Research on the Impact of National Digital Economy Innovation and Development Pilot Zones on Urban Innovation Capacity

Wenli Han[1] Siyu Chen[2]

[1,2] School of Public Administration, Southwest Jiaotong University, Chengdu 610031, China
[2]Corresponding author.

ABSTRACT

The implementation of the "National Digital Economy Innovation and Development Pilot Zone Implementation Plan" in 2019 provided a comprehensive systematic design and target requirements for innovation and governance in China's digital economy. Utilizing panel data from prefecture-level cities in China between 2015 and 2022, this study employs the Difference-in-Differences (DID) method to examine the innovation effects of this pilot policy and to elucidate its specific mechanisms. The findings reveal that the pilot policy has a positive and significant effect on promoting urban innovation. Mechanism tests indicate that the policy effectively enhances urban innovation capacity primarily by increasing government financial investment in science and technology, improving government service efficiency, stimulating the cultivation of innovation entities, and promoting the aggregation of digital talent. Heterogeneity analysis shows that the policy's effect on enhancing innovation capacity is more pronounced in cities with lower administrative ranks and lower levels of science and education resources compared to their higher-ranked counterparts. Consequently, it is advisable to appropriately expand the scope of the pilot policy, create a conducive innovation environment, foster the integration of innovation factors, tailor the construction of pilot zones to local conditions, and further leverage the policy's role in leading and demonstrating innovation.

Keywords: *National Digital Economy Innovation and Development Pilot Zone, Policy pilot, Policy effect, Urban innovation capacity.*

1. INTRODUCTION AND LITERATURE REVIEW

Urban economic advancement has entered an age driven by innovation as the Chinese economy transitioned from a period of fast expansion to one centered on high-quality development. Ongoing efforts are being undertaken at the national level to improve the system for scientific and technical innovation and to expedite the implementation of an innovation-driven development plan. In October 2019, China's top Internet regulator and the National Development and Reform Commission (NDRC) jointly released the "National Digital Economy Innovation and Development Pilot Zone Implementation Plan" to examine a path for digital economy innovation and development with Chinese characteristics. This initiative aims to establish a number of distinctive innovation and development pilot zones following the approach of "pilot first, accumulate experience, then gradually promote." So, what is the actual impact of the "Plan" on the innovation capacity of cities within the pilot zones? The following important questions are the focus of this research: First, can the pilot policy enhance the innovation capacity of pilot cities? Second, through what pathways does the pilot policy improve urban innovation capacity? Third, does the impact of the pilot policy vary based on cities' different administrative ranks and different levels of science and education resources? Investigating these questions is crucial for fully understanding the role and specific mechanisms of the "Plan" in enhancing urban innovation capacity, and is significant for expanding the pilot policy and supporting high-quality urban development.

Research related to this paper focuses primarily on the following aspects. First, studies on the effects of the pilot zone policy. Pilot policies have been shown to promote enterprise digital transformation through "fiscal support effects" and "R&D innovation effects"[1], and to stimulate enterprise innovation from both "supply and demand" perspectives[2]. Pilot policies can also effectively enhance urban entrepreneurial activity[3] and promote the level of new quality productivity[4]. Second, research on the innovation effects of related pilot policies such as "Innovative City" and "Broadband China," which have played significant roles in increasing enterprise patent numbers[5], enhancing corporate green innovation capacity[6], and boosting urban digital innovation capability[7].

Furthermore, studies on factors influencing urban innovation capacity exist. From the perspective of regional innovation system theory, enterprises, governments, and others constitute the main actors within the urban innovation system. Enterprises are the driving force behind urban innovation, while government investment[8] and strengthened urban management and public services[9] are important pathways for promoting urban innovation. Regarding innovation resources, the core endowment for driving urban innovation is innovative production factors — scientific and technological talent[10]. Concerning the innovation environment, current literature tends to view it as a system encompassing elements like the policy environment and market environment[11]. Government departments assume a pivotal role in fostering the regional innovation environment; by formulating corresponding policies, innovation factors can converge within the system, thereby creating favorable software and hardware environments for innovation entities[12].

Overall, as a major national strategic deployment, the innovation effects of the "Plan" and its mechanisms still present a broad research space. On one hand, most scholars explore the policy's impact on enterprises from a micro perspective based on listed company data, lacking corresponding research at the macro level on urban innovation capacity. On the other hand, the specific pathways through which the pilot policy affects urban innovation capacity require further exploration.

2. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESES

2.1 Pilot Zones and Urban Innovation Capacity

As an important strategic deployment jointly led by the NDRC and China's top Internet regulator, the National Digital Economy Innovation and Development Pilot Zone, in its overall goals, key tasks, development methods, and management models, is directed towards urban innovation capacity. Specifically: First, the "Plan" sets overall goals such as achieving breakthroughs in core technologies and cultivating innovation demonstration highlands, which highly align with enhancing urban innovation capacity. Second, the construction of the pilot zones revolves around key tasks including "fostering new factors" and "advancing new governance," which further strengthen urban innovation capacity. For instance, nurturing new factors provides the core "raw materials" for innovation. The aggregation and integration of factors like capital, talent, and technology accelerate knowledge flow and diffusion, stimulating urban innovation[13]. The advancement of new governance, in turn, provides "rules" and an "environment" for innovation. The uncertainty of innovation requires a compatible governance model to safeguard it and remove obstacles. Third, the data-driven development approach of the pilot zones is consistent with the intrinsic requirements of urban innovation. Data is a key driving force for internal urban innovation, enabling the improvement and optimization of innovation models and systems[14], creating greater space for urban innovation development. Fourth, the pilot zones explore the construction of intelligent management models. The "Plan" points out the need to promote the networking and intelligent transformation of urban public infrastructure, and to create sensor networks for municipal facility management. Intelligent infrastructure and service systems provide cities with more efficient and convenient management and services. Smart management models not only improve urban management efficiency but also significantly enhance urban innovation output [15]. In summary, the pilot zone initiative is essentially a pioneering experiment in institutional innovation and high-quality development, aiming to summarize replicable experiences and lead urban innovation and high-quality development through "institutional innovation." Consequently, this paper puts forward the subsequent hypothesis:

H1: The construction of the pilot zones helps to enhance urban innovation capacity.

2.2 Mechanisms of Impact

2.2.1 The Mediating Role of Fiscal S&T Support and Government Service Efficiency

At the level of the innovation environment, the pilot zones enhance internal urban innovation capacity by increasing "government financial support" and enhancing "government service efficiency." Regarding government financial support, according to implementation rules issued by pilot cities, local governments may provide direct financial support to enterprises through subsidies or indirectly increase market entities' innovation willingness through tax incentives. Simultaneously, governments have issued documents requiring the effective use of relevant special funds and investment funds, actively seeking support from national and provincial major special funds to help relevant entities alleviate innovation and R&D funding issues. Existing research shows that government funding support encourages R&D by market entities while enhancing upstream and downstream collaboration, thereby increasing innovation output[16]. Furthermore, government fiscal expenditure, as an important vehicle for government participation in innovation activities, provides guarantees for urban innovation activities.

Regarding government service efficiency, the pilot zones use "digital government construction" as a lever to further enhance intelligent government service levels. According to implementation rules for the pilot zones issued by local governments, many places prioritize accelerating the iterative upgrading of digital government. Digital transformation improves the operational methods of government agencies, expands public service supply, and strengthens administrative supervision[17]. On the other hand, the use of government transparency and online platforms can reduce administrative discretion, ensuring that government management operates under open processes and institutional norms[18]. Meanwhile, governments are accelerating the deployment of supporting infrastructure such as government big data new infrastructure and digital government service platforms. Accurately releasing policy information on e-government websites, promptly streamlining public information collection channels, and updating enterprise information directories help create a favorable credit environment for enterprise innovation and development. This allows innovation entities to devote more time and resources to innovation activities, thereby enhancing innovation capacity. Consequently, this paper puts forward the subsequent hypothesis:

H2: Pilot zone construction enhances urban innovation capacity by increasing government financial support.

H3: Pilot zone construction enhances urban innovation capacity by improving government service efficiency, thereby creating a favorable innovation environment for relevant entities.

2.2.2 The Mediating Role of Nurturing Innovation Entities and Aggregating Digital Talent

According to regional innovation ecosystem theory, the synergy among innovation entities, resources, and the environment can stimulate sustained innovation within the system. Beyond the environmental element discussed above, the pilot zones also enhance the innovation capacity of their internal cities by cultivating innovation entities and aggregating innovation resources. At the level of innovation entities, the multi-stakeholder co-governance model of the pilot zones helps standardize market transaction behaviors, creating a favorable business environment that boosts the cultivation and development of enterprises[19]. Simultaneously, the pilot zones actively cultivate specialized, refined, distinctive, and innovative SMEs , assisting leading digital industry companies and innovative firms in frontier fields to grow stronger, thereby injecting vigorous vitality into urban innovation. On the other hand, as the most dynamic innovation entities, enterprises are the focal point for innovative driving forces such as technological push, market pull, and environmental influence, directly affecting regional innovation and high-quality economic development.

At the level of innovation resources, the conduct of innovative R&D activities benefits from human capital possessing knowledge, technology, and experience[20]. The "Plan" advocates for enterprises, universities, and others to jointly establish digital skills training centers to promote digital talent cultivation. Meanwhile, the relatively better policy and institutional environment in pilot zones can attract innovative talent to converge in these areas, also generating a siphon effect on surrounding regions[21]. Furthermore, the pilot policy emphasizes accelerating the deep integration of the digital economy with the real economy and promoting the agglomerated development of the digital industry. The broad range of job opportunities creates a rigid demand for talent, continuously attracting talent inflow and providing intellectual support for innovation activities. The role of talent in enhancing innovation capacity is widely recognized in academia; the inflow of R&D personnel and the aggregation of scientific and technological talent[22] both contribute to improving regional innovation capacity. Consequently, this paper puts forward the subsequent hypothesis:

H4: Pilot zone construction enhances urban innovation capacity by promoting the cultivation of urban innovation entities.

H5: Pilot zone construction enhances urban innovation capacity by aggregating digital research talent, fully leveraging human innovative initiative.

The research framework is shown in “Figure 1”.

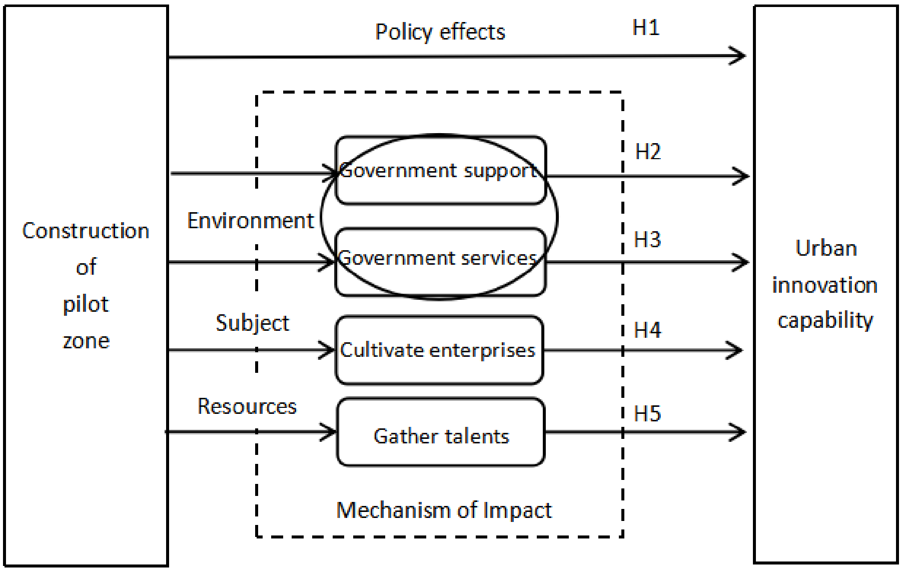

Figure 1 Research framework.

3. RESEARCH DESIGN

3.1 Empirical Model Specification

This paper establishes the following model based on a single-period DID approach:

$$uic_{it} = \alpha + \beta policy_{it} + \varphi control_{it} + \lambda_i + \mu_t + \varepsilon_{it} \quad (1)$$

where “i” and “t” denote city and time, respectively. “uic” is the explained variable. “$Policy_{it}$” is the core explanatory variable. The estimated coefficient “β” measures the impact of the pilot policy on urban innovation capacity. “$Control_{it}$” represents all control variables.

3.2 Variable Selection

3.2.1 Explained Variable

Urban Innovation Capacity (uic). Patent data is widely used as a proxy indicator for innovation capacity. This study uses patent grant data. For empirical analysis, the city’s permanent population is used as the standardization base; urban innovation capacity is measured by the ratio of the number of patents granted to the population.

3.2.2 Explanatory Variable

Policy Net Effect (policy). Represented by the interaction term of the policy dummy variable (treat) and the policy implementation time dummy variable (time), i.e., treat×time. Specifically: Pilot cities are assigned a value of 1, others 0; the period before 2019 is assigned 0, after 2019 is assigned 1. For the year the policy was announced (2019), it is assigned a value of 0.1667 based on the proportion of months affected by the policy in that year.

3.2.3 Control Variables

To mitigate the risk of omitted variable bias, this study integrates the following crucial control variables: the level of economic development (pgdp), operationalized as per capita gross regional product; the degree of openness (open); industrial structure (ind); the extent of government intervention (gi); and urbanization level (ul), quantified by the percentage of urban permanent residents within the total population.

3.2.4 Mediating Variables

The mediating variables include: Government S&T support (gti), measured by government financial expenditure on science and technology; Government service efficiency (int), measured by the government governance environment evaluation score from the 2024 China City Business Environment Database; Cultivation of innovation entities (com), measured by the number of new start-ups in the city; Digital talent aggregation (talent), measured by the number of personnel engaged in Research and Experimental Development.

3.3 Data Description and Descriptive Statistics

Based on the principle of temporal balance around the issuance of the "Plan" and data availability, data from 2015 to 2022 were collected. Raw data sources include provincial/municipal statistical yearbooks, science and technology yearbooks, and the Peking University Open Research Data Platform. After compilation, data for 283 cities over an 8-year period were obtained. "Table 1" presents the descriptive statistics of the sample used in this study.

Table 1. Descriptive statistics

	VarName	Obs	Mean	SD	Min	Median	Max
Explained Variable	uic	2264	1.39	1.78	0.03	0.71	15.81
Control Variable	pgdp	2264	10.89	0.52	9.30	10.86	12.46
	open	2264	0.16	0.25	0.00	0.07	2.49
	ind	2264	0.88	0.08	0.51	0.89	1.00
	gi	2264	0.21	0.10	0.06	0.18	0.92
	ul	2264	0.59	0.14	0.25	0.57	1.01
Mediating Variable	gti	2264	15.73	46.83	0.08	3.92	554.98
	int	2264	58.73	7.02	26.27	58.70	84.72
	com	2264	7.25	8.53	0.41	4.37	91.43
	talent	2264	2.11	4.51	0.00	0.66	57.44

4. ANALYSIS OF EMPIRICAL RESULTS

4.1 Parallel Trend Test

This paper uses a dynamic effects test method, constructing the following model:

$$uic_{it} = \alpha + \beta_1 \sum_{2015}^{2022} Year + \varphi control_{it} + \lambda_i + \mu_t + \varepsilon_{it} \quad (2)$$

"Figure 2" shows the parallel trend test results for urban innovation capacity and the policy effect. Before the policy time point, the estimated coefficients β_1 for each year are not significant, indicating that the trends in innovation capacity between pilot and non-pilot cities were not significantly different during this period, meeting the parallel trend assumption. After the exogenous shock of the pilot policy, the estimated coefficients for subsequent periods are significantly positive, indicating that the policy had a positive impact on explained variable.

4.2 Baseline Regression Results

The baseline regression results are shown in "Table 2". Column (1) shows the result without control variables. The regression coefficient is 1.914 and significant at the 1% level. Column (2) shows that after adding control variables, the coefficient for the pilot policy on urban innovation capacity remains significantly positive. Column (3) further considers time and city fixed effects; the regression coefficient is 0.322, significant at the 5% level, indicating that a one-unit increase in the policy variable is associated with a 0.322 unit increase in urban innovation capacity. In summary, the pilot policy can enhance urban innovation capacity, supporting Hypothesis 1.

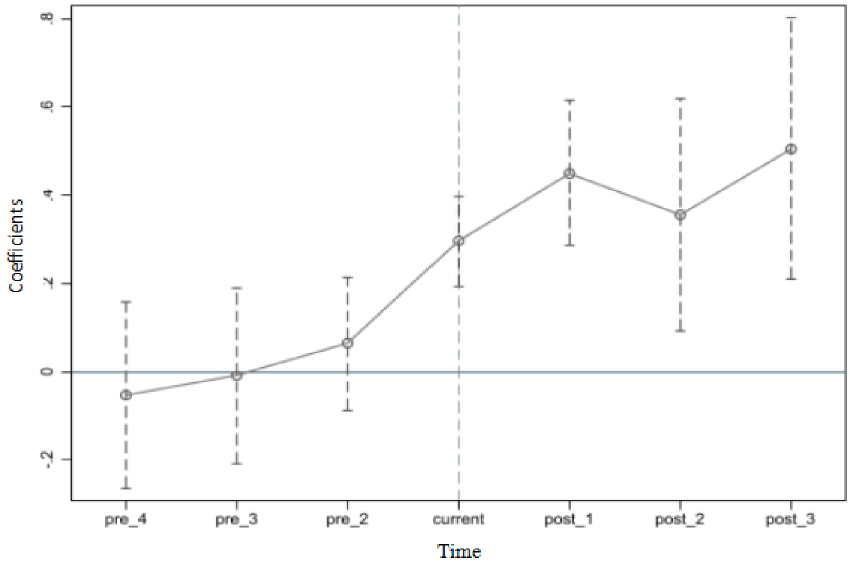

Figure 2 Parallel trend test for urban innovation capacity and policy effect.

Table 2. \ Benchmark regression results

VarName	(1)	(2)	(3)
	uic	uic	uic
policy	1.914***	1.312***	0.322**
	(0.359)	(0.228)	(0.145)
pgdp		1.281***	-1.618***
		(0.235)	(0.330)
open		1.988***	-0.910*
		(0.575)	(0.515)
ind		2.355***	6.944***
		(0.724)	(1.154)
gi		1.610***	-1.630*
		(0.563)	(0.938)
ul		2.382***	-1.390**
		(0.747)	(0.633)
Year-FE	NO	NO	YES
City-FE	NO	NO	YES
Constant	1.218***	-16.838***	14.182***
	(0.079)	(2.410)	(3.809)
N	2,264	2,264	2,264
R^2	0.090	0.599	0.911

a Note: Significance levels: *** p<0.01, ** p<0.05, * p<0.1*

4.3 Robustness Checks

4.3.1 Placebo Test

To address potential sample selection bias, this paper randomly selects some prefecture-level cities as a false treatment group and the remaining as a false control group, repeating this process 500 times to obtain corresponding estimated coefficients and t-values. "Figure 3" shows the kernel density estimation plot of the regression coefficients. The coefficients under random treatment are all clustered around zero and follow a normal distribution. The solid line on the right represents the true estimated value of 0.322, which is far from the pseudo-estimated coefficients.

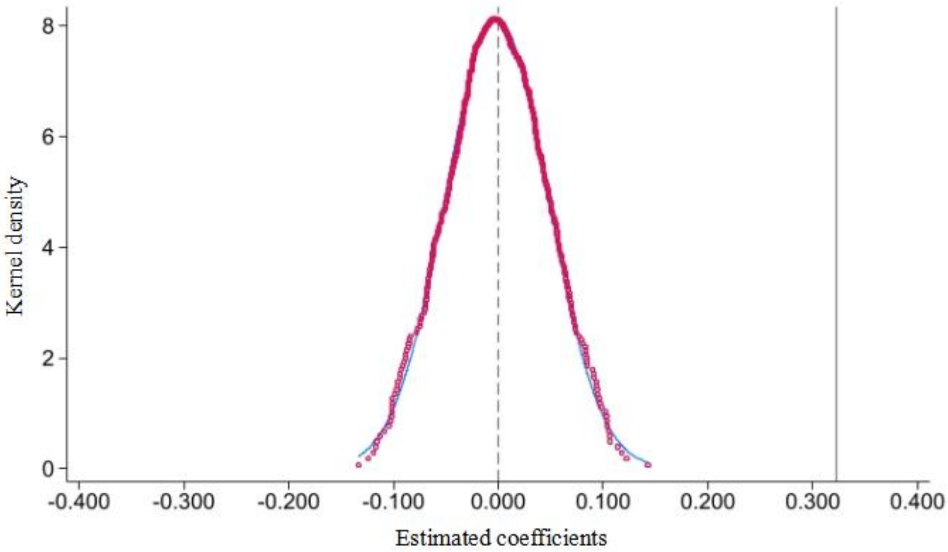

Figure 3 Placebo test.

4.3.2 PSM-DID Test

Using the Propensity Score Matching (PSM) method, the treatment and control groups were matched via kernel density matching. Balance tests were conducted on the sample; results are shown in "Table 3". After matching, the standardized biases of the control variables were reduced, with absolute values all below 10%, and the t-test results became insignificant. Furthermore, the matched sample was used in the model for regression again. The final results are shown in Columns (1) and (2) of "Table 4". The data show that after PSM, the regression coefficients for policypolicy remain significantly positive at the 5% level, indicating the robustness of the baseline regression results.

Table 3. Balance test results

VarName	Unmatched Matched	Mean		%bias	%reduct |bias|	t-test		V(T)/VC
		Treated	Control			t	p>|t|	
pgdp	U	10.977	10.866	21.4		4.30	0.000	0.93
	M	10.977	10.972	0.9	95.8	0.15	0.881	1.00
open	U	0.26578	0.13062	48.8		11.17	0.000	2.35*
	M	0.26578	0.24379	7.9	83.7	1.11	0.266	1.01
ind	U	0.8973	0.87654	28.7		5.42	0.000	0.53*
	M	0.8973	0.89513	3.0	89.6	0.57	0.569	0.86
gi	U	0.18268	0.2237	-43.7		-8.12	0.000	0.45*
	M	0.18268	0.1813	1.5	96.6	0.32	0.752	1.10
ul	U	0.60519	0.58588	14.1		2.87	0.004	1.03
	M	0.60519	0.59261	9.2	34.9	1.55	0.122	1.13

Table 4. Robustness checks

VarName	PSM-DID		Exclude special samples		Winsor	
	(1)uic	(2)uic	(3)uic	(4)uic	(5)uic	(6)uic
policy	0.452**	0.289**	0.530***	0.363**	0.375***	0.264**
	(0.190)	(0.142)	(0.190)	(0.146)	(0.142)	(0.120)
pgdp		-1.758***		-1.566***		-1.310***
		(0.377)		(0.332)		(0.204)
open		-1.390		-0.890*		-0.268
		(0.870)		(0.518)		(0.389)
ind		8.094***		6.911***		6.839***

VarName	PSM-DID		Exclude special samples		Winsor	
	(1)uic	(2)uic	(3)uic	(4)uic	(5)uic	(6)uic
		(1.224)		(1.147)		(1.067)
gi		-1.951		-1.443		-1.277**
		(1.206)		(0.937)		(0.588)
ul		-1.399**		-1.048*		-1.101**
		(0.706)		(0.604)		(0.553)
Year-FE	YES	YES	YES	YES	YES	YES
City-FE	YES	YES	YES	YES	YES	YES
Constant	1.389***	14.869***	1.302***	13.337***	1.340***	10.558***
	(0.018)	(4.418)	(0.017)	(3.827)	(0.013)	(2.271)
N	2,180	2,180	2,232	2,232	2,264	2,264
R^2	0.901	0.911	0.901	0.910	0.918	0.925

a Note: Significance levels: *** p<0.01, ** p<0.05, * p<0.1*

4.3.3 Other Robustness Checks

Additional robustness checks were conducted. First, excluding special city samples. Given the unique political and economic status of municipalities directly under the central government, the four municipalities were removed from the sample. The robustness check results are shown in Columns (3) and (4) of "Table 4". The regression coefficients of the pilot policy on urban innovation capacity are 0.530 and 0.363, respectively, higher than the baseline results but still significant at the 1% and 5% levels, confirming the robustness of the conclusion. Second, winsorization was applied. The explained variable and control variables were winsorized at the 1% level (top and bottom). The test results are shown in Columns (5) and (6) of Table 4. Compared to the main regression results, the coefficient of the pilot policy on urban innovation capacity changed slightly but remained positive and significant, supporting Hypothesis 1.

5. MECHANISM TESTS AND HETEROGENEITY ANALYSIS

5.1 Mechanism Tests

Following the stepwise regression approach, the following mediation effect test models are established. "M_{it}" refers to the mediating variable; other variables are as before.

$$M_{it} = \alpha_1 + \gamma policy_{it} + \varphi_2 control_{it} + \lambda_i + \mu_t + \rho_{it} \quad (3)$$

$$uic_{it} = \alpha_2 + \omega policy_{it} + \theta M_{it} + \varphi_3 control_{it} + \lambda_i + \mu_t + \zeta_{it} \quad (4)$$

"Table 5" shows the inspection results. Columns (2), (4), (6), and (8) show that the regression results of fiscal S&T support, government service efficiency, innovation entity cultivation, and digital talent aggregation on the digital economy innovation pilot policy are significantly positive, indicating that the pilot policy positively promotes these mediating variables. Columns (3), (5), (7), and (9) show that the regression results of urban innovation capacity on the respective mediating variables MM are significant at the 1% level, and the regression coefficients for the pilot policy decrease compared to the baseline regression. These results are consistent with the expected changes in coefficients under a mediation model, confirming Hypotheses 2 through 5.

Table 5. Mediation effect test results

VarName	(1) Benchmark Regression	(2) git	(3) uic	(4) int	(5) uic	(6) com	(7) uic	(8) talent	(9) uic
policy	0.322**	2.570*	0.274*	1.866***	0.284*	1.221*	0.285**	0.790***	0.203
	(0.145)	(1.503)	(0.139)	(0.685)	(0.144)	(0.679)	(0.140)	(0.280)	(0.141)
gti			0.018***						
			(0.004)						
int					0.020***				
					(0.004)				
com							0.030***		
							(0.010)		
talent									0.150***
									(0.034)
Control	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year-FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
City-FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	14.182***	40.337	13.443***	74.526***	12.680***	13.208	13.782***	-1.447	14.399***
	(3.809)	(39.410)	(3.623)	(19.923)	(3.680)	(14.109)	(3.802)	(3.213)	(3.842)
N	2,264	2,264	2,264	2,264	2,264	2,264	2,264	2,264	2,264
R^2	0.911	0.940	0.925	0.511	0.914	0.834	0.914	0.969	0.915

a Note: Significance levels: *** p<0.01, ** p<0.05, * p<0.1*

5.2 Heterogeneity Analysis

5.2.1 Administrative Rank Heterogeneity

To explore the differential impact of the pilot policy on cities of different administrative ranks, the 4 municipalities, 26 provincial capitals, and 5 separately listed cities are classified as higher-rank cities; the remaining cities are classified as lower-rank cities. The test results are shown in Columns (1) and (2) of Table 6. The regression coefficient for high-rank cities is 0.582 but not significant, while the coefficient for low-rank cities is 0.281, significant at the 5% level. This suggests that the pilot policy better enhances innovation capacity in cities with lower administrative ranks. This might be because higher-rank cities already possess relatively well-developed S&T infrastructure and a higher degree of talent and capital aggregation. According to the law of diminishing marginal returns, the "dividend" of the pilot policy for innovation capacity in high-rank cities gradually decreases. Conversely, lower-rank cities are still in a phase of further technological development, with a lower level of digital economy development and not yet fully realizing their innovation potential; thus, the policy resources they receive can maintain relatively high marginal utility.

5.2.2 Science and Education Level Heterogeneity

To investigate whether differences in the science and education resource base affect the policy's impact, cities with "Double First-Class" universities are classified as having higher science and education levels, and the remaining prefecture-level cities are classified as having lower levels. Regression is then performed again. As shown in Columns (3) and (4) of "Table 6", the regression result for high science-education level cities is 0.314 but not significant, indicating that the policy's effect on enhancing innovation capacity is not evident in these cities. The regression coefficient for low science-education level cities is 0.368, significant at the 1% level, indicating that the policy promotes their innovation capacity. The reason may be that high science-education level cities already possess relatively sufficient knowledge reserves; the pilot policy acts more as "adding flowers to the brocade" (icing on the cake), with limited marginal effect on their innovation capacity. Meanwhile, the pilot policy helps optimize the allocation of innovation resources and attract excellent digital talent in cities with lower science-education levels, thereby enhancing their innovation capacity.

Table 6. Heterogeneity tests based on city administrative level and science/education level

VarName	(1)higher administrative level	(2)lower administrative level	(3)higher science/education level	(4)lower science/education level
	uic	uic	uic	uic
policy	0.582	0.281**	0.314	0.368***
	(0.562)	(0.125)	(0.547)	(0.123)
pgdp	-1.576	-0.923***	-1.911	-0.776***
	(1.883)	(0.223)	(1.387)	(0.208)
open	-4.519*	-0.455	-4.936*	-0.337
	(2.647)	(0.368)	(2.479)	(0.340)
ind	26.285**	5.402***	10.656	4.939***
	(12.730)	(0.949)	(11.801)	(0.875)
gi	1.650	-0.224	0.327	-0.083
	(7.782)	(0.496)	(6.306)	(0.479)
ul	-6.266**	-0.695	-4.415**	-0.978*
	(2.879)	(0.532)	(1.963)	(0.562)
Year-FE	YES	YES	YES	YES
City-FE	YES	YES	YES	YES
Constant	1.981	6.892***	19.488	5.748**
	(24.501)	(2.417)	(20.784)	(2.336)
N	280	1,984	360	1,904
R^2	0.911	0.917	0.908	0.922

a Note: Significance levels: *** p<0.01, ** p<0.05, * p<0.1*

6. RESEARCH CONCLUSIONS AND POLICY IMPLICATIONS

6.1 Research Conclusions

Using data from 283 prefecture-level and above cities in China from 2015 to 2022, and treating the National Digital Economy Innovation and Development Pilot Zone policy as a quasi-natural experiment, this study investigates how this pilot policy affects urban innovation capacity. The results show that:

- The construction of the pilot zones has a positive and significant effect on enhancing urban innovation capacity.
- The digital economy innovation development policy primarily enhances urban innovation capacity by increasing government financial investment in S&T, improving government service efficiency, stimulating the cultivation of innovation entities, and promoting the aggregation of digital talent.
- The effect of the pilot policy on innovation capacity exhibits heterogeneity based on city characteristics. Compared to cities with higher administrative ranks and higher levels of science and education, the policy's effect on enhancing innovation capacity is more significant in cities with lower administrative ranks and lower science and education levels.

6.2 Policy Implications

Drawing on the research findings, the subsequent policy recommendations are put forward:

- The first is to orderly expand the pilot program and promote best practices nationwide. On one hand, it is necessary to thoroughly summarize the practices related to pilot zone construction, compiling a set of excellent case studies on digital economy innovation and development pilots for sharing and exchange. Simultaneously, considering the overall plan, it is also necessary to gradually and orderly expand the pilot zones on the basis of consolidating existing achievements, fully stimulating and mobilizing the vitality of market entities.

- The second is to fully leverage the leading role of government departments to create a favorable innovation environment. There will be a must to increase financial support for S&T and enhance the level of government services. On the one hand, government departments ought to augment their investment in innovation and offer support tailored to actual circumstances, furnishing essential financial backing to innovation entities, fostering the advancement of new technologies, and spurring the invention and creation of novel products. On the other hand, there is a necessity to emphasize the digital infrastructure construction for government services, including but not limited to improving new-generation mobile communication networks, building digital government platforms and security assurance centers, to enhance the digital level of government services and reform.
- The third is to formulate “tailored” construction plans for digital economy innovation development pilot zones based on local conditions. Considering the heterogeneity of factors such as city administrative level and science and education resource endowments, it is necessary to implement focused and differentiated development strategies, prioritize providing innovation support to non-central cities and those with weaker science and education resources, and accelerate technology transfer and digital talent flow. Meanwhile, such cities should better seize the opportunities brought by the digital economy innovation pilot policy to inject new kinetic energy into innovative development.

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