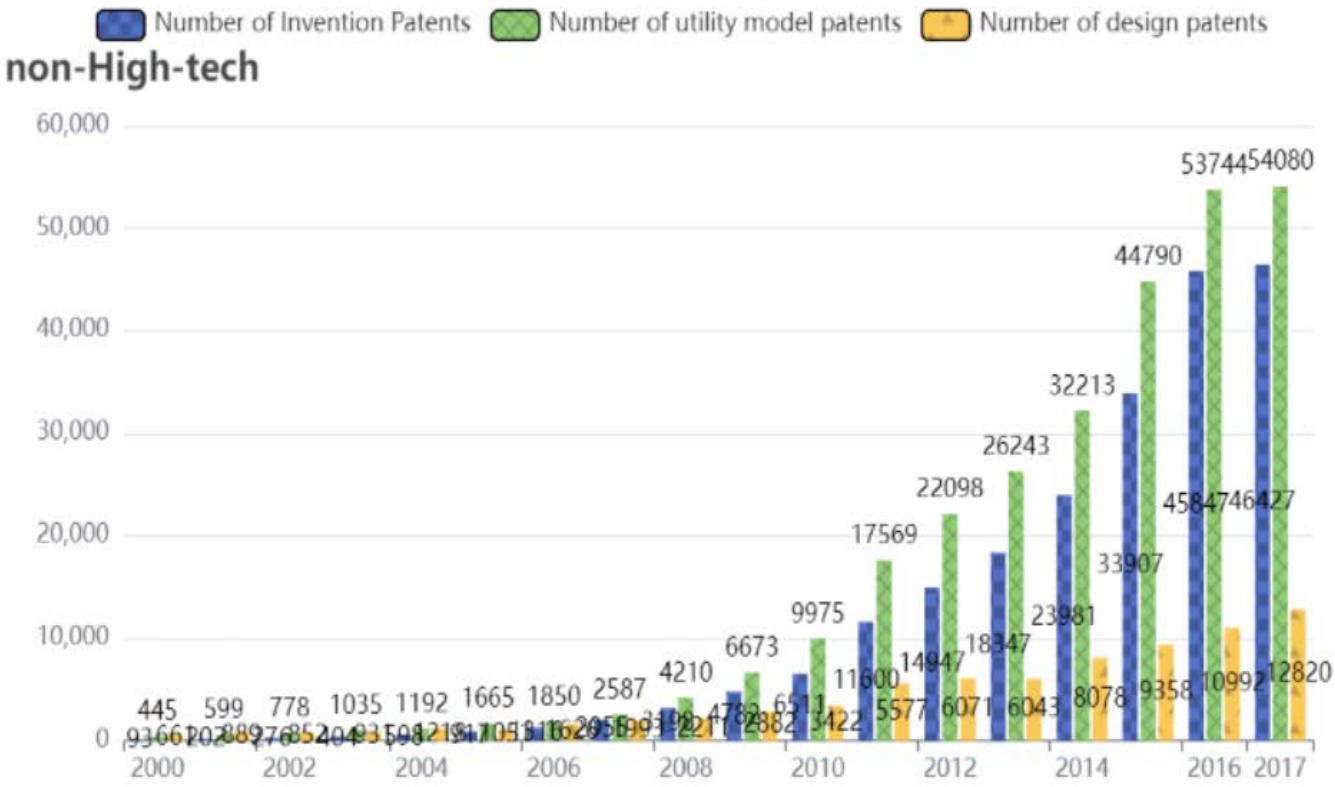


Figure 4-6 Number of various patents for non-high-tech enterprises, 2000-2017 (pieces)

According to Figures 4-5 and 4-6, there are distinct differences in the patent acquisition performance between non-high-tech enterprises and high-tech enterprises. Non-high-tech enterprises excel in obtaining

new utility patents, while high-tech enterprises exhibit significant performance in obtaining invention patents. These differences can be attributed to variations in R&D objectives and resource allocation between the two types of enterprises.

Non-high-tech firms primarily focus on product and engineering technological innovation, such as designing and improving new products and optimizing production processes. As a result, they are more inclined to obtain new utility patents, which typically involve enhancements and applications of existing technologies. On the other hand, high-tech companies prioritize fundamental research and technological innovation, which often require long-term investment and risk-taking to achieve breakthroughs in cutting-edge technologies. Consequently, high-tech enterprises are more likely to obtain invention patents.

Furthermore, the R&D investment and resource allocation strategies differ between non-high-tech and high-tech enterprises. Non-high-tech enterprises tend to prioritize practicality and market application. They allocate more resources and capital to product and engineering R&D. Obtaining new utility patents allows them to effectively promote and market their products, enhance the practicality and competitiveness of their offerings, and improve their market position and profitability.

In contrast, high-tech enterprises place greater emphasis on technological leadership and innovation. Acquiring invention patents showcases their leading position in technological research and innovation, enhancing their influence and competitiveness within the industry. Therefore, high-tech enterprises allocate more resources and capital to basic research and technological innovation, which can generate greater business value and competitive advantages.

These differences in patent acquisition patterns reflect the divergent R&D strategies and objectives of non-high-tech and high-tech enterprises. Non-high-tech enterprises seek to enhance their existing products and processes, while high-tech enterprises pursue cutting-edge breakthroughs and technological advancements.

Chapter5 Empirical Design

5.1 Sample selection and data sources

Data sources: the number of patents granted for A-share listed companies in Shanghai and Shenzhen from 2000 to 2017 in China, basic company information and financial data asset-liability ratio, current ratio, fixed asset ratio, and enterprise size from CSMAR database and CCER China Economic and Financial Database and China Statistical Yearbook.

The number of invention patents、the number of utility model patents、and the number of design patents for enterprises from China National Intellectual Property Administration (CNIPA).

Economic Policy Uncertainty Index (EPU1) from URL Download data re-normalized: http://www.policyuncertainty.com/china_epu.html In order to ensure the rigor of the data and the authenticity of the regression results, this paper processed the data before the empirical analysis as follows: First, the data of financial listed companies were excluded because of their innovative behaviors and their statement structures are more special.

Secondly, in order to avoid the existence of abnormal data to adversely affect the empirical results and analysis, the listed companies that were ST, *ST, PT, and delisted during the sample period were excluded. Third, listed companies with serious missing important data are excluded. At the same time, 29380 valid samples were obtained in order to avoid the influence of outliers on the accuracy of the empirical results. The software used in this paper is Stata 17.0 and Excel 2010 in the process of organizing, processing and analyzing the empirical data.

5.2 Variable definition

5.2.1 Explained variable

The number of patents is the most direct indicator to measure the innovation level of enterprises. In this paper, the number of invention patents (Invent), the number of utility model patents (Utili) and the number of design patents (Design) of enterprises in the current year are added 1 and the natural logarithm is taken to measure the innovation level of enterprises. The data are obtained from CSMAR database and China National Intellectual Property Administration (CNIPA).

5.2.2 Explanatory variables

Economic Policy Uncertainty Index: Scott R. Baker, Nicholas Bloom, and Steven J. Davis co-authored the paper "Political Uncertainty and Economic Activity" which was published in the American Economic

Review in 2016. Baker et al.'s method used natural language processing techniques to analyze news articles to identify the parts of them that deal with economic policy uncertainty and obtained an EPU index through quantitative analysis. Baker et al. used the LexisNexis database of news articles and went through a series of filtering and classification processes to finally obtain an EPU index that includes multiple countries and regions. The paper examines the impact of political uncertainty on economic activity, and has since become a widely cited and influential piece of research in the field. The index has been widely used in economics, finance, international relations, and other related fields.

Economic Policy Uncertainty index (EPU), this paper chooses the index Baker et al. (2016), which is downloaded at this URL: http://www.policyuncertainty.com/china_epu.html

This indicator is based on the South China Morning Post, which includes relevant reports and other fields for the four keywords "China", "economy", "uncertainty", and "policy", Perform frequency counting and standardize the result series into a monthly economic policy uncertainty index by applying multiplication factors.

Referring to Gulen and Ion (2016) and Wang Hongjian et al. (2014), the monthly economic policy uncertainty index was converted to EPU by taking the arithmetic mean and then take natural logarithm。

$$\mathbf{EPU} = \boldsymbol{ln}\frac{\sum_{i=1}^{t}\boldsymbol{EPU1}}{\boldsymbol{12}}$$

Changes in Local official (Localeu):

At this stage, China's economy is characterized by a transitional system in which local governments have greater autonomy and flexibility in formulating and implementing regional policies. As government officials are the makers and implementers of local policies, they differ in their economic development ideas and regulatory instruments due to their different job experiences, educational backgrounds, and development philosophies. Changes in local government personnel, especially the turnover of core officials, may be accompanied by the interruption of existing policies and the implementation of new policies, and local policy uncertainty may rise. Therefore, the turnover of party officials (secretary and mayor) in prefecture-level cities is used as a proxy variable for local policy uncertainty, and if the turnover of officials occurs in the first half of the year, the current year is defined as the turnover year, and if the turnover of officials occurs in the second half of the year, the next year is defined as the turnover year, with Localeu=1 for the turnover year of officials and Localeu=0 for the non-replacement year.

5.2.3 Classification Criteria and Moderating Variables

(nsoe): the nature of enterprise ownership is mainly divided into state-owned enterprises and non-state-owned enterprises. The enterprises in the sample are classified as:

non-state -owned-enterprise :nsoe=1, state-owned -enterprise: nsoe=0

(High-tech Enterprise): refer to the 2017 and 2018 National Bureau of Statistics high technology industry classification standards for the industry of listed companies, belonging to high technology industry = 1, non-high-tech industry = 0. (It is from CSMAR enterprise information database)

(Herfindahl index): Drawing on the article by Jingzhong Gao et al,The industry Herfindahl index is used as a measure of the degree of market competition, which is obtained by summing the ratio of each enterprise's business revenue to the business revenue of all enterprises in the industry, and the smaller the index is, the more intense the competition is and the higher the degree of industry competition is, and conversely, the lower it is. When the Herfindahl index is less than the median, Comp=1, it means that the industry is relatively competitive and there are more companies competing for market share, while when the Herfindahl index is greater than the median, Comp=0, the market competition in the industry is low.

5.2.4 Control variables

Compared with other investment projects, innovation activities of firms are characterized by high risk, uncertainty and unpredictability. Both firm characteristics and firm performance may affect the level of firm innovation. Referring to the existing literature, the following control variables are selected:

Firm size (Size): In this paper, we use the number of employees to take the natural logarithm to measure the size of a firm. The size of a firm can influence to a certain extent whether the firm carries out innovation activities or not. In general, the size of an enterprise is positively related to the risk it can take, and the larger the enterprise, the more financial support it can provide for its innovation activities. However, some scholars argue that small firms are more responsive to changes in the external environment and are more likely to engage in innovative activities.

Asset liability ratio （Debtass）: This paper uses total liabilities divided by total assets at the end of the year to express the debt ratio of a firm. The size of the debt ratio clearly reflects the solvency and financial position of a company. To a certain extent, the financial position of a firm can influence whether a firm is willing to innovate and how much it can innovate. When a company's gearing is too high, the company will suffer from huge repayment pressure, and if the company lacks capital inflow for a long time, then the company will lack the incentive to innovate.

Fixed Asset Utilization (Fixem): Fixed Asset Utilization is measured by the ratio of net fixed assets to the number of employees. It is usually used to measure a company's ability to utilize its assets in the production process, i.e., the productivity of fixed assets. Its impact on business innovation is not singular, but depends on a variety of factors. On the one hand, in general, higher efficiency may help firms to reduce production

costs, improve product quality and increase productivity. Such advantages may allow firms to have more capital and resources for R&D and innovation, and promote the firm's ability to innovate. On the other hand, an ultra-high fixed asset utilization rate may also mean that a firm's production capacity has reached saturation, making it difficult to provide sufficient space and resources for new products and technologies, which may limit the firm's innovation capacity.

Current Ratio (Curasslia): The current ratio is usually the ratio between a firm's current assets and current liabilities, and is used to measure a firm's ability to repay its debts in the short term. Although the current ratio is not an indicator directly related to a firm's ability to innovate, it can have an impact on a firm's ability to innovate. On the one hand, a higher current ratio usually indicates that a firm has sufficient cash flow and liquid assets to cope with debts and contingencies in the short term more easily, thus reducing the firm's financial risk and providing stable financial and resource support for its long-term innovation. On the other hand, if companies pursue high levels of liquidity ratios too much, they may sacrifice long-term growth and innovation in order to maintain liquidity stability. Therefore, an excessively high liquidity ratio may limit a firm's investment in and development of long-term innovation.

Fixed Assets Ratio (Fixass): The fixed assets ratio is usually the ratio between a firm's net fixed assets and its total assets, and is used to measure the firm's share of fixed assets in total assets. The fixed assets ratio can have an impact on the innovation capability of a company. On the one hand, a higher fixed assets ratio usually indicates that a firm has a strong infrastructure and equipment in production and operations that can support a more efficient and stable production process, thus providing the necessary physical foundation for long-term innovation. On the other hand, a higher fixed asset ratio may indicate that a firm is overinvesting in fixed assets, which may expose the firm to a higher cost of capital and higher risk. In this case, firms may be unable to invest in innovation and new technology development due to lack of capital and resources.

Firm age (Firmage): measured using the year in which the observation sample is located minus the year in which the firm was founded.

In general, firms with longer years of operation, which have a greater risk-taking capacity than firms with shorter years of operation, can also provide more funds for firm innovation and help firms to successfully carry out their innovative activities. In some cases, younger firms may be more likely to innovate in new technologies and market opportunities because they have a more flexible organizational structure, less historical legacy, and a greater sense and spirit of innovation.

Table5-1 Variable Declaration

Explained variables	**innovation**	ln(the number of Invention Patent Applications + the number of utility patent applications + the number of design patent applications +1)
Main variable	**EPU**	EPU1: http://www.policyuncertainty.com/china_epu.html $\mathbf{EPU} = ln\frac{\sum_{i=1}^{t} EPU1}{12}$
	Localeu	**Changes in Local Officials:** the turnover year of officials: *Localeu*=1 Non-replacement year: *Localeu*=0
control variables	**(size)**	***size=ln(employment+1)***
	(Debtass)	$Assets\ and\ liabilities\ ratio = \frac{\text{total liabilities}}{\text{total assets}}$
	(Fixem)	$Fixed\ Asset\ Efficiency = \frac{net\ fixed\ assets}{the\ number\ of\ employees}$
	(Curasslia)	**Current ratio**= $\frac{\text{current assets}}{\text{current liabilities}}$
	(Fixass)	**Fixed asset ratio** = $\frac{\text{net fixed assets}}{\text{total assets}}$
	(Firmage)	Firm Age= the year in which is observed -the year in which the firm was established.

5.2.5 Model Setting

To test the hypothesis , the following regression model is set in this paper:（5-1）Model 1:

$$innovation_{it} = \beta_0 + \beta_1 EPU_t + \beta_2 Localeu_{it} + \beta_3 Control_{it} + u_i + \varepsilon_{it}$$

In Model 5-1 above, the subscript i denotes the individual listed company, t denotes the year, and $innovation_{it}$ i firm indicates the level of corporate innovation. The number of patents is used to describe the innovation activity of the firm. The explanatory variable EPU_t denotes the economic policy uncertainty in year t. Localeu denotes the uncertainty of macro local officials. $Control_{it}$ denotes a set of control variables, including firm size, firm age, and Asset liability ratio.u_i: individual effects

ε_{it}: idiosyncratic error

5.3 Empirical Results and Analysis

5.3.1 Descriptive statistical analysis

Table 5-2 shows the descriptive statistics of the main variables. From this table, it can be found that innovation indicates the logarithm of the number of enterprise patents, with a mean value of 1.74, a minimum value of 0, a maximum value of 9.91, and a median value of 1.61, indicating that there are more obvious differences in innovation output among the enterprises involved in the sample. The economic policy uncertainty index (EPU) is logarithmic, with a mean value of 5.02, a minimum value of 4.02, and a

maximum value of 5.9, indicating that the volatility of economic policies is high and significant in the years covered by the sample.

table5-2 Descriptive Statistics

Variable	N	Mean	SD	p50	Min	Max
innovation	26782.00	1.74	1.74	1.61	0.00	9.91
EPU	26782.00	5.02	0.55	4.85	4.02	5.90
localeu	26782.00	0.44	0.50	0.00	0.00	1.00
size	26782.00	7.49	1.27	7.50	0.69	12.21
debtass	26782.00	0.53	5.49	0.45	-0.19	877.26
fixem	26782.00	0.01	0.03	0.00	-0.00	2.25
curasslia	26782.00	2.33	3.82	1.46	-5.13	204.74
fixass	26782.00	0.26	0.18	0.23	-0.21	0.96
firmage	26782.00	13.35	5.92	13.00	0.00	50.00

Asset liability ratio (debtass): the minimum value is -0.19, the maximum value is 877.26, and the mean value is 0.53. Overall, it seems that the debt structure of many companies is too high and the gap between companies is too large. The minimum value of company size (size) is 0.69, the maximum value is 12.21, and the mean value is 7.49, which indicates that the gap between the sizes of the companies involved in the sample is small, but there is still a gap.

Enterprise age (firmage): the mean value is 13.35, and the maximum value is 50, indicating that the gap between the age of enterprises is not very large. The average value of fixed asset utilization (Fixem) is 0.01, and the maximum value is 2.25, which indicates that there is not a big difference in the ability of each enterprise to utilize assets. It can also be seen from Table 5-2 that the current ratio (Curasslia) has a mean value of 2.33, a minimum value of -5.13, a maximum value of 204.74 and a median value of 1.46, indicating a considerable variability in the ability to service debt between firms.

Fixed Assets Ratio (Fixass): the mean value is 0.26, the minimum value is -0.21, the median value is 0.23, and the maximum value is 0.96, indicating that there is considerable variability in the use of fixed assets among the companies in the sample.

5.3.2 Correlation Analysis

	innova~n	EPU	localeu	size	debtass	fixem	curass~a	fixass	firmage
innovation	1.0000								
EPU	0.2991*	1.0000							
	0.0000								
localeu	0.0384*	0.2111*	1.0000						
	0.0000	0.0000							
size	0.3598*	0.0612*	-0.0000	1.0000					
	0.0000	0.0000	0.9956						
debtass	-0.0149*	-0.0181*	-0.0059	-0.0297*	1.0000				
	0.0108	0.0019	0.3137	0.0000					
fixem	-0.0489*	0.0070	0.0049	-0.1011*	0.0009	1.0000			
	0.0000	0.2327	0.4029	0.0000	0.8728				
curasslia	0.0273*	0.0604*	0.0051	-0.1916*	-0.0277*	-0.0342*	1.0000		
	0.0000	0.0000	0.3780	0.0000	0.0000	0.0000			
fixass	-0.1674*	-0.1930*	-0.0534*	0.2030*	-0.0003	0.1728*	-0.2109*	1.0000	
	0.0000	0.0000	0.0000	0.0000	0.9550	0.0000	0.0000		
firmage	0.1604*	0.4888*	0.0835*	0.0465*	0.0107	0.0358*	-0.0469*	-0.1025*	1.0000
	0.0000	0.0000	0.0000	0.0000	0.0679	0.0000	0.0000	0.0000	

Table5-3 Correlation Analysis

Before formally conducting the regression analysis, this paper performs correlation analysis for each variable to initially test the relationship that exists between the variables. The table above shows the correlation coefficient matrix of the main variables. From the table, it can be seen that the correlation coefficients of the explanatory variable, the number of patents granted by enterprises (innovation), and the explanatory variables, the index of economic policy uncertainty (EPU) and the turnover of local officials (localeu), are positive, contrary to the previous hypothesis. In addition, from the correlation coefficients of several variables in the table, their correlation coefficients are basically less than 0.4, which indicates that there is no serious multicollinearity between the variables, so that further empirical studies can be conducted using the above variables.

5.3.3 VIF

Variable	VIF	1/VIF
size	10.07	0.099308
firmage	7.51	0.133145
EPU	4.94	0.202479
fixass	3.59	0.278368
localeu	1.92	0.522113
curasslia	1.37	0.729429
fixem	1.09	0.921535
debtass	1.01	0.989880
Mean VIF	3.94	

Table5-4 Variance Inflation Factor

VIF (Variance Inflation Factor) is a statistical indicator used to detect multi collinearity. You can judge whether there is multicollinearity by observing the VIF value of each variable. Generally speaking, if the VIF of an independent variable exceeds 10, it indicates that there is a serious multicollinearity problem; If it is between 5 and 10, there may be a slight multicollinearity problem; If it is between 1 and 5, it is generally considered that there is no multicollinearity problem.

In this regression model, the highest VIF is 10.07, corresponding to the independent variable 'size'. This means that "size" is highly correlated with other independent variables, and there is a strong multicollinearity problem.

At the same time, the average VIF is 3.94, which may mean that there is some slight multicollinearity, but it is not enough to affect the reliability of the regression results.

5.3.4 Regression Analysis

To test hypothesis 1, because the data structure of this paper is unbalanced panel data, Hausman's test needs to be conducted before model selection, and a random effects regression was conducted first, with the following results:

Table5-5: Random effects regression results

	(1) innovation
EPU	0.1349***
	(8.3749)
localeu	0.0014
	(0.1188)
size	0.3856***
	(40.6820)
debtass	0.0020*
	(1.9096)
fixem	0.8349***
	(3.3145)
curasslia	0.0045**
	(2.2078)
fixass	-0.1210**
	(-2.0455)
firmage	0.1092***
	(57.5937)
_cons	-3.2702***
	(-35.3850)
N	26782
adj. R^2	0.2637
t statistics in parentheses	* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Fixed effects treat individual effects as part of the explanatory variables, disturbance term term cannot be correlated with the explanatory variables, focus on the average differences between individuals and eliminat individual effects to obtain the average relationship.

After storing this result, a fixed-effects regression was performed, with the following results:

Table5-6: Fixed effects regression results

	(1) innovation
EPU	0.2635***
	(16.9190)
localeu	-0.0075
	(-0.6273)
size	0.4149***
	(47.1695)
debtass	0.0020*
	(1.8513)
fixem	1.0303***
	(4.1082)
curasslia	0.0065***
	(3.2856)
fixass	-0.4437***
	(-7.7976)
firmage	0.0889***
	(49.8130)
_cons	-3.5960***
	(-38.9348)
N	26782
adj. R^2	
t statistics in parentheses	* $p<0.1$, ** $p<0.05$, *** $p<0.01$

Random effects treat individual effects as part of the disturbance term, focus on inter-individual heterogeneity, The results of the fixed-effects regression were stored, and then the Hausman test was performed based on these two results, in which the chi-square statistic was used to measure the difference between the two models. When the value of the chi-square statistic is larger and the corresponding p-value is smaller (generally less than 0.05), the results reject the original hypothesis and support the alternative hypothesis, then it suggests that the individual effects are correlated with the explanatory variables and the fixed-effects model is more appropriate. the fixed-effects model is more appropriate than the random-effects model to explain the data. This suggests that controlling for individual effects is necessary to properly analyze the data.

Table5-7: Hausmann test results

	Coefficients (b) fe1	(B) re1	(b-B) Difference	sqrt(diag(V_b-V_B)) Std. err.
EPU	.134939	.2634752	-.1285362	.0051102
localeu	.001408	-.0075242	.0089323	.0012354
size	.3855675	.4148751	-.0293076	.003948
debtass	.0020369	.0020048	.0000321	.0000684
fixem	.8349004	1.030293	-.1953922	.0525277
curasslia	.0044655	.0065454	-.00208	.0005143
fixass	-.1210268	-.4436967	.3226699	.0196078
firmage	.1092081	.0888623	.0203458	.0007335

b = Consistent under H0 and Ha; obtained from **xtreg**.
B = Inconsistent under Ha, efficient under H0; obtained from **xtreg**.

Test of H0: Difference in coefficients not systematic

chi2(**8**) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= **912.06**
Prob > chi2 = **0.0000**

Therefore, the fixed-effects model is chosen in this paper. Taking fixed effects using clustering robust standard errors for regression is a more robust regression method that can control the individual fixed effects in the panel data, while correcting heteroskedasticity and serial correlation by clustering methods to avoid the problem of bias and invalidity of standard errors. The regression results are as follows: **Table5-8: Clustering Robust Standard Error Fixed Effects Regression**

	(1) innovation
EPU	0.1349***
	(9.0704)
localeu	0.0014
	(0.1396)
size	0.3856***
	(17.6303)
debtass	0.0020***
	(13.5825)
fixem	0.8349
	(0.8912)
curasslia	0.0045**
	(2.1036)
fixass	-0.1210
	(-1.1297)
firmage	0.1092***
	(30.4263)
_cons	-3.2702***
	(-19.6299)
N	26782
adj. R^2	0.3414
t statistics in parentheses	* $p<0.1$, ** $p<0.05$, *** $p<0.01$

5-8 report the relationship between economic policy uncertainty and the turnover of local officials and business innovation in China from 2000 to 2017. It can be found that the coefficient between economic policy uncertainty and business innovation is 0.1349, which is significant at the 1% level. According to the regression results, controlling other independent variables constant, the economic policy uncertainty index changes by 0.1349% when there is a 1% change in the innovation variable. This indicates that economic policy uncertainty has a positive effect on firm innovation. Specifically, when there is higher economic policy uncertainty, firms tend to increase their investment in innovation to address the challenges and opportunities brought by the uncertainty.

The coefficient between changes Local officials and firm innovation is 0.0014, which is not significant. This suggests that the changes of local officials does not have a significant effect on business innovation. Although the changes of local officials may introduce policy uncertainty at the local level, this study did not find a significant impact on firm innovation.

Overall, these findings indicate that economic policy uncertainty plays a significant role in driving firm innovation, while the rotation of local officials does not have a significant effect. It suggests that firms are more responsive to broader economic policy uncertainties rather than local-level policy changes in terms of their innovation investment decisions.

Meanwhile, from the relationship between the control variables and the number of firm innovations,

Firm size: The regression coefficient was 0.3856 (significance level***). The results indicate that firm size has a positive effect on innovation. The larger the size of the firm, the more its innovation output will increase. When the size of an enterprise is large enough, the risk capacity that the enterprise can take is also larger. In addition, large-scale enterprises have enough ability to provide certain funds for the enterprise's innovation activities. Therefore, the larger the enterprise is, the more it is willing to invest in R&D, produce more innovation results, and improve its innovation level and capability.

Debt ratio (debtass) is positively correlated with the number of patents , implying that an increase in debt ratio leads to an increase in the number of patents granted. The study found that the debt ratio has a positive impact on enterprise innovation. A lower debt ratio means that firms are better able to cope with risks and bear the financial pressures required for innovative activities. This may imply that gearing has some influence on the innovation activities of firms. Because when a company's own financial situation is poor, it faces a more serious financing constraint, which leads to insufficient funds for innovative activities and makes it difficult to produce innovative results.

fixem (fixed asset utilization): the regression coefficient is 0.8349 (non-significant). The results show that fixed asset utilization has no significant effect on firm innovation. The fixed asset utilization rate may reflect the productivity of firms to some extent, but no significant association between it and innovation was observed in this study.

Curasslia (Curasslia): the regression coefficient is 0.0045 (significance level**). The results show that the current ratio has a positive effect on corporate innovation. A higher current ratio implies that firms have a stronger short-term solvency, which provides them with stable financial and resource support and promotes their long-term innovation activities, which means that as the current ratio increases, the innovative activity of the company increases. And the magnitude of the coefficient indicates the strength of this correlation, suggesting that the higher the liquidity of the firm, the better it is able to cope with some contingencies and risks, and thus has more energy and resources to carry out innovative activities. An increase in the liquidity ratio indicates that firms have better capital management capabilities and use funds effectively to support innovative activities.

fixass (fixed asset ratio): the regression coefficient is -0.1210 with a non-significant level of p-value. This implies that the fixed asset ratio has no significant effect on innovation. There is no significant association between the change in the fixed asset ratio and the level of innovation.

firmage (firm age): the regression coefficient is 0.1092***, indicating that firm age has a significant positive effect on innovation. Younger firms are more likely to engage in innovative activities. This may be due to the fact that younger firms are more perceptive and flexible and more inclined to adopt innovative strategies in pursuit of competitive advantage. Older firms have more ability to cope with risks and sufficient funds to carry out innovation activities than younger firms, so older firms will be more willing to innovate.

Assuming Hypothesis 1 holds, when there is an increase in economic policy uncertainty, the growth options effect dominates in firms' innovation decisions.

5.3.5 Regression analysis of grouping under different ownership nature

From Table 5-9 above, the coefficient of EPU (Economic Policy Uncertainty): on innovation is 0.1369 (significant level***) in non-state owned enterprises and 0.1288 (significant level***) in state owned enterprises. This indicates that economic policy uncertainty has a positive effect on innovation in both firm types, but a slightly higher effect in non-SOEs.

localeu (change in local officials): The effect of localeu variable on innovation is not significant for non-state and state owned enterprises. The coefficients are -0.0070 and 0.0123, respectively. Therefore, it can be concluded that the relationship between the change of local officials and firm innovation is not

significant in these two types of firms.

Table5-9: Comparison of state-owned and non-state-owned enterprises

innovation	Non state-owned enterprises	state-owned enterprise
EPU	0.1369***	0.1288***
	(6.1711)	(6.4051)
localeu	-0.0070	0.0123
	(-0.4710)	(0.9244)
size	0.4183***	0.3525***
	(13.3091)	(10.4292)
debtass	0.0020***	-0.0236
	(9.6260)	(-0.5620)
fixem	0.6592	1.3043
	(0.5571)	(1.3896)
curasslia	0.0035	0.0017
	(1.6073)	(0.2253)
fixass	-0.1696	-0.2015
	(-1.1749)	(-1.3052)
firmage	0.1027***	0.1194***
	(18.5577)	(24.3064)
_cons	-3.0967***	-3.4428***
	(-13.8512)	(-12.2987)
N	14141	12365
adj. R^2	0.2761	0.3926
t statistics in parentheses	* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$	

Combined with Tables 5-8 and 5-9, it can be seen that although the government still plays an important role in providing an innovative environment and policy support. Although changes in government officials may bring about some fine-tuning or adjustment of policies, most local governments' policies and support in innovation are usually relatively stable and continuous. This policy stability helps firms maintain some predictability and stability across government officials, and thus better plan and execute their innovation strategies. Thus changes in local government officials have relatively little direct impact on firm innovation, and the key to innovation still lies in firms' own internal motivation and capabilities.

Size (firm size): In non-state owned enterprises, firm size has a significant positive effect on innovation with a coefficient of 0.4183 (significant level***). In state-owned enterprises, the effect of firm size on innovation is also significant, but the coefficient is 0.3525 (significant level***). This indicates that larger firm size has a positive effect on innovation in both non-state and state owned enterprises, but the effect is slightly higher in non-state enterprises.

debtass (debt ratio): In non-state owned enterprises, debt ratio has a significant positive effect on innovation with a coefficient of 0.0020 (significant level***). However, in SOEs, the effect of debt ratio on innovation

is not significant with a coefficient of -0.0236. This means that in non-SOEs, an increase in debt ratio is associated with a higher level of innovation, while no such association is observed in SOEs.

Because of the differences in funding sources and financial structures between SOEs and non-SOEs. SOEs can usually rely on government support and financing sources, so debt ratios may have less of an impact on their innovative activities. In contrast, non-SOEs are more dependent on their own funds and market financing, so an increase in debt ratios may reflect their greater financial stress and financing needs, prompting them to innovate more aggressively to become more competitive.

Risk tolerance: SOEs tend to have more stable and reliable resource support, and a relatively small debt ratio may be more consistent with their risk management strategy. Non-SOEs, on the other hand, may be more inclined to take higher financial risks in pursuit of greater returns on innovation.

Organizational culture and goals: SOEs' goals may be more focused on stable operations and social responsibility, while non-SOEs may be more focused on market share and profitability. This difference may lead SOEs to be more cautious about debt financing and have a lower debt-to-asset ratio on their innovation activities. Other variables are not significant and can be ignored.

In summary, there are some differences in the effects of non-SOEs and SOEs on firm innovation. Non-SOEs are more positively influenced by economic policy uncertainty and firm size, while the debt-to-asset ratio is also positively associated with innovation. In contrast, SOEs have a relatively small impact in these areas. However, the response of both firm types to the relationship between changes in regional officials and innovation is not significant.

5.3.6 Regression analysis of grouping under different levels of industrialization

innovation	High-tech Enterprise	Non-high-tech enterprises
EPU	-0.0098	0.1683***
	(-0.3234)	(10.1276)
localeu	-0.0415*	0.0132
	(-1.9458)	(1.1659)
size	0.5586***	0.3432***
	(13.6965)	(14.6098)
debtass	0.0369	0.0018***
	(1.4703)	(10.8492)
fixem	13.8858***	0.3768
	(6.6219)	(0.5865)
curasslia	0.0098**	0.0044*
	(2.4258)	(1.6982)
fixass	-0.4953**	-0.0854
	(-1.9853)	(-0.7463)
firmage	0.1554***	0.0967***
	(21.7260)	(24.4796)
_cons	-3.6585***	-3.2044***
	(-12.3095)	(-17.3071)
N	6662	20120
adj. R^2	0.4622	0.3105
t statistics in parentheses	$^{*}p<0.1$, $^{**}p<0.05$, $^{***}p<0.01$	

Table5-10：Comparison of High-tech and Non-high-tech Enterprises

5-10 According to different industrialization levels, high-tech enterprises and non-high-tech enterprises are grouped into regressions, In high-tech enterprises, the coefficient of the effect of EPU on innovation is -0.0098 (insignificant), while in non-high-tech enterprises, the coefficient of the effect of EPU on innovation is 0.1683 (significant level***). This indicates that in high-tech firms, economic policy uncertainty has no significant effect on innovation, while in non-high-tech firms, economic policy uncertainty has a significant positive effect on innovation.

The analysis of the differences may have the following reasons:

Technology-driven and market competition: high-tech firms are usually more technology-driven and their innovation activities are mainly based on technology development and innovation. This makes high-tech firms less sensitive to changes in economic policy, as their innovation is primarily driven by technology and market demand. In contrast, non-high-tech firms may be more influenced by market competition and economic policies, as their innovation activities are more dependent on market demand and policy environment.

Policy support and financial investment: High-tech firms usually have access to more policy support and financial investment to drive their innovation activities. This support may help mitigate the impact of economic policy uncertainty on innovation. In contrast, non-high-tech firms may be more dependent on the stability and support of external economic policies, and therefore more vulnerable to economic policy uncertainty.

localeu (change of local officials): for both high-tech and non-high-tech firms, localeu change of local officials leads to a significant negative impact on innovation in high-tech firms (significance at 10%), but not in non-high-tech firms. The reasons for this are analyzed as follows:

1. Policy sensitivity of high-tech firms: High-tech firms, due to their reliance on technological advancements and market dynamics, are often more sensitive to changes in the policy environment. The change of local officials can introduce uncertainty in the implementation of policies related to high-tech industries, such as research funding, intellectual property protection, and industry-specific regulations. This uncertainty can disrupt the stability and support that high-tech firms require for their innovation activities, leading to a negative impact on innovation.

2. Specificity of high-tech industries: High-tech industries, such as information technology, biotechnology, and advanced manufacturing, often operate at the forefront of technological development. These industries face unique challenges and require a conducive policy environment to drive innovation. Changes in local

officials can lead to shifts in policy priorities, reduced funding for high-tech initiatives, or changes in regulations that directly affect high-tech firms' ability to innovate.

3. Long-term planning and investment: High-tech firms often engage in long-term research and development projects that require significant investments of time, resources, and capital. The change of local officials can disrupt the continuity and stability of these projects, affecting the firms' ability to execute their innovation strategies effectively. High-tech firms may be more affected by changes in local officials as they rely on consistent policy support for their long-term planning and investment decisions.

4. Talent attraction and retention: High-tech industries heavily rely on a skilled and specialized workforce. Changes in local officials can impact the availability of talent through policy changes related to education, immigration, and workforce development. High-tech firms may face challenges in attracting and retaining skilled professionals if there is uncertainty or inconsistency in policies related to talent management. This can hinder their innovation capabilities and contribute to the negative impact of localeu on innovation in high-tech firms.

5. Industry dynamics and competition: High-tech industries are often characterized by intense competition and a rapid pace of technological change. Changes in local officials can disrupt industry networks, collaboration opportunities, and strategic alliances that are crucial for high-tech firms' innovation. The negative impact of localeu on innovation in high-tech firms may be magnified due to the industry's highly dynamic and competitive nature.

The comparison shows that high-tech enterprises have no significant effect on EPU, but have a significant negative effect on the change of local officials.

1. Technological advancement and market orientation: High-tech enterprises are primarily driven by technological advancements and market forces. These companies often operate in dynamic and innovative industries where they focus on developing and commercializing cutting-edge technologies. As a result, their innovation activities may be less influenced by economic policy uncertainty (EPU) as compared to other factors such as technological breakthroughs, market demand, and competition.

2. Policy stability and industry support: High-tech enterprises typically require a stable policy environment to thrive and innovate. They often rely on government support, research funding, intellectual property protection, and favorable regulatory frameworks. Therefore, a change in local officials, which can introduce policy uncertainty and disrupt industry support systems, may have a negative impact on their innovation activities.

3. Long-term investment and planning: High-tech enterprises often engage in long-term research and development projects that span multiple years. These projects require substantial investments in resources, talent, and infrastructure. Any disruption caused by the change of local officials, such as policy shifts or funding cuts, can undermine the continuity and progress of these projects, leading to a negative impact on innovation.

4. Talent attraction and retention: High-tech enterprises heavily rely on a skilled and specialized workforce, including scientists, engineers, and researchers. A change in local officials can affect the availability of talent, as well as the stability of policies supporting education, training, and immigration of skilled professionals. The loss or disruption of talent can hinder high-tech enterprises' ability to innovate effectively.

5. Industry-specific challenges: High-tech industries often face unique challenges such as rapid technological obsolescence, global competition, and high research and development costs. These challenges necessitate a stable and supportive policy environment to foster innovation. Any disruption or uncertainty caused by changes in local officials can exacerbate these challenges, leading to a negative impact on innovation in high-tech enterprises. Based on the above analysis, it can be concluded that the change of local officials has a significant negative impact on high-tech enterprises compared to other enterprises.

The intensity of the real options effect of local policy uncertainty on innovation also varies across different levels of industrialization, indicating that real options play a dominant role in high-tech enterprises. Hypothesis 2 holds.

In terms of control variables, size (firm specification model): the impact coefficient of the firm specification model on innovation is 0.5586 (significant level***) in high-tech firms and 0 .3432 (display level***) in non-high-tech firms. This indicates that corporate planning has a positive effect on innovation in both categories of firms, but the effect is greater for high-tech firms. This may be due to the fact that high-tech firms often require more sources of funding and capital to support innovation activities. Larger enterprises have more resources and large-scale enterprises can also obtain cost advantages through the scale effect to further improve their competitiveness and innovation capability. Comparing the coefficients, we can see that high-tech enterprises have higher R&D and innovation investment and need larger scale to support stronger innovation ability.

Asset-liability ratio (debtass): the coefficient of the effect of debt ratio on innovation is 0.0369 (insignificant) in high-tech firms, while in non-high-tech firms it is 0.0018 (showing level***). This implies that in non-high-tech firms, an increase in debt ratio is associated with higher levels of innovation both, while this relationship is not observed in high-tech firms. This may be due to the fact that high-tech firms tend to rely

more on equity financing and venture capital, while non-high-tech firms may rely more on borrowing business financing to support innovative activities. Which may be because high-tech enterprises have higher technology investment and R&D ability compared with non-high-tech enterprises, so the asset-liability ratio has less influence on the innovation ability of high-tech enterprises.

Fixed asset utilization rate (Fixem): The number of effect of fixed asset utilization on innovation is 13.8858 (significant level***) in high-tech enterprises, while it is 0.3768 in non-high-tech enterprises, which is not significant. This indicates that there is a significant positive effect of fixed asset utilization on innovation in high-tech enterprises and it is less in non-high-tech enterprises. This may be due to the fact that high-tech firms have more specialized knowledge and technical expertise, and the fixed asset utilization rate may reflect the important characteristics of their innovative capabilities and special resources.

This means that the higher the utilization rate of fixed assets of high-tech enterprises, the stronger their innovation ability. Non-high-tech enterprises have relatively lower technology investment and R&D capability compared with high-tech enterprises, so the utilization rate of fixed assets has less influence on the innovation ability of non-high-tech enterprises.

Current ratio (Curasslia) is positively correlated with enterprise innovation, with coefficient of 0.0098 at 5% significant for high-tech and 0.0044 at 5% significant for non-high-tech. The results show that the higher the current ratio, the stronger the innovation ability of enterprises after controlling for other variables that affect enterprise innovation.

The fixed asset ratio (Fixass) the coefficient of high-tech enterprises -0.4953 is significant at 5% with negative correlation with innovation, and non-high-tech is not significant. It shows a significant negative correlation with innovation for high-tech firms, but is not significant for non-high-tech firms. This suggests that in high-tech industries, where rapid technological and market changes occur, excessive investment in fixed assets may hinder innovation capabilities. High-tech firms require more capital and resources for innovation and market development, and allocating too much towards fixed assets can limit liquidity and flexibility, impacting their ability to innovate. For non-high-tech enterprises, because they are in relatively stable industries, the need and utilization of fixed assets is more. In contrast, non-high-tech firms operate in relatively stable industries, where the utilization of fixed assets may have less impact on innovation.

Firm age (firmage) is significantly and positively associated with firm innovation for both high-tech and non-high-tech firms. The coefficient of 0.1554 for high-tech firms and 0.0967 for non-high-tech firms indicates that as firm age, their innovation levels tend to increase. This finding suggests that older firms have had more time to accumulate knowledge, experience, and resources, which can contribute to their

innovation capabilities. High-tech firms, with their focus on technology and research and development, may particularly benefit from the accumulation of knowledge and expertise over time compared to non-high-tech firms, which may emphasize other aspects such as marketing and cost control.

Overall, these results highlight the importance of financial health, allocation of resources, and firm experience in driving innovation in both high-tech and non-high-tech enterprises. the signs of the control variables are also more in line with expectations and reality.

5.3.7 Regression based on competitive strength of the market classification

Model 2:

$$\boldsymbol{innovation}_{it}=\beta_0+\beta_1 EPU_t+\beta_2 \boldsymbol{COMP}_{it}+\beta_3 EPU_t \boldsymbol{COMP}_{it}+\beta_4 Localeu_{it}+\beta_5 Control_{it}+\boldsymbol{u}_i+\varepsilon_{it}$$

Drawing on the article by Jingzhong Gao et al， The Herfindahl-Hirschman Index (HHI) is a measure of market concentration and is often used to assess the degree of competition among enterprises in a given industry. The index usually ranges from 0 to 1. HHI=$\sum_{I=1}^{n}\left(\boldsymbol{X_i}/\boldsymbol{X}\right)^2=\sum_{I=1}^{n}\left(\boldsymbol{market\ share_i}\right)^2$

Where HHI= 0 ： perfect competition with many small firms

Where HHI=1 ： a monopoly with a single dominant firm.

The index is used as a measure of the degree of market competition, which is obtained by summing the ratio of each enterprise's business revenue to the business revenue of all enterprises in the industry, and the smaller the index is, the more intense the competition is and the higher the degree of industry competition is, and conversely, the lower it is. When the Herfindahl index is less than the median, Comp=1, it means that the industry is relatively competitive and there are more companies competing for market share, while when the Herfindahl index is greater than the median, Comp=0, the market competition in the industry is low.Using the economic policy uncertainty (EPU) and the degree of market competition (Comp) interaction term, H3 is tested using model 2 and the coefficient β3 of the interaction term is expected to be significantly positive. The regression results obtained are as follows:**Table5-11**

	(1) innovation
EPU	0.0755***
	(3.3691)
comp	-0.5432***
	(-3.2237)
c.EPU#c.comp	0.1180***
	(3.5705)
localeu	0.0023
	(0.2270)
size	0.3855***
	(17.6920)
debtass	0.0020***
	(13.7001)
fixem	0.8516
	(0.9152)
curasslia	0.0049**
	(2.3165)
fixass	-0.1230
	(-1.1509)
firmage	0.1096***
	(30.6804)
_cons	-3.0025***
	(-16.2005)
N	26782
adj. R^2	0.3422
t statistics in parentheses	$^{*}p<0.1$, $^{**}p<0.05$, $^{***}p<0.01$

As you can see from 5-11：EPU (Economic Policy Uncertainty): The coefficient of EPU is 0.0755 and is statistically significant at the 1% level. This suggests that higher economic policy uncertainty is associated with increased innovation. This finding implies that during periods of economic policy uncertainty, firms may be motivated to innovate and adapt to changing conditions in order to maintain a competitive edge.

Comp (Degree of Market Competition): The coefficient of Comp is -0.5432 and is statistically significant at the 1% level. This negative coefficient indicates that a higher degree of market competition is associated with lower levels of innovation. This suggests that when competition is intense, firms may be less incentivized to engage in innovation activities, as they focus more on defending market share and cost-cutting measures.

Interaction Effect (EPU * Comp): The coefficient of the interaction term, c.EPU#c.comp, is 0.1180 and is statistically significant at the 1% level. This positive coefficient indicates that the relationship between economic policy uncertainty and innovation is strengthened when there is a higher degree of market competition. This suggests that firms operating in highly competitive markets may view economic policy uncertainty as an opportunity to differentiate themselves and gain a competitive advantage through innovation.

The changes in local officials have a significant effect on enterprise innovation at 5%. (Coefficient: -0.0023).

Several other variables also show statistically significant relationships with innovation. These include firm size (positive relationship, coefficient 0.3855), debt ratio (positive relationship, coefficient 0.0020), current

ratio (positive relationship, coefficient 0.0049), firm age (positive relationship), and a constant term. These findings align with economic intuition and suggest that larger, financially stable, and more established firms tend to engage in more innovation activities.

Specifically, larger enterprises are more likely to have more resources and capital and are more likely to engage in innovative activities; lower debt ratios and higher current ratios both indicate that firms are better able to finance and cope with financial risks and can be more active in innovative activities; and the positive effect of firm age may be due to factors such as experience, knowledge accumulation, and established reputation and credibility, which can promote innovative activities.

Fixed asset utilization rate (Fixem): The coefficient of fixed asset utilization is 0.8516, which is not significant in this regression. This implies that there is no significant effect of fixed asset utilization rate on firm innovation after controlling for other variables.

Fixed asset ratio (Fixass): The coefficient of fixed asset ratio is -0.1230, which is significant at 5% level of significance, indicating that fixed asset ratio has a negative effect on firm innovation. This implies that firms with a high fixed asset ratio may reduce their investment in innovation activities, thus affecting the level of innovation.

Overall, these regression results suggest that economic policy uncertainty and market competition are important factors influencing innovation in firms. While economic policy uncertainty alone has a positive association with innovation, the interaction effect between economic policy uncertainty and market competition further amplifies the impact on innovation. This implies that in highly competitive environments, economic policy uncertainty can drive firms to be more innovative in order to adapt and gain a competitive edge. Additionally, factors such as firm size, financial stability, current asset ratio, and firm age also play significant roles in determining the level of innovation within firms. Hypothesis 3 holds

5.3.8 regression with the Herfindahl-Hirschman index as the interaction term

Because HHI is a continuous variable, so in order to avoid the previous use of median grouping may not be standard enough to be accurate, the next direct use of the Herfindahl-Hirschman index as a interaction term to verify the impact of the degree of market competition on EPU.

Model 3:

$$\mathbf{innovation}_{it} = \beta_0 + \beta_1 \mathbf{EPU}_t + \beta_2 \boldsymbol{HHI}_{it} + \beta_3 \mathbf{EPU}_t \mathbf{HH}\boldsymbol{I}_{it} + \beta_4 \mathbf{Localeu}_{it} + \beta_5 \mathbf{Control}_{it} + \mathbf{u}_i + \varepsilon_{it}$$

	(1) innovation
EPU	0.1742***
	(7.9590)
HHI	1.7366**
	(2.2256)
c.EPU#c.HHI	-0.4245***
	(-2.6438)
localeu	0.0012
	(0.1216)
size	0.3855***
	(17.6208)
debtass	0.0021***
	(13.7814)
fixem	0.9514
	(1.0716)
curasslia	0.0048**
	(2.2462)
fixass	-0.1273
	(-1.1942)
firmage	0.1090***
	(30.2284)
_cons	-3.4254***
	(-18.3696)
N	26781
adj. R^2	0.3420
t statistics in parentheses	$^{*}p<0.1$, $^{**}p<0.05$, $^{***}p<0.01$

Table5-12

Since HHI is a continuous variable taking any value between (0, 1), the coefficients of EPU in Tables 5-12 correspond to the significance level at HHI=0, so one should focus on the coefficients of the intersection term.According to the regression results provided, the coefficient of the interaction term (EPU * HHI) is -0.4245 and is statistically significant at the 1% level of significance. This indicates that the relationship between economic policy uncertainty and innovation is influenced by market concentration.

Specifically, the effect of economic policy uncertainty on innovation is weaker when market concentration is high. This implies that in less competitive markets, firms may have less need or incentive to innovate in response to economic policy uncertainty. This may be because in more concentrated markets, where a few dominant firms have larger market shares and stronger market influence, they are better able to respond to policy changes and maintain relatively stable innovation activities.

Then, the impact of economic policy uncertainty on innovation is enhanced in more competitive markets. This may be due to the fact that firms in highly competitive markets need to continuously innovate to maintain a competitive advantage and are more sensitive to policy changes. Economic policy uncertainty may become an additional challenge for these firms, motivating them to innovate more aggressively to adapt to the changing environment.

	(1)
EPU	
1._at	0.1317***
	(8.8700)
2._at	0.0892***
	(4.0828)
3._at	0.0468
	(1.3230)
4._at	0.0043
	(0.0861)
5._at	-0.0381
	(-0.5783)
6._at	-0.0806
	(-0.9869)
7._at	-0.1230
	(-1.2622)
8._at	-0.1655
	(-1.4597)
9._at	-0.2079
	(-1.6081)
N	26781
adj. R^2	
t statistics in parentheses	* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table5-13: the marginal effectiveness estimates of EPU for innovation

At each HHI level (denoted as 1, 2, 3, ... , 9), the dy/dx list shows the marginal effectiveness estimates of EPU for innovation (Y). (Table5-13)

At each HHI level, the dy/dx list shows the estimated value of the marginal effect of the amount of change in EPU on innovation. For example, for an HHI level of 1, the amount of change in EPU has a positive and significant effect on innovation, estimated at 0.1317. This means that at this particular HHI level, the level of innovation is expected to increase by 0.1317 units when EPU increases by one unit.

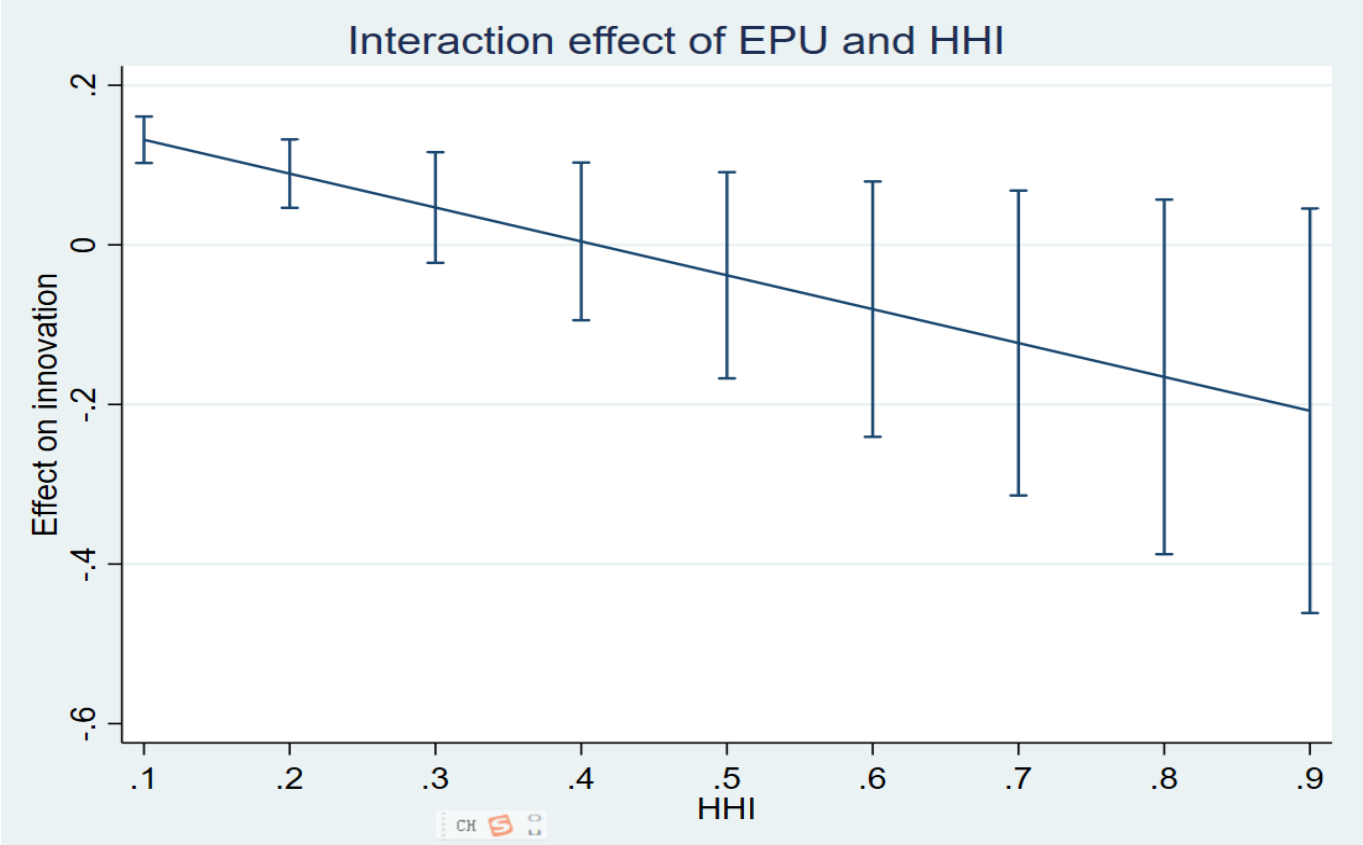
However, as the HHI level increases, the effect of EPU gradually diminishes. At an HHI level of 2, the marginal effect of EPU is still significant, but the estimated value is 0.0892, which is lower than the marginal effect at an HHI level of 1. At HHI levels of 3 to 9, the estimated marginal effect of EPU becomes progressively smaller and is no longer significant at these levels.

When the HHI level is low (indicating high market competition), the result shows that EPU has a significant positive impact on innovation. This means that in highly competitive markets with low market concentration, economic policy uncertainty can motivate firms to engage in more active innovation activities. The higher level of competition in these markets may make innovation more advantageous and necessary for firms to differentiate themselves and gain a competitive edge.

Conversely, as the HHI level increases (indicating lower market competition), the impact of EPU on innovation weakens and becomes statistically insignificant.

This result suggests that the impact of EPU varies depending on the level of HHI. At lower levels of HHI, EPU has a strong positive effect on innovation, while at higher levels of HHI, this effect gradually diminishes or disappears. This may imply that in a highly concentrated market environment, economic policy uncertainty has less impact on innovation, while in a more competitive market, economic policy uncertainty has a more significant impact on innovation.

The interaction effects are plotted as follows: **Table5-14**



As shown in Figure **5-14** above this means that the positive impact of EPU on innovation tends to be weaker in more concentrated and less competitive (higher HHI) markets. This suggests that economic policy uncertainty (EPU) has a weaker or even negative impact on innovation in more concentrated markets.

The above analysis shows that the higher the degree of competition in a firm's industry, the greater the role of economic policy uncertainty in promoting firm innovation. Hypothesis 3 holds.

5.3.9 Robustness tests

Based on the information provided, it appears that in section 5-15 of the paper, the authors conducted a robustness test by re-measuring the level of innovation using the number of invention patents as the main indicator. This was done to verify the relationship between economic policy uncertainty (EPU) and firm innovation, while also examining the impact of changes in local officials on firm innovation.

The results of the regression analysis in column (2) and (3) indicate that the coefficient between EPU and firm innovation remains significantly positive at the 1% level, confirming the previous findings. This suggests that higher levels of economic policy uncertainty are associated with increased firm innovation, as measured by the number of invention patents.

Furthermore, the coefficient between changes in local officials and firm innovation is found to be not significant, which aligns with the previous findings. This indicates that changes in local officials do not have a significant impact on firm innovation, as measured by the number of invention patents.

The remaining control variables exhibit similar signs and levels of significance as in the previous analysis, further supporting the consistency of the findings. It implies that these control variables, such as industry competition, firm size, and R&D expenditure, continue to have the expected influence on firm innovation even when using the number of invention patents as the main indicator.

Overall, the robustness test reaffirms the positive relationship between economic policy uncertainty and firm innovation, as well as the insignificance of changes in local officials on firm innovation. The findings suggest that economic policy uncertainty plays a significant role in driving firm innovation, as reflected by the number of invention patents.

Table5-15

	(1) invent	(2) innovation
EPU	0.0996***	0.1349***
	(7.8492)	(9.0704)
localeu	-0.0004	0.0014
	(-0.0417)	(0.1396)
size	0.3191***	0.3856***
	(16.5186)	(17.6303)
debtass	0.0019***	0.0020***
	(6.1085)	(13.5825)
fixem	0.6045	0.8349
	(0.8301)	(0.8912)
curasslia	0.0004	0.0045**
	(0.2336)	(2.1036)
fixass	-0.0798	-0.1210
	(-0.8857)	(-1.1297)
firmage	0.0920***	0.1092***
	(29.5379)	(30.4263)
_cons	-2.9502***	-3.2702***
	(-19.2633)	(-19.6299)
N	26782	26782
adj. R^2	0.3252	0.3414
t statistics in parentheses		* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Chapter6 Research Conclusions and Recommendations

6.1 Research Conclusions

This paper takes the number of patents of Chinese A-share listed companies from 2000 to 2017 as the research object, uses the Chinese economic policy uncertainty index measured and compiled by Baker et al. (2016) as a measure of Chinese economic policy uncertainty, adds the turnover of local government officials as a measure, and studies the relationship between economic and local policy uncertainty and corporate innovation, while this paper regresses the sample data in groups according to different ownership nature and industry attributes, and with the help of theoretical analysis and empirical results analysis, this paper draws the following conclusions:

Based on the analysis conducted in the paper, several conclusions can be drawn regarding the relationship between economic policy uncertainty, changes in local officials, degree of competition, and enterprise innovation:

1. Economic policy uncertainty has a positive effect on enterprise innovation, meaning that increasing uncertainty promotes innovation. This conclusion suggests that when firms face higher levels of economic policy uncertainty, they are more motivated to innovate in order to adapt to and overcome the challenges and opportunities presented by the uncertain environment. This finding highlights the dynamic nature of innovation and its potential to thrive under conditions of uncertainty.

2. Changes in local officials have a significant negative impact on high-tech enterprises compared to other enterprises. This conclusion implies that high-tech enterprises are more vulnerable to the turnover of local government officials. The instability caused by changes in local officials may disrupt the long-term plans and strategies of high-tech firms, hinder their innovation processes, and potentially create a less favorable business environment for these enterprises. It suggests the importance of continuity and consistency in policy implementation to support the growth of high-tech industries.

3. The higher the degree of competition in a firm's industry, the greater the role of economic policy uncertainty in promoting enterprise innovation. This conclusion suggests that in highly competitive industries, economic policy uncertainty plays a more significant role in driving innovation. The intense competition motivates firms to actively respond to uncertainty by seeking innovative solutions to differentiate themselves from competitors and gain a competitive advantage. The findings highlight the interplay between industry competition, economic policy uncertainty, and the innovation behavior of firms.

Overall, these conclusions highlight the complex relationship between economic policy uncertainty, changes in local officials, degree of competition, and enterprise innovation. They suggest that while economic policy uncertainty can serve as a catalyst for innovation, its impact may vary depending on factors such as the nature of the industry and the stability of local governance. Understanding these dynamics can help governments and enterprises formulate strategies and policies to foster a conducive environment for innovation and mitigate the potential negative effects of uncertainty on enterprise innovation.

6.2 Recommendations

The results find that the growth option effect is the dominant effect of economic policy uncertainty on firm innovation, i.e., economic policy uncertainty positively affects firm innovation; the real option effect is the dominant effect of local policy uncertainty on firm innovation, and for high-tech firms, local policy uncertainty negatively affects firm innovation. The difference in the effect of economic policy uncertainty on firm innovation between firms in high-competition degree industries and firms in low-competition degree industries verifies the growth option effect of economic policy uncertainty; The findings of this paper have certain policy implications. The transmission mechanisms and effects of economic policy uncertainty and local policy uncertainty on firms' innovation are not the same, and the central government should formulate different policies to help firms cope with different types of uncertainty.

First, economic policy uncertainty is not only a challenge but also an opportunity for enterprises, and rising economic policy uncertainty motivates enterprises to gain their own development through R&D and innovation. Relevant authorities should continue to increase intellectual property protection, establish a sound financial system, and increase policy support for enterprises with higher innovation potential, so as to ensure as much as possible that enterprises turn their willingness to innovate into innovative actions and help them cope with economic uncertainty. Second, for high-tech enterprises, the interruption and discontinuity of local policies inhibit innovation because local governments have considerable power over regional resources. Service level should be incorporated into the assessment mechanism of officials to ensure that high-tech enterprises put more energy and resources into production and innovation activities. Ultimately, governments at all levels should be committed to creating a good business environment, helping enterprises take advantage of macroeconomic uncertainties, reducing local policy uncertainties, enhancing their own competitiveness through innovation, breaking through "neck" technologies as early as possible, and breaking the restrictions imposed by Western countries on China's high-tech supply chain, which is also the key to China's economic development. This is the key to China's high quality economic development.

6.2.1 Government-level recommendations

1. Enhance policy stability:

Maintain policy consistency and avoid frequent reversals to minimize the negative impact of economic policy uncertainty on firm innovation. Ensure smooth transitions during changes in officials and provide clear guidelines and regulations. Governments should strive to maintain policy stability and consistency to minimize the negative impact of economic policy uncertainty on firm innovation. This can be achieved by ensuring smooth transitions during changes in officials, providing clear guidelines and regulations, and avoiding frequent policy reversals. Establishing long-term strategic plans and goals can help provide a stable policy framework for businesses.

2. Increase transparency and communication:

Governments should improve transparency in policy-making processes and enhance communication with businesses. This can help reduce uncertainty by providing timely and accurate information about policy changes and their implications. Engaging in dialogue with industry stakeholders and seeking their input during the policy formulation stage can foster a better understanding of the industry's needs and concerns.

Increase transparency and communication: Provide support for R&D and innovation:

Offer financial incentives, tax breaks, and grants specifically targeted at promoting research and development (R&D) and innovation activities. These measures can encourage firms to invest in innovation despite economic policy uncertainty. Establish innovation funds or programs to provide financial resources and support for firms' innovation endeavors. Support the development of incubators, research centers, and innovation clusters to facilitate collaboration and knowledge sharing among businesses, research institutions, and academia.

3. Strengthen institutional support:

Establishing robust institutions that protect intellectual property rights, enforce contracts, and promote fair competition is crucial. Governments should invest in creating a legal framework that safeguards innovation and provides a level playing field for all enterprises, irrespective of their ownership type or industry.

Governments can offer financial incentives, tax breaks, and grants specifically targeted at promoting research and development (R&D) and innovation activities. These measures can encourage firms to invest in innovation despite economic policy uncertainty. Establishing innovation funds or programs can also provide financial resources to support firms' innovation endeavors.

The measures taken are as follows:

1. Promoting Innovation in the Face of Economic Policy Uncertainty:

Increase Intellectual Property Protection: Authorities should continue to strengthen intellectual property rights and enforcement to incentivize firms to invest in R&D and innovation despite economic policy uncertainty.

Establish a Sound Financial System: Create favorable conditions for firms to access funding through channels like venture capital, bank loans, and government grants. Financial incentives such as tax benefits and subsidies can further encourage innovation investments.

Provide Policy Support: Increase policy support for enterprises with higher innovation potential, helping them translate their willingness to innovate into concrete actions. This can be achieved through targeted policies, resources, and collaboration opportunities.

2. Mitigating Local Policy Uncertainty for High-Tech Enterprises:

Incorporate Service Level into Official Assessment: Include the service level and performance of officials in the assessment mechanism to ensure that high-tech enterprises receive adequate support and resources. Holding officials accountable for fostering a stable and favorable business environment can reduce the disruptive effects of local policy changes.

Reduce Discontinuity in Local Policies: Minimize interruption and discontinuity in local policies that directly impact high-tech firms. Providing stability and support for innovation activities through consistent policies can encourage continuous investment in R&D and innovation.

3. Creating a Favorable Business Environment:

Streamline Administrative Procedures: Simplify and streamline administrative procedures to reduce bureaucratic hurdles for firms. Efficient and transparent regulatory processes enable smoother operations and encourage innovation.

Foster Collaboration: Encourage collaboration between industry, academia, and government to facilitate knowledge exchange, research partnerships, and technology transfer. Such collaboration promotes innovation and strengthens the overall business ecosystem.

Breakthrough Key Technologies:

Prioritize Research and Development: Allocate resources and investments to strategically focus on breaking through "neck" technologies and overcoming technological barriers. This targeted approach can enhance China's high-tech sector and reduce dependence on foreign supply chains.

By implementing these policy measures at the government level, China can effectively address the impact of economic policy uncertainty on firm innovation. Additionally, creating a supportive business

environment and promoting collaboration will foster a culture of innovation and drive high-quality economic development.

6.2.2 Enterprise level recommendations

Build strategic flexibility:

Firms should recognize the importance of adaptability and develop strategies that allow them to navigate economic policy uncertainties. This includes diversifying their product or service offerings to cater to different market segments and reduce reliance on a single product or market. Exploring new markets, both domestic and international, can provide opportunities for growth and help mitigate the risks associated with policy changes. Additionally, investing in multiple R&D projects across different areas can spread the risks and increase the chances of successful innovation, even if certain policies impact specific projects.

Foster collaboration and partnerships:

Collaboration with external stakeholders can help firms overcome the challenges posed by economic policy uncertainty. By forming strategic alliances and partnerships with other firms, research institutions, and government agencies, firms can leverage complementary resources, expertise, and networks. Collaborative efforts can facilitate joint research and development projects, knowledge exchange, and access to additional funding sources. Public-private partnerships can also create opportunities for shared innovation initiatives and policy advocacy.

Invest in talent and capabilities:

Developing a talented workforce with the necessary skills for innovation is crucial for firms to adapt to changing policies and drive innovation forward. Firms should prioritize attracting and retaining top talent by offering competitive compensation packages, providing ongoing training and development opportunities, and creating a supportive work environment that encourages creativity and risk-taking. Building a culture of innovation where employees are empowered to contribute ideas, experiment, and learn from failures can foster an environment that thrives in the face of uncertainty.

4. Monitor and assess policy changes:

Firms should establish processes to closely monitor policy developments and assess their potential impact on business operations and innovation strategies. This includes setting up dedicated teams or departments responsible for tracking policy changes, analyzing their implications, and providing timely feedback to decision-makers within the organization. By staying informed and proactive, firms can identify potential risks and opportunities arising from policy changes and adjust their innovation strategies accordingly.

Regular communication with industry associations and government bodies can also help firms stay updated on policy developments and provide input during the policy formulation stage.

5. Foster a culture of agility and resilience:

In uncertain business environments, it is crucial for firms to cultivate a culture that embraces agility and resilience. This involves encouraging a mindset that embraces change, adapts quickly to new circumstances, and learns from setbacks. Firms should create an environment that values experimentation, encourages creative problem-solving, and rewards calculated risk-taking. By promoting an organizational culture that is flexible, adaptable, and resilient, firms can better navigate economic policy uncertainties and maintain their innovation momentum.

6. Leverage technology and digitalization:

Embracing technology and digitalization can enhance firms' ability to respond to economic policy uncertainties. Investing in digital infrastructure, adopting emerging technologies, and leveraging data analytics can provide firms with valuable insights and enable agile decision-making. Technology can also enable remote collaboration, streamline processes, and enhance productivity, allowing firms to maintain innovation activities even in times of uncertainty. Additionally, digital marketing strategies and e-commerce platforms can help firms reach new markets and diversify their customer base.

By implementing these measures, firms can better position themselves to thrive in the face of economic policy uncertainties. The combination of strategic flexibility, collaboration, talent development, proactive monitoring, organizational culture, and technological adoption can help firms adapt, innovate, and seize opportunities in a rapidly changing business environment.

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초록

"혁신은 발전을 이끄는 첫 번째 원동력이며 현대 경제 시스템 구축의 전략적 지원입니다." 현재 중국은 발전 방식을 전환하고 경제 구조를 최적화하며 성장 모멘텀을 전환하는 공세적 시기에 있으며, 혁신은 도약과 고품질 발전을 달성하는 핵심 요소입니다. 기업이 독립적 인 혁신에 대한 투자를 늘리면 시장 경쟁의 요구를 더 잘 충족시키기 위해 기업의 제품 갱신 속도가 더욱 빨라집니다. 현재 중국 경제 전환 과정에서 비즈니스 환경의 불확실성이 기업 혁신을 '촉진'하는지 '억제'하는지에 대한 큰 논쟁이 여전히 진행 중입니다.

본 논문에서는 기업이 직면한 경영 환경의 불확실성을 거시경제 불확실성과 지역 정책 불확실성으로 구분하고, 2000-2017 년 중국 상장기업 데이터를 기반으로 이 두 가지 불확실성이 미시적 수준의 기업과 결합하여 기업 혁신에 미치는 영향을 분석합니다. 본 논문은 stata17.0 을 사용하여 2000 년부터 2017 년까지 A 주 상장 기업 표본을 대상으로 고정 효과를 사용한 실증 회귀 분석을 실시한 결과, 거시 경제 불확실성은 기업 혁신에 긍정적인 영향을 미치며 성장 옵션 효과가 지배적인 역할을 하고, 지방 정책 불확실성은 일반적으로 기업 혁신에 영향을 미치지 않으며, 첨단 기술 기업을 대상으로 할 때만 다른 기업에 비해 지방 관리의 변화가 기업 혁신에 부정적인 영향을 미친다는 것을 발견했습니다. 실질 옵션 효과가 지배적인 역할을 합니다. 동시에 기업이 위치한 산업의 경쟁 인센티브는 EPU가 혁신에 미치는 긍정적 인 영향을 촉진 할 것입니다. 이번 연구 결과는 몇 가지 정책적 시사점을 제공합니다. 경제 정책의 불확실성은 기업에게 도전이자 기회이므로 하이테크 기업에 대한 영향은 특히 신중하게 다뤄야 합니다. 기업이 글로벌 무역 마찰과 같은 불확실성 충격에 대처하기 위해서는 기술 혁신이 필수적입니다. 동시에

서비스 중심의 정부를 구축하고 우호적인 기업 환경을 조성하는 것은 지역 정책의 '확실성'을 제공함으로써 거시 경제 환경의 '불확실성'을 해결할 수 있습니다.

따라서 정부는 경제 정책을 수립 할 때 환경이 기업에 미치는 영향을 충분히 고려하고 첨단 기술 기업에 대한 혁신 지원을 강화해야하며, 또한 정부의 지원을 받아 기업 스스로 불확실성을 정확하게보고시기를 합리적으로 파악하고 경쟁 우위를 확보하고 자체 위험 예방 및 통제 메커니즘을 개선하고 기업 내부 거버넌스를 강화해야한다. 이러한 문제를 정리하는 것은 경영 환경의 불확실성이 기업 혁신에 미치는 영향을 과학적으로 판단하는 데 도움이 되며, 이는 매우 실용적인 의미가 있습니다.

핵심 단어: 경제 정책의 불확실성, 지방 공무원 변화, 기업 혁신