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Unleashing local growth: The role of regional innovation and entrepreneurship in China

Zhiwei Jin

Graduate School of Economics, Ritsumeikan University, 1-1-1 Noji-higashi, Kusatsu, Shiga 525-8577, Japan.
Email: gr0602hi@ed.ritsumei.ac.jp

Abstract

This study investigates the role of entrepreneurship and innovation in promoting local economic growth in China. Past studies have evaluated this issue using national- or province-level data. However, given China's large size and significant diversity, even within a single province, and the fact that entrepreneurial spirit is a local issue, more localized analysis is necessary for a comprehensive understanding. Thus, using a unique dataset encompassing 286 cities from 2004 to 2020, we evaluate how entrepreneurship and innovation stimulate regional economic growth at the city-level. The results show the positive effects of entrepreneurship and innovation, particularly firm entry, outside direct investment, patent granted, and trademark registration. The study also investigates heterogeneity across administrative divisions and geographical features. Entrepreneurship and innovation are found to significantly enhance local economic development. The effects are particularly strong in provincial capitals compared to other cities. Furthermore, geographical factors, such as the Qinling-Huaihe Line and the Hu Huanyong Line, play a crucial role in shaping economic outcomes, highlighting substantial regional disparities. Entrepreneurship and innovation serve as crucial drivers of regional economic growth, but their impact varies based on administrative status and geographical context. The findings underscore the importance of localized policies that promote entrepreneurship and innovation. This study also provides valuable insights into the spatial dynamics of economic growth and contributes to the broader discourse in economic geography.

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1. Introduction

Since Schumpeter introduced the concept of "creative destruction," the importance of entrepreneurship and innovation in driving economic growth has been well-established (Andrews, Chatterji, Lerner, & Stern, 2022). However, this argument is crucial not only at the national level but also at the regional level, especially in large countries with diverse regional characteristics. In China, there remains a significant gap in various macroeconomic conditions across different regions. Among these disparities, the development of regional innovation and entrepreneurship is notably varied. Some argue that differences in regional innovation and

entrepreneurship are a primary source of growth disparities within China (He, Lu, & Qian, 2019; Xu, Yu, & Li, 2021). This study empirically addresses this issue by utilizing city-level samples and employing a unique dataset to explore these dynamics in depth. In addition, we investigate the heterogeneities in the regional innovation and entrepreneurship-growth nexus across city characteristics, such as administrative division and geographical location.

This study examines the critical relationship between entrepreneurial activity, technological advancement, and local economic growth. To quantify these dynamics, the Index of Regional Innovation and Entrepreneurship in China (IREIC index) was developed by Peking University's Center for Enterprise Research (CER). The index synthesizes five city-level indicators: (1) new firm creation, capturing entrepreneurial intensity; (2) foreign direct investment and (3) venture capital inflows, reflecting external and domestic risk capital allocation; alongside (4) patent grants and (5) trademark registrations, serving as proxies for codified and market-oriented innovation outputs. This study employs a border dataset spanning 286 cities (2004-2020), with demographic controls and institutional covariates accounting for regional heterogeneity.

Our baseline results show that regional innovation and entrepreneurship significantly enhance local economic growth, even when focusing on city-level data. All five dimensions, except venture capital, exhibit significant effects. Specifically, it is observed that entrepreneurial activity (measured by the number of newly established enterprises) and technology innovation (measured by patent granted and trademark registrations) have a large positive effect on local economic growth. To ensure the robustness of our results, we conducted several checks, including instrumental variables analysis, lagged effects, alternative measurements of the dependent variable, and sample adjustments (excluding municipalities and financial crisis periods). These robustness checks consistently support our baseline findings. Moreover, this study shows some clear evidence of the heterogeneity in the effects of entrepreneurship and innovation across city characteristics. First, we present a greater impact on local economic growth in provincial capital cities than in other cities. Second, our analysis demonstrates the significant influence of geographical characteristics, specifically the Qinling-Huaihe Line and the Hu Huanyong Line (detailed in Section 2). The results underscore the interplay between regional disparities and geographical peculiarities in economic development.

This study contributes to the existing literature in several ways. First, this study enhances our understanding of the influence of innovation and entrepreneurship on economic growth by focusing on a largely unexplored aspect: dynamics at the local level. Prior studies have primarily employed national and provincial samples for their discussions (Feki & Mnif, 2016; Li, Yang, Yao, Zhang, & Zhang, 2012; Pradhan, Arvin, Nair, & Bennett, 2020; Wong, Ho, & Autio, 2005). It should be noted that China's significant size and diversity lead to substantial economic, social, and cultural differences between cities, even within the same province. For example, Guangdong province includes both the highly developed city of Shenzhen and less developed areas. Entrepreneurial spirit is a local issue, with regional differences. Localized knowledge and skill differences, as well as differences in institutional structure, underpin regional variations in entrepreneurial spirit (Acs, Braunerhjelm, Audretsch, & Carlsson, 2009; Djankov, Qian, Roland, & Zhuravskaya, 2006) so that the entrepreneurial dynamics can be substantially different across cities. Such a unique inherent locality integral to entrepreneurship (Acs, Estrin, Mickiewicz, & Szerb, 2018; Audretsch, 2018) causes provincial-level analyses to become less effective in understanding how local entrepreneurial and innovative activity fuels economic growth, which calls for the city-level examination.

Second, this study analyzes entrepreneurial activity and innovation on a regional scale by employing a new measure, IREIC index, developed by Peking University's Center for Enterprise Research. This new index is built on extensive business registration data across China from 1990 to the present, reflecting the intricate relationship among entrepreneurs, capital, and technology. Lee (2017) focus on the impact of entrepreneurship on local employment and wage growth in US cities. However, their study has limited scope in its measures of entrepreneurship, and their focus is small business births or average establishment size, which falls short of embodying the rich tapestry of entrepreneurial spirit in its entirety. The spirit of entrepreneurship involves more than just the establishment of new businesses. It encapsulates a broader scope, including at least the innovation activities based on Schumpeter's theory of "creative destruction". The IREIC index not only encompasses components of establishment but also covers other dimensions, providing a more comprehensive measurement of entrepreneurial spirit and a better understanding of its impact on local economic growth.

Third, this study highlights the pivotal influence of regional attributes on local economic development, particularly administrative and geographical positioning. China's economic landscape is marked by pronounced regional disparities. Provincial capital cities, for instance, benefit from superior infrastructure, concentrated resources, and a robust talent pool, fostering an ecosystem that supports innovation and entrepreneurship. These cities also gain from preferential policies and targeted government support, which collectively bolster economic performance. By contrast, non-capital cities often lack these advantages, resulting in divergent developmental trajectories. These disparities are explicitly addressed in the analysis. Additionally, the study examines the impact of geographic characteristics, with particular attention to the Qinling-Huaihe Line and the Hu Huanyong Line, which delineate regions with distinct climatic conditions, resource endowments, and economic structures. Cities situated on either side of these demarcations display markedly different growth patterns, shaped by their unique environmental and economic contexts. A heterogeneity analysis underscores the role of these location-specific factors in driving regional variations in economic outcomes.

Our research is closely related to but distinct from the study of Jian, Fan, Zhao, and Zhou (2021). First, while Jian et al. (2021) investigates the impact of entrepreneurship on province-level of economic growth, our

study employs city-level panel data, providing a more detailed analysis that captures the unique economic dynamics and entrepreneurial activities specific to local conditions. Second, Jian et al. (2021) measure business creation by the share of private sector employment due to data limitations, which may overlook state-owned enterprises' entrepreneurial activities. In contrast, we employ the IRIEC index, a new comprehensive measure that captures a broader spectrum of entrepreneurial activities. It encompasses all industries and scales of enterprises, particularly capturing the high entrepreneurial activity of small, micro, and startup enterprises. Third, our research emphasizes heterogeneity, accounting for administrative levels and geographical location, which offers deeper insights into how regional characteristics influence economic outcomes.

The structure of the paper is organized as follows: Section 2 describes the regional innovation and entrepreneurship development in China. Section 3 reviews the related literature and proposes hypotheses development. Section 4 discusses our empirical strategy. Section 5 presents the baseline results and robustness testes. Section 6 further studies the role of geographical characteristics in economic growth. Section 7 concludes.

2. Regional Innovation and Entrepreneurship Development in China

2.1. Constituents and Construction of Regional Innovation and Entrepreneurship Index

Currently, many research institutions and scholars are developing indexes to analyze innovation and entrepreneurship trends in various countries or regions. Prominent examples include the Doing Business report, the Global Entrepreneurship Monitor (GEM) index, and the Global Innovation Index (GII), as well as other similar indexes. These existing indexes typically have three main characteristics: First, they treat innovation and entrepreneurship separately, with no combined analysis. Second, they rely on macro-statistical data from various government levels, resulting in low aggregation between basic indicators and comprehensive but insufficiently detailed data. Third, they primarily focus on large and high-tech enterprises, often overlooking small and medium-sized enterprises (SMEs) that exhibit significant entrepreneurial spirit.

In contrast, the "Index of Regional Innovation and Entrepreneurship in China" (IREIC) incorporates distinct features that set it apart. Developed by the Center for Enterprise Research at Peking University (Dai, Zhu, & Zhang, 2024), this index draws on business registration records spanning from 1990 to the present, with a focus on enterprises. It evaluates the vibrancy of innovation and entrepreneurship at the provincial and city levels by analyzing three core dimensions: entrepreneurial activity, capital investment, and technological advancement. By relying on objective, output-oriented metrics, the IREIC index offers a robust framework for assessing the regional dynamics of innovation and entrepreneurship across China.

The IRIEC index capitalizes on big data infrastructure and technological integration, positioning enterprises as central actors in market dynamics. By synthesizing data from national commercial registries, venture capital (VC) and private equity (PE) investment databases, intellectual property filings, and trademark registries, the index enables a comprehensive evaluation of entrepreneurial activity, capital flows, and the generation of proprietary assets across subnational jurisdictions. This multidimensional framework quantifies regional innovation ecosystems by analysing behavioural indicators among market participants, with particular emphasis on entrepreneurial density and the accumulation of knowledge capital. As shown in Table 1, the IRIEC index assesses five dimensions: the number of new enterprises indicates entrepreneurial activity; outside direct investment and venture capital investment highlight the role of capital in stimulating regional innovation and entrepreneurship; and the number of patents granted and trademark registrations reflect the impact of technology. Additionally, patents are categorized into novel invention patents, utility model patents, and new design patents, providing further insight into technological contributions to innovation and entrepreneurship.

Table 1. Indicator system of the regional innovation and entrepreneurship index.

Factors	Dimensions	Indicators	Weights (%)
Entrepreneur	Firm entry	Number of new business registrations	20
Capital	Outside direct investment	Number of new outside direct investments	15
	Venture capital investment	Number of new venture capital investments	25
Technology	Granted patents	Number of new granted invention patents	12.5
		Number of new granted utility model patents	7.5
		Number of new granted appearance design patents	5
	Trademark registration	Number of new trademark registrations	15

2.2. The Dynamics and Spatial Patterns of Regional Innovation and Entrepreneurship in China

We analyze the development trends of IRIEC index across various cities within the sample period from 2004 to 2020. Our findings, as illustrated in Figure 1, reveal that the national average index stood at a comparatively low level of 49.32 points in 2004, but significantly increased to 87.74 points by 2020. The highest growth occurred between the years 2009 and 2010, where the average index increased from 60.77 to 66.42. Particularly, a distinct disparity is observed between provincial capital cities and non-provincial capital cities. Over the period of 2004-2020, the innovation and entrepreneurship gap between these two types of cities has

been gradually narrowing. Initially significant in 2004, this gap has been diminishing since 2008, reflecting a trend towards reduced regional disparities in innovation and entrepreneurship.

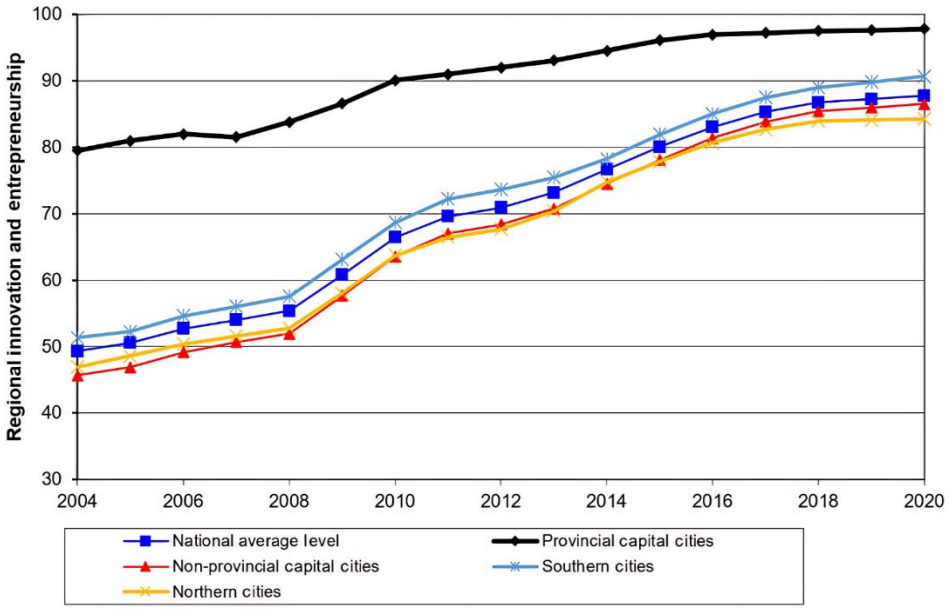

Figure 1. Regional innovation and entrepreneurship index from 2004 to 2020.

As shown in Figure 2, we divide mainland China into different regions based on the Qinling-Huaihe Line and the Hu Huanyong Line. There is a noticeable geographic trend to mention: the scores are generally higher in regions south of the Qinling-Huaihe Line and southeast of the Hu Huanyong Line. The Qinling-Huaihe Line is a major demarcation that divides China into northern and southern parts. It runs along the Qinling Mountains and the Huaihe River, and plays a crucial role in encompassing different climate conditions, agricultural models, and even lifestyle variances between northern and southern China. South of the Qinling-Huaihe Line, the average IRIEC index consistently surpassed the national average, escalating from 51.30 points in 2004 to 90.64 points in 2020. On the contrary, north of this line the index started at 46.90 points in 2004 and gradually grew to 84.25 points by 2020, a substantial improvement but still noticeably less than its southern counterpart.

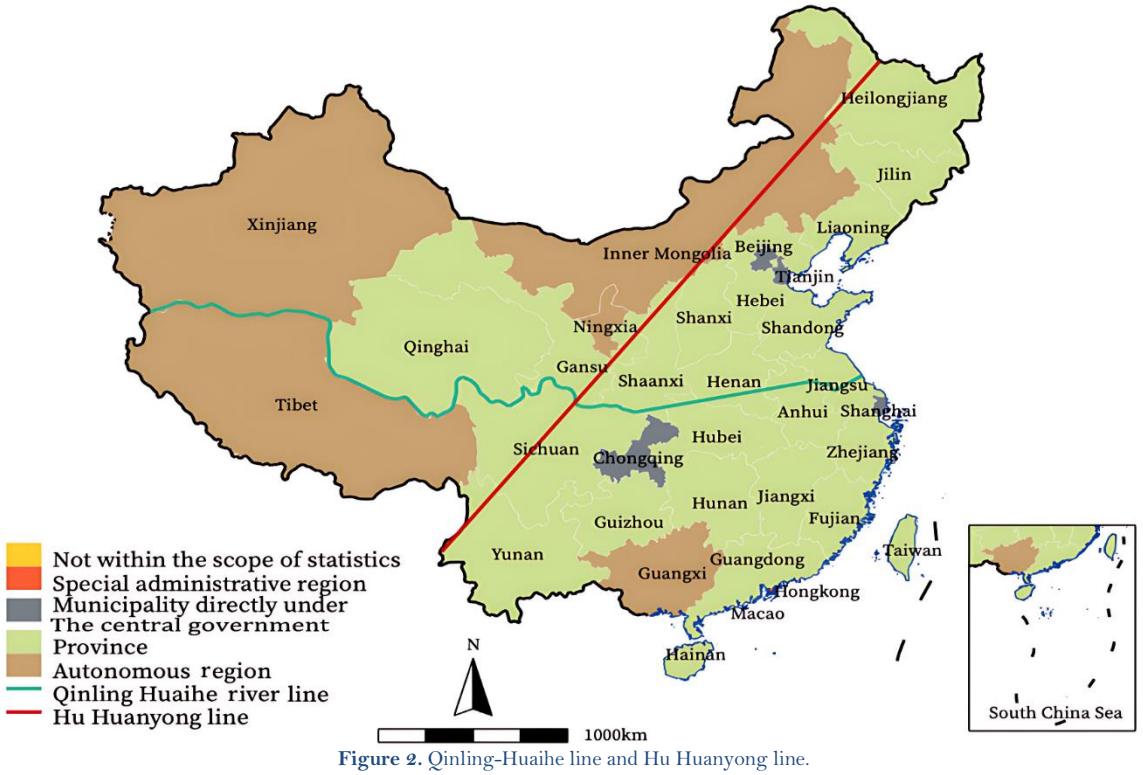

Figure 2. Qinling-Huaihe line and Hu Huanyong line.

The Hu Huanyong Line, on the other hand, is a demographic boundary drawn in 1935 based on the population distribution in China. Majority of China's population lives southeast of this line, with considerably less population density in the northwest. Figure 3 illustrates the significant growth in regional innovation and entrepreneurship levels from 2004 to 2020 in both southern and northern cities. The deepening color gradient over time clearly reflects this upward trend, highlighting the steady progress in innovation and entrepreneurial activities across regions. Specially, in areas southeast of the Hu Huanyong Line, we observed trends similar to those in the southern region—obviously higher figures that ranged from 50.90 points in 2004 to 89.02 points in 2020. Comparatively, northwest of the Hu Huanyong Line, where the population density is significantly less, the index increased at a slower pace from 36.10 points in 2004 to 76.77 points in 2020.

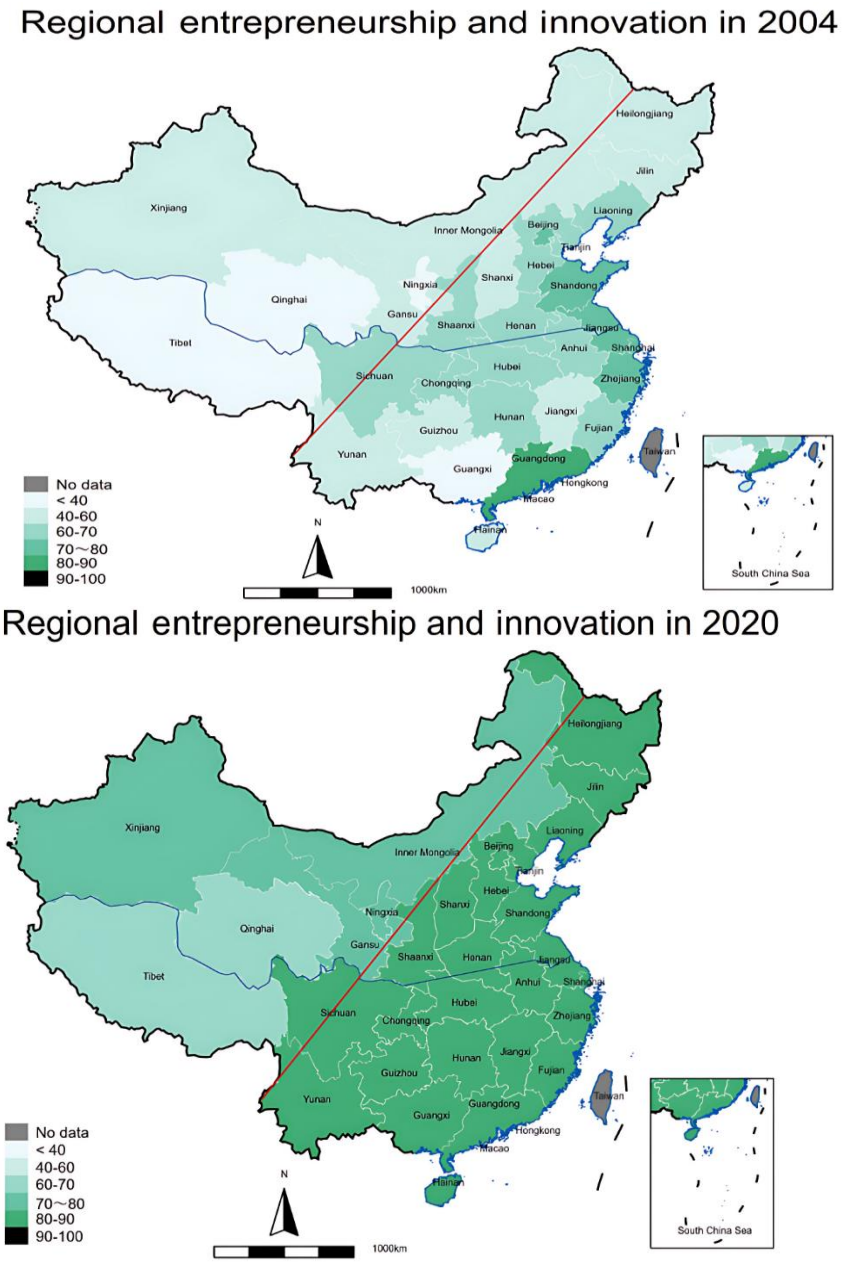

Figure 3. Spatial patterns of regional innovation and entrepreneurship index.

These results indicate a clear geographical disparity in the level of innovation and entrepreneurship across China, posing significant implications for stakeholders in directing resources and efforts towards more balanced national development.

3. Literature Review and Hypothesis Development

The role of innovation and entrepreneurship in driving economic growth has been extensively documented in the literature. Schumpeter (1934) laid the groundwork by introducing the concept of "creative destruction,"

where entrepreneurs disrupt market equilibrium by introducing new products, services, or production methods, thereby fostering economic dynamism (Batabyal & Nijkamp, 2012). This theory has been substantiated by subsequent research, highlighting the critical impact of entrepreneurial activities on economic development (Wennekers & Thurik, 1999).

Romer (1990) expanded existing insights through an endogenous growth framework that spotlighted technological innovation as a primary determinant of economic progress. It was posited that the capacity to combine knowledge in novel ways drives continual development and secures non-diminishing returns on investment (Stephens, Partridge, & Faggian, 2013). Subsequent work by Aghion and Howitt (1992) built on these propositions by integrating endogenous growth theory with Schumpeter's concept of creative destruction, unveiling a more dynamic perspective on innovation's role in shaping growth trajectories.

Empirical studies have also reinforced the importance of innovation and entrepreneurship at various levels. For instance, Wong et al. (2005) simultaneously consider innovation and entrepreneurship, using cross-sectional data from 37 countries. Li et al. (2012) demonstrated that higher levels of entrepreneurial activity significantly enhance regional economic performance in China by fostering private enterprises and market competition. Pradhan et al. (2020) highlighted the critical role of financial development in fostering entrepreneurship and innovation, which in turn drives economic growth among the Eurozone countries. Following Li et al. (2012) framework, Jian et al. (2021) explore the relationship between business creation, innovation, and economic growth. They also employ provincial-level data but over an extended period during China's economic transition from 1978 to 2017. However, much of the existing literature has focused on national and provincial levels, potentially overlooking the local dynamics that are integral to understanding entrepreneurial activity. Entrepreneurship is inherently a local phenomenon, influenced by localized knowledge, skills, and institutional structures (Acs et al., 2009; Djankov et al., 2006). Thus, using national or provincial data might not fully capture the unique locality integral to entrepreneurship (Audretsch, 2018). In China, the significant size and diversity within its provinces further complicate provincial-level analyses. This makes provincial-level analyses less effective in understanding local conditions. Our study addresses this gap by employing city-level panel data, providing a more detailed analysis that captures the unique economic dynamics and entrepreneurial activities at the local level. Drawing from this extensive body of literature, we propose the following hypothesis.

Hypothesis 1: Regional innovation and entrepreneurship have a positive correlation with local economic development.

China's economic landscape features significant regional disparities, with provincial capital cities acting as hubs of innovation and economic activity (Chen & Fleisher, 1996). These cities typically boast superior infrastructure, abundant resources, and higher concentrations of talent compared to other cities (Glaeser, 2013). These factors create an environment that is more conducive to innovation and entrepreneurial activities, leading to a more pronounced impact on economic development. Firstly, provincial capital cities typically concentrate more financial resources, research institutions, and universities, which provide a fertile ground for startups and innovative projects to thrive (Florida, 2002; Glaeser & Gottlieb, 2009). The availability of these resources supports the development and scaling of entrepreneurial ventures, contributing significantly to local economic growth. Secondly, provincial capital cities often benefit from preferential policies and government support aimed at fostering innovation and entrepreneurship. These policies including financial incentives and support for high-tech industries, can significantly impact entrepreneurial activities and economic growth (Acs & Szerb, 2007; Feldman & Kelley, 2006). Additionally, the concentration of highly skilled professionals and a diverse talent pool in provincial capital cities enhances the innovation ecosystem. The presence of top universities and research institutions attracts talent, which in turn drives innovation and entrepreneurial activities (Storper & Scott, 2009). This concentration of talent is likely to result in stronger economic growth in provincial capital cities as it fuels a continuous cycle of innovation and business creation. Based on the above analysis, we propose the second hypothesis.

Hypothesis 2: Regional innovation and entrepreneurship have a stronger correlation with local economic development in provincial capital cities than other cities.

Acs and Storey (2004) identified that certain geographical areas cultivate a more entrepreneurial environment, proposing that location is a crucial factor for entrepreneurial success and, hence, innovation and economic growth. China's geographical and economic landscape is distinctly divided by the Qinling-Huaihe Line, which separates the country into southern and northern regions. This division aligns with significant climatic, economic, and cultural differences, further supported by the Hu Huanyong Line, which demarcates population density and economic activity (Kanbur & Zhang, 2005). Southern cities, such as Shenzhen and Guangzhou, are renowned for their vibrant economies and high levels of innovation and entrepreneurship (Lin, 2011). These cities benefit from several advantageous factors that create a dynamic and competitive business environment. Historically, southern cities have been more open to market reforms and international trade, partly due to their proximity to Hong Kong and other international markets (Lu, Wang, & Zhu, 2019). This openness has fostered a conducive environment for innovation and entrepreneurship. Additionally, supportive government policies and initiatives aimed at fostering economic growth further strengthen the capacity for innovation and entrepreneurial activities in these cities.

In contrast, northern cities often face challenges such as outdated industrial structures and less favorable business climates. These cities have traditionally relied on heavy industries, which are less conducive to innovation and entrepreneurship compared to the more diversified and modern industrial structures found in southern cities (Wei, 2007). The diversified industrial base in southern cities supports a broader range of innovative and entrepreneurial activities, leading to stronger economic outcomes.

Cultural factors significantly shape the economic dynamism observed between southern and northern cities. In southern China, a cultural predisposition toward risk-taking and entrepreneurial activity contrasts with the more cautious business culture prevalent in the north (Krug & Hendrischke, 2008). This divergence fosters a stronger nexus between innovation, entrepreneurship, and economic development in southern cities, driving higher levels of economic growth. Moreover, southern cities typically benefit from superior infrastructure and enhanced connectivity, both domestically and globally. These advantages attract greater investment, talent, and technology, amplifying the synergies between innovation, entrepreneurship, and development (Lin, 2011). The enhanced infrastructure and connectivity in southern cities serve as a competitive edge, allowing them to capitalize on their entrepreneurial and innovative potential more effectively. Based on this analysis, the third hypothesis is proposed.

Hypothesis 3: Regional innovation and entrepreneurship have a stronger correlation with local economic development in southern cities than northern cities.

4. Empirical Strategy

4.1. Variable Definition

4.1.1. Dependent Variable: Local Economic Growth

We analyze local economic growth using three key indicators of economic performance. In the main model, we use the log of per capita GDP as the dependent variable, which provides a clear measure of individual economic well-being. To ensure our results are robust, we include two additional indicators in further tests. The first, LnGDP, represents the natural log of a city's total GDP, offering an overall measure of the city's economic output. The second, Payroll, reflects the average annual wage of city workers, giving insight into labor market conditions and income levels. These indicators help us better understand local economic growth and compare trends across cities over time.

4.1.2. Independent Variable: Regional Innovation and Entrepreneurship

We rely on the IRIEC index to assess regional innovation and entrepreneurship, and it stands out for several key reasons. To begin with, it highlights how innovation and entrepreneurship intersect, directing attention to enterprise-driven market identification. In addition, it draws on comprehensive enterprise data and big data techniques, encompassing firms across various sectors and sizes, with a particular emphasis on the dynamism of SMEs and startups. From a methodological standpoint, the IRIEC index adopts an interdisciplinary approach, integrating data from entrepreneurship, capital, and technology domains to yield a well-rounded evaluation. Equally important, it focuses on objective measures that capture actual outputs of innovation and entrepreneurship rather than just inputs. Taken together, these features give a more accurate snapshot of regional performance and allow for an unbiased assessment of local business conditions. By using the IRIEC index in our analysis, we aim to provide a thorough gauge of regional innovation and entrepreneurship in Chinese cities.

4.1.3. Control Variables

To enhance the credibility of our findings and reduce the impact of potential confounding factors, we introduce a comprehensive set of control variables. First, we include population size (*Lnpopulation*), recognizing that larger populations often provide greater market potential and a broader labor pool, which are critical for driving economic growth. Human capital is measured by the share of the population with at least a college degree (*Lnedu*), reflecting its central role in boosting innovation and improving productivity. Capital accumulation is represented by the fixed asset investment ratio (*Lninvest*), which is widely regarded as a key determinant of long-term growth patterns. We also control for foreign direct investment (*LnFDI*) and the proportion of loans to GDP (*Lnloan*), capturing the influence of external capital flows and domestic credit availability on economic performance. Lastly, government spending as a percentage of GDP (*Lngovernment*) is included to reflect the impact of fiscal policies and public expenditure. To ensure consistency across variables and facilitate interpretation, all data are transformed into their logarithmic forms for analysis. Table 2 provides the definitions of these variables.

Table 2. Definition of variables.

Variables	Definition
$LnGDP\_PC$	Real GDP per capita: Economic output per person, which are adjusted by CPI.
$LnGDP$	Real total GDP: Total economic output of a city, which are adjusted by CPI.
$Payroll$	Annual average wage: Average yearly wage of workers.
$IRIEC_{it}$	IRIEC index: The level of innovation and entrepreneurship within the city.
$Lnpopulation$	Population size: Year-end resident population, in tens of thousands.
$Lnedu$	Education level: Percentage of population with at least a college degree, multiplied by 100.
$Lninvest$	Fixed asset investment Ratio: Ratio of fixed asset investment.
$LnFDI$	Foreign direct investment: Actual foreign investment used in the year.
$Lnloan$	Credit scale: Ratio of outstanding loans from financial institutions to GDP.
$Lngoverment$	Government expenditure ratio: Ratio of government spending.

4.2. Descriptive Statistics

The IRIEC index is sourced from the Center for Enterprise Research of Peking University. GDP, GDP per capita, average wages of employees, resident population, fixed asset investment, and foreign direct investment are sourced from the Wind database. The percentage of the population with at least a college degree is constructed using survey data from the National Bureau of Statistics website. Government expenditure and the balance of loans from financial institutions are obtained from the EPS data platform. Missing values are supplemented using the China City Statistical Yearbook and local statistical yearbooks. After excluding cities with severe data deficiencies, this study examines 286 cities from 2004 to 2020. Descriptive statistics for the variables are presented in Table 3.

Table 3. Descriptive statistics.

Variables	Obs.	Mean	SD	Min.	Max.
LnGDP	4859	15.963	1.013	12.790	19.382
LnGDP_PC	4859	10.108	0.722	4.474	12.800
Payroll	4859	10.502	0.607	8.509	12.128
IRIEC index	4859	4.191	0.367	1.744	4.605
Lnpopulation	4858	5.864	0.699	2.819	8.136
Lnedu	3694	4.373	1.230	-2.754	7.179
Lninvest	3715	-0.503	0.423	-2.439	0.787
LnFDI	4453	9.620	2.006	0.693	14.941
Lnloan	4852	-0.241	0.517	-2.586	2.008
Lngoverment	4859	-1.857	0.497	-3.207	0.854

4.3. Baseline Model

To investigate the effects of regional innovation and entrepreneurship on local economic growth, we estimate using fixed effects model.

$$Y_{i,t} = \alpha_0 + \alpha_1 IRIEC_{i,t} + \alpha_3 Lnpopulation_{i,t} + +\alpha_4 Lnedu_{i,t} + \alpha_5 Lninvest_{i,t} + \alpha_6 LnFDI_{i,t} + \alpha_7 Lnloan_{i,t} + \alpha_8 Lngoverment_{i,t} + CityFE + YearFE + \varepsilon_{it} \quad (1)$$

Where $Y_{i,t}$ denotes the logarithm of real per capita GDP of city i in year t; $IRIEC_{it}$ represents the level of innovation and entrepreneurship within the city, measured by IRIEC index. We control for a range of variables that could potentially impact economic growth, including $Lnpopulation$, $Lnedu$, $Lninvest$, $LnFDI$, $Lnloan$, and $Lngoverment$. Additionally, we also control for city fixed effects ($CityFE$) and year fixed effects ($YearFE$) to control for inherent differences between cities and the overall growth trend of the IRIEC indicator. ε_{it} represents the random error term.

5. Empirical Analysis

5.1. Regional Innovation and Entrepreneurship on Local Economic Growth

Based on Equation 1, we first examine the impact of regional innovation and entrepreneurship on local economic growth, as measured by per capita GDP. The findings are detailed in Table 4. In column (1), after accounting for city and time fixed effects, a simple regression between the IRIEC index and local economic growth reveals a strong and statistically significant correlation (0.2126, significant at the 1% level). This highlights the core principle that regional innovation and entrepreneurial activities drive local economic prosperity. In column (2), the model is expanded to include city-level human capital variables, such as resident population and education levels. Here, the IRIEC index remains significant at 0.1312 at the 1% level, though its direct impact is somewhat reduced with the addition of human capital factors. Population growth can enhance a city's GDP through economies of scale but may also increase labor market competition and resource constraints, negatively impacting per capita GDP. Education positively influences local economies by improving labor quality and innovation capabilities.

In column (3), we introduce additional economic variables, such as city-level fixed asset investment and credit levels, which further substantiate the IRIEC index coefficient (0.1251, significant at the 1% level). This reinforces the idea that innovation and entrepreneurship benefit local economic performance. Fixed asset investment drives infrastructure development and industrial growth, while foreign direct investment brings in technology and managerial expertise, fostering industrial upgrades. These factors collectively contribute to overall local economic growth. However, the expansion of credit appears to negatively impact the local economy, possibly reflecting volatility during rapid development phases. In column (4), we consider government expenditure levels. The IRIEC index shows an even stronger significant effect (0.1422, significant at the 1% level). However, the negative coefficient of government spending (-0.2284, significant at the 1% level) raises questions about the efficiency and optimization of public sector funds in local economic development. This could indicate inefficiencies in government spending, inappropriate industrial structures, and resource allocation challenges, highlighting structural issues and policy implementation difficulties during China's economic transformation. Based on the results presented in column (4), a 1% increase in the IRIEC index leads to a 14.22% increase in a city's per capita GDP. This indicates that regional innovation and entrepreneurship significantly enhance local economic development, thereby validating Hypothesis 1.

Table 4. Regional innovation and entrepreneurship on local economic growth.

Variables	**(1)**	**(2)**	**(3)**	**(4)**
	LnGDP_PC	**LnGDP_PC**	**LnGDP_PC**	**LnGDP_PC**
IRIEC index	0.217***	0.131***	0.125***	0.142***
	(0.037)	(0.034)	(0.029)	(0.025)
Lnpopulation		-0.302**	-0.260**	-0.264**
		(0.125)	(0.120)	(0.119)
Lnedu		0.039*	0.043**	0.039**
		(0.021)	(0.019)	(0.019)
Lninvest			0.030	0.070**
			(0.034)	(0.028)
LnFDI			0.026***	0.025***
			(0.007)	(0.006)
Lnloan			-0.248***	-0.191***
			(0.044)	(0.045)
Lngoverment				-0.228***
				(0.077)
Constant	9.217***	11.044***	10.494***	10.072***
	(0.153)	(0.760)	(0.731)	(0.745)
Observations	4,859	3,694	3,613	3,613
R-squared	0.395	0.395	0.406	0.542
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Note: Standard errors are presented in parentheses, *** p<0.01, ** p<0.05.

5.2. Analysis of Sub-Index Results

In examining the potential variations in the effects of individual components of the IRIEC index on economic growth, we further investigate the impacts of five dimensions: firm entry, outside direct investment, venture capital, patent granted, and trademark registration.

As outlined in Table 5, except for venture capital within the capital component, all other elements significantly contribute to local economic growth.

Firstly, a higher firm entry index signifies a greater number of newly registered enterprises in the region for the given year. The entry of new firms enhances regional market competitiveness, restructures resource allocation patterns, facilitates Schumpeterian "creative destruction," and thereby fosters sustained economic growth.

Secondly, outside direct investment depends on a conducive business environment, reflecting the innovation and entrepreneurial vitality of the region. Attracting high-quality corporate investment improves the employment environment, achieves knowledge and technology spillovers, and fosters local industries, thereby contributing to economic growth.

Thirdly, venture capital serves as a pivotal financing model for emerging enterprises, playing a crucial supportive role in the development of emerging and high-tech industries.

These nascent industries entail prolonged investment cycles, significant risk, and require time for business incubation and scale production, which may not immediately manifest their stimulating effect on the economy in the short term. With the increasing demand for financing in these new industries and the enhancement of related regulations, venture capital is poised to emerge as a new driving force for regional economic growth in the future.

Fourth, innovation indicators such as patents and trademarks are positively linked to local economic development.

Patents, as a reflection of advanced technologies being converted into productive capacity, serve as a key driver of productivity, highlighting a city's industrial competitiveness and economic potential. Trademarks, meanwhile, often signal a company's emphasis on product quality and efforts to build a strong brand presence. By enhancing their brand image, businesses can attract greater investment, create jobs, and stimulate local economic activity, ultimately contributing to sustained growth in the region.

Table 5. Analysis of sub-index results.

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	LnGDP_PC	**LnGDP_PC**	**LnGDP_PC**	**LnGDP_PC**	**LnGDP_PC**
Firm entry	0.265***				
	(0.036)				
Outside direct investment		0.111***			
		(0.032)			
Venture capital			0.030		
			(0.024)		
Patent granted				0.338***	
				(0.050)	
Trademark registration					0.197***
					(0.030)
Lnpopulation	-0.246**	-0.275**	-0.295**	-0.260**	-0.269**
	(0.119)	(0.119)	(0.118)	(0.125)	(0.123)
Lnedu	0.029	0.045**	0.051***	0.039**	0.028
	(0.018)	(0.019)	(0.019)	(0.019)	(0.018)
Lninvest	0.052*	0.071**	0.080***	0.061**	0.067**
	(0.029)	(0.029)	(0.029)	(0.028)	(0.028)
LnFDI	0.024***	0.024***	0.027***	0.025***	0.021***
	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)
Lnloan	-0.194***	-0.191***	-0.194***	-0.198***	-0.169***
	(0.046)	(0.045)	(0.046)	(0.044)	(0.044)
Lngoverment	-0.241***	-0.222***	-0.213***	-0.231***	-0.239***
	(0.077)	(0.076)	(0.076)	(0.077)	(0.077)
Constant	9.486***	10.257***	10.673***	9.204***	9.951***
	(0.761)	(0.758)	(0.748)	(0.819)	(0.777)
Observations	3,613	3,613	3,613	3,613	3,613
R-squared	0.591	0.526	0.494	0.588	0.557
City FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Note: Standard errors are presented in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

5.3. Robustness Tests

5.3.1. Instrumental Variables Approach

Potential endogeneity issues in the relationship between regional innovation, entrepreneurship levels, and local economic growth can introduce biases in OLS estimates. These problems may arise from omitted variables and reverse causality. For instance, if unobservable city characteristics influence both local economic development and the city's innovation and entrepreneurship levels, omitted variable bias can occur. Additionally, if economically developed cities foster higher levels of innovation and entrepreneurship, reverse causality may be present. To address these endogeneity concerns, we primarily employ instrumental variable methods and fixed effects. Specifically, we utilize the provincial-level IRIEC index as our instrumental variable. The IRIEC index at the city level is intricately linked to talent, technology, and resource support within their respective provinces, satisfying the relevance criterion for instrumental variables. Furthermore, provincial-level innovation and entrepreneurship activities have limited direct impact on local economic growth, fulfilling the exogeneity requirement.

We also conduct validity tests on the instrumental variable. The Kleibergen-Paap rk LM statistic is significant at the 1% level, rejecting the null hypothesis of inadequate instrumental variable identification. Additionally, the Cragg-Donald Wald F statistic stands at 280.20, exceeding the threshold of 10, thus rejecting the null hypothesis of weak instrumental variables. Therefore, the instrumental variables chosen in this study are considered both reasonable and reliable.

Using the two-stage instrumental variable method for reexamination, the results are presented in columns (1) and (2) of Table 6. Column (1) reveals that the coefficient of the instrumental variable IV is significantly positive at the 1% level, indicating that the selected instrumental variables meet the requirement of relevance. In the second stage, empirical results demonstrate that even after controlling for endogeneity factors, the coefficient of the IRIEC index remains significantly positive at the 1% level. This suggests that the promotion effect of regional innovation and entrepreneurship on economic growth persists after addressing endogeneity concerns.

Table 6. Robustness test: Instrument variables approach.

Variables	(1)	(2)
	IRIEC index	LnGDP_PC
IV	0.361***	
	(0.047)	
IRIEC index		0.543***
		(0.114)
City-level control variables	Yes	Yes
Kleibergen-Paap rk LM statistic		57.930
Cragg-Donald Wald F statistic		280.200
Observations	3,613	3,613
R-squared		0.030
City FE	Yes	Yes
Year FE	Yes	Yes

Note: Standard errors are presented in parentheses, *** p<0.01.

5.3.2. Lagged Effect

In this section, we employ IRIEC index with a one and two-year lag to account for potential delayed effects. The results, presented in Table 7, reveal a consistent and positive relationship. In column (1), with a one-year lag, $IRIEC_{i,t+1}$ displays a coefficient of 0.1939 (SE=0.0391). This significance persists in column (2), where after controlling for city-level variables, the coefficient slightly adjusts to 0.1433 (SE=0.0331). Extending the analysis to a two-year lag continues to support the positive impact. In column (3), the coefficient of $IRIEC_{i,t+2}$ is 0.1625 (SE=0.0369). This value adjusts to 0.1149 (SE=0.0249) in column (4) when additional city-level controls are introduced. In column (5), including both $IRIEC_{i,t+1}$ and $IRIEC_{i,t+2}$ in the model leads to a minor reduction in coefficients, yet they both remain significantly positive. These findings consistently confirm the beneficial influence of regional innovation and entrepreneurship on economic performance, even when considering temporal delays.

Table 7. Robustness test: Lagged effect.

Variables	(1)	(2)	(3)	(4)	(5)
	Lagged one year		Lagged two years		
	LnGDP_PC	LnGDP_PC	LnGDP_PC	LnGDP_PC	LnGDP_PC
$IRIEC_{i,t+1}$	0.194***	0.143***			0.123***
	(0.039)	(0.033)			(0.036)
$IRIEC_{i,t+2}$			0.163***	0.115***	0.072***
			(0.037)	(0.025)	(0.018)
Lnpopulation		-0.256**		-0.277**	-0.254*
		(0.125)		(0.128)	(0.130)
Lnedu		0.048**		0.040*	0.035
		(0.021)		(0.022)	(0.022)
Lninvest		0.078***		0.078***	0.073**
		(0.028)		(0.029)	(0.029)
LnFDI		0.022***		0.025***	0.023***
		(0.006)		(0.006)	(0.006)
Lnloan		-0.194***		-0.184***	-0.188***
		(0.049)		(0.054)	(0.053)
Lngoverment		-0.214**		-0.260**	-0.267**
		(0.086)		(0.105)	(0.107)
Constant	9.351***	10.100***	9.535***	10.330***	9.881***
	(0.163)	(0.832)	(0.153)	(0.839)	(0.896)
Observations	4,573	3,334	4,287	3,054	3,054
R-squared	0.353	0.519	0.302	0.501	0.535
City FE	YES	YES	YES	YES	YES
Year FE	Yes	Yes	Yes	Yes	Yes

Note: Standard errors are presented in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

5.3.3. Alternative Measurements of Dependent Variable

In robustness tests, we replace the baseline regression's dependent variable, GDP per capita, with two alternates: the logarithm of total city GDP (LnGDP) and the annual average wage of city workers (Payroll). Table 8 reports the results. Consistent with the baseline model, the IRIEC index exhibits a statistically significant positive effect on both LnGDP and Payroll across all model specifications. Specifically, for LnGDP, the IRIEC index is associated with coefficients of 0.0486 and 0.0804, the latter being significant at the 1% level.

When examining Payroll, the index's coefficients are 0.0906 and 0.0552, both significant at the 1% level. These results underscore the robustness of the IRIEC index as a determinant of local economic growth, reflecting its broad applicability in capturing the multifaceted aspects of economic performance within cities. Control variables such as population, education, investment, foreign direct investment, loans, and government expenditure remain significant predictors in various configurations, further validating our model's reliability.

Table 8. Robustness test: Alternative measurements of dependent variable.

Variables	**(1)**	**(2)**	**(3)**	**(4)**
	LnGDP	**LnGDP**	**Payroll**	**Payroll**
IRIEC index	0.049	0.080***	0.091***	0.055***
	(0.034)	(0.020)	(0.020)	(0.017)
Lnpopulation		0.532***		-0.162**
		(0.111)		(0.069)
Lnedu		0.033**		0.010
		(0.016)		(0.010)
Lninvest		0.039*		0.032**
		(0.023)		(0.014)
LnFDI		0.018***		0.014***
		(0.006)		(0.003)
Lnloan		-0.211***		-0.063***
		(0.045)		(0.023)
Lngoverment		-0.270***		0.062***
		(0.054)		(0.024)
Constant	15.760***	11.506***	10.122***	10.953***
	(0.1433)	(0.693)	(0.085)	(0.428)
Observations	4,859	3,613	4,859	3,613
R-squared	0.205	0.626	0.875	0.775
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Note: Standard errors are presented in parentheses, *** p<0.01, ** p<0.05.

5.3.4. Sample Adjustment and City Exclusion

To mitigate potential disruptions from special events such as the global financial crisis, we adjust our sample period. Specifically, data from the year 2008 was excluded to enhance the generalizability of our findings. As depicted in Table 9, column (2), the coefficient of the IRIEC index remains significantly positive at the 1% level, consistent with the baseline regression results, underscoring the robustness of our findings.

Additionally, we refine our city sample by excluding the four major municipalities of Beijing, Shanghai, Chongqing, and Tianjin from the analysis. This step aims to ensure that our results are not unduly influenced by these major cities, thereby providing a clearer reflection of the actual impact of regional innovation and entrepreneurship levels on economic growth in other cities. In columns (3) and (4), the coefficients for the IRIEC index are 0.2126 and 0.1348, respectively, both of which are significantly positive.

Table 9. Robustness test: Sample adjustment and city exclusion.

Variables	**(1)**	**(2)**	**(3)**	**(4)**
	Drop if year=2008			**Drop municipality city sample**
	LnGDP_PC	**LnGDP_PC**	**LnGDP_PC**	**LnGDP_PC**
IRIEC index	0.220***	0.151***	0.213***	0.135***
	(0.037)	(0.026)	(0.037)	(0.025)
Lnpopulation		-0.266**		-0.268**
		(0.116)		(0.119)
Lnedu		0.039*		0.036*
		(0.020)		(0.019)
Lninvest		0.076***		0.060**
		(0.029)		(0.028)
LnFDI		0.025***		0.025***
		(0.007)		(0.006)
Lnloan		-0.186***		-0.195***
		(0.048)		(0.046)
Lngoverment		-0.253***		-0.231***
		(0.084)		(0.077)

Variables	(1)	(2)	(3)	(4)
	Drop if year=2008			Drop municipality city sample
	LnGDP_PC	LnGDP_PC	LnGDP_PC	LnGDP_PC
Constant	9.201***	10.011***	9.217***	10.109***
	(0.154)	(0.730)	(0.153)	(0.739)
Observations	4,573	3,334	4,859	3,561
R-squared	0.403	0.568	0.398	0.574
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Note: Standard errors are presented in parentheses, *** p<0.01, ** p<0.05.

6. Heterogonies Analysis

6.1. Administrative Division: Provincial Capital Cities Vs. Other Cities

In this section, we categorize city-level samples into provincial capitals and other cities based on administrative divisions. The results are presented in Table 10. Provincial capitals exhibit a higher coefficient of 0.4310, indicating a stronger relationship between innovation, entrepreneurship, and economic growth compared to other cities. Drawing on resource allocation theory, provincial capitals inherently excel in resource distribution. Their abundant resources and superior infrastructure result in significantly higher regression coefficients compared to typical cities, underscoring the pivotal role of resource concentration in driving economic growth. Moreover, in line with human capital theory, the concentration of talent and knowledge-intensive industries in provincial capitals fosters an environment conducive to innovation and entrepreneurship, thereby enhancing economic performance.

In contrast, other cities, with comparatively fewer resources and less policy support, show a lower but still positive coefficient of 0.1242. This suggests that while the concentration of resources, talent, and favorable policies in provincial capital cities creates a more conducive environment for innovation and entrepreneurship, other cities also benefit, albeit to a lesser extent. Therefore, hypothesis 2 is validated.

Table 10. Administrative division: Provincial capital cities vs. other cities.

Variables	(1)	(2)	(3)	(4)
	Administrative division			
	Provincial capital cities	Other cities	Provincial capital cities	Other cities
IRIEC index	0.504**	0.204***	0.431***	0.124***
	(0.217)	(0.039)	(0.130)	(0.026)
Lnpopulation			-0.035	-0.283**
			(0.1822)	(0.138)
Lnedu			0.0785	0.033*
			(0.0557)	(0.019)
Lninvest			0.1385*	0.059**
			(0.0800)	(0.029)
LnFDI			0.0454*	0.024***
			(0.0222)	(0.007)
Lnloan			-0.1139	-0.192***
			(0.1004)	(0.048)
Lngoverment			-0.0519	-0.262***
			(0.0813)	(0.086)
Constant	8.401***	9.192***	7.841***	10.140***
	(0.974)	(0.162)	(1.459)	(0.844)
Observations	524	4,335	395	3,218
R-squared	0.575	0.397	0.596	0.644
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Note: Standard errors are presented in parentheses, *** p<0.01, ** p<0.05, * p<0.1

6.2. Geography Location: South China vs. North China

From a geographical perspective, does the effect of the IRIEC index on local economy vary due to differences in the city's locational characteristics? We first partition our city-level sample into South China and North China based on the Qinling-Huaihe Line. Table 11 reports the results. We find that the relationship between the IRIEC index and local economic growth exhibits regional nuances, with South China displaying a robust coefficient of 0.1722, compared to North China's coefficient of 0.1064. This aligns with the theory of regional economics, which emphasizes the significance of local conditions, resources, and policies in shaping economic outcomes. Factors such as infrastructure development, access to markets, and the presence of skilled labor can influence the capacity of cities to innovate and capitalize on entrepreneurial opportunities, thereby contributing to differential rates of economic growth across regions.

Additionally, the Hu Huanyong Line delineates regions more suitable for human habitation; beyond this line to the northwest, the area is more sparsely populated, with relatively weaker economic development. Therefore, we construct locational characteristic dummy variables using the Hu Huanyong Line as a boundary (Hu line), assigning a value of 1 to cities located to the northwest of the Hu Huanyong Line and 0 to all others. Cities locales falling within the Hu Huanyong Line demonstrate a noteworthy coefficient of 0.1580, whereas those situated beyond this demarcation exhibit a non-significant coefficient of -0.0073. The contrasting coefficients highlight the pivotal role of geographical factors in shaping economic dynamics. Thus, hypothesis 3 is validated.

Table 11. Geography location: South China vs North China.

Variable	**(1)**	**(2)**	**(3)**	**(4)**
	Geography location			
	South China	**North China**	**Huline=1**	**Huline=0**
IRIEC index	0.172***	0.106***	0.158***	-0.007
	(0.034)	(0.032)	(0.028)	(0.046)
Lnpopulation	-0.503***	-0.060	-0.269**	-0.535**
	(0.143)	(0.166)	(0.130)	(0.227)
Lnedu	0.030	0.036	0.036*	0.048
	(0.024)	(0.027)	(0.020)	(0.048)
Lninvest	0.084**	0.030	0.077**	0.058
	(0.041)	(0.035)	(0.031)	(0.061)
LnFDI	0.034***	0.021**	0.026***	0.022*
	(0.008)	(0.008)	(0.007)	(0.012)
Lnloan	-0.111*	-0.210***	-0.177***	-0.266***
	(0.065)	(0.064)	(0.050)	(0.081)
Lngoverment	-0.151	-0.343***	-0.245***	-0.130
	(0.111)	(0.073)	(0.088)	(0.098)
Constant	11.472***	8.862***	10.007***	12.237***
	(0.920)	(1.033)	(0.815)	(1.265)
Observations	2,009	1,604	3,315	298
R-squared	0.451	0.600	0.534	0.612
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Note: Standard errors are presented in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

7. Discussion and Conclusion

This study presents empirical evidence underscoring the dynamic role of entrepreneurship and innovation in local economic growth. We construct a comprehensive dataset, which spanned over a period of 16 years (2004-2020) and inclusively covered 286 cities. Using the IRIEC index, we find that regional entrepreneurship and innovation promotes local economic growth. This correlation persists even when demographic and institutional variables are controlled. An in-depth analysis of the individual components of IRIEC index highlights the diverse impacts these elements have on local economic growth. Specially, firm entry fuels regional market competitiveness, reorients resource allocation, catalyzes Schumpeterian "creative destruction," and spurs sustainable economic growth. This study shows a considerable positive impact of varied innovative activities on local economic growth, emanating chiefly from patents, trademark registrations, and focus on quality and branding. The unique role of innovation as a productivity driver is well captured.

Furthermore, we emphasize the heterogeneities in the effect of regional innovation and entrepreneurship on local economic growth nexus across city characteristics, such as administrative division and geographical location. First, by categorizing city-level samples into provincial capitals and other cities according to administrative divisions, we observed a significant influence on local economic growth in provincial capitals compared to other cities. Second, we examine how geographical features, specifically those demarcated by the Qinling-Huaihe Line and the Hu Huanyong Line, influence economic results. It reveals the intricate relationship between geographic disparities and local economic growth. This study offers an in-depth examination of how entrepreneurship and innovation drive local economic growth while uncovering the role of geographic disparities in local economies.

Based on these findings, several practical policy recommendations can be drawn. First, creating a supportive environment for entrepreneurship and innovation should be a priority. This can be achieved by cutting unnecessary regulations, offering tax breaks, and increasing funding for research and development. Second, stronger protection of intellectual property rights, such as patents and trademarks, is essential to encourage innovation and sustain long-term economic growth. Third, development strategies should be customized to meet the unique needs of provincial capitals and other cities, recognizing that the effects of entrepreneurship and innovation on growth vary across regions. Finally, when designing economic policies, it's crucial to address regional disparities. Special attention should be given to areas divided by the Qinling-Huaihe Line and the Hu Huanyong Line, ensuring they receive targeted support to reduce economic inequality.

References

Acs, Z., & Storey, D. (2004). Introduction: Entrepreneurship and economic development. *Regional Studies*, *38*(8), 871-877. https://doi.org/10.1080/0034340042000280901

Acs, Z. J., Braunerhjelm, P., Audretsch, D. B., & Carlsson, B. (2009). The knowledge spillover theory of entrepreneurship. *Small Business Economics*, *32*, 15-30. https://doi.org/10.1007/s11187-008-9157-3

Acs, Z. J., Estrin, S., Mickiewicz, T., & Szerb, L. (2018). Entrepreneurship, institutional economics, and economic growth: An ecosystem perspective. *Small Business Economics*, *51*, 501-514. https://doi.org/10.1007/s11187-018-0013-9

Acs, Z. J., & Szerb, L. (2007). Entrepreneurship, economic growth and public policy. *Small Business Economics*, *28*, 109-122. https://doi.org/10.1007/s11187-006-9012-3

Aghion, P., & Howitt, P. (1992). A model of growth through creative destruction. *Econometrica*, *60*(2), 323-351. https://doi.org/10.2307/2951599

Andrews, M. J., Chatterji, A., Lerner, J., & Stern, S. (2022). *The role of innovation and entrepreneurship in economic growth*. Chicago: University of Chicago Press.

Audretsch, D. B. (2018). Entrepreneurship, economic growth, and geography. *Oxford Review of Economic Policy*, *34*(4), 637-651. https://doi.org/10.1093/oxrep/gry011

Batabyal, A. A., & Nijkamp, P. (2012). A Schumpeterian model of entrepreneurship, innovation, and regional economic growth. *International Regional Science Review*, *35*(3), 339-361. https://doi.org/10.1177/0160017611429701

Chen, J., & Fleisher, B. M. (1996). Regional income inequality and economic growth in China. *Journal of Comparative Economics*, *22*(2), 141-164. https://doi.org/10.1006/jcec.1996.0015

Dai, R., Zhu, Z., & Zhang, X. (2024). The index of regional innovation and entrepreneurship in China (IRIEC) during 1990—2020: Construction and basic facts. *Economic Science*, *1*, 5-34.

Djankov, S., Qian, Y., Roland, G., & Zhuravskaya, E. (2006). Who are China's Entrepreneurs? *American Economic Review*, *96*(2), 348-352. https://doi.org/10.1257/000282806777212387

Feki, C., & Mnif, S. (2016). Entrepreneurship, technological innovation, and economic growth: Empirical analysis of panel data. *Journal of the Knowledge Economy*, *7*(4), 984-999. https://doi.org/10.1007/s13132-016-0413-5

Feldman, M. P., & Kelley, M. R. (2006). The ex ante assessment of knowledge spillovers: Government R&D policy, economic incentives and private firm behavior. *Research Policy*, *35*(10), 1509-1521. https://doi.org/10.1016/j.respol.2006.09.019

Florida, R. (2002). The economic geography of talent. *Annals of the Association of American Geographers*, *92*(4), 743-755. https://doi.org/10.1111/1467-8306.00314

Glaeser, E. (2013). Triumph of the city: How our greatest invention makes us richer, smarter, greener, healthier, and happier. In (Vol. 10, pp. 1726-3247). New York: Penguin Books.

Glaeser, E. L., & Gottlieb, J. D. (2009). The wealth of cities: Agglomeration economies and spatial equilibrium in the United States. *Journal of Economic Literature*, *47*(4), 983-1028. https://doi.org/10.1257/jel.47.4.983

He, C., Lu, J., & Qian, H. (2019). Entrepreneurship in China. *Small Business Economics*, *52*, 563-572. https://doi.org/10.1007/s11187-017-9972-5

Jian, J., Fan, X., Zhao, S., & Zhou, D. (2021). Business creation, innovation, and economic growth: Evidence from China's economic transition, 1978–2017. *Economic Modelling*, *96*, 371-378. https://doi.org/10.1016/j.econmod.2020.03.019

Kanbur, R., & Zhang, X. (2005). Fifty years of regional inequality in China: A journey through central planning, reform, and openness. *Review of Development Economics*, *9*(1), 87-106. https://doi.org/10.1111/j.1467-9361.2005.00265.x

Krug, B., & Hendrischke, H. (2008). Framing China: Transformation and institutional change through co-evolution. *Management and Organization Review*, *4*(1), 81-108. https://doi.org/10.1111/j.1740-8784.2007.00092.x

Lee, Y. S. (2017). Entrepreneurship, small businesses and economic growth in cities. *Journal of Economic Geography*, *17*(2), 311-343. https://doi.org/10.1093/jeg/lbw021

Li, H., Yang, Z., Yao, X., Zhang, H., & Zhang, J. (2012). Entrepreneurship, private economy and growth: Evidence from China. *China Economic Review*, *23*(4), 948-961. https://doi.org/10.1016/j.chieco.2012.04.015

Lin, J. Y. (2011). *Demystifying the Chinese economy*: Cambridge University Press. https://doi.org/10.1017/CBO9780511783861.

Lu, Y., Wang, J., & Zhu, L. (2019). Place-based policies, creation, and agglomeration economies: Evidence from China's economic zone program. *American Economic Journal: Economic Policy*, *11*(3), 325-360. https://doi.org/10.1257/pol.20160272

Pradhan, R. P., Arvin, M. B., Nair, M., & Bennett, S. E. (2020). The dynamics among entrepreneurship, innovation, and economic growth in the Eurozone countries. *Journal of Policy Modeling*, *42*(5), 1106-1122. https://doi.org/10.1016/j.jpolmod.2020.01.004

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, *98*(5, Part 2), S71-S102. https://doi.org/10.1086/261725

Schumpeter, J. A. (1934). The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle. In (Vol. 46): Harvard University Press.

Stephens, H. M., Partridge, M. D., & Faggian, A. (2013). Innovation, entrepreneurship and economic growth in lagging regions. *Journal of Regional Science*, *53*(5), 778-812. https://doi.org/10.1111/jors.12019

Storper, M., & Scott, A. J. (2009). Rethinking human capital, creativity and urban growth. *Journal of Economic Geography*, *9*(2), 147-167. https://doi.org/10.1093/jeg/lbn052

Wei, Y. D. (2007). Regional development in China: Transitional institutions, embedded globalization, and hybrid economies. *Eurasian Geography and Economics*, *48*(1), 16-36. https://doi.org/10.2747/1538-7216.48.1.16

Wennekers, S., & Thurik, R. (1999). Linking entrepreneurship and economic growth. *Small Business Economics*, *13*, 27-56. https://doi.org/10.1023/a:1008063200484

Wong, P. K., Ho, Y. P., & Autio, E. (2005). Entrepreneurship, innovation and economic growth: Evidence from GEM data. *Small Business Economics*, *24*, 335-350. https://doi.org/10.1007/s11187-005-2000-1

Xu, B., Yu, H., & Li, L. (2021). The impact of entrepreneurship on regional economic growth: A perspective of spatial heterogeneity. *Entrepreneurship & Regional Development*, *33*(3-4), 309-331. https://doi.org/10.1080/08985626.2021.1872940