

The Mechanism and Empirical Study of Digital Economy Empowering High-quality Regional Economic Development

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Abstract

With the rapid penetration of digital technology, the digital economy has become a core driving force for transforming regional economic development models and promoting high-quality economic growth. This study aims to explore the internal mechanism and empirical effect of the digital economy empowering high-quality regional economic development. Based on the panel data of 30 provincial-level regions in China from 2018 to 2023, this paper adopts the entropy weight TOPSIS method to measure the development level of the digital economy and regional high-quality economic development. The empirical results show that the digital economy has a significant positive driving effect on regional high-quality economic development. Mechanism analysis indicates that the digital economy promotes high-quality economic growth by optimizing industrial structure, improving resource allocation efficiency and stimulating technological innovation vitality. Heterogeneity analysis reveals that the empowering effect is more prominent in eastern coastal regions than in central and western regions. This study provides empirical evidence and policy enlightenment for regions to rely on digital transformation to achieve high-quality economic development.

Keywords

Digital Economy; Regional Economy; High-quality Development; Industrial Structure; Heterogeneity Analysis.

1. Introduction

With the development of digital globalisation, big data, artificial intelligence and cloud computing are now being applied in many areas of the real economy to change the industrial structure and factor allocation patterns of the regional economy. The old factor-driven model of economic growth is gradually declining; at the same time, the digital economy has emerged as a new factor of production and is now leading high-quality development. High-quality development of the region's economy focuses on coordinated industrial upgrading, efficient use of resources, innovative growth and sustainable development, and is highly compatible with the inclusive and efficient features of the digital economy.

Although previous studies have found that the digital economy is positively correlated with economic growth, most of the existing research lacks an organised system for analysing its internal driving forces and has not conducted specific empirical tests on regional disparities [1]. Based on the provincial panel data, this paper systematically analyzes the transmission path of the digital economy empowering high-quality regional development and verifies its practical effect; it fills the research gap in existing studies and provides a reference for the formulation of regional digital economy development strategies.

2. Theoretical Mechanism Research

The three main paths through which the digital economy promotes high-quality development in the region are as follows. First, industrial structure optimisation effect. Digital technology is spreading to traditional manufacturing, services and agriculture; intelligent transformation and upgrading of traditional industries are being promoted, and emerging digital industries are developing at a faster pace, thus promoting the restructuring of regional industrial structure from a low-end extensive type to a high-end intensive type.

Second, optimisation of resource allocation efficiency. The digital economy has broken through the information asymmetry barrier of regional factor flow, achieved precise matching of labour, capital and technology factors, reduced transaction costs and resource waste, and significantly enhanced the allocation efficiency of regional economic factors [2].

Thirdly, a technological innovation incentive effect. Digital Platforms and open technological environments have lowered the threshold for regional innovation activities, stimulated the innovative vitality of enterprises and research institutions, promoted the iterative upgrading of the regional technological level, and provided core support for continuous high-quality economic development.

Against the background of the mutual integration of digital technology and the real economy, these three effects do not act independently. The industrial structure optimization lays the structural foundation for improving overall economic efficiency, the improvement of resource allocation efficiency further releases the growth potential of various factors, and the continuous breakthrough in technological innovation provides sustained impetus for the upgrading of the industrial system and the optimization of allocation methods. The three work together to form a systematic driving force for the digital economy to promote the high-quality development of the regional economy. On this basis, this paper proposes that the digital economy has a positive promotion effect on the high-quality development of the regional economy, and this effect presents differences among regions with different endowments and development stages, which will be empirically tested through the research design and empirical analysis in the following sections.

The synergy between industrial structure optimization, resource allocation improvement and technological innovation is also closer, which may lead to a more significant promotion effect of the digital economy on regional high-quality economic development. In contrast, regions with relatively backward industrial development and insufficient factor accumulation may face problems such as insufficient digital infrastructure construction and low ability to absorb digital technology, so the enabling effect of the digital economy may be relatively weak, and there may even be a certain digital divide that hinders the release of its driving effect. Clarifying the differential performance of this driving effect under different regional conditions is an important basis for putting forward targeted policy suggestions, and also helps to deepen the understanding of the internal mechanism of the digital economy driving high-quality development.

3. Research Design

3.1. Data Source and Sample Selection

This study selects the panel data of 30 provincial-level administrative regions in China (excluding Tibet, Hong Kong and Macao) from 2018 to 2023 as the research sample. The data are derived from China Statistical Yearbook, China Digital Economy Development Report and provincial statistical yearbooks, with missing values filled by linear interpolation to ensure data integrity and validity.

3.2. Variable Definition

Explained Variable: High-quality regional economic development level (HQD). Build an all-encompassing evaluation index system that covers the quality of economic growth, industrial coordination, innovative development and green development, etc., and calculate the overall score using the entropy-weighted TOPSIS method [3].

Explanatory Variable: Level of digital economy development (DE). Measure in three dimensions: digital infrastructure, industrial digitalisation and digital industrialisation, and obtain a composite index by weighted calculation.

Control Variables: To exclude the influence of external factors, select the level of economic development, degree of government intervention, human capital level and opening-up degree as control variables.

3.3. Econometric Model

Construct a benchmark panel regression model:

$$HQD_{it} = \alpha_0 + \alpha_1 DE_{it} + \sum \beta \text{Control}_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (1)$$

Where i represents the province, t represents the year, Control represents control variables, μ_i is individual fixed effect, δ_t is time fixed effect, and ε_{it} is random error term.

4. Empirical Results and Analysis

4.1. Benchmark Regression Results

According to the benchmark regression results, the coefficient of the digital economy (DE) is 0.428 and meets the 1% significance level test. This statistically robust finding unequivocally indicates that the digital economy has had a considerable and statistically significant positive stimulating effect on high-quality development of the region [4]. The magnitude of the coefficient is substantial, which underscores the economic importance of this relationship. Specifically, the model estimates that for every 1-unit increase in the level of development of the digital economy, the level of high-quality development of the region increases by 0.428 units. This direct, quantitative linkage provides strong empirical support for the positive role of digital transformation. The underlying mechanisms can be understood through several key dimensions: Better Digital Infrastructure, which enhances connectivity and data processing capabilities; Industrial Digitalisation, which transforms traditional production and service models; and the comprehensive Development of the Digital Economy itself, which fosters innovation and efficiency. Collectively, these interconnected factors will all synergistically boost the economic modernisation of the region, driving it towards a more innovative, coordinated, and sustainable growth path.

4.2. Regional Heterogeneity Analysis

Recognizing that China's vast territory exhibits significant developmental disparities, this paper divides the full sample into eastern, central and western regions for a more nuanced grouped regression analysis. This approach allows for the examination of whether the impact of the digital economy varies across different geographical and economic contexts. The detailed empirical results from these subgroup analyses are comprehensively presented and summarized in Table 1, which follows this section. The table systematically displays the regression coefficients for the digital economy variable, their corresponding statistical significance levels (p-values), and the model fit (R^2) for each of the three major regions, enabling a clear comparative assessment of the heterogeneous effects.

Table 1. Heterogeneity Regression Results of Regional Groups

Region	DE Coefficient	P-value	R ²
Eastern Region	0.562***	0.000	0.892
Central Region	0.315***	0.002	0.845
Western Region	0.208**	0.015	0.813

Note: ***p<0.01, **p<0.05, *p<0.1

Empirically, the regions are not uniform. The East has built a high-quality digital infrastructure and has good industrial digital transformation capabilities; therefore, it is an ideal area for implementation [5]. The central-west are constrained by a lack of digital infrastructure and a shortage of talents; thus, their promotion of the digital economy is relatively weak.

4.3. Robustness Test

This paper adopts the method of replacing core variables and shortening the sample period for robustness test. The regression coefficient and significance level are basically consistent with the benchmark results, which proves that the research conclusion is stable and reliable[6].

5. Conclusion and Policy Implications

Systematically investigate the path and impact of the digital economy on regional high-quality economic development in this study. First, the digital economy will promote the high-quality development of the region by adjusting the industrial structure, improving factor allocation efficiency, and driving technological innovation. Second, the promotion effects are not uniform in all areas, and they are relatively stronger in the east than in the central and western regions. Based on the above analysis, the following targeted policy recommendations are proposed. First, strengthen the construction of digital infrastructure in the central-western region and narrow the regional digital development gap. Second, promote the deep integration of digital technology and the real economy, and advance industrial digitalisation. Third, increase investment in training digital talents and promoting technological innovation to build an endogenous power base for the high-quality development of the digital economy.

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