

People are the Foundation of a Country: The Impact of County's STI Ability on People's Livelihood

Li Rui^{1,2,*}, Miao Dehua¹, Liu Chao^{1,3} & Li Yujia¹

¹School of Economics, Hebei University

² Research Center of Population and Health Development, Hebei University

³Research Center of Resources Utilization and Environmental Conservation, Hebei University

Abstract

Investigating whether Science, Technology, and Innovation (STI) at the county level can enhance the quality of life merits in-depth study. Using the monitoring and evaluation results of counties' STI capabilities from 2018 to 2021, published by the General Office of the People's Government of Hebei Province, this paper examines the impact of counties' STI capabilities on the development of public infrastructure, income distribution, education, healthcare, and other aspects of livelihood. Our findings indicate that enhancing counties' STI capabilities can improve local public infrastructure, reduce the urban-rural income gap, and enhance healthcare conditions. However, the impact on regional education quality is relatively minor. Indicators such as innovation subjects, innovation conditions, and innovation management, which reflect the quality of counties' STI capabilities, have a significant positive impact on people's livelihoods. Conversely, indicators reflecting the quantity of STI capabilities, such as innovation input and output, show no significant effect. Regional heterogeneity also plays a role, with more pronounced effects in counties located near metropolises.

Keywords: STI ability; Livelihood development; County; Structural analysis

1.0 Introduction

Party and state leaders continue to prioritize issues related to people's livelihoods. The report of the 20th National Congress of the Communist Party of China mentioned people's livelihoods in fifteen sections, covering various aspects such as the distribution system, employment, social security, and public health. Addressing people's livelihood needs requires leveraging the role of scientific and technological innovation. Currently, from a policy perspective, scientific and technological innovation is oriented towards addressing people's livelihood needs, with new application scenarios continually emerging to meet these needs accurately. However, from both theoretical and practical perspectives, whether and how scientific and technological innovation can promote the development and improvement of people's livelihoods remains worthy of further study.

Effective county governance ensures stability across the nation. Counties serve as the crucial link between urban and rural areas, accounting for half of the country's total population. County-level science and technology innovation activities play a crucial role in supporting rural revitalization and achieving the common prosperity of urban and rural residents. However, a significant challenge is the vast territory of China, which results in substantial disparities in the

* Corresponding author: Li Rui (lirui.19@163.com)

development levels and scientific and technological innovation capabilities of different counties. For instance, Kunshan City in Jiangsu Province, which ranks first on the list of "Top 100 Models of Scientific and Technological Innovation in Counties and Cities in 2022," has, as of July 2022, identified and filed more than 170 scientific and technological innovation carriers, over 3200 incubation enterprises, and 641 dual-creation talent projects (Zhao, 2022)^[1]. In contrast, some counties and cities in the economically underdeveloped central and western regions exhibit significantly lower scientific and technological innovation capabilities. To what extent does the level of county science and technology innovation capability affect education, healthcare, and other aspects of livelihoods for urban and rural residents in the region? What aspects of STI capability influence the development of livelihoods in the county? Answers to these questions will help assess the effectiveness of science and technology initiatives aimed at benefiting the populace, which holds significant practical importance.

Based on this premise, this paper examines the impact of STI capability on the development level of livelihoods at the county level. This paper defines the development level of livelihoods through four dimensions: public infrastructure, income distribution, education, and healthcare. It uses the monitoring and evaluation results of county-level science and technology innovation capabilities published by the General Office of Hebei Provincial People's Government from 2018 to 2021 as the proxy variable for these capabilities. This paper employs a panel fixed effects model for benchmark regression, sensitivity analysis, a system GMM for addressing endogeneity, and threshold regression for validating the model setting. Additionally, this paper empirically examines the impact of the five dimensions of scientific and technological innovation capability (innovation input, innovation subject, innovation condition, innovation output, innovation management) on the development level of livelihoods and analyzes regional heterogeneity.

This article has two notable highlights. First, the index of STI capability is derived from the monitoring and evaluation results of county-level STI capabilities published by the General Office of Hebei Provincial People's Government. Second, by focusing on scientific and technological innovation, this study provides empirical support for the improvement of livelihoods at the county level.

2.0 Literature review

Based on the existing literature, this paper reviews research from two perspectives: the impact of scientific and technological innovation on the overall development of livelihoods, and its impact on specific aspects such as income distribution and employment.

There is limited literature on the direct impact of scientific and technological innovation on livelihood development. The two relevant studies identified by the author conclude that scientific and technological innovation can enhance livelihood development, but they differ in their research subjects, methods, and specific conclusions. Zhou Xiaoli (2016)^[2] measured livelihood development levels in 18 OECD countries from 2005 to 2013 across four dimensions: healthcare, employment, education, and environment. Chao Weipeng and Jia Qiang (2017)^[3] found that scientific and technological innovation is a Granger cause of livelihood development. The input of scientific and technological resources and the output of technological achievements positively affect livelihood development, whereas the allocation of technological resources has a negative impact.

Livelihood issues encompass income distribution, employment, social security, education, and other aspects. Some scholars have investigated the impact of scientific and technological innovation on specific aspects of livelihood.

Income distribution is a fundamental aspect of people's livelihoods. To address whether technological innovation can narrow the income gap, Fan Desheng and Shao Xingyu (2023) [4] used cross-country panel data to study the relationship between financial technology and the income gap. The results indicate that the development of financial technology helps to narrow the income gap. When the expansion marginal effect exceeds the intensive marginal effect, fintech development reduces the income gap (Zhang Yu and Wang Wenqian, 2021) [5].

Employment is the cornerstone of people's livelihoods. Regarding the impact of technological innovation on employment, Zhu Jinsheng and Zhu Hua (2021) [6] found that technological innovation promotes employment in local and economically proximate areas, whereas technological entrepreneurship has no significant impact on employment in local and adjacent areas. Similarly, Zhao and Jiang (2023) [7] used China Family Panel Studies (CFPS) data to find that digital technology significantly promotes labor employment, with human capital empowerment being the main intermediary channel through which digital technology affects labor employment.

Social security is fundamental to people's livelihoods. Technological innovation can impact the efficiency of implementing social security measures, such as social welfare and relief programs. For example, Muralidharan et al. (2021) [8] found that the number of farmers unable to receive subsidies decreased by 7.8 percentage points due to the use of a human-computer interaction response system. Technological innovation addresses the efficiency challenges in the final stages of social welfare projects. Another study on a school lunch distribution project in impoverished areas of India shows that IT technology enhances the transparency and supervision of the project, reduces welfare leakage, and improves government administrative efficiency (Debnath et al., 2023) [9]. Therefore, based on related foreign research, scientific and technological innovation can enhance the efficiency of social welfare implementation and subsequently improve people's livelihoods.

In addition to income distribution, employment, and social security, technological innovation plays a significant role in education, environmental protection, and other fields. In education, computer-assisted teaching platforms can enhance students' academic performance in major disciplines (Cardim et al., 2023) [10], and are effective across various student classes and ability levels (Büchel et al., 2022) [11]. Social-oriented college online courses have enhanced opportunities for mid-career individuals to pursue continuing education, which they might not access otherwise (Goodman et al., 2019) [12]. In environmental protection, the adoption of nuclear power technology and the proliferation of intelligent public transportation have decreased the frequency of private car use in major Chinese cities, contributing to improved environmental standards (Hassan et al., 2022) [13]. Additionally, advancements in environmental monitoring technology enable individuals to continuously reassess environmental pollution, leading to better personal protection and improved health status (Greenstone et al., 2022) [14].

This paper differs from existing literature in two key aspects. First, while much of the literature on people's livelihoods or scientific and technological innovation focuses on transnational [2][4][5], provincial [6][15], urban [16][17][18], or micro-individual levels [7], there is a notable scarcity of studies examining scientific and technological innovation and livelihood development at the county level.

3.0 Data source, variable setting and measurement identification

3.1 Data sources

This paper investigates the influence of county-level science and technology innovation ability on the development of people's livelihoods, focusing on 134 counties in Hebei Province. Due to data availability, the sample period is set from 2018 to 2021. Besides the gross enrollment rate of ordinary high schools and the designation of national health cities (counties), control variables such as livelihood indicators and regional GDP are sourced from the "China County Statistical Yearbook," "China County Construction Statistical Yearbook," "China City Construction Statistical Yearbook," "Hebei Province Statistical Yearbook," and statistical yearbooks of prefecture-level cities in Hebei Province. Data on the gross enrollment rate of ordinary high schools are obtained from the official websites of education examination institutes in prefecture-level cities in Hebei Province and Baidu search. Data on national health cities (counties) are sourced from the official website of the Hebei Health Commission and Baidu search. The first and second-level index data for STI ability are obtained from the website of the Hebei Science and Technology Department.

3.2 Variable Setting and Descriptive Statistics

This paper defines livelihood variables from four aspects: public infrastructure, income distribution, education, and healthcare. The core explanatory variable, STI Ability, along with its sub-indicators, is derived from the monitoring and evaluation results of county-level STI Ability published by the General Office of the Hebei Provincial People's Government. STI Ability is scored out of 100 points, with sub-scores of 20 points for innovation input, 25 points each for innovation subject and innovation condition, and 15 points each for innovation output and innovation management. The control variables include regional GDP, industrial structure, urbanization rate, financial dependence, and population density. Descriptive statistics are presented in Table 1.

Table 1: Descriptive statistics

Variable name	Sample size	Mean value	Standard deviation	Min	median	Max
Water supply pipe density	447	11.46	6.25	2.47	10.83	37.95
Drainage pipe density	447	9.36	3.32	2.27	8.84	18.67
Rural-urban income ratio	536	2.23	0.43	1.47	2.18	3.32
Gross enrollment rate of ordinary high schools	342	0.36	0.13	0.15	0.33	1
Primary teacher-student ratio	402	0.063	0.017	0.040	0.058	0.131
Middle school teacher-student ratio	402	0.078	0.018	0.050	0.075	0.149
Number of medical and health beds	456	49.67	12.64	26.58	48.42	84.64
Number of medical and health technicians	324	48.93	12.94	26.38	46.98	87.88
National Health City (county)	536	0.082	0.275	0	0	1
STI Ability	536	51.73	17.65	15.66	49.99	88.32
Innovation input	536	9.63	4.63	0.86	9.82	19.29
Innovation subject	536	14.66	4.69	2.65	15.19	23.10
Innovation condition	536	11.69	6.67	1	10.88	23.93
Innovation output	536	8.35	2.69	2.71	8.68	13.77
Innovation management	536	7.37	3.20	2	7	14.5
Gross regional product	534	1739892	1442444	283208	1311757	9296218
Industrial structure	530	0.82	0.47	0.18	0.72	2.60
Urbanization rate	536	51.02	10.46	32.75	49.4	93.76
Financial dependence	533	0.062	0.029	0.020	0.056	0.255
Population density	447	3412.05	1933.57	696	2916	9706

Note: Since the enrollment scope of private high schools is not limited to local areas, private high schools are not included in the calculation of gross enrollment ratio of ordinary high schools.

3.3 Measurement identification

This paper employs a panel fixed effects model to examine the impact of county-level scientific and technological innovation capability on the development of people's livelihoods. The econometric model is specified as follows:

$$Y_{it} = \alpha_1 + \beta_1 X_{it} + \lambda_1 C_{it} + \eta_i + \epsilon_{it}$$

In this model, i represents the county, t represents the year, the explanatory variable Y_{it} is the people's livelihood level of county i in t year, and the core explanatory variable X_{it} is the STI Ability of county i in that year. C_{it} is the control variable vector, including regional GDP, industrial structure, urbanization rate, financial dependence and population density. β_1 reflects the effect of STI Ability on the development level of people's livelihood. λ_1 is the coefficient vector of control variables, η_i is the regional fixed effect, and ϵ_{it} is the random disturbance term. To better capture differences between prefecture-level cities, this paper categorizes the data according to prefecture-level city standards.

4. Empirical Results and Analysis

4.1 Baseline regression

This paper uses the density of water supply pipelines and drainage pipelines as proxy variables for public infrastructure, while the urban-rural income ratio serves as the proxy variable for income distribution. Table 2 presents the panel fixed effects estimation results of STI Ability on these three variables. Columns (1) and (2) indicate that a 1% increase in scientific and technological innovation capacity is associated with a 0.26% increase in the density of both water supply and drainage pipelines. Thus, enhancing county-level scientific and technological innovation capability contributes to the advancement of regional public infrastructure and the development of people's livelihoods. Column (3) shows that a 10% increase in scientific and technological innovation capability results in a 0.84% decrease in the urban-rural income ratio. This indicates that improving county-level scientific and technological innovation capability helps narrow the urban-rural income gap and promotes common prosperity.

Table 2: Regression results of public infrastructure and income distribution

	(1) Water supply pipe density	(2) Drainage pipe density	(3) Rural-urban income ratio
STI Ability	0.260*** (0.067)	0.260*** (0.057)	-0.084*** (0.025)
Control variable	Yes	Yes	Yes
Individual fixation	Yes	Yes	Yes
N	443	443	443
R ²	0.099	0.138	0.544

Note: *** represents significant at the 1% significance level. The standard error of clustering by prefecture-level cities is shown in brackets. The control variables include regional GDP, industrial structure, urbanization rate, financial dependence and population density.

The regression results in Table 3 indicate that improvements in county-level STI Ability have no significant effect on the development of education and people's livelihoods in the region. Whether using the gross enrollment rate of ordinary high schools or the student-to-teacher ratio in primary and secondary schools as proxies for educational livelihood, scientific and technological innovation capability has not demonstrated the anticipated impact. This lack of

impact may, on one hand, reflect the accelerated balanced development of compulsory education, resulting in a basic equilibrium in basic education across counties. On the other hand, it highlights that parents in China place significant importance on their children's education. In both regions with high and low STI Ability, education remains a critical and independently significant aspect of people's livelihoods.

Table 3: Regression results of education

	(4) Gross enrollment rate of ordinary high schools	(5) Primary teacher-student ratio	(6) Middle school teacher- student ratio
STI Ability	-0.016 (0.083)	0.064 (0.037)	-0.021 (0.086)
Control variable	Yes	Yes	Yes
Individual fixation	Yes	Yes	Yes
N	278	331	331
R ²	0.280	0.070	0.042

Note: The standard error of clustering by prefecture-level cities is shown in brackets. The control variables include regional GDP, industrial structure, urbanization rate, financial dependence and population density.

Advances in medical and health services are crucial for enhancing residents' sense of well-being and happiness and are a significant indicator of the development of people's livelihoods. Columns (7) and (8) of Table 4 demonstrate that improvements in STI Ability have a significant positive impact on the number of medical and health beds and medical and health technicians. The estimation results in Column (9) indicate that enhancements in STI Ability significantly increase the probability of a county being designated as a national health city (county town). In summary, the results presented in Table 4 highlight that county-level STI Ability plays a crucial role in the advancement of local medical and health-related aspects of people's livelihoods.

Table 4: Regression results of healthcare

	(7) Number of medical and health beds	(8) Number of medical and health technicians	(9) National Health City (county)
STI Ability	0.379*** (0.042)	0.433*** (0.091)	0.145* (0.070)
Control variable	Yes	Yes	Yes
Individual fixation	Yes	Yes	Yes
N	378	268	443
R ²	0.294	0.471	0.047

Note: *** and * represent significant at 1% and 10% significance levels, respectively. The standard error of clustering by prefecture-level cities is shown in brackets. The control variables include regional GDP, industrial structure, urbanization rate, financial dependence and population density.

4.2 Sensitivity analysis

To address potential errors due to missing variables, this section tests the sensitivity of the estimation results to such missing variables through sensitivity analysis (Cinelli et al., 2020)^[19]. Given that the control variable regional GDP significantly influences the dependent variable, it is used as the benchmark for assessing the impact of missing variables. From Figure 1 to Figure 3, the isoline of the regression coefficient β value of the core explanatory variable is drawn, and the dotted line is $\beta = 0$.

Figure 1 shows that adding missing variables with the same magnitude as regional GDP does not affect the robustness of the results. However, incorporating missing variables with more

than twice the magnitude of regional GDP results in a change from positive to negative estimates. Consequently, the conclusion that improvements in county-level scientific and technological innovation capability enhance regional drainage pipe density should be interpreted with caution. Even with the addition of a missing variable three times the magnitude of regional GDP, the original estimated coefficient for the rural-urban income ratio remains negative, indicating the robustness of the result.

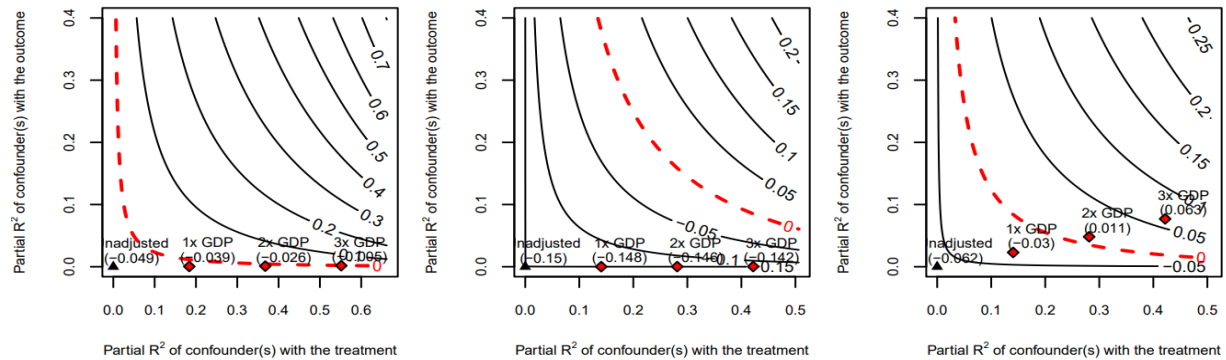


Fig.1: Coefficient contour lines of water supply pipe density, drainage pipe density, and urban-rural income ratio

Figure 2 shows that there is no issue with missing variables in the gross enrollment rate of ordinary high schools and the student-to-teacher ratio in primary schools. However, the student-to-teacher ratio in middle schools is more sensitive to missing variables, with the estimated coefficient for county-level scientific and technological innovation capability shifting from negative to positive. This shift aligns with the non-significant estimated coefficient observed in the last column of Table 3.

According to Figure 3, when a missing variable three times the magnitude of regional GDP is included, the results for the number of national health cities (county seats) and healthcare beds remain robust. However, the results for the number of medical and health technicians did not pass the sensitivity analysis, suggesting the presence of potential missing variables. Therefore, caution is warranted in interpreting the results for the number of medical and health technicians.

To further validate the model, this paper employs the System Generalized Method of Moments (GMM) for additional analysis. However, due to the limited sample period of only four years, the System GMM may be less effective. Despite this limitation, the estimation results from most System GMM analyses are consistent with those from the fixed effects model, suggesting that the lagged dependent variable and the lagged term of the county's STI Ability have minimal impact on the results.

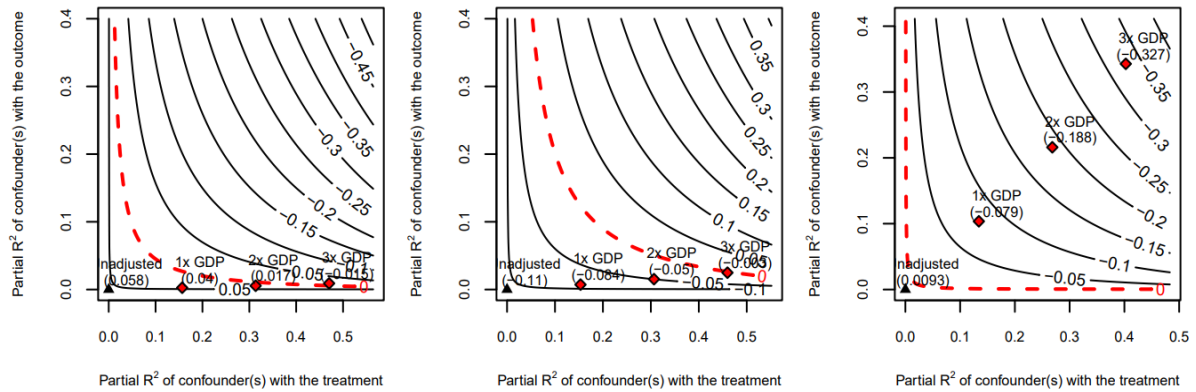


Fig.2: Coefficient contour lines of high school enrollment rate, primary school teacher-student ratio, and secondary school teacher-student ratio

4.3 Panel threshold regression

This section examines whether there is a threshold effect for the impact of county-level scientific and technological innovation capability on various livelihood indicators, with STI capability serving as the threshold variable. The analysis reveals that no threshold effect is present for the gross enrollment rate of ordinary high schools, the student-to-teacher ratios in primary and middle schools, the number of medical and health beds, the number of medical and health technicians, or the designation of national health cities (counties). In contrast, the density of water supply pipelines, the density of drainage pipelines, and the urban-rural income ratio exhibit threshold effects.

Column 1 of Table 5 indicates that county STI Ability has a double threshold effect on the density of water supply pipelines. The first threshold is 32.25 points, and the second threshold is 35.89 points. For counties with STI Ability below 32.25 points, a 10% increase in STI Ability results in a 2.54% increase in the density of water supply pipelines. For counties with STI Ability above 35.89 points, the impact on water supply pipeline density becomes more pronounced. Counties with STI Ability between the first and second thresholds constitute 6% of the total sample, where a 10% increase in STI Ability results in a 1.9% increase in pipeline density, though the effect is reduced yet still significant.

The STI Ability of a county also shows a single threshold effect for the density of drainage pipes and the urban-rural income ratio. The panel threshold regression results in Table 5 demonstrate that higher STI Ability positively enhances aspects of livelihood development, with more significant improvements observed in income distribution and other indicators.

Table 5: Threshold effect of SIT ability on public infrastructure and income distribution

	Water supply pipe density	Drainage pipe density	Rural-urban income ratio
STI Ability	STI ability <32.25	STI ability <33.25	STI ability <49.02
	0.254*** (0.078)	0.412*** (0.076)	-0.050** (0.025)
	32.25 < STI ability <35.89	STI ability >33.25	STI ability >49.02
	0.190** (2.473)	0.362*** (0.067)	-0.058** (0.024)
	STI ability >35.89	---	---
	0.263*** (0.073)	---	---
Control variable	Yes	Yes	Yes
Individual fixation	Yes	Yes	Yes

N	428	428	428
R ²	0.191	0.176	0.564

Note: *** and ** represent significance levels of 1% and 5%, respectively. The standard error of clustering by prefecture-level cities is shown in brackets. The control variables include regional GDP, industrial structure, urbanization rate, financial dependence and population density.

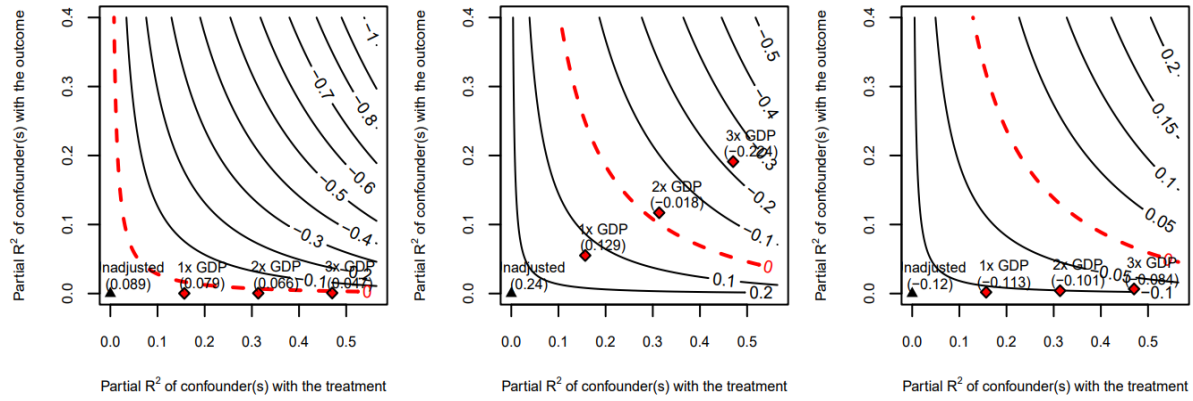


Fig 3

4.4 Structural analysis

According to the "Hebei Province County Science and Technology Innovation Leaping Plan (2019-2025)" issued by the General Office of the People's Government of Hebei Province, county-level scientific and technological innovation capability, as analyzed in this paper, encompasses five components: innovation input, innovation subject, innovation condition, innovation output, and innovation management. The estimation results of county-level STI Ability on various livelihood variables are presented in Figures 4 through 6.

Figure 4 illustrates that improvements in county-level innovation subjects, innovation conditions, and innovation management significantly enhance the density of water supply and drainage pipelines, while also reducing the urban-rural income ratio. These findings indicate that advancements in these three components of county STI Ability can, on one hand, promote the development of public infrastructure, enhance the living environment, and improve overall quality of life. On the other hand, these advancements can also narrow the urban-rural income gap, improve income distribution, and foster social equity and justice. In contrast, the indicators of county-level innovation input and innovation output do not have a significant impact on public infrastructure or income distribution.

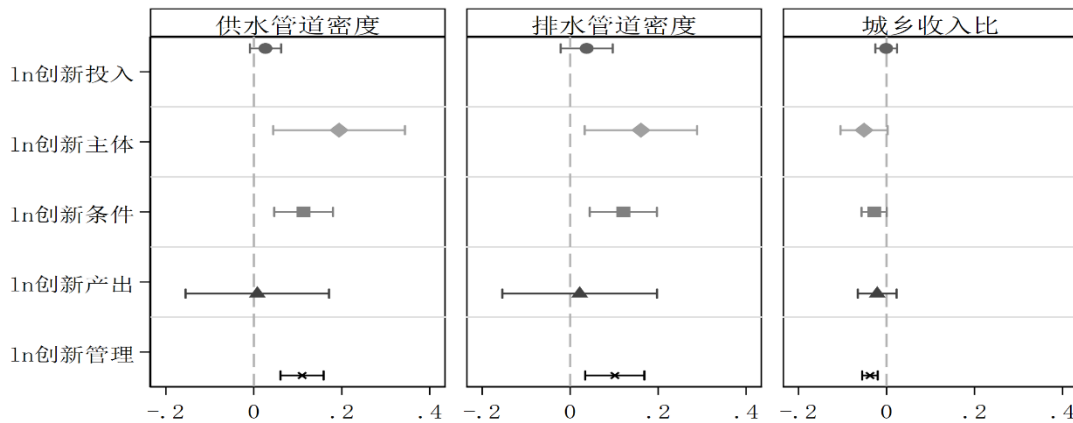


Fig.4 The regression results diagram of public infrastructure and income distribution

Figure 5 demonstrates that improvements in county-level innovation subjects and innovation output can lead to an increase in the gross enrollment rate of ordinary high schools. An increase in county-level innovation output is associated with a decrease in the primary school teacher-to-student ratio, whereas an improvement in innovation management is associated with an increase in this ratio. These two levels of county-level STI Ability exert both positive and negative effects on the primary school teacher-to-student ratio, resulting in a non-significant main regression estimation coefficient. Additionally, none of the five aspects of county-level STI Ability significantly impact the middle school teacher-to-student ratio.

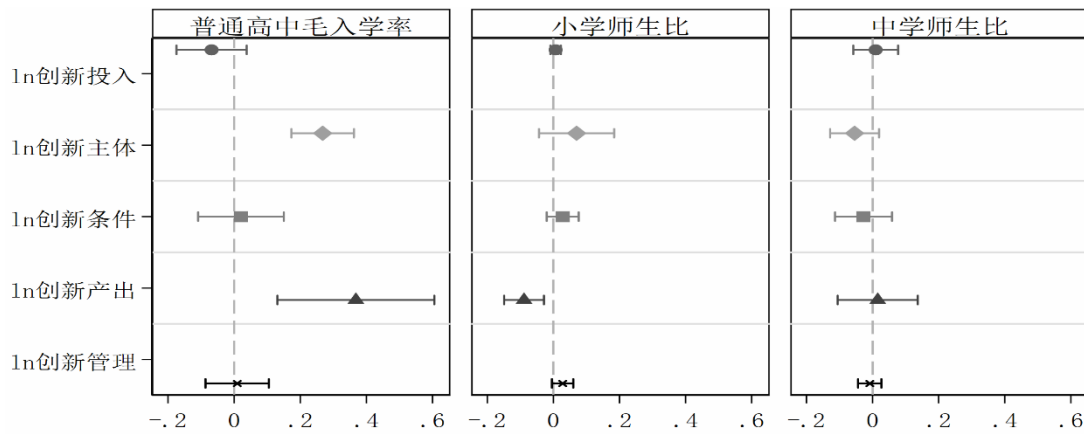


Fig.5 The regression results diagram of education

Figure 6 illustrates that improvements in county-level innovation subjects, innovation conditions, and innovation management significantly enhance the regional medical and health level. These three aspects of county-level STI Ability can enhance the supply capacity of regional medical resources and facilitate collaboration with local governments to establish national health cities (or county towns). Conversely, innovation input and innovation output do not have a significant impact on healthcare-related livelihood variables.

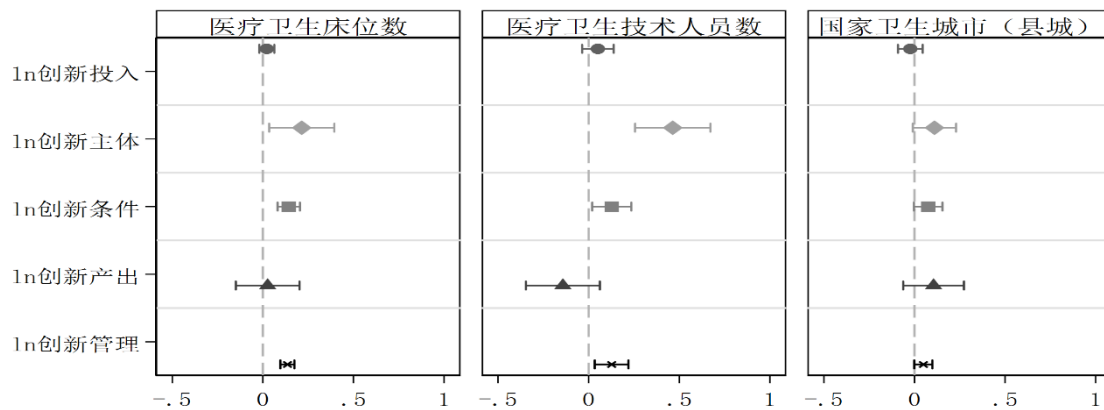


Fig.6 The regression results diagram of medical and health care

Contrary to findings in existing literature, this paper reveals that, among the five dimensions of county-level STI Ability, increases in innovation input and improvements in innovation output do not enhance the regional livelihood level. Innovation input and innovation output represent the quantitative aspects of the region's hard power in scientific and technological innovation, whereas innovation subjects, innovation conditions, and innovation management reflect the qualitative aspects of the region's soft power in innovation. This suggests that greater emphasis should be placed on developing soft power, including creating a high-quality

scientific and technological innovation environment, establishing efficient innovation service platforms, and enhancing advanced innovation management systems.

5.0 Conclusion and suggestions

This paper examines the impact of county-level scientific and technological innovation on various aspects of livelihood development, including public infrastructure, income distribution, education, and healthcare. The study found that enhancing county-level STI Ability promotes public infrastructure development, reduces the urban-rural income gap, and improves healthcare services. However, it has a minimal impact on the quality of regional education. The threshold regression results indicate that STI Ability has threshold effects on public infrastructure and the urban-rural income ratio, though the economic significance of the estimates before and after the threshold shows minimal difference. At the specific level of county STI Ability, indicators reflecting the 'quality' of innovation, such as innovation subjects, innovation conditions, and innovation management, significantly positively impact livelihood development. Conversely, indicators reflecting the 'quantity' of STI Ability, such as innovation input and innovation output, do not significantly affect improvements in livelihood development.

In summary, scientific and technological innovation is a crucial mechanism for enhancing and upgrading people's livelihoods, a fundamental component in achieving a high-quality life, and a vital support for advancing the high-quality development of livelihoods. Thus, the policy implications of this paper are as follows: grassroots governments should prioritize the development of scientific and technological soft power. This includes fostering a high-quality innovation environment, establishing efficient innovation service platforms, and enhancing advanced innovation management systems, rather than solely concentrating on quantitative indicators like innovation input and output. In regions such as plateaus and mountainous areas, where the benefits of science and technology are challenging to realize, there should be a proactive exploration of advanced technologies like artificial intelligence and big data to address social and livelihood issues. In poverty alleviation regions, it is essential to develop a county-specific innovation system that integrates the industrial, innovation, talent, and capital chains. This approach will facilitate a robust linkage between poverty alleviation outcomes and rural revitalization efforts.

References

- [1] Zhao Dina. "Top 100 Models of County and City Science and Technology Innovation in 2022" released "Strong Science and Technology" to help "Strong County" [J]. *Xiaokang*,2022,(21):46-48.
- [2] Zhou Xiaoli. Typical correlation analysis between scientific and technological progress and people's livelihood in OECD countries [J]. *Scientific Management Research*,2016,34(1):109-112.
- [3] Chao Weipeng, Jia Qiang. An empirical study on the interaction between scientific and technological progress and people's livelihood Development: A case study of Xinjiang Production and Construction Corps [J]. *Mathematics in Practice and Understanding*,2017,47(18):16-23.
- [4] Fan Desheng, Shao Xingyu. The development of financial technology and the improvement of income distribution: An empirical test based on the intermediation effect of financial inclusion [J]. *Macroeconomic Research*,2023(3):19-34.
- [5] Zhang Yu, Wang Wenqian. Can Fintech reduce income inequality? Research based on transnational panel data [J]. *Shanghai Finance*,2021(6):59-71.

- [6] Zhu Jinsheng, Zhu Hua. Research on the "local-neighborhood" employment effect of science and technology innovation and science and technology entrepreneurship [J]. Science and Technology Management Research, 201,41(11):70-83.
- [7] Zhao Fang, Jiang Guoliang. Digital technology enabling labor employment: Internal mechanism and micro evidence: An empirical analysis based on CFPS data.] Population Journal, 2019,45(2):99-112.
- [8] MURALIDHARAN K, NIEHAUS P, SUKHTANKAR S, et al. Improving last-mile service delivery using phone-based monitoring[J]. American Economic Journal: Applied Economics, 2021, 13(2): 52-82.
- [9] DEBNATH S, NILAYAMGODE M, SEKHRI S. Information Bypass: Using Low-cost technological innovations to curb leakages in welfare programs[J]. Journal of Development Economics, 2023, 164: 103137.
- [10] CARDIM J, MOLINA-MILLAN T, VICENTE P C. Can technology improve the classroom experience in primary education? An African experiment on a worldwide program[J]. Journal of Development Economics, 2023, 164: 103145.
- [11] BÜCHEL K, JAKOB M, KÜHNHANSS C, et al. The relative effectiveness of teachers and learning software: Evidence from a field experiment in El Salvador[J]. Journal of Labor Economics, 2022, 40(3): 737-777.
- [12] GOODMAN J, MELKERS J, PALLAIS A. Can online delivery increase access to education? [J]. Journal of Labor Economics, 2019, 37(1): 1-34.
- [13] HASSAN S T, KHAN D, ZHU B, et al. Is public service transportation increase environmental contamination in China? The role of nuclear energy consumption and technological change[J]. Energy, 2022, 238: 121890.
- [14] GREENSTONE M, HE G, JIA R, et al. Can technology solve the principal-agent problem? Evidence from China's war on air pollution[J]. American Economic Review: Insights, 2022, 4(1): 54-70.
- [15] Li Hui, Deng Qiyu. Research on Employment effect of digital economy development [J]. Population Journal,2023,45(04):41-56. (in Chinese).
- [16] Chen Minghua, Liu Yuxin, Wang Shan, et al. Sources and driving factors of people's livelihood development differences in China's top ten urban agglomerations [J]. Journal of Quantitative and Technical Economics,20,37(1):23-40.
- [17] Li Hongtao, Wang Lili. The impact of technological innovation in central cities on the industrial structure of urban agglomerations [J]. Studies in Science of Science, 2019,39(11):1980-1991.4-51.
- [18] Zhang Jing, He Bin, Peng Damin, et al. Construction, monitoring and evaluation of regional innovation capability index system: Based on the research and practice of 21 regions in Sichuan Province [J]. Soft Science, 2019,35(6):44-51.
- [19] CINELLI C, FERWERDA J, HAZLETT C. Sensemakr: Sensitivity analysis tools for OLS in R and Stata[J]. Available at SSRN 3588978, 2020.