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Analysis of Coordination between the Public Service in Rural Areas and Socio-economic Development

—A Case Study of Sichuan Province

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Abstract Taking Sichuan Province as an example, by using the overall evaluation function of Sichuan's rural public service equalization development level and rural socio-economic development level, we conduct profound analysis on coordination between public service in Sichuan's rural areas and socio-economic development from 2003 to 2008. The results show that the coordination between rural public service and socio-economic development in Sichuan Province is not high, and the equalization phenomenon of rural public service construction and socio-economic development is very prominent. The equalization development of public service in rural areas of Sichuan Province from 2003 to 2008 lags behind socio-economic development. The coordination between public service equalization system in rural areas of Sichuan Province and socio-economic development system abates continuously; the coordination between infrastructure and socio-economic development increases slowly; the coordination between education and socio-economic development declines sharply; the coordination between public culture and socio-economic development tends to decrease; the coordination between ecological environment construction and socio-economic development decreases continuously with great amplitude; the coordination between public health and socio-economic development decreases continuously; the coordination between science and technology and socio-economic development lingers at low level; the coordination between social security and employment, and socio-economic development increases in fluctuation, but with small amplitude.

Key words Rural public services, Socio-economic development, Coordination, Equalization, China

In the process of equalization development of public service, as against urban areas, the relatively sluggish development of the rural areas, has become one of important factors thwarting the equalization process of public service in areas. The Twelfth Five-Year Plan proposed that we should eliminate the institutional obstacles restricting the coordinated development of urban and rural areas as quickly as possible, promote the public resources to be allocated equally in urban and rural areas and factors of production to move freely between the urban and rural areas, coordinate the development planning in urban and rural areas, and promote integration of urban-rural infrastructure, public service, and social management. Sichuan Province also attaches great importance to the development of public services in rural areas, and the planning outline of the Twelfth Five-Year Plan in Sichuan Province pointed that we should focus on transportation, water conservancy, communications, electricity and other infrastructure, improve supporting urban and rural infrastructure, promote urban infrastructure to be extended to rural areas, focus on education, culture, health care, pension and other social undertakings, and promote the public service to cover the rural areas. Government pays attention for many years to the rural areas. Through years of efforts, the level of public services in rural areas has been greatly improved, and the living standards of farmers have been changing for the better. We focus on the analysis of the equalization process of the rural areas, and measure the coordination be-

tween public service equalization in the rural areas of Sichuan Province, and socio-economic development in the rural areas, so as to comprehensively reflect the development appearance of public service equalization in the rural areas, and to conduct rational evaluation on it.

1 Index selection, data source and research method

1.1 Index selection The so-called coordination, refers to the state of reasonable allocation and organic combination of system factors at certain time in system. Development refers to the evolution trend of system from simple to complex, from disorderly to orderly, from inferior to superior, under certain constraints. The system is in constant dynamic change. Only through coordinated, systematic and orderly development between systems or between system and system factors, can we ensure the optimized state of system. To this end, we choose 6 first-level indices, and 21 second-level indices as evaluation indices of equalization development of public service in the rural areas of Sichuan Province (Table 1). We choose 10 first-level indices as evaluation indices of socio-economic development in the rural areas of Sichuan Province^[1] (Table 2). In the table, the weight coefficient is determined by adopting the entropy method, combined with the MATLAB 7.0 software for adjustment.

1.2 Data source The index data are from *China Rural Statistical Yearbook* (2004–2009)^[2], *Sichuan Statistical Yearbook* (2000–2009)^[3], *China's Second National Agricultural Census Data Compilation* (2010)^[4], and *Statistical Communiqué of Sichuan Provincial Economic and Social Development* (2004–2009)^[5].

Table 1 Evaluation index of equalization development of rural public service in Sichuan Province

Object layer	First-level index	Weight	Second-level index	Weight
Equalization development of rural public service	Infrastructure	0.132 0	Rural telephone users// $\times 10^4$ people	0.029 3
			The installed capacity of hydropower station established by the rural areas// $\times 10^4$ kw	0.025 5
			Investment per capita in transportation, storage, and postal service in the rural areas//Yuan	0.031 7
	Education	0.141 9	The number of large and medium-sized tractors for agricultural use	0.045 6
			The number of farmer technology training schools	0.051 7
			Rural educational investment per capita in rural areas//Yuan	0.023 7
			The number of teaching and administrative staff of farmer technology training school owned by per 10 thousand people	0.021 2
			The number of people trained in technical schools	0.039 9
	Public culture	0.164 0	The number of county and township cultural stations	0.048 9
			The number of theatres and cinemas owned by per 10 thousand people in the rural areas	0.037 5
			Collection of books in library owned by per 10 thousand people in the rural areas//Volume	0.037 5
			Investment in culture, physical education and entertainment per capita in the rural areas//Yuan	0.040 1
			The cumulative number of people benefit from rural tap water $\times 10^4$ people	0.057 9
	Ecological environment construction	0.152 2	Rural afforestation area// $\times 10^3$ hm ²	0.054 2
			The popularization rate of toilets in rural areas//%	0.040 1
			The number of rural doctors and health worker owned by per 10 000 people	0.051 3
			The number of beds in health institutions owned by per 10 000 people in the rural areas	0.046 3
			The number of health institutions owned by per 10 000 people in the rural areas	0.058 8
	Science and technology	0.115 4	The number of scientific research institutions regarding farming, forestry, animal husbandry, sideline production and fishery	0.037 5
			The area ploughed by tractors in rural areas// $\times 10^4$ hm ²	0.031 2
			Power of machinery for agricultural irrigation and drainage// 10^4 Kw	0.046 6
	Social security and employment	0.138 1	Urban registered unemployment rate//%	0.045 9
			The number of urban residents participating in worker endowment insurance per 10 000 people	0.042 7
			The number of people guaranteed by the minimum living standard security in the rural areas among per 10 000 people	0.049 5

Table 2 Evaluation index and weight of rural socio-economic development level

Index	Weight	Index	Weight
Total agricultural output value per capita//Yuan	0.081 0	Business return of rural township enterprises// $\times 10^8$ yuan	0.071 1
Total output value of farming, forestry, animal husbandry, and sideline production// $\times 10^8$ yuan	0.075 2	Rural residents' consumer price index	0.102 5
Actual farmland area at the end of year in rural areas//1 thousand hectares	0.165 1	Commodity retail price index	0.102 1
The amount of rural employees// $\times 10^4$ people	0.161 0	Rural residents' net income per capita//Yuan	0.057 6
Total power of agricultural machinery// $\times 10^4$ kilowatts	0.117 4	Original value of fixed assets of rural residents' consumption//Yuan	0.067 0

Note: the exponential-type index is calculated based on 100.00 of exponent in 2003.

1.3 Research method We adopt coordination $G(t)$ to reflect the coordination of system at the development level of the time. The development degree index $GD(t)$ and coordinated development trend index $\beta(t)$ jointly reflect the coordination between equalization development of public service and socio-economic development. Consequently, the overall evaluation function of the equalization development level of public service in the rural areas of Sichuan and socio-economic development level in the rural areas are as follows:

$$F_1(t, x) = \sum_{i=1}^n a_i x_{it}, F_2(t, y) = \sum_{j=1}^n b_j y_{jt}, \text{ Where } a_i, b_i \text{ are}$$

weight of all characteristic indices; eigen vector that describes the level of socio-economic development in the rural areas of Sichuan Province is: $x_1(x_{1t}^*, x_{2t}^*, \dots, x_{mt}^*)$; eigen vector that describes the level of equalization development of public service in the rural areas of Sichuan Province is: $y_1(y_{1t}^*, y_{2t}^*, \dots, y_{mt}^*)$; $F_1(t, x)$ is the level of development of equalization development system of public service at the time point of t ; $F_2(t, y)$ is the level of development of socio-economic development system at the time point of t ; the smaller the relative deviation (deviation coefficient) of $F_1(t, x)$ and $F_2(t, y)$, the greater the coordination. In the mean time, coordination at the time point

of t is as follows:

$$GD(t) = \left[\frac{F_1(t, x) \cdot F_2(t, y)}{\left(\frac{F_1(t, x) + F_2(t, y)}{2} \right)^2} \right]^K$$

Where K is the identification coefficient, $K > 2$. As $F_1(t, x) > 0$, $F_2(t, x) > 0$, so the sufficient condition of smallest Cv is $\max G(t)$. From the mathematical point of view, when $F_1(t, x) = F_2(t, y)$, $F_1(t, x) \cdot F_2(t, y)$ reaches maximum, indicating that the coordination between the systems is the greatest, namely $G(t) = 1$.

$$GD(t) = [G \cdot F_1'(t, x) \cdot F_2'(t, y)]^{\frac{1}{\alpha + \gamma}}$$

Where α and γ are weights to be determined, and $\alpha + \gamma = 1$. $GD(t)$ indicates the level of system coordination and development of the time. On the basis of this, we define coordination development trend index $\beta(t)$ to reflect coordinated development trend of the system, namely at the time point of t , $\beta(t) = GD(t)/GD(t-1)$.

After standardization of eigen vector, we get the overall evaluation function of the level of public service equalization development and the level of socio-economic development.

According to coordinated development $GD(t)$, coordinated development trend index $\beta(t)$, and the relationship between socio-economic evaluation function and public service equalization development evaluation function, we divide public service equalization and socio-economic coordinated development into 3 major types, 45 minor types^[6].

When $0.80 < GD(t) < 1.00$, there is coordinated development between public service equalization, and society and economy; when $0.60 < GD(t) < 0.8$, there is general coordinated development between public service equalization, and society and economy; when $0.40 < GD(t) < 0.60$, there is critical coordinated development between public service equalization, and society and economy; when $0.20 < GD(t) < 0.40$, there is unbalanced development between public service equalization, and society and economy; when $0.00 < GD(t) < 0.20$, there is badly unbalanced development between public service equalization, and society and economy. When $\beta(t) > 1$, the public service equalization is at growth-oriented level; when $\beta(t) = 1$, the public service equalization is at stable level; when $\beta(t) < 1$, the public service equalization is at the level of recession. When $F_1(t, x) < F_2(t, y)$, the public service equalization development lags behind socio-economic development; when $F_1(t, x) = F_2(t, y)$, the public service equalization development is in sync with socio-economic development; when $F_1(t, x) > F_2(t, y)$, the public service equalization development is ahead of socio-economic development^[7].

2 Results and analysis

2.1 Analysis on coordination between public service in rural areas and socio-economic development We select the corresponding data concerning public service equalization in the rural areas of Sichuan Province and socio-economic development from 2003 to 2008. According to public service equalization development ability in the rural areas F_1 , socio-economic development ability in the rural areas F_2 , system coordination $G(t)$, coordinated development $GD(t)$, and coordinated development trend $\beta(t)$, we conduct calculation, to get the judgement system of public service equalization development and so-

cio-economic coordinated development ($K=8, \alpha=0.5, \gamma=0.5$), as is shown in Table 3.

Table 3 The coordination between public service equalization in Sichuan Province and socio-economic development, and judgement of coordination trend

Year	F_1	F_2	$G(t)$	$GD(t)$	$\beta(t)$
2003	0.757 8	1.674 6	0.398 7	0.670 2	—
2004	0.688 5	1.945 1	0.212 2	0.495 6	1.352 3
2005	0.652 7	2.053 2	0.154 0	0.422 2	1.173 9
2006	0.670 8	2.175 1	0.140 0	0.411 3	1.026 5
2007	0.686 4	2.606 2	0.082 7	0.332 5	1.236 8
2008	0.759 8	2.907 8	0.080 4	0.345 7	0.961 9

(1) The equalization development of public service in rural areas of Sichuan Province from 2003 to 2008 lags behind socio-economic development.

From Table 3, we can know that in the year 2003, the equalization development of public service in rural areas lagged behind socio-economic development by 0.916 9 point. This difference is tantamount to 220.99% of public service development ability during that time in rural areas. In the year 2008, the public service equalization development in the rural areas lagged behind socio-economic development by 2.148 1 points, tantamount to 382.72% of public service equalization development ability during that time in rural areas. It indicates that the public service equalization development greatly lags behind socio-economic development in the rural areas, and this gap will continue to widen, with not rosy prospect.

(2) The coordination between public service equalization system in rural areas of Sichuan Province and socio-economic development system abates continuously.

In the year 2003, the overall coordinated development index was 0.670 2, indicating that there was general coordination between public service in the rural areas of Sichuan Province, and society and economy, failing to achieve coordinated development. Afterwards, this coordination continued to decline along with time. In the year 2007, the coordinated development index decreased to 0.332 5, and exceeded the critical value of coordinated development, lapsing in the phase of unbalanced development. The speed of unbalanced development assumed intermittent trend of fluctuations, and the development is, on the whole, out of balance. In the light of the trend of coordinated development, from 2003 to 2007, the public service equalization index in the rural areas of Sichuan Province and the coordination trend index of socio-economic development were both bigger than 1, indicating that in these five years, the level of public service in the rural areas was elevated, but the development speed of it was slower than that of socio-economic development. In the year 2008, the coordinated development trend was smaller than 1, indicating that the level of public service in the rural areas of Sichuan Province to some extent at this time.

2.2 Structural coordination analysis of public service and socio-economic development in rural areas The aforesaid content analyses the integrated coordination between public service in the rural areas of Sichuan Province, and socio-economic

conomic development, assuming more and more unbalanced trend in general. We divide the public service into 7 types, namely infrastructure, education, public culture, ecological environment construction, public health, science and technology, and social security and employment. We specifically analyse the coordination of the above 7 indices to socio-economic development respectively, so as to find out that which ones have lower coordination to socio-economic development, decreasing the holistic coordination. The coordination between public service internal structure in the rural areas, and society and economy can be seen in Fig. 1.

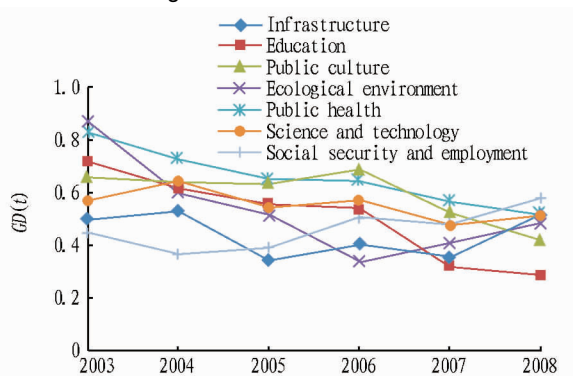


Fig. 1 The inner structure of rural public service and socio-economic coordination $GD(t)$

2.2.1 The coordination between infrastructure and socio-economic development increases slowly. It can be seen from Fig. 2, 1 that the coordination index $GD(t)$ of infrastructure and socio-economic development always stayed in between 0.4 and 0.6 during 2003–2008, except the year 2005 and 2007. From the definition of above paragraphs, we know that there was critical coordinated development between infrastructure and socio-economic development in these four years. During this time, there were two fluctuations, and coordination decreased. In the year 2005, the coordination index was 0.3407, and in the year 2007, the coordination index was 0.3547. There was unbalanced development between infrastructure, and society and economy in the two years, that is, the infrastructure has been on the verge of incoordination. If we do not take effective measures, the infrastructure and socio-economic development will be out of balance.

2.2.2 The coordination between education and socio-economic development declines sharply. The coordination index of education and socio-economic development in the year 2003 was 0.7184, in the year 2004 was 0.6138, both in between 0.6 and 0.8, that is, there was general coordinated development between education, and society and economy. It is noteworthy that the coordination index of the year 2004 decreases by 0.1046 as against that of the year 2003. This indicates that there is unbalanced trend of education. Since then, it continued to decline, and by 2005, the coordination index was 0.5551, reaching critical coordinated development. In the year 2007, the coordinated development index was 0.3201, indicating that education has not meshed with socio-economic development. At this time, the speed of socio-economic development was 286.99% that of education. By the year 2008, the coordination index

continued to decline, and there was greater unbalance between education and socio-economic development.

2.2.3 The coordination between public culture and socio-economic development tends to decrease. From 2003 to 2006, the coordination index of public culture in the rural areas of Sichuan Province and socio-economic development lingered in between 0.6 and 0.8. There was general coordinated development between public culture, and society and economy in the four years. From 2003 to 2005, the coordination tended to decrease. By the year 2006, there was a process of rise, but after the year 2007, it continued to decline, and reached 0.6 or less, reaching critical coordinated development. In the year 2008, the coordination index was 0.4196, in the brink of incoordination.

2.2.4 The coordination between ecological environment construction and socio-economic development decreases continuously with great amplitude. The coordination index of ecological environment construction in the rural areas of Sichuan Province, and society and economy in the year 2003 was 0.8668, and in this year, there was coordinated development between ecological environment construction in the rural areas of Sichuan Province, and society and economy. But by the year 2004, the coordination index declined significantly, and fell to 0.5997, quickly reaching critical coordinated development. By the year 2006, it fell to 0.3392 continuously, and in this year, there was unbalanced development between ecological environment construction, and society and economy. Two years afterwards, the coordination increased slightly. By the year 2008, the coordination index was 0.4832, still failing to resume coordinated development.

2.2.5 The coordination between public health and socio-economic development decreases continuously. The coordination index of public health, and society and economy in the year 2003 was 0.8288, and at this time, there was coordinated development between public health, and society and economy. Several years afterwards, the coordination index declined continuously, in between 0.6 and 0.8 from 2004 and 2006, with decreased coordination, thus there was general coordinated development. In the year 2007 and 2008, it had become critical coordinated development, on the verge of incoordination. In general, although public health and socio-economic development is not out of balance, the coordination declines continuously in the six years, indicating that there is trend of incoordination between the two, and we must take effective measures to arrest the downward trend.

2.2.6 The coordination between science and technology and socio-economic development lingers at low level. The coordination index of science and technology, and socio-economic development, except 0.6432 in the year 2004, as general coordinated development, was in between 0.4 and 0.6 in other five years, on the verge of incoordination. This indicates that the development of science and technology in the rural areas always stays at low level. Although it is not out of balance with socio-economic development, the service level is not high, needing to be strengthened, otherwise the coordination may continue to decrease.

2.2.7 The coordination between social security and employment, and socio-economic development increases in fluctua-

tion, but with small amplitude. The coordination index of social security and employment, and socio-economic development, was always at low level, and it decreased from 0.444 8 in the year 2003 to 0.363 7 in the year 2004, that is, the social security and employment, and socio-economic development in the year 2004, was out of balance. In the year 2005, although the coordination rose to some extent, there was unbalanced development between the two. After the year 2006, the coordination had upward trend, but by the year 2008, it was still only 0.577 0, indicating that there was still great gap for the social security and employment, to be consistent with socio-economic development.

3 Conclusion

Although the public service in the rural areas, has been promoted in terms of the overall level and structural level, it should be noted that the level and speed of promotion lags far behind the level and speed of socio-economic development, which can be reflected mainly in the following aspects.

3.1 The level of public service in the rural areas on the whole is low, and the gap between public service level in the rural areas and socio-economic development level tends to widen

The factors responsible for this kind of phenomenon are as follows: the responsibilities are unclear; the fund is short; the talents are scanty^[8]. Chengdu in November 2008 issued *Opinions on Deepening Urban-rural Coordination and Further Promoting the Level of Village-level Public Service and Social Management* (Trial) (2008 37). After the implementation of Opinions, it has achieved some results as follows: make the goals of departments at all levels clear; establish 10 000 special fund projects or so; the relations between cadres and the masses are improved; the democratic system is established. This paper argues that to make public service in the rural areas develop rapidly, the government's responsibility turns out to be particularly important, and it should be clear on how to play the role of public funds. Nowadays, the public service and socio-economic development in the rural areas lags behind that of the urban areas. Therefore, the public investment should pay more attention to the rural areas, reasonably arrange spatial distribution of public investment, and narrow the gap between urban and rural areas.

3.2 The structural coordination of public service in the rural areas is poor

This structural contradiction is mainly that various projects of public service in the rural areas develop sluggishly, losing balance. In terms of Sichuan Province, the coordination of 7 indices regarding public service selected by us in this paper, and the level of socio-economic development, all shows downward trend. This shows that the issue of public services in rural areas has been more serious. In addition, the development of internal structure of 7 indices is in imbalance. For example, although in recent years, public culture has a downward trend, it is still at relatively high level. Although science and technology change little, they are still at low levels.

The coordination of ecological environment and public health, and socio-economic development plummets. Therefore, the public service in the rural areas, should be consistent with socio-economic development. Moreover, we should focus on coordinated development of internal structure, not letting any one become an obstacle to the development of public service in the rural areas.

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