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Analysis of Temporal and Spatial Evolution of Coupling Coordination between Basic Old-age Insurance and Economic Development in China

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Abstract

Based on coupling coordination degree model, this paper calculates the coupling coordination between basic old-age insurance and Economic development in 30 provinces (municipalities and districts) in China from 1997 to 2017 (excluding Xizang, Hong Kong, Macao and Taiwan), and analyzes its influencing factors using the spatial Durbin model. Firstly, the coupling coordination between basic old-age insurance and Economic development is on the rise from the stage of reluctant coordination to the stage of primary coordination. However, the regional differences continue to expand, and the spatial subsidence pattern is "high on both sides, low in the middle". Secondly, the spatial correlation of coupling coordination degree is significant, but the degree of spatial agglomeration is weakening, and the pattern changes from "east-west symmetry" to "northeast dominated" unipolar pattern. Thirdly, the coupling coordination between basic old-age insurance and Economic development has obvious spatial positive spillover effect. Fund balance, payment base, fiscal decentralization and highly educated talents can significantly promote the coordinated development of pension insurance and economic growth, but increasing the contribution rate will worsen the relationship between the two.

Keywords

Basic Old-age Insurance; Economic Development; Coupling Coordination.

1. Introduction

The basic old-age insurance system is the internal requirements of economic and social development, but also an important guarantee for economic and social development. Benefiting from the population structure favorable to economic development formed by the population transformation, the rapid economic growth provides sufficient material basis for the development of the pension insurance system. At the same time, the steady development of pension insurance provides a stable and stable social environment for rapid economic growth. The basic old-age insurance and economic growth promote and interact with each other.

Scholars at home and abroad have conducted systematic research on the relationship between endowment insurance and economic growth, which can be summarized into three aspects. The first is to analyze the impact of pension insurance on economic growth. Based on the theoretical model of economic growth, scholars start from the perspective of basic old-age insurance financing mode selection and its income distribution effect, and then affect economic growth through its influence on savings and human capital and their formation process. Some scholars believe that the pay-as-you-go pension system can promote households' investment in human capital investment, which is conducive to economic growth(Zhang Jie(1995); Kaganovich et al.(1999)).Some scholars have concluded that the pension system has a significant inhibitory effect on human capital accumulation and economic growth (PKR(1999); PengHaoran and Shen

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Shuguang(2007)). The second is the influence of parameter reform on economic growth.Pension insurance will inevitably have an impact on economic growth by adjusting the contribution rate, system support rate and retirement age and other parameters reform. Reducing the contribution rate can increase the accumulation of physical capital, improve the total factor productivity of enterprises, and improve the wages and benefits of employees to promote economic growth (Fanti(2010); Ma Shuang et al.(2014); Hong Li and Zeng Guoan(2017); Zhao Jianyu and Lu Zhengfei(2018)). The level of pension will have a positive impact on household consumption expenditure (Jiang Yu and Quan Mengzhen (2018)). Pension adjustments help stimulate economic growth (WangHaoming and Liu Qingrui (2020)). The third is the empirical study of the causal relationship between the two. With the help of VAR model, some researchers have concluded that there is a two-way relationship between pension fund revenue and expenditure and economic development, which promotes and influences each other (Wang Weiguo et al. (2018)). Di Xiaodong and Zhang Yuan(2019) used the systematic GMM method to study the correlation between regional economic growth and pension expenditure, and found that economic growth had a certain promoting effect on pension expenditure. In addition, some scholars have studied the coupling relationship between social security and economic growth, and found that the coupling degree and coordination degree of the two subsystems of social insurance and economic development in China are increasing year by year (Deng Dasong et al. (2019).

In conclusion, domestic and foreign scholars have studied the relationship between pension insurance and economic growth, but there are few systematic studies on the interaction between pension insurance and economic growth, and there is a lack of literature analyzing the synergistic relationship between pension insurance and economic growth. Since the reform and opening up, the rapid economic growth is accompanied by the imbalance of regional economic development, resulting in the consolidation and further expansion of the pension insurance gap between regions, which not only leads to the emergence of the financial sustainability of the system itself, but also hinders the free flow of labor resources and the establishment of a fair competition market environment, and further aggravates the gap between economically developed and underdeveloped regions(Chen Yuangang and Zhang Yuhuan(2019)). Then, what is the interactive relationship between provincial pension insurance and economic growth? How does this interaction evolve over time? Is there a spatial correlation? Based on this, this paper selects 30 provinces in China (excluding Hong Kong, Macao, Taiwan and Tibet due to data availability and other reasons) since the establishment of a unified basic old-age insurance system for enterprise employees from 1997 to 2017 as the research object, and constructs a comprehensive evaluation index system for the coordinated development of old-age insurance and economic growth. The coupling coordination model is used to analyze the spatio-temporal differentiation pattern of the coupling and coordinated development of pension insurance and economic growth in each overall planning region, and the spatial econometric model is used to explore the influencing factors of the coupling and coordinated development of pension insurance and economic growth.

2. Data Sources and Research Methods

2.1. Data Collection and Index System Construction

A scientific and reasonable evaluation index system is the prerequisite for accurately grasping the comprehensive development level and coupling coordination relationship between pension insurance and economic growth. On the basis of the coupling and coordination mechanism of pension insurance and economic growth, the evaluation index system is constructed in accordance with the principles of scientificity, comprehensiveness and operability (Table 1).The data mainly come from the China Statistical Yearbook (1996-2017), China Labor

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Statistics Yearbook, the Yearbook of 30 provinces (municipalities and autonomous regions), the fiscal yearbook, the local tax yearbook, and the regional human resources and social security development communiques.

Table 1. Basic old-age insurance and economic growth coordinated development evaluation index system

System level	Functional layer	Index level	Direction	Weight
Basic old-age insuranc	Insured quality	Coverage rate	+	0.143
		Number of employees	+	0.146
		System support rate	-	0.146
	Benefit level	Substitution rate	+	0.134
	Fund capacity	Endowment burden	-	0.146
		Fund balance rate	+	0.147
		Number of months payable	+	0.138
Economic growth	stability	Unemployment rate	-	0.129
		Inflation rate	-	0.128
	structure	Industrial structure	+	0.117
		Industrialization rate	+	0.125
		Consumption rate	+	0.126
	efficiency	TFP	+	0.129
		Effect of investment in fixed assets	+	0.129
	earnings	Per capita disposable income	+	0.117

2.2. Research Methods

2.2.1. The Coupling Degree Calculation Model

This paper calculates the comprehensive index of pension insurance and economic growth based on entropy value method. They're denoted by PENij and ECOij. Then, the coupling degree calculation model of pension insurance and economic growth composite index is constructed as follows:

$$C_{ij} = \sqrt{\frac{PEN_{ij} \times ECO_{ij}}{(PEN_{ij} + ECO_{ij})^2}} \tag{1}$$

$$T_{ij} = \alpha PEN_{ij} + \beta ECO_{ij} \tag{2}$$

$$D_{ij} = \sqrt{C_{ij} \times T_{ij}} \tag{3}$$

The larger the value of C($C \in (0,1)$), the stronger the interaction between pension insurance and economic growth indicators. D is the coupling coordination degree, and T is the comprehensive evaluation index. α and β are undetermined coefficients, reflecting the relative importance of each system. Considering that economic growth is the source of sustainable development of the pension insurance system, take $\alpha = 0.4$ and $\beta = 0.6$ .Based on relevant studies, this paper divides the coupling coordination degree into six levels (Table 2).

The degree of coupling coordination reflects the degree of coordination between pension insurance and economic growth, but it cannot reflect the gap between the two systems. Therefore, this paper introduces relative development degree R to measure whether the

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current situation of pension insurance is ahead or behind the development level of economic growth.

$$R_i = \frac{PEN_i}{ECO_i} \tag{4}$$

When 0.8<R≤1.2 (Type Ⅰ), it indicates that the development level of pension insurance is compatible with the economic development level. When 0 < R≤0.8 (Type Ⅱ), the development level of pension insurance lags behind the economic development level, and the future pension insurance will have the problem of financial unsustainable, and more financial support is needed to maintain the credibility of the system. When 1.2 < R (Type Ⅲ), it indicates that the development level of pension insurance is ahead of the economic development level, which is highly likely to induce early retirement of employees, overdraft the momentum of economic growth, and inhibit economic growth.

Table 2. Coupling coordination degree grade classification standard

D value	phase	D value	phase
0<D≤0.2	Extreme dissonance	0.5<D≤0.6	Primary coordination
0.2<D≤0.4	General dissonance	0.6<D≤0.8	Well coordination
0.4<D≤0.5	Barely coordination	0.8<D≤1	Better coordination

2.2.2. The Spatial Model

Spatial autocorrelation is a measurement method to analyze the spatial relationship of data, which is used to explain the correlation characteristics of spatial attribute data and further explain its spatial agglomeration state (Zhou liang et al. (2019)). The global Moran index was selected to measure the spatial correlation characteristics of the coupling coordination degree between the basic pension insurance and economic growth in urban enterprises, and analyze the spatial agglomeration situation of the system.

What's more, the spatial Durbin model (SDM) was used to quantitatively identify the impact of key factors on the coordinated development of pension insurance and economic growth. The number of areas is $i = 1,2,\cdots,30$ .The time series is $t = 1,2,\cdots,21$ .The model is:

$$y_{it} = \alpha \sum_{j=1}^{n} w_{ij} y_{it} + \sum_{k=1}^{m} \beta_k x_{it,k} + \sum_{k=1}^{m} \sum_{j=1}^{n} \rho_k w_{ij} x_{it,k} + u_t + \kappa_i + \varepsilon_{it} \tag{5}$$

While, y_{it} is the coupling coordination; x is the explanatory variable; w is the spatial weight; α is the spatial lag coefficient of the dependent variable; n is the number of regions;m is the number of independent variables; β_k is the regression coefficient for the kth explanatory variable; ρ_k is the spatial lag term coefficient of the kth explanatory variable; u_t is the time intercept term; κ_i is the spatial intercept term; ε_{it} is the random error term.

3. Results and Analysis

3.1. The Spatial Differentiation Characteristics of Basic Old-age Insurance and Economic Growth Coupling and Coordination

The data of 1997, 2004, 2011 and 2017 were selected as the evaluation objects, and ArcGIS was used to draw the spatial distribution of the coordination degree between pension insurance and economic growth.

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3.1.1. Analyze the Comprehensive Evaluation Index

(1) The pension insurance system. From 1997 to 2017, the average value of the basic endowment insurance evaluation index first increased and then decreased, from 0.431 in 1997 to 0.542 in 2011 and then to 0.498 in 2017, showing an overall upward trend.From the perspective of spatial distribution, because the national endowment insurance pooling has not been realized, the connection between regional endowment insurance has been cut off to a certain extent. In 1997 and 2017, the standard deviation of the pension insurance evaluation index was 0.034 and 0.105, and the coefficient of variation was 0.078 and 0.210, respectively, indicating that the absolute and relative gap of the pension insurance between regions was expanding, and the spatial polarization of the pension insurance was becoming more and more obvious.

In 1997, a unified basic pension insurance for enterprise employees was established. Under the overall planning of the industry, the gap between regions of pension insurance was small, and the comprehensive evaluation index of pension insurance ranged from 0.354 to 0.489. The pension insurance evaluation index is below 0.400 in 7 regions, namely Beijing, Tianjin, Hainan, Guizhou, Yunnan, Qinghai and Xinjiang, and the lowest is 0.354 in Beijing. The pension insurance evaluation index is the highest in Zhejiang, which is 0.489. In 1998, the government proposed to transfer the industry to local management, and continuously improve the pension insurance pooling level. By 2004, the regional mean value of the endowment insurance evaluation index increased to 0.468, the standard deviation was 0.056, and the coefficient of variation was 0.120, indicating that regional differences in the development level of endowment insurance had emerged. In eastern China, the pension insurance evaluation index in Guangdong and Zhejiang exceeded 0.600, while that in Shandong, Jiangsu, Henan and Ningxia was above 0.500. In 2005, the government further improved the basic old-age insurance system for enterprise employees, expanded its coverage, strengthened the collection and supervision of basic old-age insurance funds, and adjusted pensions. Under the combined action of these measures, the evaluation index of old-age insurance in various regions has been rising continuously.In 2011, the regional mean value of the endowment insurance evaluation index increased to 0.542, the standard deviation was 0.086, and the coefficient of variation was 0.159. The gap between regions of endowment insurance was further expanded, and the spatial pattern of agglomeration of regions with high development level of endowment insurance had taken shape.There are 6 regions with pension insurance evaluation index above 0.600, which are Guangdong, Zhejiang, Beijing, Shandong, Shanghai and Jiangsu in order. There are 13 regions ranging from 0.500 to 0.600, including Fujian, Hebei, Hainan and Tianjin in the east. Anhui, Shanxi, Henan, Jiangxi and Hunan in the central region; The western region of Ningxia, Sichuan, Guizhou and Inner Mongolia. The pension insurance evaluation index is the highest in Guangdong Province (0.820), the lowest in Heilongjiang Province (0.367), and the gap between the maximum and the minimum value is 0.452.

With the intensification of the aging of the population and the slowdown of economic growth, the development level of pension insurance began to decline. In 2017, in addition to the 7 regions of Beijing, Fujian, Guizhou, Sichuan, Tianjin, Yunnan and Shaanxi, the pension insurance evaluation index maintained an upward trend, and the remaining 23 regions' pension insurance evaluation index declined to varying degrees, among which Heilongjiang saw the largest decline, which was 37.6%.The pension insurance evaluation index above 0.600 was reduced to 4 regions, namely Guangdong, Beijing, Fujian and Shandong. There are 11 regions ranging from 0.500 to 0.600, including Zhejiang, Jiangsu, Tianjin, Shanghai and Hebei in the east. The central provinces of Henan, Shanxi and Anhui; The western regions of Guizhou, Sichuan and Yunnan. The pension insurance evaluation index is below 0.400 in four regions, including Chongqing, Heilongjiang, Jilin and Liaoning. The regions with the highest and lowest pension insurance evaluation index are still Guangdong Province (0.757) and Heilongjiang Province (0.229), and

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the gap between the maximum and the minimum value is 0.528. The areas with high level of pension insurance development are concentrated in the eastern coastal areas and the southwest region, followed by the central region and the northeast region. As a whole, the collapse pattern of "high on both sides, low in the middle" and "high in the south and low in the north" have been formed.

(2) The economic development system. From 1997 to 2017, the regional mean value of the economic development evaluation index increased steadily, from 0.422 to 0.546, the standard deviation from 0.043 to 0.051, and the coefficient of variation from 0.103 to 0.094, indicating that with the implementation of regional coordination policies, the absolute gap between regional economic development levels is expanding. The narrowing of the relative gap has eased the spatial polarization of economic development.

In 1997, there were only 6 regions with the EII above 0.450, including Beijing, Tianjin, Shanghai, Jiangsu, Fujian and Hainan. The EII of the central and northeastern regions was between 0.400 and 0.450, and that of the western region was all below 0.400 except Xinjiang, Qinghai and Chongqing. There are obvious differences between East and west. In 2000, the policy of developing the western region was implemented. In 2004, the economic development evaluation index of six regions in western China, including Inner Mongolia, Gansu, Shaanxi and Ningxia, increased significantly, especially in Gansu Province from 0.352 to 0.444. In 2003 and 2004, the government successively proposed the strategic deployment of revitalizing the old industrial base in Northeast China and the rise of the central region, and by 2011, the overall pattern of economic development had undergone great changes. The number of regions with an economic development assessment index above 0.450 increased to 14, including eight provinces in the east including Beijing, Tianjin, Shanghai and Zhejiang; Jiangxi in the central region; Qinghai, Chongqing and Shaanxi in the west; and Liaoning and Jilin in the northeast. In 2017, the economic development evaluation index rose significantly, and the economic development evaluation index of all regions was above 0.450, among which Beijing's economic development evaluation index was the highest, at 0.722, and Liaoning Province was the lowest, at 0.454. There are 11 regions with an economic development evaluation index above 0.550, including eight provinces such as Beijing and Shanghai in the east, Qinghai and Ningxia in the west, and Heilongjiang in the northeast. The spatial distribution is still strong in the east and weak in the west.

3.1.2. The Characteristics of Spatial Differentiation between Basic Old-age Insurance and Economic Development

In 1997, the relative levels between the old-age insurance subsystem and the economic growth subsystem were not the same (see Figure 3). The relative development degree of 24 regions is type I, and the relative development degree of Beijing, Tianjin and Shanghai is Type II. The relative development degree of Guangxi, Gansu and Ningxia is the type Ⅲ.In 2004, the development of old-age insurance outpaced economic growth in six regions, and in 2011, the number of old-age insurance increased to 14.With the aging of the population, as well as the needs of economic development, by 2017 it became one,while the pension insurance lags behind the economic development of the increase to 7.

With reference to the classification standard of coupling coordination, we obtained the spatial distribution of coupling coordination degree between pension insurance and economic development in 1997, 2004, 2011 and 2017. In the 1990s, in order to meet the needs of the reform of state-owned enterprises and social stability, the enterprise employee pension insurance system carried out structural reform, and established the pension insurance system model combining social pooling and individual accounts.

In 1997, the coupling coordination level between pension insurance and economic development was not high on the whole, with the coordination degree ranging from 0.421 to

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0.489, and the average value was 0.461, all regions were in the stage of barely coordination. In 2004, the coupling coordination degree of pension insurance ranged from 0.437 to 0.520, with an average of 0.472. The coupling coordination degree of pension insurance and economic development in Guangdong and Shanghai exceeds 0.500, jumping from the barely coupling coordination stage to the primary coupling coordination stage, and the other 28 regions are still in the barely coupling coordination stage.

In 2011, the coupling coordination degree between pension insurance and economic development ranged from 0.452 to 0.554, and the regional average was 0.494. The number of provinces with coupling coordination degree above 0.500 increased to 8, and the new regions were Beijing, Tianjin, Jiangsu, Zhejiang, Shandong and Fujian, which jumped from the barely coupled coordination stage to the primary coupled coordination stage, and the remaining 22 regions were still in the barely coupled coordination stage. In 2017, the coupling coordination degree between pension insurance and economic development ranged from 0.439 to 0.603, and the regional average was 0.511. The number of provinces with coupling coordination degree above 0.500 has increased to 20, including 10 provinces such as Beijing and Tianjin in the eastern region, Henan, Shanxi, Anhui, Hunan and Jiangxi in the central region, and Yunnan, Ningxia, Sichuan, Qinghai and Guizhou in the western region. The coupling coordination between pension insurance and economic development in the remaining regions is still in the stage of barely coupling coordination, but Guangxi, Hubei and Shaanxi have approached the limit of the primary coordination stage, and the value of coupling coordination degree is above 0.490 and still keeps rising. From the distribution situation, the spatial distribution of the coupling coordination level of pension insurance and economic development has a certain consistency with the spatial distribution of the comprehensive evaluation index, indicating that the coupling coordination level of pension insurance and economic development has a great correlation with the basic distribution of each subsystem. From the overall trend, since 1997, the coupling and coordination of pension insurance and economic development has steadily increased, indicating that the interaction between pension insurance and economic development is increasing.

3.2. Research on the Influencing Factors of the Coupling and Coordinated Development of Pension Insurance and Economic Development

3.2.1. Autocorrelation Test

Table 3. The global Moran's I from 1997 to 2017

year	Moran's I	Z-value	P-value	year	Moran's I	Z-value	P-value
1997	0.565***	4.959	0.000	2008	0.337***	3.084	0.002
1998	0.287***	2.614	0.009	2009	0.412***	3.682	0.000
1999	0.467***	4.049	0.000	2010	0.318***	2.936	0.003
2000	0.398***	3.515	0.000	2011	0.390***	3.503	0.000
2001	0.367***	3.330	0.001	2012	0.375***	3.409	0.001
2002	0.388***	3.501	0.000	2013	0.414***	3.733	0.000
2003	0.484***	4.264	0.000	2014	0.382***	3.525	0.000
2004	0.377***	3.416	0.001	2015	0.369***	3.393	0.001
2005	0.112	1.224	0.221	2016	0.306***	2.897	0.004
2006	0.274**	2.552	0.011	2017	0.374***	3.442	0.001
2007	0.356***	3.224	0.001				

In order to further analyze the spatial evolution characteristics of the coordinated development of pension insurance and economic development, based on the coupling coordination degree index of pension insurance and economic development, the global Moran's I from 1997 to 2017 was calculated (see Table 3). The results show that, except 2005, the normal statistics of

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Moran's I in other years are significant at the significance level of at least 5%, and the sign is positive, indicating that the coupling coordination degree of pension insurance and economic development has a significant positive autocorrelation in space. The regions with similar coordination relationship between pension insurance and economic development show a spatial agglomeration trend, that is, the regions with strong (weak) coordination relationship have strong (weak) coordination in the surrounding areas. From the perspective of time series, the value of Moran's I decreased slightly, indicating the weakening of spatial agglomeration.

3.2.2. Analysis of Influencing Factors

Table 4. Variable description

Variable	symbol	value	unit
Fund balance	x_1	Previous year fund balance + Current year fund balance	Trillion yuan
Contribution rate	x_2	Collected income / (Average wage×payers)	%
Collection base	x_3	Collected income /(payers×28%)	Ten thousand yuan
Pension increase	x_4	Pension growth rate	%
Fiscal decentralization	x_5	Self-owned financial revenue/(Self-owned financial revenue+Central transfer payment)	%
Population quality	x_6	Percentage of population with college degree or above	%

The evolution characteristics of the spatial-temporal pattern of the coordinated development of pension insurance and economic development is the result of the interaction and mutual influence of various evaluation factors. This paper starts with the key factors that have an impact on both of them, and explores the degree of their role in the coupling and coordinated development of pension insurance and economic development. The more pension fund balance, the less reliance on local financial subsidies, the more local funds for economic development. The contribution rate and the contribution base determine the income of the endowment insurance fund, and affect the employment, employee wages, enterprise production efficiency and many other aspects in the market economy, which play a role in economic development. The pension benefit increase not only improves the pension security ability, but also stimulates domestic demand, promotes consumption and production, and promotes economic development. Fiscal decentralization will affect the power of local governments to collect taxes. Highly educated talents are an important support to promote industrial transformation and upgrading, often get stable jobs, and have a strong awareness of pension insurance and willingness to participate in insurance, which helps to improve the quality of pension insurance participation. Based on this, this paper selects pension fund balance, actual contribution rate, contribution base, pension increase, fiscal decentralization, and population quality (see Table 4) to establish a spatial measurement model.

In this paper, spatial Durbin model is used to analyze the spatial effect of the coordinated development of pension insurance and economic development. In order to avoid the degradation of spatial Durbin model into SEM model or SAR model, Wald test and maximum likelihood (ML) estimation test are carried out in this paper (Table 5). By comparing the significance of various models and variables, the spatial Durbin model with spatio-temporal double fixed effects was finally selected. Both Wald statistics and LR statistics passed the significance test of 1%, and the goodness of fit of the model was 0.858. At the same time, the Hausman test was used to choose between random effects and fixed effects, with a statistical value of 201.302. Random effects were rejected by the significance test.

As can be seen from Table 5, the value of spatial hysteresis coefficient is 0.126, which passes the significance test of 5%. It shows that the relationship between pension insurance and

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economic development coordination degree has obvious spatial positive spillover effect, and the coupling coordination degree of each region is not only affected by various factors in the region, but also affected by various factors in neighboring regions.

Table 5. The estimation and testing results of the SDM model

variable	No fixed effect	Individual fixation effect	Time-fixed effect	Time-space fixed effect	Random effect
intercept	3.0382***				
lnx1	0.8450***	0.4733***	0.8560***	0.4736***	0.4961***
lnx2	-0.0145***	-0.0081***	-0.0144***	-0.0090***	-0.0091***
lnx3	0.0715***	0.0383***	0.0713***	0.0386***	0.0375***
lnx4	-0.0008	-0.0007	-0.0011	-0.0011	-0.0011
lnx5	0.0042***	0.0022***	0.0043***	0.0023***	0.0031***
lnx6	0.0056***	0.0135***	0.0055***	0.0118***	0.0107***
W*lnx1	-0.1484	0.1245	-0.0112	0.1489	0.1067
W*lnx2	0.0094***	-0.0004	0.0039	-0.0056*	-0.0050
W*lnx3	-0.0493***	-0.0006	-0.0190	-0.0089	-0.0080
W*lnx4	0.0029**	0.0039***	0.0013	00019	0.0019
W*lnx5	0.0001	-0.0039***	0.0012	-0.0031**	-0.0015
W*lnx6	0.0006	-0.0135***	0.0003	-0.0151***	-0.0119**
R-squared	0.7409	0.8460	0.7585	0.8577	0.7986
log-likelihood	371.9173	531.2697	401.9009	567.6070	503.6583
W*dep.var.	0.3099***	0.4049***	0.1270**	0.1759***	0.11820***
Wald_spatial_lag	56.8251***	33.4088***	2.6417	25.2458***	20.0990***
Wald_spatial_error	26.8949***	24.1286***	13.6851**	28.6815***	24.4199***
LR_spatial_lag	589.1126***	34.1263***	2.7047	24.7997***	19.1208***
LR_spatial_error	433.5511***	24.7652***	13.8504**	28.2066***	23.8592***
Hausman test	Statistical value		DOF		P-value
	201.3015		14		0.0000

As can be seen from Table 6, fund balance is the main factor affecting the coordination degree between pension insurance and economic development. The direct effect and indirect effect are both significantly positive, being 0.481 and 0.277, indicating that the fund balance has a positive impact on the coordination between pension insurance and economic development in the region and neighboring areas. For each positive change of 1% in fund balance, the coordination degree between local pension insurance and economic development increases by 0.481%, and that in neighboring areas increases by 0.277%. The more abundant the accumulation of local pension funds, the lower the dependence on the transfer of central finance, so that more central finance is transferred to other regions, which has a positive impact on neighboring regions. Both the direct and indirect effects of the contribution rate are significantly negative, which are -0.009 and -0.008 respectively, indicating that the contribution rate has a negative impact on the association between the pension insurance and economic development in the local and neighboring areas. With a positive change of 1% in the contribution rate, the coordination degree between the local pension insurance and economic development decreases by 0.009%, and that in the neighboring areas decreases by 0.008%. The increase of the contribution rate will increase the operating costs of enterprises, reduce the disposable income of employees in

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the current period, inhibit consumption, and adversely affect economic development, and reduce the coordination between local pension insurance and economic development. The direct effect of the contribution base is 0.038, and the significance level test of 5% indicates that increasing the contribution base can improve the coordination degree between local pension insurance and economic development, but has no significant spillover effect on neighboring regions. At present, the contribution base of pension insurance is significantly lower than the theoretical level, in 2017, the contribution base of 2/3 provinces is less than 60% of the average salary of employees in the previous year, indicating that local governments have relaxed the supervision of pension insurance collection and payment, forming a financing model of "high contribution rate + low contribution base".

Table 6. The direct effect, indirect effect and total effect of the SDM model

	direct effect		indirect effect	
variable	coefficient	t-value	coefficient	t-value
x1	0.4813***	5.5414	0.2773*	1.7607
x2	-0.0092***	-5.7373	-0.0084**	-2.2361
x3	0.0383**	2.7393	-0.0017	-0.0455
x4	-0.0010	-1.1575	0.0020	1.0938
x5	0.0022***	2.7592	-0.0032*	-1.9379
x6	0.0113***	4.4263	-0.0152**	-2.5268

The direct effect of pension increase is -0.001, which does not pass the significance test. Pension increases boost the spending power of retirees, and consumption boosts the economy. However, there is a gap in the pension level between regions, and the adjustment behavior of "keeping up with each other" and "pulling up and matching" increases the financial pressure of the system. Especially with the extension of population life expectancy, pension adjustment has no significant relationship to the coordination between pension insurance and economic development. The direct effect of fiscal decentralization is 0.002, that is, it has a positive effect on the coordination relationship between pension insurance and economic development. The higher the degree of fiscal decentralization, the more financial funds the local government can independently control. Through reasonable allocation of resources, the local government can promote the economic development of the jurisdiction. Although the local government relaxes the collection and management, it is still conducive to the coordinated development of the regional pension insurance and economic development. Moreover, the degree of fiscal decentralization has a significant spillover effect. The increase of fiscal decentralization enhances the vitality of local economy and attracts liquidity resources and enterprises from surrounding areas to settle down. The siphon effect limits the economic development and pension insurance development of neighboring areas, and has a negative impact on the coordinated development of pension insurance and economic development in neighboring areas. Highly educated talents promote economic development and endowment insurance development, improve the coordinated development of endowment insurance and economic development in the region, and have a negative impact on neighboring areas. A 1% increase in the proportion of highly educated talents can promote the coordination degree between local pension insurance and economic development to increase by 0.011%, and reduce by 0.015% in neighboring areas.

4. Conclusion

By constructing the evaluation index system of pension insurance and economic development, this paper measures the coordination between the basic pension insurance of enterprise

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employees and economic development from 1997 to 2017, and analyzes the factors affecting the coordination between pension insurance and economic development through the spatial Durbin model. The research shows that the coupling coordination between pension insurance and economic development is steadily increasing. The interaction between pension insurance and economic development is increasing. In order to further promote the coordinated development of the two, we should increase the financial autonomy of local governments and the training of highly educated talents. At the same time, the establishment of incentive and restraint mechanisms to promote the national pooling of pension insurance funds.

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