Basic Public Services, Financial Competition and Economic Growth of Urban Agglomeration on Yangtze River Delta Based on Big Data

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Abstract. Under the background of big data, achieving equalization and digitization of basic public services and narrowing the regional economic gap are the main problems facing regional coordinated development in the new era. Based on the theoretical analysis of economic growth and public services, the article analyzes the internal logic of basic public services, fiscal competition and economic growth in UA-YRD based on the background of big data, establishes an empirical model of public service supply, fiscal competition and economic growth, and conducts verification analysis. The study concluded that the economic growth of UA-YRD is conducive to the improvement of the quantity and quality of public services, especially for the public services of education and health care, while the competition among local governments is negatively correlated with the supply of public services. and put forward targeted suggestions from the perspective of co-construction and sharing of digital public services for people's livelihood.

Keywords: Big Data Era, Basic Public Services, Economic Growth

1. Introduction
Public service is not only an important part of people's better life, but also an important driving force for the economy to shift to a stage of high-quality development to overcome the "middle income trap". The economy in the era of big data has turned to a stage of high-quality development. The logic behind Chinese residents' fear of consumption to a certain extent is that the supply of public services such as education, medical care, and social security is relatively insufficient, and the degree of interconnection and co-construction and sharing is insufficient. To eliminate the worries of consumption, it is necessary to build a digital co-construction and sharing system for basic public services. There is also a logic of public service behind the growth of domestic consumption. Especially in the case of fiscal decentralization and geographical boundaries, local governments have not strong incentives to provide effective public services. Especially in some cross-regional public service projects that are beneficial to the economic and social development of various regions, local governments are unwilling to pay the cost. Coupled with the information asymmetry between the central and local governments, financial resources are difficult to guarantee, and the central government is not effective in coordinating the provision of public services, which makes public...
services in this area imbalanced. As a result, the issue of co-construction and sharing in the field of public services has increasingly become a restrictive factor for local economic development, but the relationship between regional public services and economic development is relatively vague. This article is based on exploring the internal mechanisms of the two and conducting empirical tests.

2. Literature Review and Mechanism Analysis

There is a close relationship between public services and economic growth, which requires favorable coordination by local governments to promote balanced development. At present, the main researches at home and abroad focus on public services and economic growth. There are few research perspectives based on big data. For example, Barro (1991) and Keen and Marchand (1997) showed that the proportion of government productive expenditure has a negative effect on economic growth, while the proportion of non-productive expenditure has a positive effect on economic growth [1][2]; Mingxi Zhang (2006) shows that the increase in the proportion of local expenditure on science, education, culture, health and social security is conducive to narrowing the economic gap [3]. Ying Yang (2012) shows that the improvement of basic public services can promote economic growth through theoretical analysis and empirical tests [4]. The research of Chuanming Yang (2019) shows that the improvement of basic public services can promote economic development through the transmission mechanism of economic factors, while economic development in turn promotes the improvement of basic public services [5]. There is a coupling and coordination relationship that promotes and restricts each other.

The fundamental reason for the contradiction between the supply of public services and the balanced development of the economy lies in the differences in the rights and interests of residents, enterprises and the government, the deep-seated reason is that the production and supply of public services show regional characteristics. From a financial perspective, it can be seen that it is mainly reflected in the uneven distribution of local fiscal jurisdictions and the imbalance in the central and local financial expenditures for basic public services. Prud'homme (1995) and Keen and Marchand (1997) found that the government, as the main body of implementation, may have rent-seeking behaviors [6][7]. Fiscal decentralization makes local governments compete with each other, which has a negative impact on the economy. In the absence of coordination mechanism, it may lead to a systematic "deviation" in the structure of public expenditure, resulting in excessive or insufficient supply of local public goods. Therefore, the difference in the level of economic development in various regions in the region will undoubtedly greatly affect and restrict the advancement of regional public services. The development of the regional economy needs the support of public services. For this reason, local governments are often in a dilemma in their attitude towards public services and economic development, unless the region has sufficient financial resources to invest in public services.

3. The Analysis of the Equalization Level of Public Services, Fiscal Revenue and Expenditure and Economic Development of UA-YRD

3.1. Data Sources, Theoretical Mechanisms and Research Hypotheses

This paper selects 26 cities of UA-YRD as samples. Taking into account the changes in the statistical caliber of some indicators after 2012, for the rigor of the research, this paper selects the same statistical caliber for a total of 7 years from 2012 to 2018, A total of 282 data. Because the economic growth rate index needs to subtract one-year samples, this article adds the 2011 sample data when calculating the indicator, so when testing hypothesis 1, there are a total of 208 data, the other two hypotheses the verification is 182 sample data. The data come from ‘the Statistical Yearbook of Chinese cities’ and ‘the Statistical Bulletin of National Economic and Social Development’ of UA-YRD. The selection of indicators is shown in Table 1.
Table 1. Index selection

| Variable   | Description                                                                 |
|------------|----------------------------------------------------------------------------|
| lnstfr_{it} | Basic public education service indicators: the logarithm of the ratio of secondary school students to full-time teachers. |
| lnfedu_{it} | Basic Public Education Service Index: logarithm of per capita Public Education Expenditure. |
| lnlnmtr_{it} | Basic public health service indicators: the number of beds in medical institutions per 10,000 people and every. The logarithm of the number of medical practitioners owned by ten thousand people. |
| lnlnfmet_{it} | Basic public health service index: logarithm of per capita public health expenditure. |
| lnlnpgdp_{it} | Economic growth indicator: the logarithm of per capita GDP. |
| lnlnpcfdi_{it} | The index of the degree of competition of local governments: the logarithm of per capita foreign investment. |
| fssu_{it} | Fiscal revenue and expenditure target: fiscal revenue / expenditure. |
| lnlndepo_{it} | The quantity index of human capital: the average population density of the region. |

In order to make a more in-depth analysis of the relationship between public services and balanced economic development in UA-YRD, this paper constructs the measurement indicators of balanced economic development, public services and local fiscal revenue and expenditure, and empirically tests the endogenous relationship and influencing factors between them. According to the previous theoretical analysis, the following hypotheses are put forward:

Hypothesis 1: the economic growth of UA-YRD is conducive to the improvement of the quantity and quality of public service supply.

Hypothesis 2: the financial competition among local governments is not conducive to the supply of public services.

According to the relevant theories and existing empirical research on economic growth and public services, the assumptions of the empirical model can be transformed into alternative assumptions under strong constraints, such as econometric models such as equations:

\[ \text{lnstfr}_{it} = \alpha_0 + \alpha_1 \text{lnpgdp}_{it} + \alpha_2 \text{lnpcfdi}_{it} + \alpha_3 \text{fssu}_{it} + \alpha_4 \text{lnlndepo}_{it} + \eta_t + \nu_i + \epsilon_{it} \]  
\[ \text{lnlnmtr}_{it} = \beta_0 + \beta_1 \text{lnpgdp}_{it} + \beta_2 \text{lnpcfdi}_{it} + \beta_3 \text{fssu}_{it} + \beta_4 \text{lnlndepo}_{it} + \eta_t + \nu_i + \epsilon_{it} \]

The explained variables in formulas (1) and (2) are lnstfr_{it} and lnlnmtr_{it}, which represent the two public services of education and health respectively. The index of the ratio of students to teachers in the middle school stage reflects the quality of public education services; On the other hand, health is expressed by the comprehensive value given the same weight by the number of beds in hospital institutions per ten thousand people and the number of health personnel per ten thousand people. Said that reflects the level of public medical services. \( \alpha_i, \beta_i, \alpha_2, \beta_2 \) are the coefficients of the core explanatory variables that are mainly concerned, that is, when the economic development level of UA-YRD region and the degree of local government financial competition change by one unit, the amount of change of the explained variable under other conditions is unchanged. In addition, in order to ensure the robustness and scientificity of the research, we also added several common control variables in the regression: per capita foreign direct investment, fiscal revenue and expenditure and population density, indicating the realization value of the control variable of the i city in the t period. \( \alpha_0 \) and \( \beta_0 \) are constant terms, \( \eta_t \) is individual fixed effect, \( \nu_i \) is time fixed effect, and \( \epsilon \) is the error term. The explanatory variables in these two formulas are lnlnpgdp_{it} and lnlnpcfdi_{it} which represent the GDP per head and the degree of financial competition of local governments, respectively. The latter is expressed in terms of per capita foreign investment [8].

Therefore, according to the previous inference, hypothesis 1 requires \( \alpha_1 \) to be negative and statistically significant, \( \beta_1 \) to be positive and statistically significant, hypothesis 2 to require \( \alpha_2 \) to be
positive and statistically significant, and $\beta_2$ to be negative and statistically significant.

3.2. Empirical Test and Analysis of Education and Medical Public Service, Local Financial Competition and Economic growth in UA-YRD

According to the results of Hausman test, it is judged that fixed effects are used. In the calculation process of the fixed effects model, the significance level of the F statistic of the time fixed model is 0.9360, which fails the test, while the significance level of the F statistic of the individual fixed effects model is less than 0.1. Therefore, the individual fixed effect is selected. The regression results are shown in Tables 2 and 3. In the process of robustness testing, we learn from the practices of existing scholars and use alternative indicators to conduct robustness testing, that is, use the logarithmic value of per capita public education expenditure. Replace the logarithmic value of the ratio of students to full-time teachers at the secondary school level and the logarithmic value of per capita medical and health expenditure to replace the relevant indicators of basic public medical and health services. The empirical analysis results listed in Tables 2 and 3 show that the quality of basic public services from the perspective of education and medical treatment has a significant impact on the economic growth of UA-YRD. Hypothesis 1 and Hypothesis 2 have been confirmed [9].

From the perspective of hypothesis 1, the model regression and robustness test results combined with tables 2 and 3 can be seen to support the establishment of hypothesis 1. $\lnpgdp$ has a significant positive impact on $\lnstfr$, at the level of 1%, that is, the increase of GDP per head can effectively increase the ratio of students to teachers and improve the quality of public service in education. At the same time, $\lnpgdp$ has a significant positive impact on $\lnmct$, at the level of 1%, that is, the increase of GDP per head is conducive to the increase in the number of hospital beds and the number of practicing doctors, and improve the quantity and quality of medical and health public services. The impact of $\lnpgdp$ on these two aspects of public services proves that the research hypothesis 1 is established and the results of the robustness test can show that the regression results have strong robustness.

### Table 2. Regression and robustness test of model (basic public education services)

|       | (1) OLS | (2) FE_robust | (3) FE_robust | Robustness Test |
|-------|---------|---------------|---------------|----------------|
| $\lnpgdp$ | 0.141*** | 0.131*** | 0.139*** | 0.146*** | 0.141*** | 0.133*** |
|       | (0.0323) | (0.0340) | (0.0468) | (0.0280) | (0.0540) | (0.0314) |
| $\lnpcfdi$ | -0.0128* | -0.0246** | -0.0334* | -0.0117** | -0.0316** | -0.0214* |
|       | (0.0205) | (0.021) | (0.0304) | (0.0168) | (0.036) | (0.0215) |
| $fssu$ | 0.338*** | 0.122** | 0.222*** | 0.117** |
|       | (0.0858) | (0.113) | (0.0761) | (0.209) |
| $\lnindepo$ | -0.0747 | 0.245 | -0.0405 | 0.231 |
|       | (0.0432) | (0.191) | (0.0423) | (0.148) |
| $\_cons$ | 4.317*** | 2.523 | 4.071*** | 2.493 |
|       | (0.331) | (1.235) | (0.303) | (1.187) |

| Individual fixation | NO | YES | YES | NO | YES | YES |
|---------------------|----|-----|-----|----|-----|-----|
| $N$ | 182 | 182 | 182 | 182 | 182 | 182 |
| $R^2$ | 0.302 | 0.178 | 0.184 | 0.35 | 0.185 | 0.188 |

Standard errors in parentheses

$p < 0.1$, $p < 0.05$, $p < 0.01$

From the perspective of hypothesis 2, the model regression and robustness test results combined with tables 2 and 3 can be seen to support the establishment of hypothesis 2. In Table 2, the level of $\lnpcfdi$ local government fiscal competition has a significant positive impact on the public education level $\lnstfr$, at the level of 10%, that is, local government competition increases the proportion of students and teachers in the middle school stage, which is not good for the public. The improvement of
the quality of education services; At the same time, the level of lnpcfdi local government financial competition in Table 3 has a significant negative impact on the public health level cmtr, at the level of 10%, that is, local government competition is not conducive to the improvement of the quality of public health services. Therefore, the impact of local government financial competition on these two aspects of public services proves that hypothesis 2 is established, and according to the robustness test results can show that the regression results have a strong robustness [10].

Table 3. Regression and robustness test of model (basic public health services)

|       | (4) OLS | (5) FE_robust | (6) FE_robust | OLS | FE_robust | FE_robust |
|-------|---------|---------------|---------------|-----|-----------|-----------|
| lnpgdp| 0.447*** | 0.344***       | 0.352***      | 0.366*** | 0.312*** | 0.324***  |
|       | (0.101) | (0.026)       | (0.0376)      | (0.0357) | (0.0186) | (0.0264)  |
| lnpcfdi| -0.00615* | -0.0210**      | -0.0270**     | -0.0261* | -0.0179** | -0.0241***|
|       | (0.0414) | (0.0351)      | (0.0259)      | (0.0225) | (0.0531) | (0.0168)  |
| fssu  | 0.324   | 0.0190*       | 0.0989        | 0.0210* | 0.0270   | 0.563     |
|       | (0.198) | (0.130)       | (0.103)       | (0.151) |           |           |
| Indepo| -0.00965 | 0.649         | 0.130*        | -4.682  | -1.571*** | -4.583    |
|       | (0.115) | (0.487)       | (0.0740)      | (0.517) |           |           |
| _cons | -1.643*** | -4.682        | -1.571***     | -4.583  |           |           |
|       | (0.721) | (3.064)       | (0.498)       | (3.053) |           |           |

| Indigual fixation | NO | YES | YES | NO | YES | YES |
|-------------------|----|-----|-----|----|-----|-----|
| N                 | 182 | 182 | 182 | 182 | 182 | 182 |
| R²                | 0.694 | 0.401 | 0.429 | 0.522 | 0.359 | 0.374 |

3.3. Endogenous Analysis

Due to the existence of random shocks, inevitable statistical errors, omission of control variables and other external disturbances, there may still be significant interactions between model residuals and explanatory variables, which in turn leads to inconsistency and ineffectiveness of coefficient testing. In order to solve the endogenous problem, this article uses the continuous high-order lag terms of education quality and GDP per head as tool variables to control the potential "endogenous" part of the explanatory variables, in order to control the potential endogenous effects as much as possible. Table 4 lists the endogenous test results based on two-step system GMM and one-step system GMM, which shows that GDP per head and per capita foreign direct investment have a significant impact on basic public education services.

Table 4. Endogenous test

|       | (4) | (5) |
|-------|-----|-----|
| lnpgdp| 0.098** | 0.067** |
| lnpcfdi| 0.081* | 0.036* |

| Control variable | YES | YES |
| Difference method | Sys—GMM | Sys—GMM |
| Estimation method | twosteps | onesteps |
| AR(1) | 0.831 | 0.564 |
| AR(2) | 0.031 | 0.014 |
| Sargan | 16.3 | 24.9 |
| Wald coefficient test | 0.031** | 0.004*** |
4. Conclusions and Suggestions

Through the above theoretical analysis and empirical test, this article finds that the economic growth in UA-YRD is conducive to the improvement of the quality and quantity of public service supply, especially the basic public education services and basic public health services related to people's livelihood and welfare. With the existence of government fiscal competition, the improvement of the quality of basic public services such as education and health care have been restricted to varying degrees.

In terms of public medical and health services, on the one hand, relying on the big data platform to promote the overall deployment of high-end and high-quality medical and health resources in large and medium-sized cities through cooperation in running hospitals, setting up branches, and forming medical consortia, building a public medical and health service co-construction and sharing system. On the other hand, Implement the cross-district file inspection service project of people's livelihood archives, and establish a standard system of archives thematic data for mutual recognition and communication. Explore the construction of a basic public service platform in UA-YRD region in the era of big data, promote residents to enjoy basic public services in different places and facilitate settlement, and promote the balanced distribution and rational allocation of resources.

In terms of public education services, on the one hand, research and release a unified education modernization indicator system, build a big data platform for education in the Yangtze River Delta to coordinate monitoring and evaluation, and guide the high-quality development of schools at all levels and types. Relying on urban high-quality preschool education and primary and secondary school resources, schools are encouraged to help each other across regions, and the exchange and sharing mechanism between principals and teachers is deepened. On the other hand, use big data mining to identify talent shortage industries, jointly develop vocational education, build a platform for digital integration and collaborative development of vocational education, expand and strengthen joint vocational education groups and train high-skilled talents.

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