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Original Paper

Can Government Internet Service Levels Enhance Urban Entrepreneurship?—An Empirical Test Based on Data from 278 Chinese Cities

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Abstract

As economic globalization accelerates and big data and artificial intelligence dominate our era, enhancing urban entrepreneurship in China has become increasingly vital for national economic development. Policies aimed at improving government internet service capabilities align with this trend, making it crucial to investigate whether such capabilities can elevate urban entrepreneurship.This paper first introduces the conceptualization and measurement of government internet service capacity and urban entrepreneurial activity. It then examines domestic and international theoretical frameworks to analyze the underlying mechanisms through which government internet service levels may enhance urban entrepreneurship. Considering the global economic context and China's specific economic conditions at the time these policies were introduced, the paper assesses the current state of urban entrepreneurship in Chinese cities.To empirically examine whether government internet service levels can elevate urban entrepreneurship, this study utilizes panel data from 278 Chinese cities spanning 2019-2021 in the era of big data and artificial intelligence. It constructs both a two-fixed-effects model

and a mediation effect model to empirically investigate the impact of government internet service capacity on urban entrepreneurship levels.

The main findings are as follows: (1) Enhancing local government internet service capabilities significantly and positively impacts urban entrepreneurship levels, with this conclusion remaining robust after stability tests. (2) Local government internet service capabilities primarily elevate urban entrepreneurship levels through the mediating effect of the business environment. (3)Heterogeneity analysis, which categorizes cities by geographical location (central, eastern, and western regions) and smart city status (smart or non-smart), reveals that the positive effect of government internet service capacity on urban entrepreneurship is more pronounced in central and western cities, as well as in non-smart cities. Based on these findings, in the era of big data and artificial intelligence, it is imperative to steadfastly enhance local government internet service capacity. Governments should proactively implement policies that support improvements in the business environment, thereby strengthening the positive role of business environment quality in leveraging internet service capacity to boost entrepreneurship levels.

Keywords

Government Internet Service Capacity, Entrepreneurial Activity, Dual Fixed Effects Model

1. Introduction

1.1 Research Background

In the era of big data and artificial intelligence, the rapid advancement of internet technology and the continuous refinement of market economic systems have propelled human society into the information age at an unprecedented pace, deepening global economic integration. The vigorous development of the digital economy, underpinned by modern information technology and communication networks, has profoundly impacted economic structures and fundamentally optimized economic forms.Entering the digital economy era, on one hand, market competition among enterprises has intensified. On the other hand, changes in the urban entrepreneurial environment have progressively driven major transformations in the methods and pathways of urban entrepreneurship, exerting a profound impact on the level of urban entrepreneurship.

The report to the 20th CPC National Congress states that innovation is the primary driving force. We must thoroughly implement the innovation-driven development strategy and pioneer new frontiers and new avenues for development.Within the market economy system, governments should better leverage their role by actively participating in and advancing economic development. In the era of big data and artificial intelligence, the deep integration of technologies such as big data, AI, blockchain, cloud computing, and mobile internet with urban entrepreneurship has liberated it from reliance on manual labor alone. Integrating government services with internet technology, strengthening top-level design to standardize management systems, and improving government service platforms will enhance local governments' internet service capabilities—a crucial pathway to elevating urban entrepreneurship.

Against this backdrop, this paper aims to investigate whether the level of government internet services can elevate urban entrepreneurship. It explores strategies for fully leveraging government service capabilities in the era of big data and artificial intelligence, with the goal of promoting a virtuous cycle of urban entrepreneurial development and fostering sustainable economic growth.

1.2 Research Significance

1.2.1 Theoretical Significance

The theoretical significance of this study lies in its empirical validation of the positive impact of government internet service levels on urban entrepreneurship. It examines the influence mechanism through which government internet service capabilities affect urban entrepreneurship, enriching theoretical research on this subject and advancing related theoretical development.

1.2.2 Practical Significance

This study also holds significant practical implications. By examining whether government internet service levels can elevate urban entrepreneurship in the era of big data and artificial intelligence, it not only provides valuable reference for enhancing urban entrepreneurship and advancing the national innovation-driven development strategy but also offers crucial guidance for promoting local government digital transformation, improving governance capabilities, and ultimately fostering sustainable economic and social development.

As economic globalization deepens and the global financial crisis intensifies, recent years have witnessed significant downward pressure on the global economy, a challenging external environment, fierce market competition, and declining demand. Traditional industrial structures, lacking core competitiveness, have suffered severe impacts and urgently require structural adjustment and transformation. Domestically, economic growth has slowed, and international financial markets remain volatile.Therefore, there is an urgent need to actively seek new economic growth drivers, promote technological innovation and industrial upgrading, optimize the policy environment, build innovation markets, stimulate new momentum for urban innovation and entrepreneurship, adjust industrial structures, and improve the entrepreneurial ecosystem to drive economic recovery and growth.

A city’s entrepreneurial level serves as a key indicator of its economic development. Innovation and entrepreneurship activities are vital forces driving technological progress, capable of injecting fresh vitality and momentum into economic growth. They facilitate industrial restructuring and upgrading while fostering emerging industries, propelling the economy toward higher-level development. The level of urban entrepreneurship also directly reflects a city’s innovation capacity and competitiveness. A high entrepreneurial level attracts more capital, talent, and other innovation resources, promoting a virtuous cycle of enhanced overall innovation capability.

Amidst the proliferation of big data and artificial intelligence in the internet era, public demand for government services has become increasingly diverse and personalized. To enable governments to meet these needs more efficiently and effectively, enhancing the overall efficacy of government service delivery is essential. This necessitates improving local governments’ internet service

capabilities.Simultaneously, enhancing local governments' internet service capabilities improves the efficiency of information acquisition and dissemination, optimizes the entrepreneurial environment, drives innovation and entrepreneurship, and elevates the city's overall competitiveness. Therefore, researching the impact of local governments' internet service capabilities on urban entrepreneurship levels not only aligns with the national innovation-driven development strategy but also provides theoretical guidance for enhancing urban entrepreneurship, thereby better promoting China's sustainable economic development.

2. Literature Review

2.1 Research on Local Government Internet Service Capabilities

2.1.1 Research on the Conceptual Framework of Local Government Internet Service Capabilities

Hou (2023) defines local government internet service capability as the government's service capacity within the "Internet Plus" context, representing an extension of traditional e-government. Tang, Zhang, Li, and Zhang (2019) note that this capability emerges from the convergence of government public service capacity research and e-government service capability studies ( ), shaped by the backdrop of the information age. Zhao (2022) defines local government internet service capability as the capacity to enhance public service quality and efficiency by actively leveraging new-generation information network technologies—including but not limited to the internet, cloud computing, big data, and artificial intelligence—through information interoperability and multi-source data integration. Li and Gu (2020) characterize government internet service capability as the capacity to deliver public goods and services through the adoption of information technology.

2.1.2 Related Research on Measuring Local Government Internet Service Capability

Li (2023) categorizes government service capacity into three dimensions: government internet service supply capability, government internet service responsiveness, and government internet service intelligence. Qin (2023) emphasizes that measuring government internet service capacity involves multiple elements, including technological, organizational, and environmental dimensions.

2.2 Research on Urban Entrepreneurship Levels

2.2.1 Research on the Conceptual Framework of Urban Entrepreneurship Levels

Yang (2023) defines urban entrepreneurship level as the collective manifestation of all individual entrepreneurial activities within a city. It refers to the activities undertaken by individuals possessing entrepreneurial spirit who, under the combined influence of the city's legal framework, institutional environment, economic development status, and social conditions, establish new enterprises. Through the integration of resources they own or can access, these individuals generate economic contributions and social value. Tian (2020) defines urban entrepreneurship level as the entrepreneurial status within a specific city. Due to variations in geographical location, economic development, and other factors across regions, significant disparities in entrepreneurship levels exist between different areas. Xia (2020) defines "urban entrepreneurship level" as the entrepreneurial activities of talent within a specific

city and the societal evaluation thereof. Li (2018) specifies that urban entrepreneurial level refers to the enthusiasm for entrepreneurship among social groups within a defined scope and the outcomes of collective entrepreneurial endeavors; Zhu (2012) proposes that urban entrepreneurial level denotes the ease or difficulty of market entry for an industry or sector under specific market conditions.

2.2.2 Related Research on Measuring Urban Entrepreneurship Levels

Number of newly established enterprises per 100 people. Sun, Fan, Zhang, and Zhang (2021) defined entrepreneurial enterprises based on their business registration dates, measured the number of new enterprises per 100 people, and evaluated entrepreneurial levels. This approach not only effectively reflects the comprehensive characteristics of regional urban entrepreneurial levels but also significantly reflects the overall development potential and dynamic changes of regional entrepreneurship. Shen and Zhang (2023) similarly employed newly registered enterprises in each city to indicate urban entrepreneurial activity, measuring differences in entrepreneurial levels across cities. They also applied regression analysis after taking logarithms to derive final conclusions; Gao, Li, and Han (2023) adopted Kou Zonglai's urban innovation index to represent the core explanatory variable of entrepreneurial innovation spirit, using the number of newly registered enterprises in prefecture-level cities to symbolize entrepreneurial spirit. It is evident that the number of newly established enterprises per 100 people exhibits a strong correlation with urban entrepreneurial levels.

Number of invention patents. Xu and Ma (2023), in examining the impact of the digital economy on high-quality entrepreneurship, established an indicator system encompassing metrics such as the number of newly established enterprises, external investment, external venture capital, invention patents, utility model patents, design patents, and trademark registrations. This system balances input and output factors of new enterprises, enabling precise measurement of entrepreneurial levels. Cheng (2023), when selecting micro-level factors influencing technological innovation, incorporated the number of valid invention patents into the factor system from the perspective of internal input-output within innovation entities. Jiang (2021), while constructing the output dimension of an indicator system for technological talent entrepreneurship capabilities, verified that indicators such as the number of high-tech invention patents and patent applications in high-tech industries exhibit relatively high grey correlation in the context of research achievements and economic benefits.

2.3 Research on the Impact of Government Internet Service Levels on Enhancing Urban Entrepreneurship

Regarding the impact effects on China following the implementation of policies promoting the enhancement of local government internet service capabilities, both domestic and international scholars have conducted active exploration and research. These efforts can be broadly categorized into improving the infrastructure for public goods (,), enhancing service connectivity capabilities, and boosting the professional efficiency of urban smart systems, thereby promoting the elevation of urban entrepreneurship levels.

Regarding infrastructure development for public goods, Huang et al. (2006) demonstrated that

introducing state-owned assets—including infrastructure—into the market creates a series of operational entities authorized by local governments. This approach provides reverse financing support for infrastructure construction, driving the continuous improvement of urban public goods infrastructure. Li, Gao, and Li (2024) found that pilot cities for new-type urbanization can strengthen urban infrastructure development, thereby enhancing the city's innovation and entrepreneurship vitality. Regarding enhancing service connectivity capabilities—specifically service provision capacity—Long and Lü, and Liu (2020) employed big data methods to comprehensively assess local governments' internet service capabilities. Using computational analysis techniques such as difference trend analysis, cluster analysis, and descriptive statistics, they concluded that enhancing local governments' internet service capabilities can actively advance the development of online government service platforms across regions and departments. This effectively optimizes government services, facilitates businesses and citizens, and promotes mass entrepreneurship and innovation.

Regarding enhancing smart city operational efficiency, Li, Ma, and Zheng (2022) employed the TOE analytical framework, selecting regional digital service capacity to characterize government internet service capabilities. Their findings revealed a consistency index exceeding 0.9, demonstrating that improving local government internet service capabilities is a necessary condition for enhancing smart city operational efficiency.

2.4 Literature Review

In summary,existing research predominantly focuses on the respective connotations and measurements of government internet service capabilities and urban entrepreneurial levels, while studies examining the direct correlation between these two measurements remain scarce. Therefore, this paper aims to fill this research gap by investigating, from an urban perspective, the impact of implementing policies to enhance local government internet service capabilities on urban entrepreneurial levels, thereby enriching the literature centered on government internet service levels.

3. Theoretical Hypotheses

Regarding administrative efficiency, innovating government service and management concepts and methods, enhancing government internet service levels, and building a service-oriented government that satisfies the people can facilitate businesses and citizens, improve administrative efficiency, and significantly unleash development potential, thereby promoting mass entrepreneurship (Li, 2022). Regarding legal system development, as local governments enhance their internet service capabilities, legal frameworks increasingly reflect public needs and demands. This advances the construction of a law-based government and society, indirectly promoting the refinement of laws protecting innovators and entrepreneurs—such as intellectual property legislation—and stimulating public entrepreneurial enthusiasm (Sun & Hu, 2024). At the regulatory level, enhancing government internet services and leveraging technologies like big data can strengthen credit supervision, elevate urban credit standards, and improve the creditworthiness of market micro-entities. This increases the likelihood of SMEs and

individuals accessing innovation and entrepreneurship capital, thereby boosting regional entrepreneurial activity (Ning, Xu, W. H., & Xu, L. J., 2023). Regarding infrastructure development, advancing the digitalization of government services and applying big data models and artificial intelligence to enhance infrastructure construction can provide a solid foundation for urban entrepreneurship (Jiang, 2023). Regarding policy support, higher government internet service capabilities can better reflect public demands for innovation and entrepreneurship, providing policy support such as offering youth entrepreneurship training programs and guidance. This ultimately elevates urban entrepreneurial levels (Li, 2021). Based on the above discussion, this paper proposes the following hypothesis:

H_1 : Enhancing government internet service levels will promote the advancement of urban entrepreneurship.

The business environment is a critical factor in the productivity, market competitiveness, and overall socioeconomic development of enterprises in a region or city.Enhancing government internet service capabilities through measures such as promoting online government transparency (Chen, 2024) can drive continuous institutional innovation, streamline administrative approval processes, strengthen legal frameworks, deepen policy support, and safeguard legitimate business rights. This fosters a fair, open, just, and transparent business environment, elevating its marketization, rule of law compliance, and internationalization (Xu & Zeng, 2024). This, in turn, unlocks the city's innovation and entrepreneurship potential, ignites the intrinsic motivation of entrepreneurs, and indirectly drives continuous improvement in the city's entrepreneurial level. Regarding investment environment improvement, Huang et al. (2006) found that implementing policies to enhance local government service capabilities strengthens social management and public service functions, significantly increasing the approval rate of investment projects like foreign direct investment and optimizing the city's investment environment. Bao (2024) found that intensifying efforts to guide financial institutions and venture capital sub-funds toward supporting innovation and entrepreneurship entities, thereby fostering a favorable investment environment for innovation and entrepreneurship, can elevate regional innovation and entrepreneurship levels. Zhang, Wu, and Ma (2022) suggest that revitalizing the rural economy requires measures to improve the agricultural investment environment, thereby stimulating farmers' entrepreneurial enthusiasm. Zhou and Yan (2016) argue that improving the investment environment reduces foreign investment risks, enhances market efficiency, and consequently promotes the inflow of foreign investment into cities, elevating urban entrepreneurship levels. Based on the above discussions, this paper proposes the following hypothesis:

H_2: Government internet proficiency enhances urban entrepreneurial activity by improving the business environment.

4. Data Variables and Model Design

4.1 Data Sources and Variable Selection

Considering data availability and continuity, this study utilizes panel data from 278 Chinese cities spanning 2019-2021. Sources include the China Urban Statistical Yearbook, Guotai An Database, Zhongli Data Network, and China Statistical Yearbook.

1. Dependent Variable: Urban Entrepreneurship Level (NBP). This study employs the number of newly established enterprises per 100 people (NBP) as the indicator for the dependent variable, urban entrepreneurship level. The rationale is twofold: First, the number of newly established enterprises per 100 people ( ) directly reflects the quantity and vitality of entrepreneurial activities within a city. A high number of business registrations signifies a robust entrepreneurial ecosystem and strong innovation capacity.Second, this metric also reflects the quality of the city's entrepreneurial environment and the strength of supportive policies in a given year. Streamlined registration processes and tax incentives lower barriers to entrepreneurship, increase success rates, and boost entrepreneurial motivation, thereby driving growth in business registrations.Finally, the number of new enterprises per 100 people also reflects a city's economic development status, industrial restructuring progress, population scale, and other social factors. This metric draws from Wang Gang et al.'s regional entrepreneurial level assessment (2020), which utilized enterprise registration data to construct a regional entrepreneurial level evaluation system, revealing the correlation between a city's annual enterprise registrations and its entrepreneurial level.

2. Core Explanatory Variable

Local Government Service Capability. Based on the connotation and core concepts of local government internet service capability, as well as the content from the China Local Government Internet Service Capability Development Report (2019) authored by Tang Zhiwei and Li Jin Zhao, a core explanatory variable reflecting the impact of local government internet service capability on urban entrepreneurial levels is constructed to represent the comprehensive evaluation level of local government internet service capability.

3. Mediating Variable

Business Environment Variable. On one hand, the business environment variable is represented by a single indicator: the government business environment.As the soft environment within the broader business environment, the government business environment reflects aspects such as social legal system development, government streamlining of administrative procedures, and enhanced coordination between enterprises and government. On the other hand, the business environment is a crucial component of the innovation system, serving as a vital foundation for supporting innovation and entrepreneurship activities. A favorable business environment provides the necessary conditions and environment for entrepreneurs and potential entrepreneurs. Therefore, the business environment variable can be used as a mediating variable to verify its impact on urban entrepreneurship levels.

4. Control Variables: This study also controlled for other variables potentially influencing urban

entrepreneurship levels, specifically including: (1) Urbanization Process (GCR). Measured using the green coverage rate of built-up areas. (2) Urban Economic Development Level (RGDPGR). Measured using the city's regional GDP growth rate. (3) Industrial Structure (TGDP). Measured using the tertiary industry's share of GDP.(4) Urban and Rural Residents' Savings (URS), measured by the year-end savings balance of urban and rural residents. (5) Urban Education Level (EI), measured by the city's education expenditure. (6) Urban Science and Technology Level (STI), measured by the city's science and technology expenditure. The measurement indicators for each variable are shown in the table below:

Table 1. Variable Summary

Variable Type	Calculation Method	Variable Name	Symbol
Dependent VariableNBP_{it}	Number of New Businesses per 100 People	Entrepreneurship Level	NBP
Core Explanatory Variable LGSC	Local Government Service Capacity	Local Government Internet Service Capability	LGSC
Mediating VariableM_{it}	Business Environment	Business Environment	BE
	Green coverage rate in built-up areas	Urbanization Process	GCR
Control VariablesK_{it}	Share of Tertiary Industry in GDP	Industrial Structure	TGDP
	Year-end balance of urban and rural residents' savings	Urban and Rural Residents' Savings Status	URS
	Citywide Education Expenditures	Urban Education Level	EI
	Citywide GDP Growth Rate	Urban Economic Development Level	RGDPGR
	Municipal Science and Technology Expenditure	Urban Science and Technology Level	STI

4.2 Model Construction

Based on the aforementioned theoretical analysis and assumptions, to investigate whether local government service capacity can exert a positive influence on urban entrepreneurial levels, this study first constructs a double fixed-effects model:

$$NBP_{it}=\beta_0+\beta_1 LGSC+\beta_2 \sum K_{it}+\lambda_i+v_t+\varepsilon_{it} \quad (1)$$

In this context, subscripts i and t denote the region and year of the data, respectively.NBP_{it} represents the explained variable, also known as the dependent variable. This study uses the number of newly established enterprises per 100 people as the metric to measure urban entrepreneurial activity. LGSC denotes the core explanatory variable, which is the capacity of local government services. K_{it} denotes the control variables, comprising six factors: urbanization rate (GCR), urban economic development level (RGDPGR), industrial structure (TGDP), urban and rural household savings (URS), urban education level (EI), and urban science and technology level (STI). Their coefficientsβ_2 indicate the extent to which these control variables influence urban entrepreneurial activity.Additionally, ε_{it} represents the random error term, accounting for the influence of other unobserved latent factors on the urban entrepreneurship levelNBP_{it}. Its inclusion enhances the precision and validity of the experimental results.λ_i denotes the individual fixed effects, whilev_t represents the time fixed effects.

To further explore the underlying mechanisms by which government service capacity influences urban entrepreneurial levels in the era of big data and artificial intelligence,this study also adopts Jiang Ting's (2022) recommendations for mediation models. Given the evident correlation between the selected mediating variable (business environment) and the dependent variable (entrepreneurship level), the focus is on examining how the explanatory variable (local government service capacity) influences the mediating variable. This aims to verify whether local government internet service capacity can enhance urban entrepreneurship levels by improving the business environment.Thus, based on the dual fixed-effects model equation, this paper constructs the following mediation effect model:

$$NBP_{it}=\gamma_0+\gamma_1 LGSC+\gamma_2 \sum K_{it}+\lambda_i+v_t+\varepsilon_{it} \quad (2)$$

This equation describes the total effect of the independent variable LGSC on the dependent variableNBP_{it} , whereγ_1 represents the total effect coefficient ofLGSC onNBP_{it}.

$$M_{it}=\beta_0+\beta_1 LGSC+\beta_2 \sum K_{it}+\lambda_i+v_t+\varepsilon_{it} \quad (3)$$

This equation describes the effect of the independent variable LGSC on the mediating variableM_{it} , whereβ_1 is the effect coefficient of LGSC onM_{it}.

Here, the definitions and measurement methods of explanatory variables and control variables are consistent with the dual fixed-effects model.NBP_{it} denotes the dependent variable, LGSC denotes the independent variable,M_{it} denotes the mediating variable, andK_{it} denotes the control variable.

5. Empirical Analysis of How Internet Service Capabilities Promote Urban Entrepreneurship Levels

5.1 Descriptive Statistics of Variables

Descriptive statistics are statistical methods used to examine the overall characteristics and average

scores of quantitative data. They facilitate a deeper understanding of data distribution, central tendency, and dispersion during data organization and analysis, thereby enhancing comprehension of data features.Therefore, before modeling variables, descriptive statistical analysis of relevant control variables is essential to identify and evaluate their fundamental information. This primarily includes mean, standard deviation, extreme values, median, and mode. The mean reflects the average level of an indicator, standard deviation indicates its variability, while median and extreme values reveal its distribution. Specific descriptive statistical results are presented in the table below:

Table 2. Variable Descriptive Statistics Results

VarName	Obs	Mean	SD	Min	Median	Max
NBP	794	2.463	0.675	1.261	2.437	3.761
LGSC	794	1.944	0.125	1.675	1.956	2.126
BE	794	3.873	0.162	3.270	3.878	4.289
GCR	794	3.715	0.094	3.474	3.732	3.857
URS	794	16.479	0.978	14.712	16.549	18.285
TGDP	794	3.879	0.139	3.616	3.875	4.155
EI	794	1.014	1.288	0.045	0.712	11.478
Real GDP Growth Rate	794	4.972	19.296	-530.000	6.250	16.800
STI	794	0.196	0.531	0.001	0.057	5.484

As shown in the Table above, the mean value of the dependent variable NBP (number of newly established enterprises per 100 people), which measures urban entrepreneurial activity, is 2.463. The significant disparity between the maximum and minimum values indicates substantial regional variations in entrepreneurial levels across Chinese cities.The mean value of the core explanatory variable, local government service capacity, is 1.944, with a notable gap between its maximum and minimum values. This indicates that the level of local government internet service capacity varies across different cities and regions in China, reflecting characteristics of uneven regional development.

5.2 Benchmark Regression Results

Table 3. Benchmark Regression Results

	(1) NBP	(2) NBP	(3) NBP
LGSC	0.953***	0.424**	0.619***
	(0.182)	(0.166)	(0.220)
GCR		0.521**	0.310
		(0.214)	(0.269)

URS		0.241***	0.234***
		(0.029)	(0.036)
TGDP		0.157	-0.574
		(0.178)	(0.571)
EI		-0.078**	0.599***
		(0.030)	(0.160)
RGDPGR		0.000	-0.001***
		(0.000)	(0.000)
STI		0.241***	-0.181
		(0.068)	(0.157)
CODE	NO	NO	YES
YEAR	YES	YES	YES
_cons	0.610*	-4.838***	-2.093
	(0.348)	(1.062)	(2.565)
N	794.000	794.000	794.000
r2_a	0.436	0.529	0.674

Note. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively. The same applies below.

First, we examine the impact of local government internet service capabilities on urban entrepreneurship levels. This study performs regression analysis on the previously defined Model (1), with the table above reporting the regression results for this relationship. To prevent individual standard errors from being distorted by clustering effects, cluster-robust standard errors were applied at the individual level in accordance with Model (1) specifications.

Column (1) includes only the core explanatory variable LGSC (Local Government Internet Service Capability) while controlling for annual fixed effects. The regression results show that the coefficient for LGSC is 0.953, significantly positive at the 1% level. This indicates that improvements in local government internet service capability exert a significant positive impact on enhancing entrepreneurial activity in cities. Column (2) incorporates multiple-level control variables on top of the core explanatory variable. The coefficient for the core explanatory variable is 0.424, significant at the 5% level, which still indicates a positive correlation between improvements in local government internet service capacity and increases in urban entrepreneurship levels.Column (3) controls for individual fixed effects on top of Column (2). The coefficient for the core explanatory variable LGSC (local government internet service capability) is 0.619, significantly positive at the 1% level, and higher than the value in Column (2). This aligns with the theoretical expectation that local government internet service capability enhances urban entrepreneurial activity.Additionally, while the control variable urbanization process (GCR) is not statistically significant, its positive coefficient suggests that

urbanization can moderately promote entrepreneurial activity. This limited impact may stem from a mismatch between urbanization progress and actual entrepreneurial demand.The corresponding coefficient for Urban and Rural Residents' Savings (URS) is positive and significant at the 1% level. This may occur because increased resident savings boost investment demand, thereby influencing local entrepreneurial activity. The coefficient for Industrial Structure (TGDP1) is negative and insignificant, possibly due to the pandemic's unique period affecting industrial structure's influence on entrepreneurial activity.The coefficient for education expenditure (EI) is positive and significant at the 1% level. This may be because increased investment in education raises regional educational standards, increases the local talent pool, and thereby promotes higher entrepreneurship levels.

Overall, improvements in local governments' internet service capabilities can enhance urban entrepreneurship levels.

5.3 Further Analysis

5.3.1 Mediating Effect

Table 4. Mediating Effect Analysis Results

	(1) NBP	(2) BE
LGSC	0.619***	0.127*
	(0.220)	(0.073)
GCR	0.310	-0.083
	(0.269)	(0.066)
URS	0.234***	-0.014
	(0.036)	(0.010)
TGDP	-0.574	0.202
	(0.571)	(0.165)
EI	0.599***	0.027
	(0.160)	(0.046)
RGDPGR	-0.001***	-0.000***
	(0.000)	(0.000)
STI	-0.181	-0.092*
	(0.157)	(0.055)

_cons	-2.093	3.369***
	(2.565)	(0.694)
r2_a	0.674	0.521

This study employs mediation analysis to examine the mechanism by which local government internet service capacity influences local entrepreneurship levels, as proposed in the preceding theoretical analysis. As shown in the table above, the regression coefficient for the explanatory variable LGSC (Local Government Internet Service Capacity) on the dependent variable NBP (Entrepreneurship Level) is 0.619, passing the significance test at the 1% level. This indicates that enhancing local government internet service capacity can elevate urban entrepreneurship levels.The regression coefficient of the explanatory variable LGSC (Local Government Internet Service Capability) on the mediating variable BE (Business Environment) is 0.127, passing the significance test at the 10% level. This indicates that local government service capability exerts a significant positive influence on the business environment, meaning that enhancing local government internet service capability can optimize the business environment.

Following Jiang Ting's (2022) recommendations for analyzing mediation effects in causal inference studies, this paper selected the business environment as the mediating variable due to its clear and intuitive causal relationship with the dependent variable, entrepreneurial activity levels. The business environment is significantly positively correlated with entrepreneurial activity levels (Liu & Huang, 2023), and the government environment within the business environment positively influences corporate entrepreneurial activity levels (Peng, 2023). Combining the preceding analysis reveals that the explanatory variable LGSC (local government internet service capability) exhibits significant positive correlations with both the dependent variable NBP (entrepreneurship level) and the mediating variable BE (business environment). Furthermore, the mediating variable BE (business environment) also shows a significant positive correlation with the dependent variable NBP (entrepreneurship level). Therefore, enhancing local government internet service capability can optimize the business environment, thereby elevating urban entrepreneurship levels.

5.3.2 Heterogeneity Analysis

(1) Heterogeneity Analysis Based on Regional Development Levels

Given disparities in economic development and educational investment across China's regions, differences exist in government internet service capabilities and entrepreneurial activity levels. Consequently, the impact of government internet service capabilities on urban entrepreneurial activity may exhibit regional heterogeneity.To further investigate the regional heterogeneity of this impact, this study categorizes the examined cities into eastern, central, and western regions ( ) (Shen, Chen, & Lin, 2021). The eastern region is coded as 1, the western region as 0, and the central region as 2. The regression results are presented in the table below.

Table 5. Regional Heterogeneity Regression Results Table

	(1)NBP (0)	(2) NBP (1)	(3) NBP (2)
LGSC	0.879**	0.232	0.612*
	(0.395)	(0.422)	(0.343)
GCR	-0.098	0.463	0.401
	(0.555)	(0.510)	(0.379)
URS	0.291***	0.171**	0.185***
	(0.064)	(0.073)	(0.065)
TGDP	-1.191	-1.844	0.218
	(1.511)	(1.800)	(0.594)
EI	-0.642	0.447**	0.782
	(0.679)	(0.180)	(0.598)
RGDPGR	0.016	-0.001	-0.001 ***
	(0.016)	(0.016)	(0.000)
STI	-0.960*	-0.163	-0.506
	(0.529)	(0.181)	(0.608)
_cons	1.388	4.194	-4.707
	(6.455)	(6.931)	(2.975)
N	224.000	288.000	276.000
r2_a	0.567	0.739	0.622

According to the data in column (1), the coefficient value for government internet service capability in the western region is 0.879 ( ), passing the significance test at the 5% level. According to the data in column (3), the coefficient value for government internet service capability in the central region is 0.612 ( ), passing the significance test at the 10% level. According to the data in column (2), the coefficient for government internet service capacity in the eastern region is 0.232, but it does not pass the significance test. This indicates that in China's western and central regions, government internet service levels can significantly enhance urban entrepreneurship levels. However, in the eastern region, the role of government internet service capacity in boosting entrepreneurship levels is not pronounced.

The significance in the western region is greater than that in the central region, suggesting that the role of government internet service capacity in enhancing urban entrepreneurship levels is more pronounced in the western region. Considering the distinct overall conditions across China's three regions, this discrepancy may stem from the eastern region's higher economic development level and more favorable entrepreneurial environment compared to the western and central regions. Consequently, the impact of government internet service capacity on entrepreneurial activity is relatively diminished in the east. Conversely, the western and central regions lag behind the east in economic development and entrepreneurial environment, leaving greater room for improvement in entrepreneurial activity. Thus, enhancing government internet service capacity can significantly boost urban entrepreneurial activity in these areas.Furthermore, the significance in the western region exceeds that of the central region, potentially linked to the western region's policy advantages and favorable development environment (Feng, 2006). The state has injected substantial funds to support western development, and major domestic and international enterprises prioritize investment and cooperation in the west. Simultaneously, the western region possesses advantages in mineral resources, land resources, and human resources. Building upon these strengths, the improvement in government internet service capabilities facilitates resource circulation, thereby exerting a further positive impact on local entrepreneurial activity.

(2) Analysis Based on the Heterogeneity of Smart Cities and Non-Smart Cities

Smart cities integrate physical infrastructure, digital spaces, and socio-cultural ecosystems to enable real-time perception, analysis, and coordination of urban dynamics, delivering intelligent responses to governance and public services. Their development significantly enhances governmental management and service capabilities (Wang, 2024). Given differing developmental conditions and varying governmental management capacities between smart and non-smart cities, the impact of governmental internet service capabilities on urban entrepreneurship may exhibit heterogeneity. Therefore, based on the three batches of national smart city pilot lists published on the official websites of the Ministry of Industry and Information Technology (MIIT), the Ministry of Housing and Urban-Rural Development (MOHURD), and the Ministry of Science and Technology (MOST), this study categorizes the cities under investigation into smart cities and non-smart cities for heterogeneity analysis. Smart cities are assigned a value of 1, while non-smart cities are assigned a value of 0. The regression results are presented in the table below.

Table 6. Regression Results for Heterogeneity Between Smart Cities and Non-Smart Cities

	(1) NBP (0)	(2) NBP (1)
LGSC	0.692**	0.607*
	(0.292)	(0.342)

GCR	0.791**	-0.072
	(0.376)	(0.353)
URS	0.207***	0.228***
	(0.050)	(0.052)
TGDP	0.072	-1.217
	(0.686)	(1.050)
EI	1.190***	0.449***
	(0.417)	(0.168)
Real GDP growth rate	-0.006	-0.001***
	(0.007)	(0.000)
STI	-0.101	-0.083
	(0.540)	(0.185)
_cons	-6.401*	2.020
	(3.239)	(4.384)
N	423.000	365.000
r2_a	0.666	0.676

As shown in column (1), the coefficient for local government internet service capability in non-smart cities is 0.692, passing the significance test at the 5% level. As shown in column (2) of the table above, the coefficient for local government internet service capability in smart cities is 0.607, passing the significance test at the 10% level.This indicates that the improvement in government internet service capability significantly positively impacts entrepreneurship levels in both smart cities and non-smart cities. In non-smart cities, the impact of government internet service capability on entrepreneurship levels is significantly greater than in smart cities. This may be because non-smart city governments have lower management and service capabilities, leaving greater room for improvement in government internet service capability. Consequently, enhancing this capability has a stronger impact on entrepreneurship levels than in smart cities.

5.3.3 Robustness Tests

The number of new enterprises per 100 people in a city serves as an intuitive metric reflecting entrepreneurial outcomes. While this study employs new enterprises per 100 people as the primary logical variable, robustness testing replaces the entrepreneurial metric with authorized patents (PAT).

The regression results are presented below.

Table 7. Robustness Test Regression Results

	(1) PAT	(2)PAT	(3)PAT
LGSC	6.060***	3.192***	0.167**
	(0.583)	(0.334)	(0.081)
GCR		0.440	0.079
		(0.417)	(0.089)
URS		0.635***	0.007
		(0.062)	(0.011)
TGDP		1.027***	-0.281
		(0.379)	(0.205)
EI		0.397***	0.014
		(0.141)	(0.030)
RGDPGR		-0.000*	0.000
		(0.000)	(0.000)
STI		0.087	-0.049
		(0.309)	(0.106)
CODE	NO	NO	YES
YEAR	YES	YES	YES
_cons	-14.890***	-25.813***	-2.750***
	(1.117)	(2.064)	(0.846)
r2_a	0.231	0.644	0.988

As shown in columns (1), (2), and (3) of the table above, the magnitude of the coefficient LGSC (Local Government Internet Service Capability) has changed, yet it remains significantly positive at the 1% level. Its significance and coefficient sign have not altered, which validates the reliability of the baseline regression and indicates the robustness of the results.

6. Research Conclusions and Policy Recommendations

This study examines the impact mechanism and heterogeneity analysis of government internet service levels on urban entrepreneurship in the era of big data and artificial intelligence. Using panel data from 278 Chinese cities between 2019 and 2021, we constructed a mediation effect model and reached the following conclusions:

First, government internet service levels significantly promote urban entrepreneurship, a finding that holds even after robustness tests. Heterogeneity exists in the impact of local government internet service capabilities on entrepreneurship across regions with differing developmental conditions. The innovation effect of government internet services is particularly pronounced in China's western and central regions, whereas in the eastern region, the promotional effect of enhanced government internet services on urban entrepreneurship is less evident.Additionally, while this innovation effect exhibits positive impacts in both smart and non-smart cities, the significance of government internet service capacity on entrepreneurial activity is markedly greater in non-smart cities than in smart cities.

Second, enhancing local government internet service capabilities optimizes the business environment, thereby elevating urban entrepreneurship levels. An improved business environment protects the rights and interests of existing and potential entrepreneurs, stimulating their endogenous motivation for innovation and entrepreneurship, which in turn boosts urban entrepreneurship levels.

Based on these conclusions, and considering China's existing policies to enhance local government internet service capabilities or urban entrepreneurial levels, actual socioeconomic development conditions, and the advancement of big data and artificial intelligence technologies, the following policy recommendations are proposed:

First, leverage big data and artificial intelligence to enhance the development of "Internet Plus Government Services" platforms, thereby improving local governments' online service capabilities. Against the backdrop of the information age, utilize cutting-edge technologies such as big data, artificial intelligence, and cloud computing to continuously optimize and refine multimedia platforms for online e-government services. This will boost the efficiency of e-government services, enabling businesses and individuals to access required information and complete relevant procedures more conveniently and efficiently. Consequently, it will reduce the institutional transaction costs faced by existing and potential entrepreneurs during the startup process.

Second, continuously optimize the business environment and strive to establish a fair, just, convenient, and orderly environment. This includes streamlining application approval processes, shortening approval timelines, and addressing traditional challenges such as low entry barriers but high entry difficulties. Strengthen the rule of law in society, promote intellectual property protection to safeguard innovators' achievements, and provide policy consultations and free legal services for innovation and entrepreneurship to assist potential entrepreneurs in resolving objective policy-related issues encountered during their ventures.Leverage technologies like big data to enhance public infrastructure development; assess public demand for such infrastructure, increase funding and policy support for its

construction, and provide free public services to alleviate the pressure on potential entrepreneurs.

Third, adopt tailored approaches by formulating differentiated development strategies and reasonable implementation policies based on regional development conditions and specific challenges. Due to variations in economic development levels, technological innovation capabilities, information infrastructure, social environments, historical and cultural traditions, and population education levels, the demand for government service capabilities differs across regions. Consequently, significant disparities exist in the internet service capabilities of local governments among cities located in different geographical areas and at varying stages of development.Therefore, it is essential to comprehensively consider each region's unique characteristics and internal/external environmental conditions, tailoring implementation policies accordingly. This approach will guide local governments to leverage their internet service capabilities to elevate urban entrepreneurial levels, thereby fostering sustainable, high-quality economic development.

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Moving forward, we will draw upon the experiences and insights gained from this competition to diligently study statistical modeling, continuously refine our skills, and contribute our modest efforts to the advancement of this field. Finally, we sincerely thank all the experts and reviewers for taking the time to evaluate this paper amidst their busy schedules. We humbly welcome any corrections for its shortcomings and pledge to listen attentively.

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