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# Analysis of the impact of information resource management systems incorporating intelligent algorithms on regional economic development models

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**Abstract** Information resource management systems driven by intelligent algorithms are gradually changing the regional economic development model. Collaborative filtering algorithm optimizes resource allocation through user behavior records and provides accurate decision support for regional economic development. In this study, an information resource management system based on collaborative filtering algorithm is constructed, and its impact on regional economic development model is analyzed by multi-period double difference method. The study adopts MapReduce process to implement the collaborative filtering distributed screening recommendation algorithm, takes the average nighttime light brightness as the assessment index of regional economic development, selects 160 pilot prefecture-level cities as the experimental group and 150 prefecture-level cities as the control group, and analyzes the regional economic data from 2010 to 2020. The empirical results show that the information resource management system significantly improves the level of regional economic development, increasing the average nighttime light brightness in the pilot regions by about 2.29 and contributing 8.41% to economic growth. The system is effective in reducing the data error rate, and the promotion of the ratio of secondary and tertiary industries in the pilot cities in the eastern region is more obvious, with a coefficient of 0.0253 for the total population in employment. The number of end-of-year cell phone subscribers and telecom business revenue have a positive moderating effect on the high-quality development of the regional economy, with the coefficients of the triple difference term being 0.0092 and 0.0088, respectively. The study finds that information resource management has a significant impact on the economic efficiency, innovation drive, green ecology and sharing ability significantly, but the effect on coordination and optimization and cooperation and openness is not yet significant, indicating that the integration of intelligent algorithms and traditional industries still needs to be deepened.

**Index Terms** collaborative filtering algorithm, information resource management system, regional economic development, multi-period double-difference, night light brightness

## I. Introduction

Information resource management system is an important information management tool aimed at quantitative and qualitative analysis, classification, statistics and monitoring of various types of information assets, so that information resources can be maximized and managed, thus improving the efficiency of information technology operation and management level [1]-[4]. In the development of modern regional economy, the information resource management system can have an important impact on the regional economic development model [5].

In regional economic development, information resource management system can play an important role, focusing on the optimization of regional resources, industrial transformation and upgrading, and the promotion of regional synergistic development [6], [7]. Resource management system can achieve the statistics and optimization of various information resources, including processes, data, organizations and other various resources through quantitative and qualitative analysis of the classification, elements and importance of various information resources in the region [8]-[10]. With the information resource management system, it is possible to monitor and evaluate various aspects such as the utilization and security of various resources in the region [11], [12]. In addition, the life cycle of various information resources can be managed and controlled with the help of information resource management system, so as to ensure the effective utilization and management of regional information resources [13]. And in the process of regional economic development, through a variety of channels for information communication and transmission, the realization of information dissemination and sharing of resources can be timely understanding of the deficiencies and solutions that exist in the process of regional development, and the use of these channels will help to promote the synergistic development of the region, and thus improve the quality of regional economic development [14]-[17].

Regional economic development is facing major opportunities and challenges of digital transformation. At present, the global economic pattern is undergoing profound changes, and the rapid development of digital technology breaks the boundary limitations of traditional economic development and provides new kinetic energy for regional economic development. As a key production factor, the management efficiency of information resources directly affects the quality of regional economic development. Information resource management system provides scientific basis for regional economic decision-making by integrating multi-source data and optimizing resource allocation. However, the traditional information resource management model has problems such as information silos, poor data quality, and limited analytical capability, which makes it difficult to meet the demand for high-quality regional economic development. Intelligent algorithms, especially collaborative filtering algorithms, can effectively improve the efficiency of information resource management by virtue of their superior data mining and prediction capabilities. Existing research mainly focuses on the technical architecture and realization method of information resource management system, and the quantitative assessment of its economic impact is relatively insufficient. Meanwhile, the problem of unbalanced regional economic development remains prominent, with obvious development gaps between eastern and western regions and between urban and rural areas, and there is an urgent need to explore new development models. The mechanism and effect of the information resource management system as a digital economic infrastructure on regional economic development have not yet been systematically verified. Economic policy design and evaluation methods based on big data analysis have gradually become the focus of academic attention, but empirical studies are still insufficient.

This study constructs an information resource management system model based on the collaborative filtering algorithm, and analyzes its impact on regional economic development using the multi-period double-difference method. First, the mathematical model and implementation process of collaborative filtering algorithm are designed to construct an information resource management system capable of intelligent data collection and analysis. Secondly, taking some regions in China as samples and utilizing the quasi-natural experiment formed by the implementation of regional economic guidance fund policy, the actual effect of the information resource management system is assessed by comparing the differences in economic development indicators between the experimental group and the control group. Third, we analyze the heterogeneous effects of the information resource management system under different regional characteristics and explore its mechanism of action on the dimensions of high-quality regional economic development. Finally, the moderating effects of the number of cell phone subscribers and telecommunication business revenue are verified through the triple difference method, revealing the impact of digital infrastructure on the role of the information resource management system.

## II. Information resource management system based on collaborative filtering algorithms

### *II. A.Information resource management system based on collaborative filtering algorithm*

#### II. A. 1) Collaborative Filtering Algorithms

Collaborative filtering algorithms [18], [19] are now widely used in management system platforms, which mainly recommend choices for user groups that match their behavioral preferences based on past behavioral records. Collaborative filtering algorithms can be divided into two main categories, one based on user experience and participation, and the other based on different processes and project content. Collaborative filtering algorithms are mainly through all the behavioral choices involved in the platform system, automatically constructed I-U historical behavioral record matrix, and then according to the degree of proximity between the project and the project, deduce Item adjacent N surrounding user behavioral choices. According to the proximity of the N surrounding user behavior choices as well as being recommended to predict the behavior of all project-based or user groups to the existing behavior of the I for idle scoring and thus produce a list of recommended choices and choices to optimize the existing process and choices. The main processes are as follows:

1) The content of the project or the user group of the platform system scores the browsing and operation of the target, which becomes the first design behavior for obtaining data and information preferences. The scoring of the behavior indicates the preference of the user group for the item or how well the item content matches the selection.

2) In the generated $I-U$ behavioral preference matrix $IU=(P_{ij})_{m\times n}$, mutually corresponding $U$ and $I$ are entered into the historical behavioral preference matrix according to the user's choices and preferences and the content of the items, respectively.

3) According to the historical behavioral preference $I-U$ matrix constructed automatically by the algorithm, the behavioral choices of $I$-adjacent $N$-neighboring users are deduced, and the similarity of all behaviors of the user group and the project based on them is deduced by algorithms calculating similarity by cosine coefficients, Pearson

coefficients and so on, and the following is the computational method used in this paper in calculating the Pearson coefficients:

$$S(I_i, I_j) = \frac{\sum_{k \in U_i} (P_{ik} - P_l^*)(P_{jk} - P_l^*)}{\sqrt{\sum_{k \in U_i} (P_{ik} - P_l^*)^2 \sum_{k \in U_{ij}} (P_{jk} - P_l^*)^2}} \tag{1}$$

where $S(I_i, I_j)$ indicates the degree of proximity between a $i$-item and a $j$-item of the sub-item in the general system platform. $U_{ij}$ is then the intersection of $I_i$'s historical behavioral preferences for $I_j$'s range of historical behavioral preference interactions that overlap. $P_i$ denotes the average preference for the item. The predicted value of the user group's preference for the final recommendation outcome of item $i$ is calculated as follows:

$$P_{iu}^{'} = P_l^* + \frac{\sum_{k \in I_w} S(i,k)(P_{ku} - P_l^*)}{\sum_{k \in I_w} S(i,k)} \tag{2}$$

The final optimal choice is then filtered based on the deduced predicted preference values.

**II. A. 2) Information resource management systems**

(1) Division of human resource system functions

The information resource management system [20] is an information management system that facilitates timely and convenient access to and tracking of regional economic development, and it can facilitate regional economic development by obtaining various consulting information materials, information resource management, information filtering, access to past data, and other diverse services. This system mainly adopts the combination of module optimization and screening and object-oriented method, and uses collaborative filtering algorithm on Hadoop platform to analyze, design and study the information resource management system.

(2) Overall architecture of the system

Through the management of existing regional economic development information resources, the information resource management system is constructed in accordance with the process model of three-layer staggered architecture. The Hadoop distributed framework distribution infrastructure is used to provide optimized selection and Web services to external user groups.

In order to realize the goal of the preset regional economic development information management system, the paper constructs a three-layer structure for the information resource management system so as to carry out in-depth research and development design for the information resource management system.

(3) Algorithm Flow

In order to optimize the design of the information resource management system to better recommend optimal behavioral choices for the user group, it is necessary to use the Hadoop distributed architecture platform and collaborative filtering algorithm to realize the optimization of the information resource management system. The specific realization steps are as follows:

Step 1: First generate specific vectors $U = ((I_1, P_1), (I_2, P_2), \cdots, (I_t, P_t))$ in terms of the user groups and preferences. Among the specific vectors generated, the selected user vector consists only of the group of users who have a history of behavior showing various preferences for the choices, and the new vector $(n_{1k}, n_{2k}, \cdots, n_{mk})$ is obtained by evolving the covariance matrix of the items:

$$\langle Offset, (u, I, P) \rangle \to \langle u, (I, P) \rangle \to \langle u, list(I, P) \rangle \tag{3}$$

Step 2: For the covariate vectors $I = ((I_1, n_1), (I_2, n_2), \cdots, (I_k, n_k)$ and the total number of choices exhibited by Item $I_{sum} = \sum_1^m n_{ik}$ . For vectors we choose only specific vectors that are related to and co-occur with the content of the project, so $k \le m$ . Evolution in Multiple Outputs using Hadoop as a platform:

$$\langle Offset, U \rangle \to \langle i, (I, 1) \rangle \to \langle i, list(I, n^{'}) \rangle \tag{4}$$

Step 3: The subvector $Col^{''} = ((I_1, Col_1), (I_2, Col_2), \cdots)$ is obtained by the deduction process. In the distributed filtering recommendation with collaborative filtering, there are the above steps automatically generated the file Tag, and then the Reduce process calculates the $P_{ku}RowI_k$ to finally output the $K$ value of the user group as well as the $V$ value. Then there are:

$$\langle Offset, U/I\rangle \rightarrow \langle i, TaggedMapOutput\rangle \rightarrow \langle u, ColU)\rangle \tag{5}$$

Step 4: Deduce the prediction vector $U^{''}=((I_1,Col_1),(I_2,Col_2),\cdots)$ from the above process. Its inputs are based on the subvector $ColU^{''}$ file. I.e.:

$$\langle Offset,(u,ColU^{''})\rangle \rightarrow \langle u,ColU^{''}\rangle \rightarrow \langle u,U_j^{''})\rangle \tag{6}$$

Step 5: Generate the prediction vector $I^{'}=((U_1,P_1),(U_2,P_2),\cdots,(U_n,P_n))$ according to the process structure. The medium of $I_{sum}$ and $U^{''}$ is used to realize the deduction of realizations in the $U^{''}$ vector. To wit:

$$\langle Offest, I_{sum}/U_j^n\rangle \rightarrow \langle i, TaggesMapOutPut\rangle \rightarrow \langle i,(U,P)\rangle \tag{7}$$

Step 6: Deduce the final prediction vector $U^{'}=((I_1,P_1),(I_2,P_2),\cdots)$, based on the result of the previous process for the input object. I.e:

$$\langle Offset, I^{'}\rangle \rightarrow \langle u,(I,P)\rangle \rightarrow \langle u, list(I,P)\rangle \tag{8}$$

The collaborative filtering distributed screening recommendation algorithm is implemented by utilizing a complete MapReduce process using Hadoop platform as a medium.

### *II. B.Simulation effect analysis*

In order to test the effectiveness of the intelligent collection system of regional economic development information based on collaborative filtering algorithm designed in this paper, a comparative simulation test is designed. Taking X region of M province in China as the test object, the undeveloped undeveloped regional economic development information intelligent collection system and the regional economic development information intelligent collection system based on collaborative filtering algorithm designed in this paper are used to collect and calculate data at the same time. When simulating the environment, 120 samples are collected and calculated, and the parameters need to be set in order to ensure the validity of the data.

#### II. B. 1) Parameter setting

In order to ensure that the intelligent collection system of regional economic development information based on collaborative filtering algorithm designed in this paper can carry out accurate data collection, set the process data coefficient $p$ to be 75.33; set the undeveloped data difference coefficient R to be 7.5: respectively, set u to be 15; and the k bit to be 55, and carry out the experiments according to the simulation environment and parameter settings mentioned above.

#### II. B. 2) Analysis of results

The experimental results of data error rate comparison are shown in Figure 1. The intelligent collection system of regional economic development information based on collaborative filtering algorithm designed in this paper is able to maintain a low data error rate in the process of collection, which significantly reduces the data error of system collection.

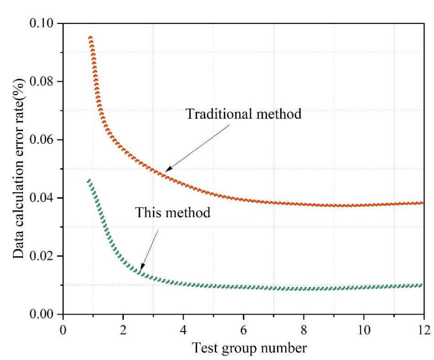


Figure 1: Data error ratio compared with experimental results

The results of the data collection stability comparison experiment are shown in Figure 2. The intelligent collection system of regional economic development information based on collaborative filtering algorithm can maintain high stability, and in the process of data collection, the probability of error is obviously reduced, which solves the phenomenon of calculation error in the undeveloped regional economic development information collection system.

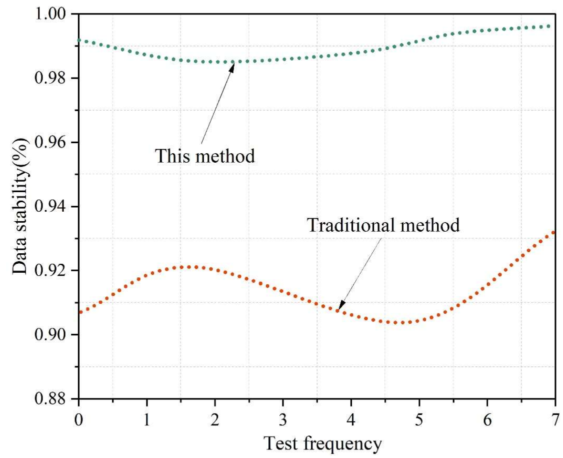


Figure 2: Data acquisition stability compared with experimental results

## III. Impact of information resource management systems on regional economic development patterns

### III. A. Modeling

#### III. A. 1) Model setup

As of 2024, a total of 20 provinces (autonomous regions and municipalities) out of 31 provincial administrative regions in China, excluding Hong Kong, Macao, and Taiwan, have successively disbursed regional economic guidance funds, and the provinces that have not disbursed such funds constitute a natural experimental and control group. In most cases, applications for regional economic guidance funds are submitted by prefecture-level cities. At the same time, considering the impact of sample size on statistical results, this study groups regional economic guidance funds by prefecture-level cities, and finally 160 prefecture-level cities are used as the experimental group (Region X) and 150 prefecture-level cities are used as the control group (Non-Region X). In addition, due to the different years when the regional economic guidance funds started to be disbursed in each region, the following multi-period double-difference model was constructed:

$$LnGDP_{it} = \alpha_0 + \alpha_1 SIGF_{it} + \alpha_2 ControlVar_{it} + \varphi_i + \mu_t + \varepsilon_{it} \tag{9}$$

where $LnGDP_{it}$ denotes the level of economic development of prefecture-level cities; and $SIGF_{it}$ denotes the regional economic guidance funds; $ControlVar_{it}$ denotes a collection of control variables; $\varphi_i, \mu_t$ denote prefecture and year fixed effects, respectively; $\varepsilon_{it}$ denote randomized disturbance terms.

#### III. A. 2) Variable selection

(1) Explained variable: regional economic development. Fixed capital stock is chosen as a measure of regional economic development and treated in natural logarithm to eliminate the effect of magnitude. At the same time, regional GDP per capita is selected as a proxy variable for robustness testing.

(2) Core explanatory variable: regional economic guidance funds. Taking the regional economic guidance fund support as a quasi-natural experiment, the interaction term between the dummy variable for the type of prefecture-level city and the dummy variable for the start time of disbursement is used to represent the support effect of the regional economic guidance fund.

(3) Mediating variables: industrial structure optimization and upgrading and social employment scale growth. Optimization and upgrading of industrial structure. The ratio of the value added of tertiary industry to the value added of secondary industry indicates the optimization and upgrading of industrial structure. Growth of social employment scale. The natural logarithm of the number of urban, private and individual employees at the end of the period (10,000 people) is used to express the scale of social employment.

(4) Control variables: A total of 12 control variables were selected, namely "the proportion of secondary industry, the proportion of tertiary industry, the number of mobile phone users at the end of the year, the total employed population, the stock of fixed capital, the number of industrial enterprises, public financial revenue,

telecommunication business income, the number of Internet broadband access users, science and technology expenditure, the permanent resident population at the end of the year, and the number of teachers in ordinary colleges and universities".

Data source: The data of the core explanatory variable, i.e., regional economic guidance funds, are mainly obtained from the past literature, as well as manually screened and sorted out from the relevant information disclosed on the official websites of provincial people's governments, finance departments and sports bureaus, and the relevant data are obtained for a total of 20 provinces (districts and municipalities), which started to distribute regional economic guidance funds in 2010.

The data of the explanatory variables, mediating variables and control variables are obtained from the China Urban Statistical Yearbook. The time span of the regional economic guidance funds in each province is relatively long, and considering the need to observe the data in the years before the implementation of the policy to test whether the experimental group and the control group satisfy the assumption of parallel trends and the possible time lag of the policy effect, the data from 2010 to 2020 are finally selected for the study.

## *III. B. Analysis of empirical results*

### III. B. 1) Benchmark model regression results

In this section, average nighttime light brightness is used as the main factor to assess regional economic development, and Region X is used as the survey object for the experiment. Setting the coefficient of the variable Treati × Periodit to be positive at the 0.5% significance level indicates that the establishment of the information resource management data trading platform significantly increases the average nighttime light brightness in Region X. Relative to non-Region X, the establishment of the information resource management data trading platform increases the average nighttime light luminance in Region X by about 2.29, and the average nighttime light luminance in Region X from 2010 to 2020 is 25.67, which implies that the establishment of the data trading platform contributes to the economic growth of Region X by about 8.41% relative to non-Region X.

### III. B. 2) Parallel trend test

An important prerequisite for the application of the multi-period double-difference method is that the experimental group and the control group should satisfy the “parallel trend assumption”. Figure 3 compares the trends of the average nighttime light intensity in area X and non-X. It can be seen that from 2010 to 2014, the average nighttime lighting trends in region X and non-region X were basically parallel, but from 2015 to 2016, the gap was widened, so it is necessary to carry out a more rigorous analysis of the dynamic effects to judge.

Combined with the event study method, the following dynamic effect model is constructed:

$$pDN_{it} = \beta_0 + \sum_{k\geq -6, k\neq 0}^{4} \theta_k D_{it}^k + \varphi_1 \sum X_{it} + \alpha_i + \lambda_t + v_{it} \tag{10}$$

where $D_{it}^k$ represents a dummy variable for the event of setting up a local data trading platform, when $k > 0$, if $i$ city is in the $k$ years after it becomes region X $D_{it}^k = 1$, otherwise $D_{it}^k = 0$, and when $k < 0$, if $i$ city is in region X and is in the $k$ years before the platform is set up, $D_{it}^k = 1$ otherwise $D_{it}^k = 0$. In the specific analysis, this paper takes the year when the data trading platform is established in region X as the base year, i.e. $k \neq 0$. At this point, the significance of the $D_{it}^k$ coefficient $\theta_k$ in the above equation reflects whether there is a significant difference between the nighttime average light intensity of the experimental group and the control group.

The dynamic effects and parallel trend hypothesis test established by the data trading platform are shown in Figure 4. It reports the change in $\theta_k$ over time, where the horizontal axis indicates the relative years before and after the distance became region X, and the vertical axis indicates the magnitude of the estimated value of $\theta_k$. It can be seen that the estimates of $\theta_k$ are not significantly different from zero in the years prior to the base year for which the data trading platform was established, so the hypothesis that the experimental and control groups satisfy parallel trends cannot be rejected.

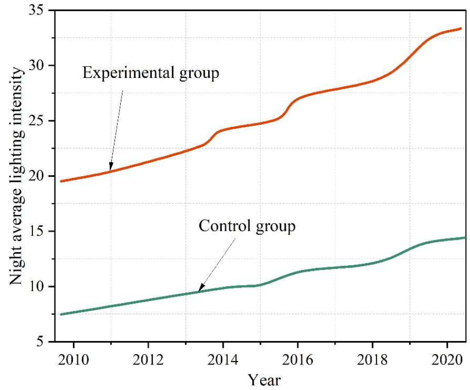


Figure 3: Platform market and non-platform parallel trend chart

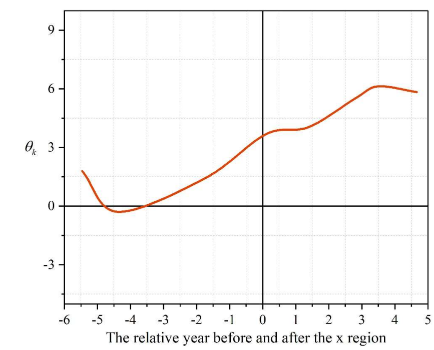


Figure 4: The dynamic effect of the data and the parallel trend hypothesis test

### III. B. 3) Robustness Tests

Since there is a gap in the number of cities between Region X and non-Region X, in order to mitigate the possible selectivity bias, this paper re-performs Gaussian kernel matching on the control group. The results of the score-matching balance test are shown in Table 1; the standardized deviations of the variables are shown in Figure 5; and the common range of values of the propensity score is shown in Figure 6. It can be seen that the characteristics of individuals in the control group on various variables are closer to those of the experimental group after matching, which can be confirmed by both the variable standardized deviation and the common range of values of the propensity score.

Table 1: Score matching balance test results

| Variable | Prematch | | | Match back | | |
|---|---|---|---|---|---|---|
| | Experimental group | Control group | P value | Experimental group | Control group | P value |
| | Mean | | | Mean | | |
| A: Second yield | 48.8426 | 49.8026 | 0.0000 | 46.2365 | 46.6007 | 0.7156 |
| B: Tertiary proportion | 41.586 | 35.2686 | 0.0000 | 38.4908 | 37.9625 | 0.8806 |
| C: Mobile phone number of users | 6.3013 | 0.3194 | 0.0000 | 5.788 | 5.9754 | 0.8122 |
| D: Population | 1.0224 | 0.3762 | 0.0000 | 0.8763 | 0.8813 | 0.9968 |
| E: Fixed capital stock | 9.2934 | 3.6812 | 0.0000 | 9.2098 | 9.0052 | 0.8858 |
| F: Number of industrial enterprises | 3.0995 | 0.8072 | 0.0000 | 2.2971 | 2.2628 | 0.9102 |
| G: Public revenue | 4.3835 | 1.136 | 0.0000 | 4.206 | 4.0342 | 0.7598 |
| H: Telecommunications revenue | 0.673 | 0.2785 | 0.0000 | 0.5437 | 0.5439 | 0.9907 |
| I: Internet broadband access users | 1.5395 | 0.5427 | 0.0000 | 1.4903 | 1.4253 | 0.7879 |
| J: Science and technology expenditure | 20.8925 | 4.4834 | 0.0000 | 20.0721 | 19.3451 | 0.8197 |
| K: End-date population | 5.9056 | 4.5172 | 0.0319 | 5.0463 | 4.9109 | 0.7645 |
| L: Number of teachers of normal colleges and universities | 0.8207 | 0.4129 | 0.0033 | 0.7567 | 0.7841 | 0.8336 |

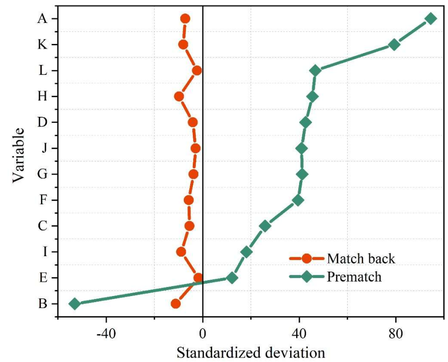


Figure 5: Variable standardized deviation

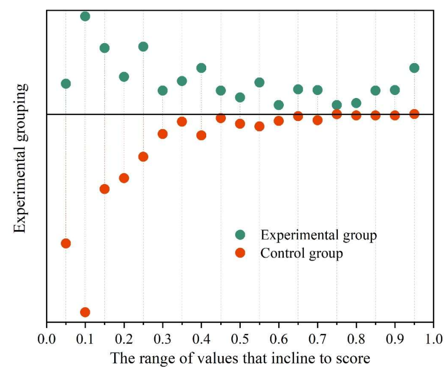


Figure 6: They tend to score common values

### *III. C. Results of further analysis*

Due to the unbalanced development of each region, there is a large difference in the level of economic development between the eastern and central-western regions of China. This section analyzes the regression analysis of the regional heterogeneity of the establishment of information resource management affecting high-quality economic development. The results of the relevant econometric regression are shown in Table 2. Among them, the results in columns 1 and 2 indicate that the total employed population and public finance income tests show that the proportion of secondary and tertiary industries of the information resource management pilot is more obvious for the promotion of cities in the eastern region of China.

Group regressions are conducted based on the median share of primary industry output in fixed capital stock in 2020. Columns 3 and 4 of the table find that the coefficients are positive and significantly different. For cities with better regional economic development, the effect of the proportion of the secondary and tertiary industries is more significant, indicating that the proportion of the secondary and tertiary industries in the national-level big data comprehensive experimental zone has a more obvious effect on the proportion of the secondary and tertiary industries in areas with better regional economic development.

According to the median number of teachers in general higher education schools in 2020 as an indicator of the high level of science and education in the city, the treatment group was divided into two groups and regressed again using the benchmark model. It can be seen that the number of teachers in general colleges of higher education in the information resource management pilot has a greater effect on the total number of people employed in the city with high science and education level, and is more significant in the test of science and technology expenditures.

On the basis of the previous analysis, both the number of end-of-year cell phone subscribers and telecommunication business revenue have a significant impact on the high-quality development of regional economy. In order to verify the above conjecture, this paper uses the triple-difference method, in which the double-difference term $did$ in the baseline regression model is cross-multiplied by the number of end-of-year cell phone subscribers $(be)$ and telecommunication business revenue $(ere)$ respectively to carry out further empirical analyses. The model is set up as follows:

$$Hqd_{i,t} = \alpha_0 + \alpha_1 did_{i,t} \times M_{i,t} + \alpha_2 X_{i,t} + \lambda_i + \mu_i + \varepsilon_{i,t} \tag{11}$$

where $M_{i,t}$ is the moderating variable, specifically including the number of end-of-year cell phone subscribers $(be)$ and telecom business revenue $(ere)$.

Table 2: Heterogeneity regression

| Variable | Eastern region | Midwest | Industrial good | Poor industrial foundation | High school | Low academic level |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| *did* | 0.0253 *** | 0.0153 | 0.0275 *** | 0.0042 * | 0.0179 *** | 0.0139 * |
| | 4.5774 | 0.0723 | 3.3143 | 1.9631 | 3.2321 | 1.9223 |
| *-cons* | 0.2766 *** | 0.3407 *** | 0.3526 *** | 0.3132 *** | 0.4544 *** | 0.1734 *** |
| | 2.8261 | 4.4269 | 3.5053 | 3.7806 | 4.7458 | 2.1894 |
| Control variable | YES | YES | YES | YES | YES | YES |
| Individual effect | YES | YES | YES | YES | YES | YES |
| Time effect | YES | YES | YES | YES | YES | YES |
| N | 1325 | 1703 | 1476 | 1545 | 1276 | 1759 |
| R2 | 0.2599 | 0.4834 | 0.3017 | 0.4392 | 0.3027 | 0.4219 |

The number of cell phone subscribers at the end of the year $(be)$ indicates whether city $i$ has a good number of cell phone subscribers at the end of the year in year $t$, and it takes 1 if yes and 0 if no. The number of cell phone subscribers at the end of the year is investigated by using the economic development index of region X as a proxy, which is composed of the degree of connection between the government and the market, the level of development of the non-state economy, and the degree of development of the product market, etc., which are three secondary indicators that accurately depict the number of mobile phone subscribers at the end of the year. The index is mainly composed of the degree of government-market connection, the level of non-state economic development and the degree of product market development, and these three secondary indicators accurately depict the rich connotation of the year-end cell phone subscriber numbers.

Table 3 reports the regression results of the moderating effect of year-end subscriber numbers for cell phones. In column 1, the coefficient of the triple difference term *did*×*be* is 0.0059, which is significant at the 1% level of significance before the control variables are added, and in column 2, the coefficient of the triple difference term *did*×*be* is 0.0027, which is significant at the 1% level of significance after the control variables are added. This shows that after the establishment of information resource management, cities with good end-of-year cell phone subscriber numbers have relatively high levels of high-quality regional economic development, i.e., the number of end-of-year cell phone subscribers positively moderates the impact of the establishment of information resource management on high-quality development of the regional economy; the better the number of end-of-year cell phone subscribers is, the more obvious is the role of the establishment of information resource management in promoting the high-quality development of the regional economy.

Table 3: Test results of the business environment adjustment effect

| Variable | 1 | 2 |
|---|---|---|
| *did×be* | 0.0153 | 0.0092 |
| | 2.552 | 2.5921 |
| *-cons* | 0.173 | 0.3122 |
| | 119.4427 | 4.9072 |
| Control variable | NO | YES |
| Individual effect | YES | YES |
| Time effect | YES | YES |
| N | 3017 | 3017 |
| R2 | 0.2946 | 0.3277 |

Table 4 reports the regression results of the moderating effect of telecommunications revenue. In column 1, before adding control variables, the coefficient of the triple difference term *did*×*ere* is 0.0187, which is significant at 5% level of significance; in column 2, after adding control variables, the coefficient of the triple difference term *did*×*ere* is 0.0124, which is significant at 5% level of significance. It also shows that after the establishment of information resource management, the stricter the telecommunication business income is, the higher the level of high-quality development of regional economy is, i.e., the telecommunication business income positively moderates the influence of the establishment of information resource management on the high-quality development of the regional economy, i.e., the stricter the telecommunication business income is, the more obvious is the role of the establishment of information resource management in promoting high-quality development of the regional economy.

Table 4: The results of the environmental regulation effect

| Variable | 1 | 2 |
|---|---|---|
| *did×be* | 0.0024 | 0.0088 |
| | 1.7404 | 1.8115 |
| *-cons* | 0.1601 | 0.3163 |
| | 148.0164 | 8.6424 |
| Control variable | NO | YES |
| Individual effect | YES | YES |
| Time effect | YES | YES |
| N | 3017 | 3017 |
| R2 | 0.3751 | 0.4035 |

The theoretical and empirical analyses mentioned above have shown that the establishment of information resource management can promote high-quality regional economic development. Then, the impact of the establishment of information resource management on the various sub-dimensions of high-quality economic development needs to be further explored. Combined with the theoretical analysis in this paper, we further test the impact of the subvariables from six aspects, namely, economic efficiency, innovation drive, coordination and optimization, green ecology, cooperation and openness, and sharing capacity, and explore the impact of the pilot project of information resource management on the constituents of regional economic high-quality development comprehensive indicators. Table 5 shows the results of the impact of different dimensions of regional economic high-quality development.

From the table, it can be seen that the impact effect of the pilot of information resource management on each sub-variable of regional economic high-quality development is positive, indicating that the second-level indicators of regional economic high-quality development level measurement selected in this paper are reasonable. The effects of information resource management on economic efficiency, innovation drive, green ecology and sharing capacity of the total population of practitioners are all positive and significant. For coordination and optimization and cooperation and openness, the total number of practitioners is positive but not significant. This may have something to do with the fact that the establishment of information resource management promotes urban innovation activities, produces high-quality patents through R&D and innovation, realizes patent transformation and application through technical talents, reduces pollution, improves labor productivity and product and service quality, and thus can realize economic quality and efficiency. However, the development of big data technology and the integration of traditional industries still have certain difficulties and dilemmas, and the promotion of the transformation and development of traditional industries still needs to be further strengthened.

Table 5: The effect of regional economic high quality on different dimensions

| Variable | Economic benefit | Innovation drive | Coordinated optimization | Green ecology | Cooperative opening | Sharing capacity |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| *did* | 0.0127 ** | 0.0168 *** | 0.0041 | 0.0135* | 0.0014 | 0.0123 ** |
| | 2.0293 | 3.3621 | 0.8546 | 1.6565 | 0.3237 | 2.1094 |
| Control variable | YES | YES | YES | YES | YES | YES |
| Individual effect | YES | YES | YES | YES | YES | YES |
| Time effect | YES | YES | YES | YES | YES | YES |
| N | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 |
| R2 | 0.4363 | 0.1557 | 0.2456 | 0.518 | 0.0877 | 0.4389 |

## IV. Conclusion

The information resource management system based on collaborative filtering algorithm has a significant contribution to regional economic development. The multi-period double difference analysis shows that the establishment of the information resource management data trading platform increases the average nighttime light brightness in the pilot region by about 2.29 and contributes 8.41% to economic growth. The system demonstrated a low error rate and high stability in the data collection process, effectively solving the problem of calculation errors in traditional information collection systems. The analysis of regional heterogeneity shows that the promotion effect of cities in the eastern region is more significant, with the coefficient of total employed population reaching 0.0253, which is higher than that of the central and western regions, which is 0.0153. The coefficient for regions with a good industrial base is 0.0275, which is significantly higher than that for regions with a weak industrial base, which is 0.0042. Cities with a high level of science and education benefit more, with a coefficient of 0.0179. The triple difference results show that the number of cell phone subscribers at the end of the year and the telecom business revenue have a positive moderating effect on the functioning of the information resource management system, with coefficients of 0.0092 and 0.0088, respectively. The impact of information resource management on the high-quality development of the regional economy is mainly manifested in the four dimensions of economic efficiency (0.0127), innovation drive (0.0168), green ecology (0.0135), and sharing ability (0.0123) dimensions, but the impact on coordination and optimization and cooperation and openness is not yet significant, indicating that the integration of intelligent algorithms and traditional industries still needs to be further deepened.

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