

The Impact of 'institution-governance' configuration on the Ambidextrous innovation of platform enterprises——Qualitative Comparative Analysis based on Fuzzy Set (fsQCA)

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Abstract. Based on the system theory and principal-agent theory, the project choice of China's 95 platform enterprises as the research object, based on the comprehensive analysis of internal and external environment, consider the external institutional factors, internal governance structure optimization, select "system management" because of conditions before the configuration, using the fuzzy qualitative comparative analysis study on causal configuration (fsQCA), Further explore the role and influence mechanism of this conditional configuration in ambidextrous innovation activities of platform enterprises. It is found that board capital in internal governance factor and intellectual property protection in external institutional factor are the core conditions for high exploratory innovation behavior. For high development innovation behavior, the core conditions of high development innovation behavior are ownership concentration degree of internal governance factors, incentive mechanism and tax incentive of external governance factors.

Keywords: Institutional environment; Corporate governance; Ambidextrous innovation; Platform enterprise; Fuzzy sets Qualitative comparative analysis.

1. Introduction

Digital technology has opened a new era of the Internet of everything and the twin of knowledge (Heimans & Timms, 2014), and platform-based enterprises dominated by platform business models have grown significantly in volume and scale (Evans & Gawer, 2016). In the context of the continuous development of digital society, digital innovation is of great significance to the survival and development of contemporary enterprises (Yang Wei et al., 2020). At the same time, the emergence and development of platform enterprises depend on the network environment with great volatility and strong competition, which stimulates them to carry out independent innovation urgently. According to the ambidextrous innovation theory, the innovation of an enterprise can be divided into exploitative innovation and exploratory innovation. The innovation that takes both into account in the innovation process is called ambidextrous innovation (Benner & Tushman, 2003). Among them, development innovation is the behavior of fine-tuning or moderately revising the existing knowledge, technology and products in combination with the current situation of the enterprise (Weng Zhigang et al., 2015). Exploratory innovation is a kind of breakthrough innovation, focusing on the development of new technologies, products and services (Fu Binghai, 2015). Existing theories believe that ambidextrous innovation is the key factor driving the improvement of enterprise performance (BENNER et al., 2003; GUELLEC, 2003). Therefore, in the face of constantly changing external environment and increasingly fierce industry competition, platform enterprises should obtain sustainable competitive advantages through ambidextrous innovation strategy.

As a unique emerging organizational paradigm, platform-based enterprises transform the traditional unilateral market into a bilateral market structure linked by platforms (Kaiser & Wright, 2006). Through digital platforms, platform-based enterprises connect multiple specific groups -- platform side, demand side and supply side, which have three main characteristics: One is bilateral or multilateral market, that is, two or more stakeholder groups participate (Gawer, 2014). The second is network effect, that is, a single group in the network will benefit from the size and characteristics of other groups (Boudreau & Jeppesen, 2015). The third is openness, that is, platform-based enterprises have an open system that affects their opportunity identification and supports the

interaction of different market groups. Platform type enterprise itself does not participate in value creation, decided to its operating mode the dependence on the environment are significantly higher than other enterprises, combined with competition relationship between enterprises gradually strengthen, platform, enterprises need to undertake the ambidextrous innovation to adapt to the external dynamic environment, meet the demand of internal development (Li Hua etc., 2010), which further reveal the role of the ambidextrous innovation. The ambidextrous innovation of platform-based enterprises not only has the general characteristics of enterprise ambidextrous innovation, but also has the following unique attributes: First, platform-based enterprises with intangible assets are more affected by the institutional environment, and are more sensitive to external institutional factors, so their innovation behavior is stronger than that of enterprises with physical assets. Second, the governance structure is more complex. The governance subjects of platform enterprises include the government, technology departments, platform enterprises and platform participants, covering the multiple identities of enterprise platform operators, ecosystem managers, infrastructure providers and so on. Therefore, it is necessary and reasonable to adopt diversified governance mechanisms (Wang Xuhui et al., 2020). In recent years, kedi Jingdong Mall and other platform-based enterprises have used multiple strategies to improve their governance structure, constantly stimulating enterprise innovation activities and achieving remarkable results.

Meanwhile, the institutional basis for technological innovation of enterprises is corporate governance (O'Sullivan, 2000; Belloc, 2012), in terms of corporate governance, differences in shareholders, boards of directors and incentive mechanisms also have a significant impact on enterprises' innovation ability (Lu Tong and Dang Yin, 2014; Ma Weihong, 2012). As the "survival principle" of enterprise behavior, institution is an important factor affecting its strategic choice (DiMaggio & Powell, 1983). In terms of institutional environment, differences in intellectual property rights, financial subsidies and tax incentives will also affect the innovation ability of enterprises (Yin Zhifeng et al., 2013; Ma Weihong, 2011; Liu Fang et al., 2016). However, most of the existing researches regard traditional enterprises as the research object, and few researches on platform enterprises based on governance and institutional factors. In addition, the configuration after holding the community of research is the research paradigm (Du Yunzhou and Liangding jia, 2017), but the existing theory focuses on the linear relationship between variables, based on single factor more single influence on platform type enterprise innovation variables, performance are discussed, cannot at the same time to explore a variety of complex causality condition and configuration research to combine the different elements, Combining the advantages of qualitative analysis and quantitative analysis, this paper discusses the common influence of conditional variables on platform enterprises. Therefore, in view of the comprehensive consideration of internal and external antecedent conditions of enterprises, the "institutional-governance" configuration is selected, and the following questions are discussed through qualitative comparison analysis method of fuzzy sets: which configuration will achieve high development innovation or high exploration innovation of platform enterprises? What configuration contributes to the innovation duality of platform enterprises?

Based on this, the project uses "institution" to refer to the external environment, and "governance" to refer to the internal governance structure of the company. Different elements are organically combined and based on fuzzy set qualitative comparative analysis (fsQCA), the impact of different configurations of "institution and governance" on the ambidextrous innovation of platform enterprises is studied. This paper introduces the "institution-governance" configuration into the research on the influencing factors of binary innovation, expands the theoretical perspective of existing research, and enriches the research pattern and content of binary innovation. Introducing the theory of ambidextrous innovation platform type enterprise innovation research, according to the result of configuration to carry out policy advice, guidance platform type system and the configuration of the integrated management level of enterprise, to fill in system and governance factors mutual influence of ambidextrous innovation theory blank, at the same time demonstrated dual sexual innovation theory, the extension and application.

2. Theoretical mod

2.1 Institutional factors and ambidextrous innovation

Different institutional environments have different incentive effects on enterprise innovation, which affects enterprise ambidextrous innovation. First of all, intellectual property protection is an important part of external institutional factors. When an enterprise is located in an area with a high level of intellectual property protection, it will exert more efforts on high-level innovative talents (Su Yi et al., 2017), which can attract more external innovation investment and provide continuous power for enterprise innovation behavior. In this way, executives are encouraged to implement developmental innovation with a short return period and relatively little risk. Enterprises under moderate intellectual property protection can effectively avoid technology spillover, reduce the risk of patent infringement, prevent market distortion and resource allocation imbalance, and give innovators certain rights and compensation, so as to stimulate the initiative of innovation subjects and promote exploratory innovation behaviors such as patent application (Xing Fei et al., 2020). When intellectual property rights protection is too strong, the bargaining power of property rights owners increases, which can improve the innovation rate in a short term and realize the development of enterprise development innovation behavior. On the other hand, in an environment of strong intellectual property protection, it is more difficult for enterprises to negotiate with property owners, and the transaction cost of subsequent innovation increases. Enterprises are more inclined to benefit from old technology products, but ignore r&d investment, which may ultimately weaken exploratory innovation behavior.

Secondly, financial support can directionally provide financial support for enterprises' technological innovation or patent invention activities, promote the growth of enterprises' innovation investment, stimulate their ENTHUSIASM for R&D activities (Ma Weihong, 2011), and have a positive effect on enterprises' exploratory innovation (Wang Suikun and Hao Jiwei, 2014; Gu Qun et al., 2016), meanwhile, signals of government support for the enterprise or the industry are conveyed to the market, which reduces the financing pressure of enterprises when they raise their r&d funds by themselves (Yang Ye et al., 2015), with strong policy pertinence and a greater incentive effect on enterprises' innovation behavior than tax incentives (Zheng Chunmei and Li Pei, 2015). However, it may lead to enterprises' dependence on government innovation subsidy funds, weaken enterprises' independent innovation ability (Zhang Jie et al., 2015) and squeeze out enterprises' investment in innovation expenses.

Finally, the tax incentive is mainly reflected in the tax deduction and exemption of enterprises' technological innovation behavior, so as to save the r&d innovation cost and increase the r&d innovation investment of enterprises. The r&d achievements brought by tax incentives can further enhance the tax incentives available to enterprises, forming a virtuous cycle of the two, constantly reducing the cost of innovation, stimulating enterprises' innovation enthusiasm, and promoting enterprises' ambidextrous innovation (Chen Hong et al., 2019). At the same time, the impact of tax incentives on ambidextrous-innovation of enterprises is mainly reflected in the long-term. Research shows that every 1% reduction in R&D cost, r&d investment will increase by about 1.7% (Pottelsberghe & Guellec, 2003). Tax incentives constantly promote enterprises' innovation behavior from the aspect of cost reduction.

To sum up, in order to further explore the influence of different external institutional factors on enterprise development innovation and exploratory innovation behavior, this paper takes financial support, tax incentives and property rights protection as the set of antecedent conditions at the institutional level.

Table 1 Institutional factors of platform enterprises

Institutional factor	Connotation	Function
Financial support	Government subsidies to enterprises for technological innovation or patented inventions	Direct financial subsidies are provided to reduce the financing pressure of enterprises, reduce their R & D risks, and improve their enthusiasm for exploratory innovation
Tax Incentives	The government gives enterprises a reduction in the amount of tax payable by means of taxation	Ease the financing constraints of enterprises, reduce the cost of r&d and innovation of enterprises, stimulate enterprises' investment in new technology fields, and promote enterprises' investment in R&D and innovation
Property rights protection	The protection of patent by state policy	Reduce r&d spillover losses of enterprises, alleviate external financing constraints, improve expected revenue of R&D investment, and encourage enterprises to increase innovation output

2.2 Governance factors and ambidextrous innovation

Corporate governance plays a decisive role in enterprise technological innovation (Niu Jianbo and Li Wei 'an, 2020), which can be divided into three levels: shareholders, board of directors and incentive mechanism.

First, at the level of shareholders, the influence of shareholders on corporate internal governance is mainly reflected in ownership concentration (Jian Jianhui and Huang Ping, 2010). Higher ownership concentration is conducive to enhancing shareholders' ability to control and monitor enterprises (Yang Yong et al., 2007), which makes managers pay more attention to long-term development of enterprises and has a significant positive impact on technological innovation investment of enterprises. Moreover, the increase of r&d investment by major shareholders can also earn more profits for themselves and further enhance the long-term profitability of enterprises.

Secondly, from the perspective of the board of directors, as the decision-making body of enterprise technological innovation, it can provide diversified resources for the enterprise. Factors affecting the capital of the board of directors of corporate governance include social capital and human capital (Hillman & Dalziel, 2003), among which, social capital is a necessary condition for the formation of exploratory innovation ability (Tao Qiuyan et al., 2016), the board of directors helps enterprises to obtain policy resources in innovation and obtain legitimacy guarantee in technological innovation by establishing contact with the government (Anna Grandori & Giuseppe Soda, 1995). Meanwhile, the association of directors will make reference between related enterprises. To form a comprehensive innovation management concept (Zhong Xi et al., 2019), so as to influence the ambidextrous innovation of enterprises; Human capital to explore and expand learning has significant positive impact (Wang Lihong etc., 2013), the board of directors of human capital can pass control net cash flows, implement enterprise innovation process china-africa investment efficiency to reduce, to ensure better innovation performance (being wei and Wang Xia, 2017), including technical directors have more professional knowledge, To enable the board of directors to make better innovation decisions when choosing future innovation projects (Ma Lili, 2020), and enhance enterprises' ability of exploratory and exploitative innovation.

Thirdly, from the perspective of compensation incentive, as the most common incentive method in corporate governance, high compensation is the embodiment of management value. Based on the agency theory, both long-term and short-term incentives for executives can reduce agencynt of enterprises (Wang Yanni, 2011). The higher the compensation of management, the m costs so that they can better serve shareholders and encourage them to take a price favorable to shareholders Value increase and r&d investment activities for long-term developmeore innovation input of enterprises, the

more conducive to technological innovation activities of enterprises (Xu Min et al., 2017), which has positive benefits for independent innovation of enterprises (Li Juan, 2021). In addition, in-service consumption, as an implicit incentive for executives, provides non-monetary benefits for executives to effectively make up for their lack of short-term compensation, which to some extent meets the needs of corporate executives for self-realization and is conducive to motivating executives to promote enterprise R&D and innovation (Liu Zhangfa and Tian Cunzhi, 2017).

To sum up, this paper selects ownership concentration, ownership nature, compensation incentive and board capital as antecedent condition variables at the governance level to explore the complex causal relationship between them and the ambidextrous innovation of platform enterprises.

2.3 "System-governance" configuration and platform enterprise ambidextrous innovation

Ambidextrous innovation behavior of enterprises is mainly influenced by macro-government policies (Li Wenjing et al., 2016) and internal organizational structure, namely "system-governance" configuration. Platform enterprises are access systems with cross-network externalities that connect users and enterprises and face greater institutional pressure in obtaining legitimate resources (Peng Zhengyin and Wu Xiaojuan, 2019). At the same time, corporate governance, as an enterprise institutional framework, plays a fundamental role in determining the innovation activities of current platform enterprises (Hua Jinyang, 2002). The institutional level reflects the external pressure that platform-type enterprises face when they acquire resources, while the governance level is related to the construction of internal organizational structure of enterprises. The different combination relations of the two determine the ability of enterprises to formulate macro-strategy and micro-management in the process of constructing, managing and participating in the network (He Jianhong et al., 2013), coordinating the dynamic ability of combination and restructuring transformation (Li Deqiang et al., 2017), enhancing enterprises' knowledge accumulation and enhancing enterprises' exploitative innovation ability (Yang Fei et al., 2017), and finally providing conditions for their exploitative and exploratory innovation behavior through internal resource reorganization and integration and resource creation (Xi Lei et al., 2017). And then affect the performance of enterprises' ambidextrous innovation.

3. Research design

3.1 Case selectio

Taking timeliness, annual report information release and establishment year of platform enterprises into consideration, this paper takes a-share main board companies of Shanghai and Shenzhen stock exchanges from 2018 to 2021 as initial observation cases and conducts screening as follows: (1) remove ST and ST* companies; (2) Eliminate the enterprises with missing data; (3) Through other primary and secondary materials (such as informal interviews, senior management speeches, platform experience, field research, enterprise website media interviews, professional books, papers and literature, etc.) to obtain the positioning of enterprises for themselves as platform-based enterprises. A total of 267 observation cases were selected from 95 platform enterprises. All the financial index data involved in this paper come from CSMAR and Wind databases.

(2) Measurement of outcome variables

With the strengthening of national supervision, the disclosure of financial statements becomes more standardized, standardized, and transparent. According to the Accounting Standards for Business Enterprises No. 6 - Intangible Assets (2006), the investment of internal development projects can be divided into research stage investment and development stage investment. This project will begin as exploratory innovation investment study phase and development phase as open innovation investment (BiXiaoFang et al., 2017), in order to avoid investment scale size influence on the results, the platform is adopted enterprise's expense accounts for the ratio of R&D expenditure to measure open innovation, capitalization accounts for the ratio of R&D expenditure measure exploratory innovation.

Table 2 Sample enterprise profile

The serial number	Platform enterprises	Amount of R&D input (expenditure) expense (YUAN)	Amount capitalized by R&D investment (expenditure) (YUAN)	Capitalized R&D (expenditure) as a percentage of R&D (%)
1	Gehua	49956649.41	1593706.02	3.09
2	China Unicom	858482986.50	450830789.00	34.43
3	jiadu Technology	78274353.86	88915828.25	53.18
4	Four create electronics	81972899.49	90530508.28	52.48
5	China overseas transport	48681487.90	46833367.47	49.03
6	People's Daily online	49013087.80	16037076.34	24.65
7	Cambridge technology	188698822.70	104080544.72	35.55
8	co., LTD shares	401818361.39	8275259.65	2.02
9	Hua Yang Lianzhong	259846749.78	19166174.70	6.87
10	New wisdom recognition	116066116.53	51217287.83	30.62
11	xing Map Xinke	29462903.11	3150989.56	9.66
12	Zhejiang number culture	215546296.74	194977154.67	47.49
13	number control 100 shares	183027209.87	7490958.48	3.93
14	ji Vision	58771456.29	26602983.76	31.16
15	The league of nations share	17290079.82	6459746.16	27.20
16	IReader Technology Co	116372346.41	4478488.40	3.71
17	xinhuanet	64096961.98	8422467.16	11.61
...	...	...	...	...
263	Sophia	150279595.63	9020734.71	5.66
264	Cross-border flow	67309290.87	46525017.98	40.87
265	Iflytek Co.Ltd	662773786.19	606818557.40	47.80
266	Shenzhen Yitao Intelligent Control Co.,Ltd	31035598.99	7978268.64	20.45
267	Qiming information	56787952.68	7084220.58	11.09

3.2 Selection of conditional variables

This paper measures the ambidextrous innovation input of current platform enterprises from two aspects: exploitative innovation behavior and exploratory innovation behavior. In the construction of "system-governance" system, six indicators are selected to measure ownership concentration, board capital, compensation incentive, tax incentive, financial support and property right protection according to the existing research basis.

Table 3 "Institutional-governance" variable definition table

Variable name		Discrimination basis	Measure method
Ownership concentration	OC	Distribution state and stable state of corporate equity	The sum of the squares of the proportion held by the top five shareholders
Board capital	BC	Provide human capital and social capital	Average age structure power board education background Board political relevance and factor analysis
Incentive mechanism	SI	Compensation and equity incentives for employees	Company executive compensation incentive equity incentive in-service consumption and factor analysis
Tax incentive	TI	All tax refunds received /(all tax refunds received + all taxes paid)	(nominal tax rate - effective tax rate)/ nominal tax rate
Financial support	F	The change or influence of enterprise behavior after the government implements policies	The government gives enterprises r&d subsidies, technological innovation subsidies, and technological subsidies
Property rights protection	IPP	The protection of the exclusive rights enjoyed by the state policy for the creative intellectual achievements of enterprises	The ratio of the number of patent infringement cases to the number of patent ownership (PI1) The ratio of the number of patent counterfeiting cases to the number of patent ownership (PI2) The ratio of the settlement of patent infringement disputes (CR) was analyzed by factor analysis

Governance level index data are mainly obtained from CSMAR database, Wind database and CNRDS platform. First of all, equity concentration refers to the measurement index of equity concentration by Yang Yong (2007) and is measured by the sum of squares of the proportion held by the top five shareholders of listed companies. Secondly, according to Hillma and Dalziel (2003), who first proposed the concept of board capital, this study selected the indicators of average age of board members, structural power, board education background (EDU) and board political connection (GOV) and conducted factor analysis to obtain the principal component score.

Structural power is measured by whether the CEO concurrently holds the position of director. When the CEO concurrently holds the position of chairman of the company, the value of structural power index is 2; when the CEO concurrently holds the position of director, the value is 1; when the CEO does not concurrently hold the position of director, the value is 0. The educational background of the board of directors is measured by the mean of the highest educational level of the board members, and the highest educational level is assigned as follows: 5 for doctoral students, 4 for master's students, 3 for undergraduate students, 2 for junior college students, and 1 for technical secondary school students and below. The degree of political connection of the board of directors is measured by the proportion of the members with political background in the board of directors, that is, the proportion of the members who

are currently or were once deputies to the National People's Congress or members of the CPPCC, or who have worked in the party, government and military in the total number of the board of directors. Finally, the incentive mechanism adopts the balance of executive compensation incentive, equity incentive and in-service consumption of platform enterprises, and takes logarithmic treatment respectively. Due to the limitations of information disclosure rules of Listed companies in China, in-service consumption is naturally concealed. Therefore, by referring to the method of Chen Donghua (2005), office expenses, travel expenses, business entertainment expenses, communication expenses, overseas training expenses and directors in the notes to the annual report can be found through the China Research data Service platform Membership fee, light fare and conference fee eight itemized data sum. Finally, the principal component score is obtained by subdividing item of each index through factor analysis.

Institutional index data are mainly obtained from The China Economic and Social Big Data Research Platform, the Database of China Economic Network and the State Intellectual Property Office. First of all, since the effective tax rate focuses more on the income tax burden, and empirical studies with preferential tariff policies in the past mostly adopt the variable of the effective tax rate (Shevlin, 1987; Wu Liansheng, 2009). Therefore, this study adopts the difference between the platform enterprise income tax and its actual comprehensive tax rate during the observation period to measure tax incentives to explore the tax preferences obtained by platform enterprises under the actual situation. Secondly, the financial support is measured by the government's financial subsidies to platform enterprises, including r&d subsidies, technological innovation subsidies and science and technology subsidies. Finally, property rights protection is measured by three indicators: the ratio of the number of patent infringement cases to the number of patent ownership (PI1), the ratio of the number of patent counterfeiting cases to the number of patent ownership (PI2), and the ratio of settlement of patent infringement disputes (CR) (Zhuang Ziyin et al., 2021; Shi Yupeng et al., 2013), the detailed measurement method of each indicator is as follows:

$$PI1 = \frac{\text{Cumulative number of patent infringement disputes}}{\text{The accumulative number of patents granted in the region}} \times 100\% \quad (1)$$

$$PI2 = \frac{\text{Total number of cases of patent counterfeiting}}{\text{The accumulative number of patents granted in the region}} \times 100\% \quad (2)$$

$$CR = \frac{\text{Total number of patent infringement disputes settled}}{\text{Cumulative number of patent infringement disputes}} \quad (3)$$

3.3 Calibration

In the qualitative comparative analysis method of fuzzy sets, data calibration is the process of assigning membership degree to case sets (Ragin, 2008). According to relevant theories, practical standards and specific understanding of the problem solved, three critical values are set, which are complete membership, intersection point and complete non-membership, and the membership degree of the numerical set is between 0 and 1. Referring to existing studies, the basic anchor points were determined on the basis of following the quartile calibration method, and the three anchor points of the conditional variable and the resulting variable were set as the upper quartile, the median and the lower quartile of the sample data respectively. At the same time, considering that there are great differences in system and governance indicators of various platform-based enterprises at different scales, this paper uses the direct calibration method to determine anchor points for structural calibration. The calibration anchors of each variable are shown in Table 4 below.

Table 4 Calibration anchor points for each variable

The research variables		Anchor		
		Full nonmembership	Cross point	Full membership
conditional variable	Equity concentration Board of Directors (OC)	0.06	0.11	0.17
		3.94	4.05	4.18
	Board capital (BC)	1935550	3137250	5200950
	Incentive mechanism (SI)	0.08	0.21	0.60
		17.10	17.95	18.88
	Tax incentive (TI)	0.01	0.01	0.02
	Financial support (F)	0.64	0.84	0.94
outcome variable	Property rights protection (IPP)			
	Development innovation (DI)	0.06	0.16	0.36
	Exploratory innovation (EI)			

Based on the above calibration method, the conditional variable and the result variable were assigned values. FsQCA3.0 software was used to construct the initial table and perform the truth table operation. The initial values are shown in Table 5.

Table 5 Initial table of conditional variables and outcome variables of platform enterprises' ambidexterity innovation

Research case	conditional variable						Outcome variable	
	Governance			Institution			DI	EI
	OC	BC	SI	TI	F	IPP		
High-speed Railway in China	0.06	0.56	0.23	1	1	0.95	0.2	0.83
Visual China Group	0.04	0.96	0.97	1	0.05	0.22	0.02	0.98
HAN'S LASER	0.02	1	0.09	0.55	1	0.22	0.95	0.05
Dhi sichuan pharmaceutical co.	1	0.77	0.95	1	0.05	0.49	0.14	0.88
Number of zhejiang culture	0.98	0.02	0.05	0.49	0.08	0.98	0	1
Thousands of industry enterprise	0.56	0.25	0.75	1	0.02	0	0	1
Three Ann photoelectric	0.61	0.06	1	1	1	0.05	0	1
Jin Yu group	0.01	0.99	0.26	0.06	0.7	1	0.95	0.05
East of material science and technology	0.04	1	0.98	0.14	0.01	0.99	0.4	0.64
sinotrans	1	0.82	1	0.17	1	0.95	0.01	1
Peoples Network	0.99	0.17	0.66	0.93	0.16	0.95	0.95	0.05

Cambridge technology	0.1 6	1	0.5 5	0.0 1	0.0 6	0	0	1
Embellish of medical	0.0 4	0.0 4	0.9 5	0.9 4	0.0 2	0	0.95	0.05
In the stock	0.7 1	0.6 8	1	0.0 2	0.0 7	0.2 2	0.49	0.55
Vertex software	0.5	0.2 5	0.0 5	1	0.3 9	0	0.95	0.05
He shares	1	1	0.4 3	0.0 2	0.0 5	0.9 5	0.05	0.96
...	...	...	...	...	...	...	...	...
Yang hua community	0.7 2	1	0.2 1	0.0 3	0.0 3	0.9 5	0.95	0.05
The new intellectual cognition	0.8	0.9 9	0.9 6	0.8 8	0.6 6	0	0.04	0.96
xinhuanet	1	0.9 9	0.8 7	0.7 1	0.9 2	0.9 5	0.18	0.85
Trillion easy innovation	0.0 2	0.9 5	0.0 1	0.4 5	0.3 1	0.9 5	0.26	0.78

4. Empirical research result

4.1 Analysis of necessary conditions

According to the basic flow of fsQCA analysis, this paper first analyzes the necessity of a single condition. The necessary conditions in this paper refer to all those that can produce "high exploitative innovation behavior" and "high exploratory innovation behavior". Condition variables that must occur in the condition configuration of. Necessity analysis explores the relevance between the result set and the condition set in the set membership degree. When the result appears with a high frequency, the condition is called the necessary condition for the existence of the result. In the necessary condition analysis of fsQCA, the consistency indicator is used to measure the extent to which the result variable is a subset of the condition variable. The consistency score of necessary conditions should reach 0.9, with sufficient coverage (Douglas, 2020), and the logical residual hypothesis should be excluded before the sufficiency analysis to enter the minimization procedure to avoid the elimination of necessary conditions (Schneider & Wagemann, 2012).

Table 6 Necessity analysis of a single condition

Antecedents	Exploratory innovation behavior	Development innovation behavior
	Consistency	
Equity concentration Board of Directors	0.460407	0.626915
~Equity concentration Board of Directors	0.63299	0.460273
Board capital	0.587385	0.513295
~Board capital	0.512295	0.579758
Incentive mechanism	0.523861	0.552986
~Incentive mechanism	0.566898	0.531739
Tax incentive	0.563725	0.562473
~Tax incentive	0.545341	0.539343
Financial support	0.551097	0.538127

~Financial support	0.531828	0.539285
Property rights protection	0.540252	0.535838
~Property rights protection	0.564781	0.562212

The results of necessity analysis by using fsQCA software are shown in Table 6. The above condition variables do not exist when the consistency is greater than 0.9, so there is no necessary condition. This paper will further identify the "institutional-governance" configuration through adequacy analysis.

4.2 Sufficiency analysis of conditional configuration

In the process of analysis of truth table, using standard analysis, the software can output three kinds: complex solution (without any counterfactual analysis and do not include any more than logic), simple solution (through simple and difficult counterfactual analysis included in more than all the logic and evaluate its rationality), intermediate solution (only consider the simple fact that points Analysis and elimination of necessary conditions). Among them, the intermediate solution only includes the logical remainder consistent with theory and empirical evidence, which is generally superior to the other two solutions and is the first choice for analysis in QCA studies (Zhang Ming and Du Yunzhou, 2019). In this paper, the sufficient condition to be obtained is the condition configuration that can produce "high exploitative innovation behavior" or "high exploratory innovation behavior". On the basis of the initial table, fsQCA3.0 software was used to construct the truth table. In the operation of the truth table, consistency threshold was set to 0.85, the case threshold (Frequency) is set to 1, and three kinds of corresponding solutions are obtained. The kernel is distinguished by the reductive and intermediate solutions. If the antecedent condition appears in both the reduced solution and the intermediate solution, it is the core condition that has an important influence on the results. If the antecedent condition only appears in the intermediate solution, it is the edge condition of the auxiliary contribution, and the configuration results are presented in Table 7.

Table 7 Corresponding configuration solutions of high exploration and high development innovation behavior

conditional variable	High exploratory innovation behavior		High development innovation behavior
	1	2	1
Equity concentration Board of Directors	⊗	●	●
Board capital	●	●	
Incentive mechanism	⊗	⊗	●
Tax incentive	⊗	⊗	●
Financial support	⊗	●	⊗
Property rights protection	●	●	⊗
Consistency	0.870821	0.867133	0.91441
cover degree	0.0888993	0.0577147	0.0758201
Unique coverage	0.0617486	0.030564	0.0758201
Consistency of the population solution	0.872522		0.91441
The coverage of the population solution	0.119463		0.0758201

Note: "●" indicates the existence of core conditions; "⊗" indicates the existence of the core condition of logical "no". "●" indicates that auxiliary conditions exist. "⊗" indicates absence of auxiliary conditions. The space indicates that the condition variable is optional.

It can be seen from Table 7 that there are three configurations that lead to enterprise innovation behavior, among which the high exploratory innovation row corresponds to two configurations. In the configuration listed in the above table, for high exploratory innovation behavior, the consistency level of single solution (configuration) and the overall solution is 0.87, and the coverage of the overall solution is 0.12. For high development innovation behavior, the consistency level of single solution (configuration) and the overall solution is 0.91, and the coverage of the overall solution is 0.08, indicating that sufficient conditions have been formed to lead to the results, and the configuration effect is significant.

① High exploratory innovation behavior configuration analysis

Board capital, property rights protection, non-incentive mechanism and non-tax incentive all play a core role. Because the exploratory innovation focused on more uncertain fuzzy situation, investment cycle is long, the risk is big, need more resources behind the strong supply and continuously optimize financing environment, the director of education background, political association and composition of the board of directors capital is abundant, the more able to bring in the enterprise wide financing channels and preferential policies, and promote enterprise exploratory innovation. In addition, when the location of an enterprise has a strong property rights protection policy, it can promote the introduction of high-level innovative talents, stimulate the initiative innovation ability of the enterprise by avoiding technology spillover and reducing the risk of infringement, and realize high exploratory innovation behavior. Secondly, due to the risk aversion and short-sightedness of senior executives, only when enterprises change the incentive mechanism based on traditional compensation incentive, can managers be relieved of their worries and more willing to implement exploratory innovation behavior decisions with long return cycle but beneficial to the long-term development of enterprises. Finally, when companies get more tax exemption or lower tax rate, demand for improve the profit of the current period, will be more inclined to increase capital investment to improve the product with high profitability and enlarge its production scale and decrease the R&D of a new field, new products, thus inhibiting the enterprise high exploratory innovation behavior.

Configuration 1 ($OC \times BC \times Si \times Ti \times F \times IPP$) indicated that the presence of board capital and property rights protection, absence of ownership concentration, fiscal subsidy, incentive and tax mechanism, would lead to a high level of exploratory innovation behavior. Among them, ownership concentration, board capital, incentive mechanism, tax mechanism and property right protection are the core conditions, and fiscal subsidy is the marginal conditions. The level of ownership concentration determines the function of the board of directors and the ultimate controller, and also affects the incentive effect of shareholders on corporate executives. When the equity of a company is too dispersed, the external supervision cost of a single shareholder is high and the individual shareholder lacks supervision willingness and motivation, which forces the company to formulate a more comprehensive executive incentive plan, and ultimately affects the support and execution effect of the board capital for the enterprise's exploratory innovation behavior. On the contrary, when the ownership concentration level of the company is too high, the major shareholders have the advantage of control, and their decision-making on innovation behavior is mainly based on personal preference and evaluation of future earnings, which is highly subjective and dependent on personal ability, which is not conducive to the improvement of the efficiency of innovation resource allocation and the landing and development of exploratory innovation behavior.

Configuration 2 ($OC \times BC \times Si \times Ti \times F \times IPP$) indicates that high ownership concentration, board capital, financial subsidies and environmental protection, and low incentive mechanism and tax incentive will constitute the sufficient conditional configuration of high exploratory innovation behavior. Here, board capital, financial subsidies, property rights protection, non-incentive mechanism and non-tax incentive play a core role, and ownership concentration plays a supplementary role. On the one hand, the protection of property rights can protect the patent owner's technological monopoly, mobilize the initiative of innovation subjects, and reduce the spillover of innovation resources. On the other hand, fiscal subsidies can alleviate the soft budget constraints of innovation subjects and release signals of strong economic benefits for external investors, thus playing a leverage role to promote the inward flow

of innovation resources. The combined effect of the two aspects can realize the agglomeration of innovation resources in enterprises to a great extent and ultimately promote the production of exploratory behavior of enterprises. The moderate concentration of equity further strengthens the owner's control over the board of directors, and the capital role of the board of directors enables the board of directors to choose those with stronger management ability and decision-making style more in line with the development path of the enterprise. Agent is beneficial to prompt managers to pay more attention to the long-term development of enterprises, and further promote the sustainability and rationality of enterprise technological innovation strategy decision-making and implementation.

② Configuration analysis of highly exploitable innovation behavior High development innovation behavior corresponds to a configuration ($OC \times SI \times TI \times F \times IPP$), in which ownership concentration, incentive mechanism, tax incentive, non-financial subsidy and non-property right protection all play a key role in development innovation behavior. Exploitative innovation behavior mainly uses existing resources for organizational development. Compared with exploratory innovation behavior, exploitative innovation behavior is more predictable, less risky and less cyclical. Tax incentives significantly reduce the cost of enterprises' development innovation behavior, and directly affect the innovation degree and quality of enterprises' products in the short term, which has a significant promoting effect on enterprises' development innovation behavior in the short term. Failure risk type gauge avoid tendency executives for innovation influence on their pay income, will often choose to reduce innovation investment decisions, so rich and complete management equity incentive and salary incentive executives can effectively dispel risk concerns, at the same time increase the enterprise R&D investment, ultimately promote effectively the high open innovation activities of enterprises in the short term. When the degree of external property rights protection is low, technological resources are more open, it is more difficult to obtain financial subsidies for R&D and technological innovation, and the uncertainty between industries increases. Enterprises are more inclined to realize sustainable development through the optimization of internal processes and products in the existing field, thus promoting the development of innovation behavior.

(3) Robustness test

Referring to the existing literature, there are four methods for QCA robustness test, including increasing or decreasing case samples, increasing PRI consistency threshold, increasing original consistency threshold, and adding other conditions. In this paper, we use the method of changing the consistency threshold to test robustness (Zhang Ming, Du Yunzhou;2019). For the two outcome variables of high exploratory innovation behavior and high exploitative innovation behavior, the consistency threshold is adjusted from 0.85 to 0.9. The new configuration results are consistent with the above analysis results, indicating that the empirical results of this paper are robust.

5. Conclusions and prospect

5.1 Conclusions

High exploitative innovation behavior and high exploratory innovation behavior are two important indicators for platform enterprises to carry out ambidextrous innovation, and various indicators at the institutional and governance levels have different degrees of impact on high exploitative innovation behavior and high exploratory innovation behavior. In this paper, the institutional level of the "institution-governance" configuration is divided into three dimensions of tax incentive, financial support and property rights protection, and the governance level is divided into three dimensions of ownership concentration, board capital and compensation incentive. The exploratory innovation behavior and exploratory innovation behavior of platform enterprises are analyzed using ambiguity. Based on qualitative comparative analysis (fsQCA), this paper studies the relationship between the "institution-governance" configuration of platform-based enterprises and their development-type innovation behavior and exploration-type innovation behavior, and draws the following conclusions:

① Board capital is the core condition for high exploratory innovation behavior of platform enterprises. In this study, the average age of board members is higher, the proportion of CEO concurrently serving as board members of other companies is higher, the board members have higher educational background and more political resources mean strong board capital. Higher average age represents richer external market experience and internal management ability, providing stronger empirical support for enterprises' exploratory innovation behavior. When the CEO concurrently holds the position of director of other enterprises in the industrial chain, there are information channels between enterprises to communicate with the changing external environment, which is conducive to timely decision-making on exploratory innovation behavior. Higher educational background represents stronger market analysis and risk bearing ability, scientific decision-making and exploratory innovation behavior process. When board members have more political resources, enterprises can more easily obtain the resources needed for development and reduce their own investment risks. Therefore, platform enterprises can promote their exploratory innovation behavior by increasing the age and education threshold of board members, the proportion of CEO holding the same position as board members of other enterprises in the same industry chain, and the political resource source of board members.

② Property rights protection is the core condition of high exploratory innovation behavior of platform enterprises. Further strengthening of ipr protection by the government can not only reduce the risk of ipr infringement by platform-based enterprises, but also encourage platform-based enterprises to increase r&d investment in exploratory innovation in pursuit of long-term benefits. And can reduce the financing platform for enterprises to explore a new type behavior of asymmetric information problem, namely the platform for enterprises under the system of the environment of strong intellectual property protection, more willing to exploratory innovation behavior and prospect to disclose relevant information to the outside capital providers, long cycle for the platform type enterprise, risk of exploratory innovation behavior to provide the external institutional guarantee. Therefore, the government can actively establish a strong intellectual property protection environment to encourage platform-type enterprises to explore innovative behavior.

③ Incentive mechanism and tax incentive are the core conditions of platform enterprises' high development innovation behavior. Incentive mechanism is mainly manifested by short-term cash compensation or bonus based on current financial performance. In order to pursue short-term interests, senior executives prefer to choose the development innovation behavior with fast return and low investment risk as the main innovation behavior to promote enterprise performance. Tax incentives can provide financial support for the development innovation behavior of platform enterprises in the short term, reduce the tax burden and external financing cost of platform enterprises, increase the available funds for the innovation behavior of platform enterprises, and help the market to provide greater support for the development innovation behavior of such enterprises in the short term. Therefore, platform-based enterprises can improve the incentive mechanism of executives and actively strive for government tax incentives to promote their development-oriented innovation behavior.

④ By exploring the different configuration of high exploration and high development innovation behavior, it can be found that for high exploration innovation behavior, board capital in internal governance factor and intellectual property protection in external institutional factor are the core conditions of high exploration innovation behavior. In the internal governance of platform enterprises, the board of directors should accumulate resources from all sides more actively, and further promote exploratory innovation behavior by improving the experience, educational background, degree of association with other platform enterprises and political resources of board members. For platform enterprises facing the external environment, the executive floor response and have a keen insight into the current market environment, when the government is encouraging innovation, provide enterprises with strong intellectual property rights protection of the environment, senior management should seize the opportunity in time, in this environment promote the development of exploratory innovation behavior, improve the innovation performance type platform exploratory innovation behavior.

For high exploitative innovation behavior, ownership concentration in internal governance factors, incentive mechanism and tax incentive in external institutional factors are the core conditions of high

exploitative innovation behavior. In the internal governance of platform enterprises, the board of directors should improve the degree of ownership concentration by repurchasing shares and issuing new shares to the management. At the same time, in order to improve the innovation performance of development innovation behavior, the incentive mechanism for senior executives should be constantly optimized to make the incentive system more scientific and humanized. As for the external environment faced by platform enterprises, senior management can select the entry point of open innovation behavior according to the current tax incentive situation, so as to improve the innovation performance of open innovation behavior more specifically.

Platform enterprises should improve the influencing factors of internal governance and external environmental factors conducive to the further promotion of innovation behavior according to different categories of ambidextrous innovation behavior.

5.2 Limitations and prospects

The research on enterprise ambivalent innovation behavior is in the ascendancy. This paper makes a beneficial exploration in this field, but there are many limitations. First, the data selected in this study are all statistical data from major authoritative databases, and there is no field survey of platform enterprises. Secondly, due to the short period of time when the concept of platform enterprise was put forward, the amount of data available for this study is small, and the results are not universal in terms of time dimension.

In the follow-up research, the following methods can be used for improvement: First, the first-hand data can be extracted by visiting and investigating platform enterprises to more accurately depict the overall picture of today's platform enterprises; Second, the dynamic tracking of the platform enterprises selected in this study and the longitudinal study of other typical platform enterprises in the market are conducted to further explore the relationship between the dynamic change of "institution-governance" configuration and the performance of binary innovation.

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