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The Enabling Role of Digital Technology for Rural Revitalization--QCA Study Based on Digitization Index of 58 Counties in Anhui Province

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ABSTRACT

As part of the modernization of the national governance system and governance capacity, the local digital governance model is still in the exploratory stage, and there is an urgent need for academics to clarify whether digital technology can, to a certain extent, empower rural economic development and promote rural revitalization. Taking 58 counties in Anhui Province as the research object, this study adopts a multilevel governance theoretical perspective and the QCA method to identify the realization paths of high digital governance levels. It is found that (1) none of the single antecedent conditions can individually constitute a necessary condition for the improvement of county economic development level (high quality development of county economy). (2) The grouping analysis reveals that there is a common path to promote the improvement of county economic development level, i.e., the digital village grouping consisting of digital infrastructure, digital governance, and digital life. The findings of the study help deepen the rational understanding of the government and localities on digital governance, provide practical insights on digital governance in counties in China, and propose a path to optimize digital empowerment for rural revitalization.

KEYWORDS

Local digital governance; Multi-level governance; QCA; Rural revitalization

1. INTRODUCTION

The report of the Twentieth Party Congress clearly states that one of the main goals and tasks of China's development in the next five years is to further promote the modernization of the national governance system and governance capacity. In this context, the governance model based on digital technology has gradually become the focus of the modernization of the national governance system and governance capacity. To this end, in 2023, the Central Committee of the Communist Party of China (CPC) and the State Council further released the Overall Layout Plan for the Construction of Digital China, which explicitly put forward the construction of fair and standardized digital governance initiatives as an important direction for national governance. Under the guidance of national policy, digital governance in the region has made rapid progress [1]. In the policy context, how to explore the path of digital empowerment for rural revitalization, and how to better promote digital empowerment for rural revitalization has become a topic of reflection in the academic community.

In Anhui Province, under the guidance of the national policy, the local digitalization construction has achieved remarkable results, and the digitalization technology has a significant empowering effect on the three aspects of "agriculture, rural areas and farmers" in each county. Digital technology has a significant empowering effect on "agriculture, rural areas and farmers" in each county of Anhui

Province, and the QCA method, as a fuzzy set of qualitative comparative analysis, can systematically explore the specific impact of the use of digital technology on the improvement of the level of economic development of the countryside from a group perspective. In the literature research, it is found that digital technology has a significant impact on the level of county economic development, based on the group thinking, this paper adopts the emerging analysis method of QCA, and mainly carries out the following research: first, what are the significant group paths of digital technology-enabled rural revitalization? Second, how to put forward suggestions for improving the ability of digital technology-enabled rural revitalization?

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Digital governance is a systematic management structure that utilizes precise digital information to solve problems related to governance in order to achieve more effective, precise and actionable governance goals [2]. Digital governance facilitates the adoption of appropriate digital tools for governance according to the owner's requirements and the actual situation, so as to minimize the differences affecting the outcome of governance and to achieve the desired governance results [3]. Digital governance is widely used in a variety of governance domains, including government agencies, businesses and communities, to enhance traditional governance models, facilitate more effective communication and interaction between government managers, company operators and members of society, and improve the quality of governance and the effectiveness of policies by fully reflecting the results of technological advances [4].

This study draws on multilevel governance theory to examine the enabling role of digital technology in rural revitalization:

Originally used to explain the phenomenon of European integration, the theory of multilevel governance is an important theoretical framework for studying how to carry out governance actions under the conditions of multiple actors, centers and sectors [5]. In the process of digital governance, there are multiple governance subjects such as government, public, enterprises, etc., and it is obvious that the governance subjects and their logic of action are diversified [6]. However, different governance subjects in a closed-loop state need to construct a theoretical framework covering multiple action subjects to analyze the grouping path of high digital governance level. Thus, the theory of multi-level governance lays a theoretical foundation for this paper to study the coupling effect of multiple factors on digital governance from a holistic perspective. In digital governance, the framework is used to explore the pragmatic digital governance of the government and the substantive digital governance path of the localities with good feasibility. Specifically, digital governance paths include information infrastructure, digital financial infrastructure, basic data resource system, governance tools, digital culture, education and health, digital life services and other governance paths in multiple aspects of finance, information, culture, education and life.

And the level of economic development is reflected in the growth of per capita income level of residents, gross domestic product, the improvement of rural living standards, the construction of agricultural industrialization and other aspects. This study explores the enabling role of digital technology for rural revitalization, and rural revitalization is based on solving the problems of agriculture, rural areas and farmers, so to study the development level of rural revitalization, we can take the level of economic development of the countryside as an entry point, and reflect the level of economic development in terms of the number of GDP of the county economy, and then carry out the measurement of the development level of rural revitalization.

3. RESEARCH DESIGN

3.1. Research Methodology

Qualitative Comparative Analysis (QCA) is a research method developed by Ragin [7] to analyze the causal relationships of small and medium samples, combining the strengths of qualitative and quantitative to conduct cross-case comparative analyses from a holistic perspective. There are three main types of analysis in QCA analysis - clear set, multi-valued set, and fuzzy set. As fs-QCA has a wider scope of application, it can effectively uncover how antecedent conditions are coupled to be able to generate paths of entrepreneurial activity. So this paper draws on Du Yunzhou et al. [8] et al.'s study to use the fs-QCA approach to explore the influential conditions and paths of digital rural governance.

3.2. Data Sources

This paper takes the digital rural index of 58 counties in Anhui Province in the County Digital Rural Index Report (2020) jointly released by the Institute of New Rural Development of Peking University and Ali Research Institute in June 2022 as a typical case to analyze the impact effect of digital technology on the improvement of the level of economic development of the countryside in the process of digital governance. The sample covers 58 county-level administrative units in Anhui Province, which meets the data analysis requirements of the medium sample of the QCA method. Since the outcome variable is the level of county economic development, in order to measure this level, the study selects the GDP of 58 counties in Anhui Province as the data reference, and the source of the data is the Anhui Provincial Statistical Yearbook. In order to ensure data consistency, the data collection years of uniform sources are all 2022.

3.3. Variable Measurement and Calibration

3.3.1. Outcome variables

This study takes the empowering role of digital technology on the level of rural economic development as the object of research, so based on the data of Anhui Provincial Statistical Yearbook (2021), the GDP of 58 counties in Anhui Province in 2021 is taken as the outcome variable, and the influence of digital technology on the level of economic development of 58 counties in Anhui Province is judged by the influence of the antecedent variable on the outcome variable.

3.3.2. Antecedent variables

In this study, digital technology is selected as the antecedent variable, and the relevant digital indexes published in the County Digital Rural Index Report (2020) are adopted as the outcome variables. Among them, six indicators, namely, information infrastructure, digital financial infrastructure, basic data resource system, means of governance, digital culture, education and health, and digital life services, are taken as antecedent variables to explore the impact of the digital village index composed of these six variables on the level of high-quality economic development. The six variables are explained below:

Digital financial infrastructure refers to a new type of technological infrastructure formed based on the evolution of a new generation of information technology, digital technology, and intelligent technology, including a new generation of financial data centers and arithmetic centers, as well as innovative technological applications such as artificial intelligence, blockchain, and secure multi-party computing for financial scenarios. The development of the rural financial digital financial industry has been centralized.

A basic data resource system refers to a series of norms and guidelines jointly established by the Government, enterprises and various parties in society to promote the standardization, unification and

sharing of data and to improve the quality and value of data. It provides important support for social development, for example, in the construction of villages, the institutional system can promote synergy among the various actors in the villages and improve the management and service level of the villages.

Digital cultural tourism, revitalizing the beauty of history and humanities through digital forms, actively tapping the value of data assets, conducting effective business analysis and precise layout, is one of the effective grips for the high-quality development of cultural tourism industry. As a new idea of cultural tourism industry, digital cultural tourism can largely promote the growth of rural tourism economy.

Digital life service refers to a way of life based on the Internet and a series of digital science and technology applications, which can conveniently and quickly bring people a better life experience and work convenience. It has a significant role to play in improving the living standards of farmers and promoting rural economic development.

3.3.3. Variable calibration and descriptive statistics

In this paper, fs-QCA software is used to analyze the data when the initial data need to be dimensionless. According to the actual situation of each index, this paper takes the values of condition variables above 5%, 50% and 95% as calibration parameters, and the specific calibration anchors are shown in Table 1;

Tables 1. Calibrated anchor point

prerequisite	Calibration Anchor		
	Full affiliation 95%	Midpoint 50%	Completely unaffiliated 5%
information infrastructure	87.344	64.76	46.61
Digital financial infrastructure	147.398	129.35	112.21
Basic data resource system	102	51	51
Governance tools	75.054	56.03	31.967
Digital Education and Health (DED)	79.4843	60.97	40.961
Digital Life Services	71.562	47.69	19.868

4. EMPIRICAL ANALYSIS

4.1. Individual Conditional Necessity Analysis

Before conducting the group analysis, necessity analysis is needed to examine whether individual variables are necessary for the explanatory variables. In this paper, fs-QCA software is used to analyze the necessity of county economic development level. The results of the table show that the consistency of all six conditional variables is less than 0.9, indicating that the increase in the level of county economic development is not caused by a single antecedent condition alone. The results of necessity analysis are shown in Table 2:

Tables 2. Necessity analysis result

antecedent variable	consistency	degree of coverage
information infrastructure	0.596902	0.630316
~Information Infrastructure	0.725301	0.669101
Digital financial infrastructure	0.625129	0.621705
~Digital Financial Infrastructure	0.677453	0.660625
Basic data resource system	0.784510	0.622168
~Basic Data Resource System	0.558004	0.724631
Governance tools	0.742857	0.721981
~ Means of governance	0.570740	0.569564
Digital Education and Health (DED)	0.648193	0.643541
~Digital Culture, Education and Health	0.626506	0.611970
Digital Life Services	0.783821	0.764094
~Digital Life Services	0.529776	0.527055

4.2. Sufficiency Analysis of Conditional Configurations

After the QCA necessary conditions analysis, the sufficient conditions analysis is conducted through fs-QCA3.0 software to explore the grouping path where the synergistic effect of multiple antecedent conditions can produce high utility governance/substantive governance. Specific analysis found that five conditional variables, namely digital financial infrastructure, basic data resource system, governance means, digital culture, education and health, and digital life services, form a group state, which combines to form a path to have an impact on the growth of the level of economic development in the county. Among them, in the case of complex solutions, the influence of the two variables of digital financial infrastructure and governance means on the increase of the level of economic development is significant. The specific conditional analysis grouping is shown in Table 3:

Tables 3. Results of conditional configuration analysis

Prerequisite	System formation configuration
Information infrastructure	
Digital financial infrastructure	●
Basic data resource system	
Governance tools	●
Digital Education and Health (DED)	
Digital Life Services	
Consistency	0.91331
Original coverage	0.359036
Unique coverage	0.359036
Overall consistency	0.359036
Overall coverage	0.91331

5. CONCLUSIONS AND OUTLOOK

5.1. Conclusions of the Study

This study utilized the relevant data from 59 counties in Anhui Province and conducted a group analysis using fsQCA software, and the main conclusions are as follows:

First, the grouping analysis found that there is a total of one path to promote the improvement of the level of economic development in the county, i.e., the digital village grouping composed of three aspects: digital infrastructure, governance digitalization and life digitalization.

Second, none of the individual antecedent conditions alone can constitute the necessary conditions for the improvement of the level of county economic development (high-quality development of the county economy), indicating that individual antecedent conditions are weakly explanatory for the high-quality development of the county economy.

5.2. Outlook and Recommendations

This study finds that optimizing the indicators of digital financial infrastructure, basic data resource system, governance tools, digital culture, education and health, and digital life services can, to a certain extent, contribute to the improvement of the county's economic development level. As an important part of national governance, improving the level of regional digital governance needs to be based on the development of practice. To ensure the high-level development of regional digital governance, effective policy support and technical support should be actively provided. For example, improving the efficiency of digital government services and playing the helping hand of the government are important measures for digital governance; making up for the lack of digital utilization capacity and highlighting the main role of public digital means in digital governance; and accelerating the construction of digital infrastructure to provide effective governance tools and carriers for digital governance.

In the process of digital rural governance, it is important to build on local strengths, adapt to local conditions and accumulate experience. The realization of a high level of governance in the county requires local governments to strengthen policy guidance and inject technology and funds into the digital governance process as a guarantee.

No. Under the joint action of multi-layered subjects, such as the improvement of public digital literacy, the construction of enterprise digital platforms, and the improvement of government digital services, the development of high-quality local digital governance can be promoted. We need to strengthen the integration and synergy of all parties in rural governance, and promote digital governance to empower a higher level of rural revitalization.

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