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Digital Economy-Driven Coordinated Development in the Chengdu-Chongqing Twin-City Economic Circle: Mechanisms and Pathway Construction

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Abstract: With the development of digital technology in recent years, it has gradually been integrated into all sectors of the economy and reshaped the regional economy. The Chengdu-Chongqing Twin-City Economic Circle (CTEC) in western China is one of the main development areas of the region's economy. To promote the coordinated development of the region, this paper will examine how the digital economy can help achieve such coordination in the Central-Western Economic Circle (CTEC). As shown in the results of the mechanism analysis, the digital economy promotes coordinated development in all areas of the country, provinces, within provinces and among urban and rural areas through the following three channels: (1) Penetration and empowerment, (2) Network synergy and (3) Spatial reshaping. Correspondingly, it is suggested that efforts be made to improve the digital infrastructure and connectivity, promote differential development strategies for the digital economy, enhance the digital literacy of human resources, etc.

Keywords: Digital economy; Chengdu-Chongqing Twin-City Economic Circle; Coordinated regional development

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1. Introduction

Under the strong support of the national strategy for the Belt and Road Initiative (BRI), the Yangtze River Economic Belt (YREB) and Western Development Strategy (WDS), CTEC in Chengdu and Chongqing has been assigned the weighty responsibility of taking the lead in high-quality development for China's economic growth. The government has stated in the policy document "Outline of the Plan for the Construction of the Chengdu-Chongqing Twin-City Economic Circle" that it needs to enhance the spillover and driving functions of the two core cities and promote regional connectivity and resource sharing. However, CTEC still has some serious problems: its spillover effect from the central city is weak, there is insufficient growth in secondary cities, and the urban-rural gap is quite large. All of the above problems make it difficult to achieve the goal of high-quality regional development.

With the development of digital technology, the new stage of economic development that has followed agriculture and industry is now being driven by the digital economy. Therefore, with its high permeability, good diffusion ability and rising marginal returns, it has altered resource distribution, industrial layout and other aspects of the economy and social life. The significance of the digital economy has been affirmed in policy documents such as the "Report of the 20th National Congress of the Communist Party of China" and the "14th Five-Year Plan for the Development of the Digital Economy", which have further designated it as one of the essential driving forces for Chinese-style modernisation. Therefore, it is necessary to clarify the inner workings of how the digital economy drives the coordinated development of the CTEC and to build a practical path for its construction.

In light of the coordinated development of regions and considering the special characteristics of the digital economy, this paper will examine how to reduce economic disparities in provinces, within provinces, and between urban and rural areas through the development of the digital economy. Development along the path of digitalisation has been promoted to support the high-quality development of CTEC in terms of theory and practice.

2. Literature review and problem statement

Existing research has identified two main lines of inquiry concerning the digital economy and regional development. The first is about the regional empowerment effect of the digital economy. Generally speaking, it is believed that the digital economy has the potential to boost the development of a region. Due to its high growth speed, good spread effect and cost reduction effect, it will promote industrial digitalisation, optimise the regional division of labour and improve the efficiency of resource allocation [1–3]. More importantly, the effect of the digital economy on different regions is not uniform across space. It will reduce the difference in development level of some areas, but it may also make the regional imbalance worse due to the digital divide [4]. The second line of inquiry is about industrial synergy in the CTEC. As the area has changed from the "Chengdu-Chongqing Economic Zone" to the "Chengdu-Chongqing Urban Agglomeration", and then further to the "Chengdu-Chongqing Twin-City Economic Circle", scholars have been studying issues related to the upgrading of industrial structure, industrial efficiency and industrial layout in an organized manner. The research has found that there are still some problems in the central cities. For instance, lack of strong radiating and driving power, homogeneity of industrial structure, and failure to resolve the dual structure of urban-rural areas [5,6].

Although some studies have provided a foundation for understanding the digital economy and the development of the Chengdu-Chongqing area, three deficiencies still need to be addressed as follows:

(1) The mechanism by which the digital economy affects the coordinated development of the CTEC is not well known. Previous studies have not systematically explored how to promote the digital economy under the special conditions of a "strong dual core and weak periphery" model in the region;
(2) It has not been determined yet how to develop paths that can leverage the driving role of the digital economy and be in line with the characteristics of the Chengdu-Chongqing area;
(3) There is no systematic plan at all levels that covers the division of labour for all functional clusters in the region connected with micro-urban-rural areas, and how to learn from other urban agglomerations and build a synergy-based development model under different circumstances should also be explored for the

Chengdu-Chongqing area.

To address these gaps, this study attempts to construct a mechanism framework for digital economy-driven coordinated development of the CTEC from three dimensions, inter-provincial, intra-provincial, and urban-rural, and to propose corresponding pathway designs targeting the aforementioned shortcomings.

3. Mechanism analysis

The coordinated development of the CTEC can be spatially decomposed into three levels as outlined:

(1) Inter-provincial coordination between Sichuan and Chongqing;
(2) Intra-provincial coordination among cities within each province;
(3) Urban–rural coordination.

Through three mechanisms, the digital economy generates differentiated coordination effects at each of these levels as follows:

(1) Penetration and empowerment;
(2) Network synergy;
(3) Spatial reshaping.

A detailed analysis is presented below.

3.1. Penetration and empowerment mechanism and inter-provincial coordinated development

Coordinated development between the provinces aims to achieve economic convergence of the two administrative areas, Sichuan Province and Chongqing Municipality. It is a good conductor of electricity and easily spread; thus, the digital economy can help to break down administrative restrictions and promote the cross-regional movement of factors and industries.

The first is the use of digital technology to empower traditional industries and promote cross-provincial rearrangement of industrial chains. Manufacturing enterprises in Sichuan can use the digital service platforms and cloud computing services of Chongqing via the industrial Internet. The above connections will form an inter-provincial digital industrial chain covering research and development, design, intelligent manufacturing, logistics and distribution, etc. It will improve the efficiency of production at both ends and reduce homogeneous competition by way of value chain division. Therefore, the inter-provincial relations have reached a high level of chain cooperation and are no longer at a low level of project competition to bridge the development gap between the two areas.

Another way is to build and use the same digital infrastructure to support the coordination of various provinces. As the national-level internet backbone interconnection points of Chengdu and Chongqing, they can work together to build data centers and computing scheduling platforms to reduce the cost of information transmission and solve the problem of the digital divide. The free flow of the digital economy will also help distribute talent, technology and capital more reasonably among Sichuan and Chongqing. The peripheral cities can then share the digital benefits of the two core cities to promote all-around economy development in all provinces.

3.2. Network synergy mechanism and intra-provincial coordinated development

Coordination of the development in the province to reduce the economic difference between cities in Sichuan Province and districts and counties in Chongqing Municipality is essential. The structure of CTEC is a typical

core-periphery model; it has been concentrated in Chengdu and the main urban area of Chongqing, and the surrounding central cities and remote areas or counties are relatively underdeveloped. Through the power of networks, the digital economy will spread the benefits of these growth poles and promote an orderly development across all areas of the country.

One way is that the low-cost development of the Internet has lowered the obstacles for small and medium-sized enterprises (SMEs). Traditional enterprises in small-town and rural areas can use the Internet for e-commerce, live-streaming, etc., to reach the whole country and even the world at a lower cost, without being limited by geography. It can help the surrounding areas live well by using their own advantages in the local area, such as special agricultural products and cultural tourism resources, to expand the income base and narrow the economic gap with the central city.

The other way is that digital technology can help divide and cooperate for all the cities in a province. Core cities can construct a digital headquarters economy to gather high-end service functions such as research and development, design and finance, etc., and then distribute manufacturing, logistics, back-office operations, and so on to nearby cities via digital links. The functions are divided in terms of digital connection rather than physical location, so there is still space, but the organisation is small; thus, a "digital functional network" of the urban area has been formed. This way can reduce the strong siphon effect of large cities and promote the development of cities in the province in a manner that is both distinct and complementary.

A third way is that the sharing of data elements will promote the equalisation of public services. Through the construction of digital public service platforms, such as telemedicine and smart education, high-quality resources have been spread to the areas in the center and suburbs to nourish the human resources of peripheral cities and build a foundation for long-term economic convergence.

3.3. Spatial reshaping mechanism and urban-rural coordinated development

Coordination of urban and rural development persists as a serious problem in the economic and social changes of the Chengdu-Chongqing area. Through the mechanism of spatial reshaping, the digital economy can help to break down the traditional division of urban and rural areas and promote two-way factor flow and industrial integration between them.

One is that new forms of urban-rural industrial cooperation are being promoted through digital technology. According to the specific demands of urban consumers, digital technology has enabled the creation of various business models in the rural area, such as intelligent rural tourism, personalised agriculture and rural live-streaming e-commerce. Through integration, the countryside will no longer be just a source of agricultural products; it will become an all-weather platform for production, consumption and experience, boosting the original vitality of the rural economy and narrowing the income gap between urban and rural areas.

Another is that the digital transformation has expanded the scope of the rural labour force market. Digital employment platforms have broken the constraints of time and space for traditional employment; now, migrant workers and rural residents can obtain skills training and flexible job information online and be able to "work from the village" or "work from home". With improved digital literacy, rural labour no longer needs to move to the cities to participate in the benefits of the urban economy, and thus, income convergence between urban and rural areas at the market level is promoted.

Digital governance will help build new facilities and improve services for the people in rural areas. The construction of digital villages will extend the range of government services, financial services, education and

medical resources to rural areas; at the same time, residents will be able to enjoy high-quality public services in their daily lives. By reducing the gap in quality of life between urban and rural areas, attract talent and capital to villages, a good cycle of two-way urban-rural development can be promoted.

4. Path construction

Based on the mechanism analysis above, the following path construction strategies are proposed to provide theoretical and practical references for the high-quality development of the CTEC. The detailed strategies are presented below.

4.1. Promote the integration of digital infrastructure to consolidate the foundation for coordinated development

It is recommended that Sichuan and Chongqing should jointly formulate a special plan for digital infrastructure, covering the layout of 5G networks, industrial internet, data centers and computing hubs. The plan should ensure good quality of the digital network in the main axis and key node cities of the Chengdu-Chongqing area, and extend coverage to county seats and important townships. It is proposed that a special fund for the "Chengdu-Chongqing Digital Corridor" be established, this fund should be run in a public-private partnership (PPP) manner to raise social capital for investment, and thus relieve the problem of insufficient funds to build digital infrastructure in underdeveloped areas. At the same time, a regional data-sharing and exchange platform should be established in conjunction with others to address the problem of data silos caused by administrative divisions and lay the foundation for the next stage.

4.2. Implement differentiated digital industry development strategies to build a tiered synergy pattern

Given the differences in resources and industrial foundations of cities in the Chengdu-Chongqing area, various development directions for the digital economy should be taken. The main urban areas of Chengdu and Chongqing should focus on promoting high-end chips, artificial intelligence, industrial software, etc., as well as other core digital technologies, to become innovation bases for the digital economy. Mianyang, Yibin, Luzhou, Wanzhou, Fuling and other areas in the central city should develop different kinds of digital industry clusters to cover electronic information manufacturing, big data applications and digital content. Small and medium-sized cities and county towns should focus on the digitalisation of industries with local characteristics, and at the same time, develop application scenarios such as rural e-commerce and smart cultural tourism. A three-tier structure can be formed for the space of industrial digitalisation; that is to say, the first level is the core, the second level is a region, and the third level is a county.

4.3. Enhance regional digital human capital to empower the deep driving force for coordinated development

Digital literacy education should be added to the public education system in the Chengdu-Chongqing area. Universities will organise interdisciplinary programmes in the field of the digital economy, and joint digital skills training bases will be set up by enterprises and universities. Customised upskilling programmes should be organised for migrant workers, rural women and young entrepreneurs who have returned to their hometowns to narrow the digital usage gap in urban and rural areas and among various groups of people. A region can also

be established for joint recognition of the qualifications of digital talents and cross-regional mobility of this type of talent, and the institutional barrier of household registration and social security will be removed. Such arrangements will help to direct the good use of digital talent in all areas to promote the all-round development of these small and medium-sized cities and rural areas.

4.4. Innovate cross-regional collaborative governance mechanisms to ensure path implementation

A joint conference system for the digital economy in the Chengdu-Chongqing area should be built to coordinate the main digital projects and policies and distribute the benefits reasonably between the two administrative areas. Moroever, it can also improve the uniformity of statistics and regulations for the digital economy area, adjust the business environment to reduce hidden market barriers, etc. A regional index system for the coordinated development of the digital economy can be built, incorporating indicators of the level of digitalisation balance at different stages (such as inter-provincial, intra-provincial and urban-rural areas), and it will be used in the performance evaluation of the government. It will be possible to achieve the intended results through the construction of cooperation mechanisms among all parts of the region.

5. Conclusion

CTEC is about to change from polarisation to cooperation and development. The digital economy is a new type of economic system that, due to its functions of penetration and empowerment, network synergy and spatial reshaping, has provided new paths to tackle the structural problems of the region, such as the coexistence of strong dual cores and a weak periphery, and strong cities with weak rural areas. First of all, in this paper, we presented the transmission mechanisms by which the digital economy promotes coordinated development of the three areas of inter-provincial, intra-provincial and urban-rural areas. Based on the above mechanisms, a series of practical paths have been proposed to promote infrastructure connection, tiered industrial arrangement, strengthening human resources, etc. Looking ahead, the Chengdu-Chongqing area should leverage the opportunities provided by the digital era to build a systematic digital economy strategy, promote more balanced and high-quality integrated development of the region, and provide a good model for coordinated regional development in western China and other places.

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