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Heterogeneity of Family Business Innovation in China

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Abstract: Family business innovation has regained public and academic attention and has become an essential part of economic healthy growth in China. In light of the ongoing theoretical discussion regarding the research on family business innovation, this study aims to investigate the impact of various management models on family business innovation from the perspective of the heterogeneity of family businesses. Additionally, this article discusses the moderating effect of the political connections. The findings indicate that authoritative governance appears to have a negative impact on family business innovation, while intergenerational inheritance seems to have the effect of fostering innovation. When the moderating variable of political connection is taken into consideration, it will increase the impact of authoritative governance on innovation, which is a factor that inhibits innovation. However, it becomes more challenging when considering the effect of intergenerational inheritance. This study incorporates the theoretical arguments on family business innovation research. Based on the heterogeneity perspective, it includes remedies and ideas for transforming and upgrading family businesses according to the results.

1. Introduction

In recent years, family businesses have gained popularity as resilient corporate organizations. Academic research and government regulations now focus on family business. Chinese theoretical studies have likewise stopped dismissing family businesses and started examining them rationally. They want to learn from Western sophisticated management and offer Chinese family enterprises growth advice. Discovering China's ideal growth and development route is the goal.

Chinese economic growth relies on family business. Family businesses make up over 80% of private listed enterprises [1]. China's economic transformation has made innovation essential to family businesses' long-term success. De Massis et al. reviewed family firm technical innovation studies and suggested new areas for study [2]. Some scholars examined how family affects corporations' ability to innovate, and others stressed the importance of family-owned SMEs obtaining innovation resources from innovation partners [3] [4]. Family participation and firm innovation were examined in a Chinese family business to determine their importance in a competitive environment [5]. New studies have also studied how family enterprises might maintain competitiveness through innovation during ownership transfers [6].

However, family firms must embrace the heterogeneity of management approaches to achieve innovation. Businesses using different management models use different ways to innovate. This article examines how different management approaches affect family company innovation in China, taking into account the unique characteristics of the country's national conditions. It will focus on the

heterogeneity of management models in family business and propose strategies to reconcile academic debates.

To summarize, this article has the following structure: First, the current family business innovation publications are reviewed and classified. Heterogeneity in family enterprises is then explained based on innovation research. Another finding was that Chinese family enterprises' management practices are based on authoritative governance and intergenerational inheritance. These two variables are analyzed to determine how family business management methods affect innovation, taking into account Chinese family business growth. In addition, the influence of the actual controller's political connections on the relationship between family management and innovation is investigated, all while taking into consideration the particular political system. Therefore, it is the primary focus of the investigation that the significance of the moderating influence of political affiliation on this relationship. After conducting multiple regression simulations and robustness tests, a summary of the nature and characteristics of creative development in Chinese family businesses has been compiled on the basis of the conclusions that correspond to those activities. Last but not least, suggestions for long-term expansion have been proposed.

2. Theoretical Foundation

Family firms have garnered significant attention due to their innovation. This study focuses on researching innovation in family businesses, where two main academic views exist regarding the value of family involvement.

One perspective is that family engagement can foster innovation. Kellermanns et al. primarily examined the innovation capacities of family businesses and posited that family members' involvement and enduring dedication can facilitate corporate innovation [3]. Ayyagari et al.'s empirical analysis of firms in 47 developing nations demonstrated that controlling families have the ability to encourage innovative corporate activities [7]. Huang and his colleagues discovered that family ownership would enhance company innovation regarding second-generation participation [8]. Ashwin et al.'s empirical study found that family firms tend to invest significantly in innovation [9]. When family members are engaged in enterprises, it could improve social capital and then boost the innovative ability of the firm. Also, family involvement can prompt its adaptability and resource integration capacity [10].

While it is commonly believed that family participation can foster innovation, several research has indicated that family involvement may impede corporate innovation. Although family involvement can enhance resource integration, family control also has the possibility of leading to unreasonable resource allocation, negatively influencing its innovation ability [11]. Compared to non-family businesses, when there is a favor for low-risk project investment, a higher risk aversion is exhibited in family firms [12]. Similarly, Zahra discovered that the cautiousness towards risk exhibited by family firms frequently hampers their ability to invest in and pursue creative ventures, thus impeding innovation [13]. Another study revealed a negative correlation between the level of family engagement and the extent of technical innovation in Chinese family firms [14]. Matzler et al. studied German companies listed on the stock exchange. They discovered that when a company is owned and governed by a family, it tends to have a detrimental effect on the investment made in innovation. Block analyzed a sample of 154 R&D-intensive public corporations in the United States and discovered that family control leads to decreased investment in research and development [15]. Furthermore, Litz and Kleysen discovered that intergenerational ties within family firms and older individuals' conservative mindsets could impede the younger generation's capacity to foster innovation inside the organization [16]. In their study, Islam et al. found that the potential impact of conservative decision-making and how it can impede corporate innovation. They specifically

examined the excessive involvement of family members in corporate management as a factor contributing to this phenomenon [17].

The heterogeneity of study outcomes in the academic study can be attributed to the perception of family businesses as homogeneous organizations. Nevertheless, family business exhibits significant heterogeneity, and numerous scholarly articles have investigated the variations within the family businesses and their influence on corporate governance, strategy, and financial results [18]. De Massis et al. highlighted the distinctiveness of ability and willingness in family business and examined how these characteristics appear in various family businesses [19]. Chrisman et al. also noted that varying family intentions and behaviors could influence firms' innovation input and output [10]. Various forms of family engagement in businesses will necessarily provide varying effects on enterprise innovation. Yan and colleagues suggested that the heterogeneity of family participation in businesses can be observed through family ownership, family control, and family management rights [11]. Family engagement in firm management is a significant characteristic that contributes to the heterogeneity of family business. Chua et al. concisely overview many factors contributing to family business' heterogeneity, including family governance, the distribution of ownership, and intergenerational inheritance [12]. It also found that various external institutional environments can result in distinct family business behavioral traits and innovation. As to the Chinese family firms, a comprehensive analysis points out the contribution to heterogeneity, such as the family members' background, family traditional culture, and corporate history, all within the unique environment of China. Generally speaking, it is necessary to study family business innovation. This article will examine the impact of different management models on family business innovation in China. It will focus on the heterogeneity of management models in family business and propose relevant recommendations.

This article emphasizes that political connections can strongly influence family business innovation complementary to formal institutions. Political connections are essential in alleviating financial restrictions and accessing government resources and programs [13]. There is a finding that political donations can secure funding, and these connections will significantly affect business innovation investment, which means a high engagement in innovative practices [14]. Similarly, companies' political connections in China directly affect their funding and corporate performance and indirectly influence their innovation [15]. In summary, political connections significantly impact corporate innovation activities as an additional mechanism for formal institutions to improve corporate investment efficiency [16].

Overall, family business has a dual impact on company innovation, stimulating and inhibiting it. Family heterogeneity is a significant influencing factor that must not be disregarded. Hence, this article's contribution is evident in two facets: This article primarily examines family management from the heterogeneity perspective. It focuses on the diverse characteristics of family management models and categorizes them into two dimensions: authoritative governance and intergenerational inheritance. The study investigates how these dimensions of family business management models influence innovation and elucidates the pathway through which family management affects corporate innovation. This research aims to reconcile theoretical debates in family business innovation studies and offer analytical insights for enhancing family business governance. Additionally, given China's unique position as a new economic transformation entity, the study acknowledges that political connections, supplementary mechanisms to formal institutions, can somewhat impact corporate innovation. This article examines the impact of political connections of current controllers as internal factors on the relationship between family management and corporate innovation. It also analyses how political connections moderate this relationship. The findings of this study can assist enterprises in adapting to various internal environmental changes and provide recommendations for their transformation and upgrading.

3. Methodology

3.1. Theoretical Assumptions for Research

Family-owned businesses in China have distinct management styles. Scholars have observed that their management structure is shaped by factors such as paternalistic leadership, dual authority integration, and power transfer from father to son. Chen analyzed how the combination of paternal authority and intergenerational inheritance in Chinese family firms affects agency costs [17]. Chrisman et al. noted that when considering family business innovation, it is essential to address the heterogeneity of family businesses, including their goals and ambitions [20]. Family intentions relate to governance, while family visions focus on non-economic objectives across generations. The combination of these aspects is reflected in Chinese family business management models, manifesting as paternal authority (active control) and intergenerational inheritance (passing management to future generations).

This article integrates research findings, categorizing Chinese family business management styles into two dimensions: authoritative governance and intergenerational inheritance, while analyzing their impact on innovation.

3.2. The impact of authoritative governance on innovation

In traditional Chinese culture, family members often manage businesses autonomously, consolidating ownership and control in one individual. As family businesses grow and evolve, this concentration of power hinders innovation.

First, authoritative governance limits innovation. De Massis noted that family businesses avoid external opportunities to preserve control, restricting their pursuit of new, uncertain ventures . According to social-emotional wealth theory, families with a strong desire to control are less likely to innovate [18]. Highly centralized organizations often avoid R&D to maintain control, leading to cautious decision-making and reduced innovation. Chrisman et al. observed that such governance can prioritize family interests over economic goals, further stifling innovation .

Additionally, risk aversion in authoritative governance promotes conservatism, limiting family firms' ability to become innovative. Zahra found this governance model reduces risk-taking and resource allocation for innovation [13]. Hou et al. found that it restricts information exchange and creativity, negatively affecting innovation [18]. Centralized decision-making discourages employee creativity and innovative activities. Hence, the hypothesis is formed:

H1: Authoritative governance is negatively associated with family business innovation.

3.3. The impact of intergenerational inheritance on innovation

The study of intergenerational inheritance's impact on innovation in family businesses has gained notable attention. In Chinese familial structures, a firm's success is highly valued by ancestors, and perpetuating the family business is a key goal for the family patriarch. Family businesses prioritize longevity more than non-family firms and often transfer ownership to offspring to preserve wealth across generations. When the family directly controls the business, it not only meets economic objectives but also reflects the family's social status and wealth. To ensure long-term growth, the family maintains control, making intergenerational inheritance vital to family business management. However, successors often lack the drive and capability for innovation, hindering corporate progress [19].

The social-emotional wealth theory suggests successors retain the family firm to protect its social and emotional value, but this can reduce their innovation incentive. Miller et al. noted that family

firms may face challenges during ownership transfers between generations. Successors' conservative nature and reliance on the status quo can hinder new ideas and changes. Consequently, second-generation family CEOs may invest less in innovation compared to first-generation founders.

Additionally, asset specificity theory highlights that successors struggle with inheriting the founder's unique assets, leading to a lack of innovation resources and ineffective innovation activities. Cabrera-Suárez et al. found that successors often have difficulty leveraging resources and expertise from predecessors, reducing the firm's innovation capacity. Therefore, highly innovative firms are more likely in the initial generation. We propose the following hypothesis:

H2: Intergenerational inheritance is negatively associated with family business innovation.

3.4. The impact of political connections

Political connections impact corporate innovation by influencing strategic decisions and internal management. These connections might lead enterprises to prioritize established models over innovation, as they provide consistent resources and support. This reliance can diminish the need and incentive for innovation, with companies sticking to the status quo rather than exploring new opportunities.

In authoritative governance, decision-making is concentrated among a few family members, and political connections can reinforce this centralization, discouraging new advancements. They may also offer market protection and preferential policies, reducing competitive pressure and the urgency for innovation [26]. Additionally, political ties can lead to increased bureaucracy and complex decision-making processes, impeding quick and adaptable innovation and reinforcing a conservative corporate culture. Authoritarian control can result in a rigid corporate culture that stifles creativity and limits the recruitment of external talent, reducing the diversity of innovative ideas. Therefore, we propose the following hypothesis:

H3a: Political connections weaken the negative relationship between authoritative governance and R&D intensity.

In firms with intergenerational inheritance, entrepreneurs with political connections will focus more on long-term goals and improve resource allocation. This strengthens the link between intergenerational inheritance and corporate R&D investment. Political ties help family firms enter specialized markets and gain monopolistic positions, providing a solid market base for successors to introduce innovative ideas. These connections can also offer policy benefits like tax exemptions, subsidies, and R&D funding, boosting economic support and driving innovation. Additionally, they provide training and development opportunities, helping successors gain management experience and knowledge. This smooth transition aids in effectively promoting innovation and streamlining decision-making. Thus, we propose the following hypothesis:

H3b: Political connections weaken the positive relationship between intergenerational inheritance and R&D intensity.

4. Research Design

4.1. Samples selection and data source

This article focuses on listed family businesses. According to Wang et al., Chinese family businesses are defined by two criteria: (1) The ultimate controller is an individual or family; (2) There are at least two family executives, and the family's control is at least 15%.

The data sample includes private listed companies from 2013 to 2022, sourced from the CSMAR database. Management model characteristics and other data are extracted from annual financial statements and prospectuses. Manually collected data supplemented the sample. Companies labeled

as ST or *ST, as well as regulated financial and insurance firms, were excluded due to not meeting the criteria. In China's stock market, ST ("Special Treatment") denotes companies with severe financial or operational issues, including two consecutive years of losses or major disclosure violations. ST stocks face stricter disclosure and reporting requirements. "*ST" stocks, marked with a delisting risk warning, have lost money for three consecutive years and face even stricter trading rules, including limited price fluctuation and closer scrutiny of trading behavior.

A total of 10,934 observations were gathered. To reduce outlier impact, all continuous variables were trimmed by 1%.

4.2 Models design

This research analyzes how the family business management model affects corporate innovation, focusing on authoritative governance, intergenerational inheritance, and corporate innovation. It also examines the moderating effect of political connections.

The study employs two models: the first examines regression without considering political connections, and the second includes the moderating variable.

$$Rd_Intensity=\beta0+\beta1Augovi,t+\beta2Inheri,t+\beta3Degreei,t+\beta4Sizei,t\text{-}1+\beta5Dtai,t+\beta6Roai,t\text{-}1+\beta7Exei,t+\beta8Indirecti,t+\beta9Salaryi,t+\beta10Famstylei,t+Yeari,t+Indui,t+\epsilon \quad (1)$$

$$Rd_Intensity=\beta0+\beta1Augovi,t+\beta2Inheri,t+\beta3Polii,t+\beta4Augovi,t*Polii,t+\beta5Inheri,t*Polii,t+\beta6Degreei,t+\beta7Sizei,t\text{-}1+\beta8Dtai,t+\beta9Roai,t\text{-}1+\beta10Exei,t+\beta11Indirecti,t+\beta12Salaryi,t+\beta13Famstylei,t+Yeari,t+Indui,t+\epsilon \quad (2)$$

4.2.1. Dependent variable—R&D Intensity

Enterprise innovation can be measured in various ways, with R&D spending being a well-established method for assessing innovation capability. R&D investment is crucial for advancing new technologies, products, and services. Griliches supported using R&D investment as a metric for enterprise innovation based on extensive research linking R&D spending to productivity and innovation. Similarly, Hall and Lerner highlighted R&D expenditure's role in fostering innovation during financing [20].

R&D intensity, the ratio of R&D expenditure to total operating revenue, is commonly used to measure R&D investment and innovation activities. A higher R&D intensity indicates significant resource commitment to innovation.

Studies have shown a direct relationship between R&D investment and innovation performance. Increased R&D spending generally leads to better innovation outcomes. Barge-Gil and Lope analyzed R&D activities and their impact on innovation [21], while Griffith et al. found a direct correlation between R&D investment and innovation capacity across four European countries [22]. These studies provide both theoretical and empirical support for using R&D spending as an indicator of a company's innovation capability.

4.2.2. Explanatory variables

This article's family business management model primarily consists of authoritative governance and intergenerational inheritance.

In the family business context, "Authoritative Governance" refers to a governance structure where family members or founders exert dominant control, characterized by centralized decision-making [23]. Schulze et al. found that authoritative governance centralizes decision-making among a few family members, leading to personalized approaches to managing corporate resources [22]. To accurately represent Chinese family businesses, we use Chen Jianlin's method, which measures

whether the chairman and general manager are family members. A value of 1 indicates they are related, while 0 indicates they are not [23].

In academic literature, "Intergenerational Inheritance" in family businesses refers to the transfer of ownership, managerial rights, and operational control from one generation to the next. This process involves challenges such as transferring managerial responsibilities, preserving business culture, and managing family dynamics [25]. It underscores the importance of wealth transmission for the sustainability and long-term success of corporations, as emphasized by Handler [24]. For Chinese businesses, intergenerational inheritance is assessed by whether second-generation family members hold executive positions. A value of 1 indicates they are executives, while 0 indicates they are not [24].

4.2.3. Moderating variable—Political Connections

Political linkages are argued to affect the relationship between family management models and business innovation by providing competitive advantages and resource support in complex political and economic environments [21]. Thus, political connection is used as a moderating variable.

In China, two main groups wield significant political influence: the National People's Congress (NPC) and the Chinese People's Political Consultative Conference (CPPCC). Members of these groups offer political support and resource allocation, allowing actual controllers with such connections to secure policy support and protect corporate interests. By engaging with these groups, business controllers can influence policymaking and promote business-friendly policies.

Therefore, membership in the NPC or CPPCC is a key indicator of political connections. A value of 1 is assigned if the actual controller is or was a CPPCC member or NPC delegate; otherwise, the value is 0 [25].

4.2.4. Control variables

Typically, control variables refer to the factors manipulated or controlled in an experiment to observe their effects on the dependent variables. In this research, it identifies control factors based on three different aspects.

The chosen financial indicators for the company take into account the unique characteristics of the data and the presence of lagged effects. These indicators consist of the company's performance in the previous year (Roat-1), the company's asset scale in the last year (Sizet-1), and the capital structure (Dta). Furthermore, the chosen corporate governance indicators encompass the following: the ratio of independent directors (Indirect), the proportion of executive salary received by family members (Salary), the method employed by the family to run the company (Famstyle), and the percentage of family members serving as executives (Exe). The family business controller's education degree (Degree) is ultimately utilized to represent the distinctive indicators of the controller. Furthermore, this article includes the yearly dummy variables (Year) and the industry dummy variable (Indu).

The table 1 below displays the names and precise meanings of all variables mentioned in this article:

Table 1: Explanations of variables.

	Variables	Explanation
Dependent Variable	Rd_Intensity	Family business innovation indicator, which is calculated as follows: $$\frac{\text{R\&D Intensity} - \text{R\&D Intensity in industry level}}{\text{R\&D Intensity in industry level}}$$
Independent Variables	Inher	The intergenerational inheritance indicator, which measures whether the second-generation family member becomes a company executive, is used to measure whether intergenerational inheritance occurs. If a second-generation member serves as a company executive, it is 1; otherwise, it is 0.
	Augov	Authoritative governance indicator, whether the chairman and general manager are family members. If the chairman and general manager are members of the same family, it is 1; otherwise, it is 0.
Moderating variable	Poli	The political connection indicator is whether the actual controller is a CPPCC member or NPC deputy. If he is or has served as a CPPCC member or an NPC deputy, he is assigned a value of 1. Otherwise, it is 0.
Control Variables	Roa	Financial indicators, corporate performance in the previous year
	Size	Financial indicators, corporate asset size in billions (CNY)
	Dta	Financial indicators, capital structure in the previous year
	Exe	Corporate governance indicators, the proportion of family members' directors, supervisors, and senior management
	Salary	Corporate governance indicators, salary proportion of directors, supervisors, and family members
	Famstyle	Corporate governance indicators, the method of family control of the company
	Indirect	Corporate governance indicators, the proportion of independent directors in the board of directors
	Degree	Family business controllers' characteristic indicator, education level of family business controllers

5. Results

5.1. Descriptive Statistics

As show table 2. The study sample consists of 10,934 observations from 2013 to 2022, providing a robust basis for regression analysis and model construction. This dataset offers essential background information for understanding family business operations and governance.

The analysis reveals that 25.45% of the sampled enterprises have second-generation involvement in management, highlighting significant family inheritance and succession. Family businesses often view this as vital for perpetuating the firm and maintaining governance. Second-generation managers generally have advanced education and a better grasp of modern management principles, supporting ongoing growth. The average education level of managers in the sample is 3.379, indicating high

educational attainment. This education enhances managerial skills, fosters innovation, and helps maintain a competitive edge. Managerial education significantly impacts decision-making, company culture, values, strategy, and success.

Table 2: Descriptive statistics of the sample.

Variable	Mean	Std. dev.	Min	Max
Rd_Intensity	0.0002	0.7434	-1	39.1210
Augov	0.8592	0.3478	0	1
Inher	0.2545	0.4356	0	1
Poli	0.1675	0.3734	0	1
Degree	3.3795	1.5290	1	7
Size	5.9614	16.4150	0.0582	493.8607
Dta	0.3605	0.1935	0.008	4.9953
Roa	0.0555	0.1361	-4.3657	8.1491
Exe	0.1499	0.0750	0	0.5000
Indirect	0.4410	0.0800	0	0.7500
Salary	0.2630	0.1543	0	1.6010
Famstyle	0.9187	0.2733	0	1

The sample's corporate governance is diverse and shows substantial autonomy. Family members hold an average of 14.99% of director, supervisor, and senior management positions, while independent directors make up 44.98%. This indicates significant family involvement in management but also substantial independent oversight, improving governance transparency and reducing the risk of power abuse. Financially, the sample shows variability in company size, asset-liability ratio, and return on assets, reflecting firm heterogeneity. Larger firms often have more R&D resources but face higher operational risks and management complexity. Financial indicators such as debt-to-asset ratio and return on assets provide insights into a company's financial health and investment behavior. From a governance perspective, 85.92% of companies have family members as both chairman and general manager, enhancing family authority and influence. While this dual role balances stability and flexibility in decision-making, it also poses potential governance risks, such as prioritizing family interests and lacking external oversight. Political connections are also crucial for Chinese companies, helping them navigate complex market conditions and regulatory environments. About 16.75% of CEOs are NPC or CPPCC members, offering potential benefits like policy support, enhanced firm status, and easier access to resources and markets.

In conclusion, the study highlights significant heterogeneity in family business management, governance, financial status, and R&D investment. This diverse foundation is valuable for model construction and regression analysis, providing insights for policymakers, business leaders, and researchers.

5.2 Regression Analysis

Regression models 1, 2, and 3 analyze the relationship between family business management and R&D intensity, focusing on the impact of authoritative governance and intergenerational inheritance on innovation. The dataset consists of 10,934 observations from 2013 to 2022, capturing family business heterogeneity effectively.

The study primarily examines authoritative governance's influence on R&D investment. The regression in Table 3 reveals a statistically significant negative relationship between authoritative governance and corporate R&D spending, with a coefficient of -0.6015 and a p-value less than 0.01, supporting hypothesis H1. Centralized control by family members often restricts diverse viewpoints

and leads to cautious decision-making, hindering high-risk R&D investments and collaboration on innovation projects.

Table 3: Regression results without the moderating effect of political connections.

The dependent variable: R&D intensity			
	Model 1	Model 2	Model 3
Augov		-0.6342***	-0.6015***
		(0.0247)	(0.0240)
Inher	0.2240***		0.1437***
	(0.0159)		(0.0135)
Degree	0.0420***	0.0340***	0.0311***
	(0.0038)	(0.0036)	(0.0036)
Size	-0.0004	-0.0011***	-0.0010***
	(0.0003)	(0.0003)	(0.0003)
Dta	-0.1113***	-0.0367	-0.0182
	(0.0349)	(0.0351)	(0.0349)
Roa	0.0981	0.1839*	0.1871*
	(0.1009)	(0.0989)	(0.0966)
Exe	0.2490**	0.7229***	0.6274***
	(0.1158)	(0.1080)	(0.1085)
Indirect	1.6937***	1.6165***	1.5663***
	(0.0750)	(0.0717)	(0.0712)
Salary	-0.4791***	-0.1852***	-0.2199***
	(0.0541)	(0.0520)	(0.0513)
Famstyle	0.1433***	0.1973***	0.1931***
	(0.0212)	(0.0216)	(0.0211)
Cons	-0.9732***	-0.5343***	-0.5485***
	(0.0420)	(0.0464)	(0.0456)
Adjusted R2	0.1199	0.2132	0.2232
F-statistic	136.4243	192.538	182.4041
Note: Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01			

Conversely, intergenerational inheritance positively influences R&D investment. In all models, intergenerational inheritance (Inher) consistently shows significant positive effects, with coefficients of 0.2240 ($p<0.01$), 0.1437 ($p<0.01$), and 0.1437 ($p<0.01$), disproving H2. Second-generation managers often focus on long-term development and technological innovation, bolstered by higher educational attainment, which enhances their ability to promote R&D investments. Executive education (Degree) similarly has a significant positive effect on R&D intensity in all models, suggesting that well-educated managers prioritize innovation and are adept at identifying market opportunities.

Independent directors (Indirect) also have a significant positive effect on R&D intensity, as shown by the coefficient of 1.5663 ($p<0.01$) in model 3. Independent directors balance family interests and promote technological innovation. However, the salary ratio of family members negatively affects R&D intensity in all models, likely due to short-term profit goals and uneven resource allocation. Financial factors such as company size, debt-to-asset ratio, and return on assets show varying effects. Larger companies tend to invest less in high-risk R&D, while the asset-liability ratio's negative association with R&D becomes insignificant in models 2 and 3. Return on assets has no significant effect on R&D spending.

In conclusion, family business governance structures and management characteristics, particularly intergenerational inheritance and education, significantly influence R&D investment. Authoritative governance negatively impacts innovation, while independent directors and sound governance structures enhance it. The financial situation, such as executive compensation and company size, also plays a role, warranting further study.

Table 4: Regression results with the moderating effect of political connections.

The dependent variable: R&D intensity		
	Model 4	Model 5
Augov	-0.4060***	-0.0347
	(0.0224)	(0.0224)
Inher	0.1117***	0.0370***
	(0.0131)	(0.0124)
Poli	0.3561***	0.8828***
	(0.0191)	(0.0453)
Augov*Poli		-0.7838***
		(0.0447)
Inher*Poli		0.0687
		(0.0431)
Degree	0.0268***	0.0214***
	(0.0035)	(0.0034)
Size	-0.0010***	-0.0009**
	(0.0003)	(0.0004)
Dta	-0.0153	-0.0048
	(0.0334)	(0.0319)
Roa	0.1616*	0.1242
	(0.0914)	(0.0843)
Exe	0.5412***	0.4382***
	(0.1063)	(0.1041)
Indirect	1.5416***	1.5734***
	(0.0699)	(0.0689)
Salary	-0.2759***	-0.2784***
	(0.0501)	(0.0494)
Famstyle	0.1599***	0.1187***
	(0.0203)	(0.0194)
Cons	-0.6831***	-0.9582***
	(0.0433)	(0.0415)
Adjusted R2	0.2565	0.2933
F-statistic	186.9115	163.157
Note: Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01		

This article starts by using three regression models to study the impact of various factors on R&D investment, focusing on authoritative governance (Augov) and intergenerational inheritance (Inher). Political connections (Poli) are introduced as a moderating variable to assess how political ties influence the relationship between family business management and innovation. After including political connections, the analysis delves into how these variables affect R&D investment.

Table 4 shows a significantly negative coefficient (-0.7843, $p < 0.01$) for the interaction between political connections and authoritative governance. This suggests that political connections amplify

the negative impact of authoritative governance on innovation. When family members hold both chairperson and general manager roles and have political ties, R&D spending decreases, as companies may prioritize political contacts over innovation, supporting hypothesis H3a. Such businesses might rely on political influence rather than technological advances, hindering R&D efforts.

The positive coefficient for the interaction between political connections and intergenerational inheritance is not statistically significant. Thus, hypothesis H3b is not confirmed, indicating no clear evidence that political connections enhance the effect of intergenerational inheritance on innovation. While political ties could potentially aid intergenerational family firms in innovation, this study did not find such evidence, suggesting the need for further research into the complex effects of political connections.

Other results show that political connections positively impact R&D investment, as firms with political ties often secure government support, leading to more funds for innovation. Political capital enhances a company's capacity for innovation. However, when political connections are factored in, the influence of authoritative governance loses statistical significance, suggesting that the impact of family members holding both top positions is more nuanced when political factors are involved. Authoritative governance may suppress innovation, but this effect changes with political connections.

In conclusion, family heritage and political connections significantly affect R&D investment, with second-generation involvement and political ties particularly beneficial. Second-generation managers bring new ideas, and political connections offer external resources. However, the role of authoritative governance in innovation remains complex and warrants further exploration. Future studies should investigate how political connections and other moderating factors influence family firms' governance structures and innovation activities. These findings provide valuable insights for policymakers and business leaders in developing governance frameworks and leveraging family and political influence to enhance innovation and long-term competitiveness.

5.3 Robustness Test

Addressing heteroscedasticity and autocorrelation in regression analysis is essential, and robustness tests are used to ensure reliable results. This article employs robust standard error estimation to improve regression accuracy and conducted various robustness tests for reliability. These tests fall into two main approaches.

First, a random effects model was used to address unobserved heterogeneity between variables. As shown in Appendix A1, the random effects model produced results consistent with the original findings, supporting the study’s reliability. Prior studies, such as Bhatt & Bhattacharya and Gaur et al., demonstrated the effectiveness of random effects models in studying family firm governance and performance [26]. Second, as detailed in Appendix A2, the study applied a logarithmic transformation to the firm size variable, which is widely recognized for minimizing outlier impact in innovation-related studies. This re-analysis confirmed that the relationship between authoritative governance, intergenerational inheritance, and innovation remained robust. Together, these tests validate the reliability of the findings, reinforcing the applicability of the random effects model in studying family firm governance. Additionally, referencing methodologies from Wooldridge and Petersen, the study used robust standard errors and panel data models to address heteroscedasticity and autocorrelation [27].

In conclusion, the robustness tests confirm that regardless of variable measurement changes or model alterations, the study's findings regarding the impact of authoritative governance and intergenerational inheritance on innovation are reliable and stable, providing a solid foundation for future research.

6. Discussion

This article synthesizes academic debates on the variability of family business management models. Previous research has produced conflicting results, with some arguing that these models foster innovation, while others claim they hinder it. This article highlights that these disagreements stem from treating family business management approaches as uniform. In reality, they are heterogeneous and yield different outcomes for innovation. Based on the research findings, the following recommendations are proposed:

First, it is crucial to balance authoritative governance and intergenerational inheritance. Authoritative management alone can stifle innovation, but when combined with intergenerational succession, it can create a more balanced governance approach. Family businesses should carefully manage this balance, fostering innovation by integrating the next generation into management and promoting intergenerational collaboration. Second, political connections should be leveraged to enhance access to government resources and support, especially in research and development. Family businesses should build and maintain positive relationships with government entities, using political influence to secure resources and foster innovation. Third, for sustainable growth, family businesses should gradually implement democratic decision-making and shift toward a more pluralistic governance structure. Separating the roles of chairman and general manager can mitigate the negative impact of authoritative governance on innovation, while decentralizing authority can encourage a more innovation-friendly environment. Additionally, family businesses should foster strong relationships with the government to address institutional weaknesses and ensure sustainable growth within China's institutional framework. Finally, academics should further explore the relationship between family business governance and innovation, emphasizing the heterogeneity across cultural and economic contexts. Understanding the role of informal institutions like political connections is also crucial. Future research should delve deeper into these mechanisms to better understand how family firms can harness these factors to drive innovation.

7. Conclusion

This article analyzes the impact of different management models on family business innovation, using data from family-listed companies between 2013 and 2022. It focuses on the diversity of family business management approaches and explores how authoritative governance and intergenerational inheritance influence company innovation. The findings show that authoritative governance tends to hinder innovation, while intergenerational inheritance promotes it.

The research also highlights the moderating role of political connections in this relationship. Political ties amplify the negative effect of authoritative governance on innovation. However, when authoritative governance is combined with intergenerational inheritance, its suppressive effect on innovation diminishes. This suggests that political regulation can help enhance innovation within family businesses. The results indicate that while authoritative governance alone may impede innovation when balanced with intergenerational inheritance, it can create an environment that fosters innovation. The role of political connections adds complexity to this relationship, requiring further exploration to understand the underlying mechanisms. These insights are valuable for policymakers and family business leaders aiming to leverage political capital more effectively in shaping management and innovation strategies. By considering these recommendations, family businesses can better utilize internal and external resources, enhance their innovative capacity, and build a strong foundation for future growth.

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