

Research on the Formation Mechanism of Local Government Open Data (Postprint)

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Abstract

[Purpose/Significance] Promoting government data sharing and openness constitutes a fundamental prerequisite for fostering digital economy development and enhancing social governance effectiveness. [Method/Process] Grounded in a three-dimensional framework encompassing demand orientation, driving force support, and digital empowerment, this study examines 31 Chinese provinces (excluding Hong Kong, Macao, and Taiwan) as research cases, employing fuzzy-set Qualitative Comparative Analysis (fsQCA) to conduct a configurational analysis of factors influencing government data openness. [Results/Conclusion] No single factor can independently drive high levels of government data openness; rather, these factors operate through configurational forms. The interactive effects among elements across the three dimensions—demand orientation, driving force support, and digital empowerment—yield five configurational paths that drive government data openness. Based on their dominant forces, these paths can be categorized into three types: demand-oriented, digital empowerment, and hybrid linkage. Accordingly, it is imperative to identify the key forces driving local government data openness, formulate optimal policy toolsets tailored to local conditions, advance orderly government data openness, and further unleash data vitality and benefits.

Full Text

Preamble

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Research on the Generation Mechanism of Local Government Data Openness

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Abstract:

[Purpose/Significance] Promoting government data sharing and openness is fundamental to fostering digital economy development and enhancing social governance effectiveness. [Method/Process] Based on a three-dimensional framework of demand orientation, power support, and digital empowerment, this study takes 31 Chinese provinces (excluding Hong Kong, Macao, and Taiwan) as research cases and employs fuzzy-set qualitative comparative analysis (fsQCA) to conduct a configurational analysis of factors influencing government data openness. [Result/Conclusion] No single factor can drive the generation of high-level government data openness; rather, factors operate in configurational forms. The interactive effects of elements across the demand orientation, power support, and digital empowerment dimensions form five configurational paths that drive government data openness. Based on the dominant forces, these paths can be categorized into three types: demand-oriented, digital empowerment, and hybrid linkage. Therefore, it is essential to identify the key forces driving local government data openness, formulate optimal policy toolsets tailored to local conditions, promote orderly government data openness, and further unleash data vitality and benefits.

Keywords: Open Government Data; Data Value; Digital Economy; Digital Governance

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In recent years, digital technologies such as artificial intelligence, cloud computing, and blockchain have matured and been integrated into digital government construction, driving government digitalization and intelligent transformation while enhancing governance effectiveness. During digital transformation, governments produce, collect, and control vast data resources covering all aspects of society. If government data can be safely and orderly opened, it will further unleash the value of data resources, promote digital economy development, and enhance digital governance effectiveness. Against this backdrop, the Chinese government has attached great importance to data openness. In March 2021, the *Outline of the 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives Through 2035* proposed establishing and improving the national public data resource system and promoting the safe and orderly opening of basic public information data. In January 2022, the State Council's *14th Five-Year Plan for Digital Economy Development* identified data resources as key elements of the digital economy and a strong driver of economic and social digital development, calling for promoting the safe and orderly opening of basic public data, strengthening the supply of high-quality data elements, and activating data element potential. In February 2023, the *Overall Layout Plan for Digital China Construction* issued by the CPC Central Committee and State Council proposed unblocking the data resource circulation cycle and promoting the aggregation and utilization of public data. These successive policies reflect the government's high regard for data openness work and provide policy guidance for local data openness initiatives.

In response to central government calls to enhance data openness levels, local governments have actively introduced relevant policies to advance government data openness. For instance, Guizhou Province promulgated the *Interim Measures for the Management of Government Data Resources in Guizhou Province* to standardize the management of government data resources; Guangdong Province issued the *Interim Measures for the Opening of Public Data in Guangdong Province* to regulate and promote the opening and development of public data; and Zhejiang Province introduced the *Regulations on Public Data in Zhejiang Province* to construct an orderly public data opening system. Promoting government data openness has become a key component of local digital government construction. However, the *China Local Government Data Openness Report—Provincial Level (2021)* [1] indicates significant disparities in current government data openness levels across regions. This raises the question: Why do such vast gaps exist in local government data openness levels despite similar policy drivers, and how do these differences emerge? This is the core question this paper attempts to answer. To this end, this study takes 31 provincial-level administrative units nationwide as cases and employs qualitative comparative analysis to reveal the factor configurations and pathways driving government data openness, aiming to provide useful references for local data openness practices.

1.1 Literature Review

Government data, also known as public data or administrative data, can be considered as data generated and obtained by public management and service institutions in fulfilling their duties [2]. Further, government data openness refers to government departments disclosing non-confidential data they control to society to facilitate public access and use, thereby activating data element value [3]. Government data has public attributes, and promoting government data openness and sharing helps unleash both economic and social value [4]. Regarding economic value, research by Huang Xianhai et al. indicates that government data openness can enhance urban digital industry entrepreneurship vitality and talent agglomeration, thereby improving urban innovation levels [5]. Regarding social value, Men Yulu et al. argue that government data openness enables two-way information interaction between government and other social actors, jointly participating in building a social trust system and achieving more effective social cooperative governance [6].

Building on clarified conceptual connotations and significance, scholars have conducted multi-angle research on factors influencing government data openness. Government data openness involves stakeholders including government departments, the public, and enterprises, and is influenced by political, economic, cultural, and other multidimensional factors [7]. Zheng Lei notes that government departments, as the disclosing parties of government data, have internal processes and data openness strategies that significantly impact data openness levels [8]. Hao Wenqiang finds that an open administrative culture

can promote government data departments' recognition of the practical significance of data openness, playing an important driving role [9]. Tang Zhiwei and Wang Yan point out that resources required for government data openness all need financial support, and increasing fiscal support for data openness platform construction can enhance government data openness levels [10]. Cheng Feng and Shao Chunxia argue that social actors such as the public, as the targets of government data openness, their ability to receive, feedback, and utilize data directly affects government data openness levels [11]. Han Xiao and Wu Jinpeng believe that digital infrastructure, as a key component of the data openness ecosystem, helps improve the accessibility of government data openness and has a significant positive effect [12].

In summary, existing literature has extensively explored the connotation, value, and influencing factors of government data openness, providing important references for this study. However, further investigation is still needed. On the one hand, existing research has focused on verifying correlations between single factors and government data openness levels, neglecting the interactive relationships where factors may interact and jointly shape outcomes. On the other hand, relevant studies have overlooked regional differences and failed to explain and investigate the generation mechanisms behind disparities in local government data openness levels. In view of this, this paper takes 31 provinces nationwide as samples, employs fuzzy-set qualitative comparative analysis based on a configurational perspective, analyzes influencing factors of local government data openness levels, presents pathway patterns for generating high local government data openness levels, and expects to provide insights and references for local government data openness practices.

1.2 Research Framework

Government data openness faces a complex and rapidly changing social field, influenced not only by demands from social actors but also by intergovernmental competition and digital transformation drivers. Multiple overlapping factors affect local government data openness levels, so regions often advance government data openness orderly based on their own realities and resource conditions. Accordingly, this paper explores configurational pathways leading to the desired outcome (high government data openness level) from three dimensions—demand orientation, power support, and digital empowerment. The analytical framework is shown in Figure 1 [Figure 1: see original paper].

Figure 1 Analytical Framework

First, **demand orientation** affects local government data openness through two aspects: public demands and business needs. Government data openness adheres to the “people-centered” principle, and meeting public demands for accessing and utilizing government data is the core essence and practical orientation of data openness. Government open data serves as an information element for business decision-making, holding important practical significance in

assisting enterprises to optimize resource allocation and improve production efficiency. Second, **power support** includes intergovernmental competition and fiscal support. On the one hand, amid increasingly intense “local competition,” local governments’ competitive strategies have gradually shifted from “competing for industries” and “competing for investment” to “competing for rankings” and “competing for indices,” focusing more on optimizing government services and improving governance effectiveness to enhance local livability and business environment and strengthen sustainable development momentum. Government data openness, as part of public service optimization, can meet social actors’ needs for government information and data, inherently containing government service responsiveness to public opinion. When local public policy makers have not yet grasped the actual status of local government data openness, emulating and referencing data openness policies issued by peer governments or administrative agencies becomes a rational strategy, leading to spatial correlation in adjacent regions’ government data openness behaviors [17]. This paper measures the intensity of intergovernmental competition using the mean value of surrounding provinces’ data openness indices, with data from the *China Local Government Data Openness Report—Provincial Level (2021)*. **Fiscal support** is crucial as responding to social actors’ data openness demands and optimizing data openness services requires continuous fiscal investment to fund data collection, cleaning, desensitization, updating, etc., providing society with continuous data resources. Current data openness practices basically position data openness as inclusive services, with fiscal funds supporting free public access. However, some regions have limited fiscal support capacity, making the sustainability of public data openness difficult to guarantee, let alone funding platform optimization and tool open-sourcing [18]. Thus, fiscal investment intensity significantly impacts local government data openness levels. This paper measures fiscal support intensity using the proportion of local fiscal general public service expenditure to total fiscal expenditure, with data from the *China Statistical Yearbook 2022*.

Third, **digital empowerment** comprises digital infrastructure and digital governance capacity. Maximizing data element value requires ensuring data resource quality and improving data openness levels to better leverage data’s fundamental resource role and enabling effects. The notion of “using data for decision-making and governance” reflects data elements’ driving role in digital transformation, while building 完善的 digital infrastructure is the prerequisite and foundation for orderly data resource development and utilization. Only by accelerating digital infrastructure construction such as local digital centers can we promote government cloud adoption across regions and departments, facilitate inter-departmental data sharing, support integrated government data openness platform operation, and improve citizens’ data service experience. Thus, government data openness requires relatively high local digital infrastructure construction levels. This paper measures local digital infrastructure construction level using the proportion of local internet broadband access users to total population, with data from the *China Statistical Yearbook 2022*. **Digital gov-**

ernance capacity is also critical. While integrated data openness and sharing platforms provide effective support for public data openness, government personnel' s digital literacy and skills also affect digital platform operational effectiveness. Beyond emphasizing digital information technology' s enabling role, enhancing government digital governance capacity is equally crucial. Government digital governance capacity focuses on how governments reconstruct organizational models and optimize government service systems through digital resource integration and utilization to improve public service quality and efficiency. In June 2022, the State Council issued the *Guiding Opinions on Strengthening Digital Government Construction*, proposing to build a new digital and intelligent government operation form and promoting government departments' standardized and orderly use of new technological means to empower management services. Improving government data openness levels requires corresponding digital governance capacity. This paper measures government digital governance capacity using the Digital Government Development Index, with data from the *China Digital Government Development Research Report (2021)* compiled by the Data Governance Research Center of Tsinghua University' s School of Social Sciences.

Table 1 Variable Settings

Variable	Measurement	Data Source
Government Data	Local Government Data	<i>China Local Government</i>
Openness	Openness Index	<i>Data Openness Report</i>
Public Demand	Relative Scale of Local Internet Users	<i>China Statistical Yearbook</i>
Business Needs	Local Economic Development Level	<i>China Statistical Yearbook</i>
Intergovernmental Competition	Mean Value of Neighboring Provinces' Data Openness Indices	<i>China Local Government Data Openness Report</i>
Fiscal Support	Proportion of Fiscal Public Service Expenditure	<i>China Statistical Yearbook</i>
Digital Infrastructure	Relative Number of Internet Access Users	<i>China Statistical Yearbook</i>
Digital Governance Capacity	Digital Government Development Index	<i>China Digital Government Development Research Report</i>

2.3 Measurement and Calibration

QCA identifies causal relationships between antecedent and outcome variables through case-based qualitative measurement, with all variables existing as unique sets. While raw data reflects differences in sample variable values, it

cannot meet fsQCA' s Boolean logic operation requirements. Therefore, before conducting configurational analysis, data calibration is needed to convert all variables into fuzzy-set membership scores between 0 and 1 to clarify sample membership categories and degrees. Following FISS' s [19] calibration method, this study uses the 75th, 50th, and 25th percentiles of sample data to set anchors for full membership, crossover point, and full non-membership, respectively, then calibrates using fsQCA software. All variable calibration results are shown in Table 2 .

Table 2 Variable Calibration

Variable	Full Membership (75%)	Crossover Point (50%)	Full Non-Membership (25%)
Government			
Data			
Open-			
ness			
Public			
Demand			
Business			
Needs			
Intergovernmental			
Compe-			
tition			
Fiscal			
Support			
Digital			
Infras-			
tructure			
Digital			
Gover-			
nance			
Capac-			
ity			

3.1 Necessity Test

Before exploring antecedent variable configurational pathways affecting the outcome variable, necessity tests must be conducted to verify the explanatory power of individual antecedent variables on the outcome variable and determine whether a single antecedent variable constitutes a necessary condition for the outcome variable. According to fsQCA' s operational logic, the indicator for judging whether a single antecedent variable is a necessary condition is the consistency level. If the consistency level exceeds 0.9, the antecedent variable is considered a necessary condition for the outcome variable [20]. If no antecedent

variable' s consistency level exceeds 0.9, it indicates no single antecedent variable can independently dominate the outcome variable, meaning the outcome variable results from the joint action of antecedent variables. Additionally, the coverage indicator is only meaningful for necessary conditions that pass the consistency test and has no acceptable lower threshold [21].

Using fsQCA software to conduct single-factor necessity tests for each antecedent variable, the results are shown in Table 3 . The results show that no antecedent variable' s consistency level exceeds 0.9, indicating that public demand, business needs, intergovernmental competition, fiscal support, digital infrastructure, and digital governance capacity are all not necessary conditions for government data openness. In short, improving government data openness levels cannot rely on a single antecedent variable; further exploration of antecedent variable configurations driving government data openness is needed to identify their joint effects. Thus, all antecedent variables must be included in subsequent configurational analysis.

Table 3 Necessity Test

Antecedent Variable	Consistency	Coverage
Public Demand		
Business Needs		
Intergovernmental Competition		
Fiscal Support		
Digital Infrastructure		
Digital Governance Capacity		

3.2 Configuration Analysis

After necessity testing, configuration analysis can explore combinations of different antecedent variables leading to expected outcomes. Configuration analysis requires setting three key parameters: frequency threshold, raw consistency threshold, and PRI value. Since this study' s sample size is medium-to-small, the frequency threshold is set to 1, the raw consistency threshold uses the system default of 0.8, and the PRI value is set to 0.7 [22]. With reasonable parameter settings, software operation yields three solutions of varying complexity: complex, intermediate, and parsimonious. Generally, the intermediate solution, which includes logically residual items with reasonable justification, is superior to the complex and parsimonious solutions and is the desired result [23]. Further, core and peripheral conditions are identified based on the nesting relationship between intermediate and parsimonious solutions: conditions included in both intermediate and parsimonious solutions are considered core conditions, while those only in the intermediate solution are peripheral conditions [24].

Table 4 Configuration Analysis Results

Configuration	Public De- maion	Business Needs	Intergovern- ment Competi- tion	Fiscal Sup- port	Digital Infras- truc- ture	Digital Gover- nance Capacity	Raw Cov- er- age	Unique Cov- erage
Demand- Driven Digital ~ Em- pow- er- ment 1			~					
Digital ~ Em- pow- er- ment 2		~						
Hybrid ~ Link- age 1		~			~			
Hybrid Link- age 2		~		~	~	~		
Total Cov- er- age Total Con- sis- tency							0.678725	0.886924

Note: indicates core condition present, indicates peripheral condition present, indicates core condition absent, indicates peripheral condition absent, blank indicates the condition variable may be either present or absent in the configuration path.

Through fsQCA3.0 software operation, five configurational paths were obtained, as shown in Table 4 . The total consistency value is 0.886924, exceeding the acceptable minimum standard of 0.75, indicating valid configurational analysis results. The total coverage is 0.678725, reflecting that these five configurational paths can explain over 67% of cases with high government data openness levels.

Each configuration path's consistency value exceeds 0.8, demonstrating strong explanatory power.

Analysis of these configurational paths clarifies the joint logic of antecedent variables for high government data openness levels, providing references for local data openness. Based on the distribution of core and peripheral conditions in configurational paths, this paper identifies three patterns for achieving high government data openness levels. The first is **demand-oriented**, where demand factors play a core role. The second is **digital empowerment**, where digital factors play a core role. The third is **hybrid linkage**, driven by combined elements across different dimensions. Specific case analyses of these three configurational paths follow.

(1) Demand-Oriented Type. Configuration 1 belongs to the demand-driven type, expressed as: High Government Data Openness = Public Demand $\times$ Business Needs $\times$ Intergovernmental Competition $\times$ Digital Governance Capacity. This path indicates that when local governments face high public data openness demands and business environment construction pressures, driven by intergovernmental competition, those with higher digital governance capacity will enhance data openness levels. This configurational path can explain approximately 40% of high government data openness cases, with typical cases including Shanghai, Zhejiang, Jiangsu, Guangdong, Tianjin, Beijing, and other municipalities/provinces. Taking Zhejiang as an example, to leverage data elements' key role and promote comprehensive data integration into production and social service management, Zhejiang formulated a provincial public data openness list covering healthcare, social security, employment, and other fields. To better respond to public demands, Zhejiang held data openness innovation application contests to cultivate economically and socially beneficial, people-centered data openness innovations. Regarding business environment construction, Zhejiang piloted national data basic systems, continuously improved integrated digital resource system functions, achieved automatic opening and unified acceleration of public data and government cloud resources at provincial, municipal, and county levels, and built an intelligent and efficient digital business environment. To achieve the goal of "benchmarking against international first-class and targeting domestic best," Zhejiang comprehensively implemented the *Zhejiang Province Public Data Regulations*, pioneered a data basic system framework, leveraged digital government construction to drive data resource sharing and openness application innovation, and created a digital China demonstration zone and global digital transformation highland.

(2) Digital Empowerment Type. Configurations 2 and 3 belong to the digital empowerment type. Although their paths differ, both reflect digital empowerment's core driving role in government data openness. Configuration 2 is expressed as: High Government Data Openness = $\sim$ Public Demand $\times$ Intergovernmental Competition $\times$ $\sim$ Fiscal Support $\times$ Digital Infrastructure $\times$ Digital Governance Capacity, where intergovernmental competition, digital infrastructure, and digital governance capacity are core conditions. This configuration

shows that even lacking public demand and fiscal support, local governments with good digital infrastructure and digital governance capacity will strive to promote data openness when driven by intergovernmental competition. The typical case for this path is Anhui Province. As the Yangtze River Delta region has consistently ranked nationally high in digital government construction, digital governance levels, and data openness, Anhui, to fill gaps and keep pace with high-quality integrated Yangtze Delta development, comprehensively advanced “Digital Jianghuai” construction and strived to become a national digital economy innovation development pilot zone. The *Anhui Province Digital Government Construction Plan (2020-2025)* proposed actively participating in “Digital Yangtze Delta” construction, strengthening collaboration in data sharing, platform co-construction, and business synergy; using digital government construction as the focal point and breakthrough, relying on the Jianghuai Big Data Center to orderly open public data resources to society, continuously improving data sharing levels, and strengthening data services.

Configuration 3 is expressed as: High Government Data Openness = $\sim$ Public Demand $\times$ $\sim$ Intergovernmental Competition $\times$ Fiscal Support $\times$ Digital Infrastructure $\times$ Digital Governance Capacity, where digital infrastructure and digital governance capacity are core conditions, and fiscal support exists as a peripheral condition, indicating that digital transformation is the key force in government data openness, while adequate fiscal support is also indispensable for improving government data openness levels. The typical case for this path is Shandong Province. To seize digital development opportunities and advance digital province construction, Shandong accelerated building a “1+16+N” province-wide integrated big data platform system, established the Shandong Data Trading Platform, and promoted data supply-demand matching through the “Ai Shandong” government service platform and provincial integrated big data platform to continuously improve data supply capacity. Regarding digital governance capacity, Shandong focused on enhancing government cloud-network support capabilities, implementing digital government construction projects, and promoting deep integration of digital technology and government services to strengthen the foundation and quality of digital government construction. Shandong also issued the *Implementation Rules for Provincial Financial Rewards and Subsidies for New Data Center Construction* to support data centers in improving data service levels and empowering economic and social digital development.

(3) Hybrid Linkage Type. This type includes Configurations 4 and 5, where neither configuration contains two variables from the same dimension simultaneously, but rather combines single variables from different dimensions. Configuration 4 is expressed as: High Government Data Openness = $\sim$ Public Demand $\times$ $\sim$ Business Needs $\times$ Fiscal Support $\times$ $\sim$ Digital Infrastructure $\times$ Digital Governance Capacity, where digital governance capacity is the only core condition and fiscal support is a peripheral condition. This indicates that under conditions of absent data openness demand pressure and low digital infrastructure construction levels, adequate fiscal support and high digital governance capacity are needed to promote data openness level improvement. The typical case

for this path is Guizhou Province. Leveraging its first-mover advantage in big data, Guizhou prioritized data aggregation, integration, and efficient utilization as the priority direction of its big data strategic action. By building an “Internet + Government Services” platform covering five levels (province, city, county, township, and village), Guizhou truly helped its people achieve “less running for citizens, more running for data.” Simultaneously, Guizhou vigorously promoted big data-government governance integration, driving data openness and sharing through innovative digital governance. The *Guizhou Province 2023 Work Points for Building a Digital Economy Development Innovation Zone* proposed implementing a data element development action to strengthen public data supply through scenario application innovation. Additionally, the *Guizhou Province Government Data Sharing and Openness Regulations* stipulate that county-level and above governments should incorporate required funds for data sharing and openness work into the same-level fiscal budget and coordinate funds for support.

Configuration 5 is expressed as: High Government Data Openness = Public Demand $\times$ ~Business Needs $\times$ Intergovernmental Competition $\times$ ~Fiscal Support $\times$ ~Digital Infrastructure $\times$ ~Digital Governance Capacity. In this configuration, only public demand and intergovernmental competition exist as core conditions, while other variables appear as “absent,” indicating that public demand and intergovernmental competition are the driving forces of government data openness. The typical case for this path is Guangxi Zhuang Autonomous Region. In responding to citizen data openness demands, the *Guangxi Public Data Openness Management Measures* propose that data openness follows demand-oriented and priority-focused principles, clarifying government data resource openness needs, formulating public data openness plans, and prioritizing public data closely related to people’s livelihoods and urgently needed by society. Guangxi strengthens whole-process management of data openness, adjusts, optimizes, and updates data openness catalogs based on broad solicitation of social needs for public data resource openness, and requires data user entities to regularly feedback data usage to promote continuous optimization of public data openness services. Regarding intergovernmental competition’s driving role, the *China Local Government Data Openness Report—Provincial Level (2021)* shows that in the cumulative ranking of the provincial “Data Forest Olympics” from 2018-2021, Guizhou ranked 3rd nationally, Guangdong 4th, while Guangxi ranked 10th. This indicates that under competitive pressure from neighboring provinces like Guizhou and Guangdong, Guangxi Zhuang Autonomous Region proactively improved government data openness levels to narrow the gap.

3.3 Robustness Test

To ensure research conclusion reliability, this paper conducts robustness tests by adjusting the raw consistency threshold. If parameter adjustment does not cause substantive changes in output results, the analysis results can be considered reliable. Adjusting the raw consistency threshold to 0.85 and using stricter

thresholds for robustness testing of configurations producing high government data openness levels shows no significant changes in configuration quantity, configuration paths, consistency, or coverage, indicating that the obtained configurational results are robust.

4.1 Conclusions

Government data openness has become an important issue for promoting digital economy development and enhancing digital governance effectiveness. Exploring influencing factors and implementation pathways of government data openness can enrich data openness theory while providing ideas and references for digital government construction. Based on this, this study takes 31 provincial-level administrative units as research objects, uses fsQCA qualitative comparative analysis to explore core factors and configurational paths influencing government data openness, and examines configurational pathways and multi-factor joint logic for producing high government data openness levels from demand orientation, power support, and digital empowerment dimensions. The conclusions are as follows: (1) None of the six antecedent variables across the three dimensions can independently constitute a necessary condition for driving government data openness, reflecting the “multiple concurrent” characteristic of influencing factors—government data openness requires leveraging factor joint effects. (2) Public demand, business needs, intergovernmental competition, digital infrastructure, and digital governance capacity are core conditions for high government data openness levels, playing dominant roles in different configurational paths and indicating work directions and priorities for driving government data openness. (3) Configurational paths leading to high government data openness levels can be summarized into three types: demand-oriented, digital empowerment, and hybrid linkage, with different factor joint logics showing the characteristic of “different paths leading to the same destination.”

4.2 Implications

First, attach great importance to digital empowerment effects and intergovernmental competition’s driving role. According to the obtained configurational paths, digital governance capacity appears as a core variable in 4 of the 5 paths, and intergovernmental competition appears as a core variable in 3 paths, indicating that digital governance capacity and intergovernmental competition are key variables driving government data openness. Therefore, on the one hand, government digital governance practice should strengthen government data coordination capabilities, improve data openness mechanisms, and remove obstacles in data collection, sharing, and application processes. Promote digital government and digital government affairs construction, make data openness a key component of government digital transformation, and enhance government digital governance capacity and efficiency. On the other hand, properly recognize the driving role of horizontal intergovernmental competition, reshaping local competitive advantages through competition. Fully learn from other lo-

cal governments' data openness models and experiences, emphasize leveraging strengths and avoiding weaknesses, actively acquire and absorb data openness-related resources, and optimize data openness strategies.

Second, systematically integrate elements across demand orientation, power support, and digital empowerment dimensions to form policy synergy. Research shows that high government data openness levels result from coordination among elements across the three dimensions, and building a scientific factor synergy system is the inevitable path to driving government data openness. Therefore, data openness should adopt a “holistic thinking” approach, using coordination and integration as means to mobilize each factor's kinetic energy in data openness governance and gather joint forces to promote data openness. First, properly recognize public and enterprise data openness demands and enhance public participation in government data openness. Second, stimulate the driving effects of intergovernmental competition and fiscal support on government data openness, using intergovernmental competitive relationships to stimulate continuous improvement in local government data openness levels. Third, enhance digital infrastructure construction and government digital governance capacity to digitally empower government data openness. Finally, drive the combined matching of multiple factors to create a “combination punch” for promoting government data openness.

Third, adhere to formulating optimal tool schemes for promoting government data openness based on local conditions. Research shows that configurational paths producing high government data openness levels are diverse, meaning localities should explore data openness paths suitable for their own conditions. Regarding the configurational paths obtained in this paper, factor matching patterns differ significantly across configurations, indicating that local government data openness resource endowments, development levels, and other conditions vary, providing different support conditions for government data openness, and factor joint logics present different states. This is particularly practically significant for western and northeastern regions to find data openness models that fit local development realities under limited resource conditions. Therefore, localities should accurately assess the demands, resources, and conditions facing government data openness and select optimal combination schemes for promoting data openness.

4.3 Limitations and Future Directions

This paper analyzes driving paths of government data openness from a configurational perspective, revealing factor matching logic for government data openness and providing references for practice. However, limitations exist: constrained by qualitative comparative analysis method's limitations on antecedent variable quantity, this paper only examines six antecedent variables across demand orientation, power support, and digital empowerment dimensions, while real-world factors influencing government data openness are complex and not fully covered; research data comes from secondary sources such as statistical yearbooks

and third-party evaluation reports, lacking primary data from interviews and surveys. Therefore, future research should combine field investigations to obtain primary data and comprehensively use multiple research methods to more thoroughly explore diverse paths of government data openness.

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Note: Figure translations are in progress. See original paper for figures.

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