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Health Industry Development In The Digital Economy: An Empirical Study About The Intermediary Effect On Higher Education

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Abstract:

This paper empirically tested the effects of digital economy and education level on the development of health industry based on the data of 11 provinces and cities in Yangtze River Economic Belt from 2011-2020. By using a fixed effects model and a mediating effects model, the key pathways to promote the development of the health industry were investigated. The results revealed that: (1) the application of digital technology to the development of the health industry is of great interest, and digital technology plays an important role in both the development planning of the health industry, the development and production of health industry products, and the collection of market information and the conclusion of market transactions. (2) The digital economy and education level have promoted the development of health industry. The digital economy acts on the development of health industry through education level, and education level plays the role of full mediating effect. People with different levels of education have differences in their health awareness. Education promotes social stratification, and at the same time, the social public has different health concepts and the pursuit of health because of their different levels of education. In particular, the group with higher education has a strong emphasis and pursuit of health, thus promoting the development of the health industry.

Keywords: Digital economy; educational attainment; health industry development; fixed effects model; mediating effects model

Introduction

The Word Bank estimated that the global economic downturn would be the most severe since 80 years due to the Impact of COVID-19. By 2021, the number of extremely poor people in the world increased to 150 million, setting back the global process of reducing poverty rates by three years (Zhou et al., 2021). In this background,

finding a path for social development that resolves the interaction between health and economic development become a hot topic of studies in the area of economics, sociology and education. With the rapid development of modern technology, digital technology is widely used in the practice of economic development. It will certainly help the development of health industry. Especially, with the improvement of national education level, the health concept is deeply penetrated into the national mind and the health industry is developing rapidly. Therefore, it is of great practical significance to study the influence of digital economy and education level on the development of health industry, in order to comprehensively apply modern digital technology, improve the management level and promote the stable development of health industry.

Health industry is an important medium for the country to realize the combination of medical services and pension services and improve the national health management(Ataguba & Ataguba, 2020). By the end of 2021, China's digital economy and related industries were worth 44.2 trillion yuan, playing a huge role in supporting epidemic prevention and control and social development(Daiet al., 2021). Meanwhile, according to the "Global Digital Economy 2021 White Paper" published by the China Academy of Information and Communication Technology, the value added of the digital economy in 47 countries reached US$32.6 trillion in 2020, representing a nominal growth of 3.0% year-on-year and a 43.7% share of GDP(Tommaso & Spigarelli, 2020). The digital economy, as a new type of business model and economic practice based on information technology, shows great potential for driving strong economic growth and has became a global trend in economic development.

With the rise of digital technology, big data has been widely used in the health industry (Galetsiet al., 2019), which, coupled with technological innovation and improved production efficiency, has promoted cross-over between industries. The digital economy has formed a new model with cross-complementary functions and mutual extension of technology between industries, thus promoting the flourishing development of the big health industry. However, because of the limitations of concepts and technology, the health industry also suffers from serious homogeneous competition and insufficient deep integration of industrial development(Liet al., 2020; Qiu & Cantwell, 2018; Xiaoet al., 2021). Therefore, while developing the health industry, there is a need to give full play to the role of digital technology as a way to improve the business performance of the health industry (Purwanto, 2020). It is also necessary to focus on collaborative innovation of knowledge technology to promote technological breakthroughs in the research and development of new products in big health, and continuously improve the competitiveness of the big health industry and industrial safety and security (Munirathinam, 2020). Health industry entities need to proactively engage in the Internet and make good use of Internet thinking to solve problems in health product development (Ogbukeet al., 2022).This paper studies the positive effects of digital economy and education level on the development of health industry, and

identifies the development pattern in order to provide suggestions for boosting the development of health industry.

Literature review

The potential of the digital economy

Many scholars considered that the digital economy was a general term for economic activities such as production, exchange and consumption supported by technology, and that it was the essence and core of digital innovation, which was the inevitable result of digital diffusion to the whole economy and society(Albukhitan, 2020; Hanelt et al., 2021; Jouanjean et al., 2020; Pramanik et al., 2019). Innovation in the digital industry had moved from sharing internal resources such as knowledge to external resources, which resulted in new forms of sharing economy and financial crowd-funding. The health industry is a powerful support for meeting the growing national health requirements and accelerating the construction of a harmonious nation, as well as a new growth area for maintaining medium to high economic growth in the future. Support social forces to set up non-profit medical institutions, institutions combining medical care and health care, agencies for traditional health care and health insurance, and actively promote the integration of health with nursing care, tourism, internet, physical fitness and leisure(Wu, 2021; Wu & Yabar, 2021). It could give rise to new industries, industries and models of health (Badri et al., 2018). During this process, the emergence of digital information elements could strongly promote the original capital production structure, and raise further production efficiency and economic growth. The digital economy could drive the transformation of the health infrastructure through inter-industry differences in technological progress(Panet al., 2022; Semple & Cherrie, 2020).

The need for growth in the health industry

In the face of the COVID-19, The New England Journal of Medicine editorialized that the United States had a huge advantage in facing the crisis, with a biomedical research system that is the envy of the world, with strong expertise in public health, health policy and basic biology, which it has been able to translate into new treatments and preventive measures. But in actual fact they performed disastrously, with little emphasis on detection capacity, no effective quarantine measures, lack of government leadership, and the federal government even weakening the capacity of the Centers for Disease Control and Prevention (CDC), the National Institutes of Health (NIH), the Food and Drug Administration (FDA) - the professional agencies - to stop following the science and politicise the pandemic response (Bardosh et al., 2022, 19). The right theory and professional approach would need to be taken seriously and put into practice in order to ensure the value and meaning of health for society and the population. In recent years, digital health has emerged as an innovative area of business that is attracting a lot of attention for its rapid expansion. In 2020 and 2021, China's social investment in health fixed assets increased by 29. 9% and 24. 5% respectively compared to the previous year(Ahmad, 2021; Tommaso & Spigarelli, 2020). It was maintaining a high level of growth in overall industry fixed asset investment for two consecutive years, 10 times and 5 times that of the whole industry respectively. Since 2020, the investment and financing market in the fields of eHealth, bio-

medicine and mobile devices has continued to be active, and the industrial investment agents are diversified (Yu et al., 2021) and industrial cross-border financing is very frequent.

The rapid development of the health industry was also marked by problems such as excessive and unsuitable consumption in the Health Examination, Medical Aesthetics and Pharmaceutical E-commerce industries. For example, some medical examination institutions induced patients to receive treatment by exaggerating their conditions or even creating problems; the results of consumer genetic tests were not yet approved for guiding clinical use, but many testing companies exaggerated the significance of the tests in their publicity to mislead consumers; and the medical aesthetics industry was also caught in a ruinous situation with a lot of negative news (Makary, 2019). These irregularities had affected the development of healthy industry and exacerbated the unreasonable increase in health costs. In particular, after the new crown pneumonia epidemic, the whole society was more aware of health, more concerned about their well-being, and the rational understanding of health care, protection and other products as well as scientific health management and other consumer needs. These irregularities had affected the development of healthy industry and exacerbated the unreasonable increase in health costs(Luyckx et al., 2021). In particular, the social demand for health education emerged gradually as the whole community became more and more concerned about their own health after the COVID-19. It was particularly important to incorporate health education into the education system as a means of strengthening personal responsibility for health, enhancing mental health literacy and ultimately creating a social climate of health-loving, health-pursuing and health-promoting as well as a healthy lifestyle(Liang et al., 2019; Yan & Zhong, 2022).

There was a potential link between the level of education of the population and the positive feedback from the health industry. The study on the feedback of health services from residents with different levels of education revealed that residents with different levels of education had different levels of satisfaction with fitness services and social health services. The overall level of satisfaction with health services was at a low level among residents with primary school education and below, while the overall level of satisfaction with health services was at a relatively high level among residents with tertiary education and above(Meng et al., 2018). Equally, in contrast to residents with primary school education and below, who have a lower overall level of demand for health services other than health protection services and health care services, relatively well educated residents with tertiary education and above show a lower overall level of demand for health care services and a higher level of demand for other health services(Cameron et al., 2020). While erecting the dominant position of public medical institutions in offering basic medical services and ensuring basic healthcare services, continuously improving the quality of services and residents' sense of experience could improve the overall residents' health experience. Research on the rational layout of the supply of healthcare resources, accelerating the promotion of socially run

healthcare, and providing non-basic, hierarchically diversified and high service quality health services needs to be deepened (Karaca & Durna, 2019; Karakose et al., 2021; Tanhanet al., 2020). It is through a multi-faceted exploration that we can find the important purpose of enhancing the comprehensive service capacity of health service providers and meeting residents' needs for diversified health services.

Theoretical background and research hypothesis

Based on the characteristics of digital economy being widely used and the fact that higher education in China was moving to popularization level. The reality that people's health awareness had been strengthened and the health industry was rapidly developing, so this paper could make following hypotheses：

Hypothesis 1: The digital economy can significantly promote the development of the health industry and have a positive impact.

Digital technology had become a key driver for industry development and market expansion. The widespread use of digital technologies enhanced the efficiency of the market-based allocation of various factors and increased the innovation capacity of the regions concerned (He et al., 2021). With the increasing improvement of people's living standards, the health industry became a significant industry to fulfill people's needs for a quality life(Nandi et al., 2021). Driven by the development of science and technology, the industry's main body used digital technology in a large number of areas such as information acquisition, production deployment and market development, which broke the space and time limitations of the connection between industrial development and consumers, and inevitably enhanced the efficiency of its industrial development and promoted the rapid development of the industry.

Hypothesis 2: The dimensions of education can mediate the development of the digital economy for the health industry.

Education was an important vehicle for improving the quality of the public, especially with the advent of universal access to higher education, the rising level of education and the increasing availability of work skills(Maas et al., 2017). As a result of the widespread use of digital technology, the number of traditional manual workers decreased and the number of mental workers increased(Pappa et al., 2021). This was accompanied by a higher social status and a general improvement in the living conditions of the population. A comfortable and beautiful living environment inspired the pursuit of health and thus a significant increase in health awareness. The degree to which people focus on their health was closely related to their level of education as well as their work environment and social status.

Variable description and model formulation

This study used the fixed effects model and the mediating effects model to empirically test the impact of the digital economy and education levels on the development of the health industry.

Variable selection

The core variables include both explained and explanatory variables. The explained variable was Health Industry Development

(HID) and the explanatory variables were Digital Economy (DE) and Education Level (EL).

Explained variables

By reviewing the standard "Statistical Classification of Health Industries (2019)" issued by the National Bureau of Statistics, this study established the statistical scope of the health industry, as including 13 major categories, 58 medium categories and 92 sub-categories. By eliminating 16 inter-industry duplications, the health industry was actually divided into 85 industries (74 without * and 11 with * actually sub-crossing health industry industries) and 16 industries with *, mainly involving 9 major health industry categories (Table 1).

Table 1 Sector-wide classification of industries included in the health sector (85+16)

	Health industry category codes and names	Volumes(pcs)
85 industries (74 without *, 11 with * are actually sub-sectors across the health industry)	01 Health Services	26
	02 Health Affairs, Health Environment Management and Research Technology Services	12
	04 Health Promotion Services	9
	05 Health Insurance and Financial Services	4
	07 Distribution services for pharmaceuticals and other products	12
	09 Pharmaceutical manufacturing	9
	10 Medical instrumentation and device manufacturing	5
	11 Manufacture of health equipment and smart devices	6
	13 Chinese herbal medicine industry	2
16 with * industry	02 Health Affairs, Health Environment Management and Research Technology Services	3
	03 Health Personnel Education and Health Literacy	1
	04 Health Promotion Services	5
	05 Health Protection and Financial Services	1
	10 Manufacture of medical instrumentation and apparatus	2
	11 Manufacture of health products, equipment and smart devices	4

(For reasons of page length, the names of sub-categories of the health industry were not listed.)

Health Industry Development (HID).

Therefore, based on the list of health industry classifications and the theoretical connotations of health industry, it relied on the research methods of other scholars. After fully considering the availability of data, the thesis constructed a comprehensive evaluation index system for the development

of the health industry(Chen, 2016; Murmuraet al., 2020; Stavrouet al., 2016).

Table 2 Comprehensive evaluation index system for health industry development

Level 1	Level 2	Direction of effect	weights
Health Services	Third industry value addition	+	0.1099
Services for medical institutions	Health Care Expenditure	+	0.0668
	Numbers of health care facilities	+	0.0580
	Numbers of health technicians	+	0.1000
	Numbers of Practitioners	+	0.1055
	Numbers of medical beds	+	0.0697
Medical insurance	Numbers of participants in basic medical insurance	+	0.0676
Health literacy and promotion services	Technical advices and policy recommendations	+	0.1049
	Public Health Education Activities	+	0.0780
	Co-productions with the media	+	0.0566
	Working with the media to broadcast information	+	0.0737
	Art galleries and cultural centres	+	0.0775
	Broadcast program coverage	+	0.0318

Setting of indicator weights

Entropy method's basic idea is to reflect the degree of differentiation of an indicator from the discrete degree of the indicator, i.e. through the perspective of the entropy of the indicator to the evaluation object. When the entropy value of the indicator is smaller, the more orderly the sample data of the indicator is, and the corresponding weight will be larger. In this study, the entropy value method is used to calculate the weights of the indicators of the health industry. The specific calculation steps are as follows.

First, constructed a matrix of indicators. From the original data, an original data matrix of $m \times n$, with m representing the total number of years for which indicators were selected, n representing the number of indicators selected, $m \times n$ representing the total number of indicators for all years, and X representing the original data matrix.

$$X = (x_{ij})_{m\times n}\begin{pmatrix} x_{11} \dots & \dots x_{1n} \\ x_{m1} \dots & \dots x_{mn} \end{pmatrix}$$

Secondly, made a normalization of indicator values. Due to the large differences in the number of units and orders of magnitude of the raw data obtained, it was necessary to normalize them. By using the deviation equalization method to eliminate the magnitude of the data, the formulae for positive indicators were found on equation (2) and for negative indicators on equation (3).

$$y_{ij} = \frac{x_{ij} - x_{i,min}}{x_{i,max} - x_{i,min}}$$

$$y_{ij} = \frac{x_{i,max} - x_{ij}}{x_{i,max} - x_{i,min}}$$

where: $y_{ij}$is the standardised value of the indicator i in year j. $x_{i,max}$ and $x_{i,min}$ represent the maximum and minimum values of the indicator in the time series respectively.

Again, the entropy value of the evaluation indicator is determined with the formula:

$$e_i = \frac{\sum_{j=1}^{n} y_{ij} \ln y_{ij}}{\ln n}$$

where : e_i is the entropy value of the indicator i and n is the number of years of the indicator. Following this, the weights of each indicator are determined:

$$w_t = \frac{1 - e_i}{\sum_{i=1}^{n}(1 - e_i)}$$

where: w_i is the weight of indicator i. The calculation results of each indicator are shown in Table 2.

Core explanatory variables

Digital Economy (DE) and Education Level (EL).

At present, the digital economy is developing rapidly, and with the increasing popularity of artificial intelligence and big data products, the health industry has been gradually integrated with "high precision" technology. Regarding the measurement indicators of digital economy, this paper refers to the studies of Pan Weihua et a(潘 et al., 2021)l. and Liu Jun et al. (刘 et al., 2020) to construct a comprehensive evaluation index system of digital economy as shown in Table 3. The level of education is measured as a percentage of the number of students in higher education compared to the total population.

Table 3 Comprehensive evaluation index system for the digital economy

Indicators	Description	Direction of effect	weights
Digital Financial Development	China Digital Inclusion Index	+	0.0415
Internet penetration rates	Numbers of Internet users as a percentage of total population	+	0.0599
Internet-related practitioners	Information transmission, software and information technology services employees	+	0.0631
Internet-related outputs	Telecom services per capita	+	0.0596
Mobile phone penetration	Numbers of mobile phone subscribers as a percentage of total population	+	0.0593
Information technology industry revenues	Software business revenue	+	0.0958
Third industry proportion	Percentage of GDP in the third industry	+	0.0534
E-commerce sales per capita	Ratio of e-commerce sales to total population	+	0.1291
Percentage of businesses with e-commerce activities	Proportion of businesses with e-commerce trading activities	+	0.0574
Number of websites per 100 enterprises	Number of websites per 100 enterprises	+	0.0336
Percentage of information services workers per 100	Information services employees as a proportion of employed	+	0.1065

employed persons	persons		
Financial allocation for science and technology as a proportion of municipal expenditure	Science and technology expenditure as a share of fiscal expenditure	+	0.0630
Percentage of GDP spent on R&D	R&D expenditure as a percentage of GDP	+	0.0360
R&D personnel	R&D personnel	+	0.0653
Number of patent applications per million people	Proportion of patent applications to total population	+	0.0766

Control variables.

As the development of health industry is influenced by a combination of factors, fiscal spending (GS), per capita GDP (RDL), industrial structure upgrading (IUP) and urban-rural insurance coverage (URI) are selected as control variables in this paper. Fiscal expenditure is expressed as a ratio of total fiscal expenditure to GDP, and fiscal investment is the basis for the development of the health industry and is related to the rate of development of the health industry. GDP per person is expressed as the percentage of total population to GDP, and a higher GDP per person indicates a higher standard of living, which inevitably strengthens people's health awareness and thus promotes the development of the health industry. The industrial structure upgrade is expressed by the ratio of the sum of added value of secondary and tertiary industries to GDP, and the continuous upgrade of the industrial structure can provide a constant impetus for the development of the health industry. The urban and rural insurance coverage ratio is measured by the sum of the number of urban and rural residents' social pension and basic medical insurances participants to the total population. A high insurance coverage rate can reduce people's worries and strengthen their health awareness, thus promoting the development of the health industry.

Variable descriptive statistics

The study was based on 11 provinces and cities in the Yangtze River Economic Belt and covers the period of 2011-2020. T The dates were mainly obtained from the website of the National Bureau of Statistics, local statistical yearbooks and the China Health Statistics Yearbook. In order to eliminate the heteroskedasticity phenomenon as much as possible, the variables including fiscal expenditure and GDP per capita were introduced into the model after taking the natural logarithm, and the descriptive statistics of the corresponding variables were calculated using Stata15. 0 software, as shown in Table 4.

Table 4 Descriptive statistics of variables

Variables	Symbols	Observations	Average	Standard deviation	Minimum	Maximum
Health Industry	HID	110	0.4034	0.2210	0.0769	0.8859

Development						
Digital Economy	DE	110	0.2838	0.2415	0.0352	0.8147
Education level	EL	110	1.8947	0.4406	0.9748	2.8568
Government Spending	lnGS	110	3.0584	0.2964	2.4901	3.7104
Per capita GDP	lnRDL	110	10.8440	0.4969	9.7058	11.9658
Industry upgrade percentage	IUP	110	0.3949	0.2022	0.0681	0.8132

In Table 3, the mean values of health industry development, digital economy and education level are 0. 4034, 0. 2838 and 1. 8947, the standard deviations are 0. 2210, 0. 2415 and 0. 4406, respectively, which means that the health industry developed faster and the digital economy and education level improved significantly over time. It also indicated that there were differences in development levels among the Yangtze River Economic Belt's 11 provinces and cities, and the control variables showed similar characteristics, indicating the imbalance in the overall development level of the Yangtze River Economic Belt.

Model setting

Fixed-effects model

Based on the theoretical analysis and the characteristics of the data used in this paper, the following fixed effects model was constructed as follows.

$$HID_{it} = \alpha_0 + \alpha_{1E}L_{it} + \alpha_{2E}L_{it} + \alpha_{3Co}l_{it} + \gamma_i + \delta_t + \mu_i + \varepsilon_{it}$$

where HID_{it} is the degree of health industry development in province i in year t.

DE_{it} is the level of digital economy in province i in year t.

EL_{it} is the education level of province i in year t.

Col_{it} is a control variable for government spending (GS), GDP per capita (RDL), industrial upgrade (IUP), and urban-rural insurance coverage (URI) in province i in year t

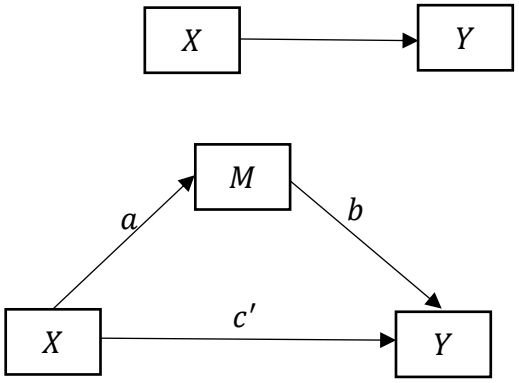
a_i is a predictor to be estimated.

γi represents the individual fixed effect, δ_t represents the time fixed effect, μ_i is the intercept term, and ε_{it} is the random error term.

Mediated effects model

Figure 1 shows a schematic diagram of the mediating effect of the three variables. If X can have some effect on Y by affecting M, then M is said to be the mediating variable. If the coefficients a, b and c in the model are significant at the same time, it will indicate that there is a mediating effect and the share of the mediating effect in the total effect is ab/c. Meanwhile, if c′ is significant, it is an incomplete mediation effect (or partial mediation effect); if c′ is insignificant, it is a complete mediation effect.

Figure 1 Schematic diagram of the mediating effect of the three variables



$$Y = cX + e_1$$

$$M = cX + e\_2$$

$$Y = c'X + bM + e_3$$

In this paper, referring to the method of Wen Zhonglin et al. (2004), we construct the following mediating effect model with health industry development (HID) as the dependent variable, digital economy (DE) as the independent variable, and education level (EL) as the mediating variable:

$$\mathrm{HID_{it}} = \alpha_0 + \alpha_1 \mathrm{DE_{it}} + \alpha_2 \mathrm{Col} + \varepsilon_{it}$$

$$\mathrm{EL_{it}} = \beta_0 + \beta_1 \mathrm{DE_{it}} + \beta_2 \mathrm{Col} + \varepsilon_{it}$$

$$\mathrm{HID_{it}} = \gamma_0 + \gamma_1 \mathrm{DE_{it}} + \gamma_2 \mathrm{EL_{it}} + \gamma_3 \mathrm{Col} + \varepsilon_{it}$$

where $\mathrm{HID_{it}}$ denotes the health industry development in province i in year t, $\mathrm{DE_{it}}$ denotes the digital economy level in province i in year t, $\mathrm{EL_{it}}$ denotes the education level in province i in year t. Col represents the control variables, $\alpha_i, \beta_i, \gamma_i$ are the coefficients of the variables to be estimated, and ε_{it} is the random error term.

Empirical test and analysis

Fixed-effects model analysis

Smoothing test

The three tests of LLC, Fisher-ADF, and Fisher-PP were chosen to verify the unit root of each variable to avoid the phenomenon of "pseudo-regression". As shown in Table 4, the original series did not all pass the smoothness test, while the first-order difference series D_HID, D_DE and D_EL are all smooth at the 1% significance level, indicating that D_HID, D_DE and D_EL are all first-order single integers.

Table 4 Results of smoothing tests for core variables

	LLC	Fisher-ADF	Fisher-PP
HID	-1.6271*	5.8910***	12.3270***
DE	18.2619	1.7039**	44.2244***
EL	18.8056	0.4770	-0.2337
D_HID	-9.4604***	8.0666***	42.5349***
D_DE	-5.4372***	6.7555***	101.8030***
D_EL	-3.3967***	11.5650***	2.8125***

Regression analysis

Based on econometric principles, the Hausman test is used to determine whether a fixed-effects model or a random-effects model should be chosen. The statistic result was 5. 12, which was significant at the 1% level, indicating that a fixed effects model should be chosen. The cross-sectional self-

correlation, within-group self-correlation and between-group ANOVA tests of the variables had statistics of 23. 628, 61. 60 and 112. 02, respectively, all at the 1% level of significance, so the original hypothesis was rejected. This demonstrates the existence of cross-sectional self-correlation, within-group self-correlation and between-group variance between the variables.

First, mixed regression models (model 1), individual fixed-effects models (model 2), time-fixed-effects models (model 3) and double fixed-effects models (model 4) are constructed to test the impact of digital economy on the development of health industry.

After that, robust estimation (Model 5) and FGLS-corrected estimation (Model 6) are performed on the basis of controlling for individual fixed effects, so as to solve possible autocorrelation problems and obtain relatively accurate empirical results.

Finally, based on model (6), education level (EL) is added to initially explore the impact of digital economy and education level on the development of health industry in the same analytical framework. The specific results are shown in Table 5.

Table 5 Model regression results

	HID						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
DE	0.8034***（4.08）	0.3975***（2.61）	0.3631（1.61）	0.3702（1.79）	0.4967***（3.25）	0.1923***（16.71）	0.1783***（9.49）
EL							
Col	Yes	Yes	Yes	Yes	Yes	Yes	Yes
C	8.1037***（9.57）	1.2280***（2.49）	0.6838（0.53）	-1.9213（-1.17）	7.8727***（7.91）	0.7860***（16.56）	0.6119***（5.99）
R2	0.5779	0.9699	0.3696	0.3889	0.9408		

As it is observed from Table 5, the estimated coefficients of the digital economy in both Model 1 and Model 2 are significantly positive at the 1% level; the estimated coefficients of the digital economy in Models 3 and 4 are not significant. Moreover, the estimated coefficients of the digital economy are significantly positive at the 1% level in both the modified model 5 and model 6. This result indicated that the development of the digital economy has had a significant effect in driving the health industry. The reason for this is that with the wide application of digital technology, it objectively promotes the upgrading of industrial structure, especially in medical and pharmaceutical industries, and realizes information sharing and common use, which in turn promotes the rapid development of health industry. While in model 7, the estimated coefficients of both digital economy and education level were significant at the 1% level, and the coefficient values of digital economy were not significantly different from those in model 6. Therefore, it could be tentatively judged that the digital economy and the level

of education can act simultaneously on the health industry and promote the development of the health industry.

Mediation effect test

Following the common steps of mediated effects model testing, the mixed regression method was used for the empirical analysis of equation (2) (denoted as model 8), equation (3) (denoted as model 9), and equation (4) (denoted as model 10), and the results are shown in Table 6.

Table 6 Results of the mediating effects test

	HID Model 8	EL Model 9	HID Model 10
DE	0.1923*** （16.71）	0.1256*** （4.48）	0.1783*** （9.49）
EL			
Col	Yes		
C	0.7860*** （16.56）	1.2910*** （4.02）	0.6119*** （5.99）

The results in Table 6 showed that the estimated coefficients of the digital economy in model 8 and model 9 were 0. 1923 and 0. 1256, respectively, both significant at the 1% level. It showed that the digital economy and education level have a significant positive contribution to the development of health industry. In model 10, the estimated coefficient of the digital economy was 0. 1783 and the estimated coefficient of the education level was 0. 0428, both of which passed the 1% significance test. It indicated that the digital economy and education level played a significant positive role in promoting the development of health industry, and also showed that the improvement of education level played a role of fully mediating effect in the process of digital economy helping the development of health industry. This paper focused on the impact of digital economy and education level on the development of health industry, so the effect of each control variable is not specifically analyzed.

Conclusion

The above tests and analyses lead to the following basic conclusions.

(1) Digital economy and education level have promoted the development of health industry.

Digital economy as an advanced economic form widely exists in production practice. Digital technology is applied to the whole process of health industry development, whether it is the development planning of health industry, the R&D and production of health industry products, or the collection of market information and the conclusion of market transactions, digital technology plays an important role.

(2) The digital economy acts on the health industry through the level of education, which plays the role of a full mediating effect.

The measurement results showed that the level of education plays a fully mediating role in the role of digital economy in the health industry. Education promotes social stratification, and the social public has different health concepts and health pursuits due to different levels of education. Especially, the group with higher education has a strong emphasis and pursuit of health, thus promoting the development of health industry.

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