SciencePG
Science Publishing Group

Research Article

Characteristics and Influencing Factors of the Uncoordinated Coupling Between Higher Education and Regional Economy in Yunnan Province

Xuefeng Li[1, *] , Sheng Liao[2] , Ke Gao[3, 4]

[1]Faculty of Education, Yunnan Normal University, Kunming, China

[2]China Media Group, Beijing, China

[3]School of Economics and Management, Shandong Youth University of Political Science, Jinan, China

[4]Shandong Agricultural Development Credit Guarantee Co., Ltd, Jinan, China

Abstract

The relationship between higher education and regional economy has always been a hot topic in academic circles. This paper explored the influencing factors of the uncoordinated coupling between higher education and regional economy in Yunnan Province from 2010-2021. The main conclusions of this paper are as follows: Firstly, based on spatial durbin model, it studied the influence of the per capita disposable income of urban residents on the uncoordinated coupling between higher education and regional economy. The results show that per capita disposable income has a positive effect on the coordinated development between higher education and regional economy, but it has negative effect on the coordinated development between higher education and regional economy in neighboring cities. Secondly, A spatial heterogeneity analysis was based on the background of "Double First-rate". The results show that after "Double First-rate", the per capita disposable income of urban residents reduces the uncoordinated coupling between local higher education and regional economy, but improves the uncoordinated development between higher education and regional economy in the neighboring areas. Finally, expenditure on education and science both play a completely mediating role in the relationship between the per capita disposable income and uncoordinated coupling.

Keywords

Higher Education, Regional Economy, Uncoordinated Coupling

1. Introduction

The academic research on the realationship between higher education and regional economy mainly includes two aspects. On the one hand, to explore the influencing factors of the coordinated development between higher education and regional economy, Scholars have proposed multiple factors affecting the coordinated development from different perspectives, For example, strengthening industry-university-research cooperation [1], Scientific and technological Innovation [2], Market level and market competition [3], university-enterprise cooperation [4], Household

consumption level [5], etc., However, some scholars suggest that the ability of scientific and technological innovation has no significant impact on the coordinated development between higher education and regional economy [6]. On the other hand, some researches focus the analysis of the influence mechanism between higher education and regional economy, such as Zhang Maocong used provincial panel data, explored the relationship between the regional economic growth and higher education, reveals the urbanization plays a mediating role in the relationship between higher education scale and regional economic growth, the higher education scale by promoting urbanization, to promote regional economic growth [7]. Some scholars have also confirmed the scientific and technological innovation ability play a mediating role in the relationship between higher education and regional economy [8].

From the previous studies, many studies have focused on the impact of per capita disposable income on higher education, For example, there is a long-term and stable dynamic equilibrium relationship between per capita disposable income and the scale of higher education [9], the per capita disposable income of rural residents has a direct impact on the scale of higher education [10], the per capita disposable income of regional residents has a significant negative impact on the scale of open education [11], etc.; Some other studies have also analyzed the impact of per capita disposable income on the regional economy, For example, per capita disposable income influences the coordinated coupling between the living environment and economic development [12], tourism and economy [13], ecological environment and economic development [14], social security and economic development [15], etc.;. However, few studies have discussed the impact of per capita disposable income on the coordinated coupling between higher education and regional economy. This paper will analyze the impact of per capita disposable income on the coordinated coupling between higher education and regional economy. Meanwhile, studies have shown that the close connection between education and science spending on higher education [16, 17] and regional economic development [18, 19]. Therefore, this paper will confirm the role of education and technology expenditure play on the relationship between the per capita disposable income and uncoordinated couplin of higher education and regional economy.

2. Model Construction and Variable Selection

Higher education and regional economy may show coupling or uncoupled coordination in different regions or different time stages. This paper will build the uncoupled coordination model between higher education and regional economy, so as to reveal the uncoupled coordinated development trend between higher education and regional economy in different cities in Yunnan Province from 2010 to 2021. The

specific steps are as follows:

(1) Build a coupling model. For the two systems of higher education and regional economy, the calculation methods are as follows:

$$C = \frac{2\sqrt{U_1} * \sqrt{U_2}}{U_1 + U_2}$$

In tha equation, C represents the coupling degree between the higher education and the regional economy, and which value is between 0 and 1. When the value of C is 0, it indicates that the coupling degree between higher education and regional economy has reached the minimum value, that is, the two will be disordered development; when the value of C is 1, it indicates that the coupling degree between higher education and regional economy has reached the maximum value, indicating that the two systems will show the trend of orderly development. In this paper, U1 represents the higher education system; U2 represents the regional economic system.

(2) Build the coupling degree model as follows:

$$D = \sqrt{C} * \sqrt{T}$$

$$T = xU_1 + yU_2$$

In the equations, D represents the coordination coupling degree between higher education and regional economy; C represents the coupling degree between higher education and regional economy; T represents the comprehensive coordination index of higher education system and regional economic system; x, y represents the coefficient. Higher education is as important as regional economy. Consider previous study [20], this paper assigns the coefficient to 0.5.

(3) Build uncoordinated coupling model, the calculation method is as follows:

$$ND = 1 - D$$

In the equation, ND indicates the uncoordinated coupling between higher education and regional economy, which value is between 0-1. When the value of ND is closer to 0, the lower uncoordinated coupling level between higher education and regional economy, which means the more coordinated development between higher education and regional economy, But when the value is closer to 1, the higher uncoordinated coupling level between higher education and regional economy. Referring to the previous study, $0 < ND \leq 0.2$ is the first stage of non-coordination level; $0.2 < ND \leq 0.5$ is the second stage of non-coordination level; $0.5 < ND \leq 0.8$ is the third stage of non-coordination level; $0.8 < ND < 1.0$ is the fourth stage of non-coordination level.

This paper focus what factors influence the uncoordinated coupling between higher education and regional economy in

Yunnan province. Consider the value of dependent variable is between [0 1], the least squares method (OLS) is not suitable to be used, for there may be a large bias in the estimation results. The spatial measurement model is suitable to test the influence of the uncoordinated coupling between higher education and regional economy and its spatial spillover effect. The equation of the spatial measurement model is as follows:

$$Y_{it} = \alpha \sum_{j=1}^{n} W_{ij} Y_{jt} + \beta X_{it} + \gamma \sum_{j=1}^{n} W_{ij} X_{jt} + \delta_i + \theta_t + \zeta_{it}$$

$$\zeta_{it} = \lambda \sum_{i=1}^{n} \sum_{j=1}^{n} W_{ij} \zeta_{jt} + \epsilon_{it}$$

In the above formula, Y_{it} represents the uncoordinated coupling degree between higher education and regional economy in t th year and i th city, α is the spatial autocorrelation coefficient of the explained variable; X_{jt} represents the set of all independent variables in t th year and i th city, β is the

estimated coefficient of the independent variable; γ is the spatial autocorrelation coefficient of the independent variable; W_{ij} is the spatial weight matrix element of i th and j th city; δ_i and θ_t are spatial and temporal fixed effects respectively; ζ_{it} is the spatial error term; λ is the spatial autocorrelation coefficient of disturbance items. SDM model for $\lambda = 0$; SAR model for $\lambda = \gamma = 0$, SEM model for $\alpha = \gamma = 0$.

Selection of variables: the dependent variable is the uncoordinated coupling degree between higher education and regional economy, the independent variable is per capita disposable income, the control variables include foreign direct investment, the number of practicing doctors and the urbanization rate, and the mediator variable is expenditure on education and science.

The mediation model is built with its basic expression form being as follows:

$$Y_i^* = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon_{it}$$

$$\begin{cases} Y_i = Y_i^* & (if \ Y_i^* < 1) \\ Y_i = 1 & (if \ Y_i^* \geq 1) \end{cases}$$

In the equation, β_1 presents the influence of per capita disposable income on the dependent variable, if it becomes less significant after adding mediator variable, it means that expenditure on education and science plays a complete mediating role in the relationship between the uncoordinated coupling of higher education and regional economy.

3. The Results of the Empirical Analysis

3.1. Descriptive Analysis

According to the calculation formula of the uncoordinated coupling model, the uncoordinated coupling between higher education and regional economy in various cities in Yunnan Province from 2010 to 2021 is calculated, and the results are shown in Table 1. The average value of uncoordinated coupling degree between higher education and regional economy in Kunming and Dali is 0.180 and 0.498, which is at the first and second stage of non-coordination level. Specifically, the uncoordinated coupling degree between higher education and regional economy in Kunming is always at the first stage of non-coordination level in the last decade,, which indicates that the positive interaction between higher education and regional economy is gradually significant, and showing a coordinated

state. The uncoordinated coupling in Dali is relatively stable, fluctuating between the second and third stage of non-coordination level. Except for Kunming and Dali, the higher education and regional economic systems in other cities of Yunnan Province are almost at the third stage of non-coordination level. The average value of uncoordinated coupling degree from low to high is Honghe (0.507), Dehong (0.519), Qujing (0.539), Yuxi (0.543), Wenshan (0.543), Banna (0.546), Baoshan (0.562), Chuxiong (0.563), Zhaotong (0.569), Lijiang (0.569), Lincang (0.583) and Pu'er (0.601). From the perspective of the changing trend of the uncoordinated coupling degree, there are large differences among the various cities. The uncoordinated coupling degree of Qujing, Wenshan, Honghe and other cities has decreased steadily, while Baoshan, Pu'er, Lincang, Chuxiong, Dehong and other cities is rising steadily, Yuxi and Banna first drops and then rises, Zhaotong and Lijiang increased first and then decreased. The above results indicate that the relationship between higher education and regional economy in Qujing, Wenshan and Honghe cities is getting closer and closer, but in Baoshan, Pu'er, Lincang, Chuxiong and Dehong is becoming weaker and weaker, Yuxi and Banna is first strengthened and then weakened, Zhaotong and Lijiang is first weakened, and then strengthened.

Table 1. Evolution of uncoordinated coupling between higher education and regional economy in Kunming, Qujing, Yuxi, Baoshan, Zhaotong, Lijiang and Pu'er from 2010 to 2021.

Year	City						
	Kunming	Qujing	Yuxi	Baoshan	Zhaotong	Lijiang	Pu'er
2010	0.2689	0.5749	0.5625	0.5390	0.5425	0.5599	0.5604
2011	0.2476	0.5764	0.6191	0.6145	0.5383	0.5992	0.5618
2012	0.2285	0.5866	0.4841	0.4708	0.5226	0.5087	0.5472
2013	0.1952	0.5223	0.5842	0.4962	0.5491	0.6032	0.5560
2014	0.1942	0.5442	0.5923	0.5495	0.6132	0.6454	0.5698
2015	0.1796	0.5246	0.5163	0.5381	0.5888	0.6542	0.5543
2016	0.1559	0.5206	0.5083	0.5306	0.5977	0.6663	0.5927
2017	0.1465	0.5261	0.5051	0.5528	0.5998	0.5280	0.6411
2018	0.1517	0.4999	0.5171	0.5648	0.6102	0.5059	0.7150
2019	0.1288	0.5223	0.5287	0.6108	0.5894	0.4926	0.6824
2020	0.1357	0.5212	0.5354	0.6279	0.5654	0.5217	0.6250
2021	0.1275	0.5437	0.5606	0.6500	0.5101	0.5436	0.6061

Table 2. Evolution of uncoordinated coupling between higher education and regional economy in Lincang, Dali, Wenshan, Honghe, Chuxiong and Dehong from 2010 to 2021.

Year	City						
	Lincang	Dali	Wenshan	Honghe	Banna	Chuxiong	Dehong
2010	0.5886	0.5282	0.5523	0.5754	0.5613	0.5745	0.4993
2011	0.5594	0.5013	0.5195	0.5672	0.5443	0.5499	0.4610
2012	0.5343	0.5063	0.5291	0.5201	0.5146	0.5455	0.4572
2013	0.5439	0.5007	0.5444	0.5161	0.4965	0.5529	0.7832
2014	0.5404	0.5049	0.5482	0.5126	0.4900	0.5452	0.5290
2015	0.5036	0.4921	0.5461	0.4846	0.5020	0.5504	0.5296
2016	0.5612	0.4875	0.6471	0.4768	0.5105	0.5447	0.5234
2017	0.6012	0.5021	0.5081	0.4687	0.5099	0.5521	0.4229
2018	0.6387	0.5202	0.5070	0.4646	0.4779	0.5318	0.4324
2019	0.6521	0.4340	0.5367	0.4556	0.5400	0.6046	0.4782
2020	0.6643	0.4963	0.5504	0.4993	0.6336	0.6120	0.5159
2021	0.6057	0.5038	0.5296	0.5382	0.7658	0.5949	0.5938

3.2. Benchmark Regression

This paper used panel data in Yunnan province from 2010-2021, due to the higher education and regional economy of different cities has different characteristics, fixed effect model would be suitable, and through the Hausman test, then contrast fixed effect of space, time fixed effect and space and time fixed effect, finally choose the most appropriate model to estimate. The results of the LM test showed that the null hypothesis of no spatial error term was rejected at the 1% level (LM spatial lag=3.35, robust LM spatial lag=10.03; LM spatial error=4.35, robust LM spatial error=14.03), indicating that the SDM model with temporal and spatial fixed effects should be used in this study.

Benchmark regression results are shown in Table 3. It can be seen that the direct and indirect effects of per capita disposable income are significant, but the total effect is not sig-

nificant. Among the control variables, the direct effect, indirect effect and total effect of the number of practicing doctors are significant, but foreign direct investment and urbanization rate are not significant. The above results show that with the increase of per capita disposable income, the uncoordinated coupling between higher education and regional economy will decrease, that is, the per capita disposable income has a positive effect in promoting the coordinated development of higher education and regional economy. Meanwhile, the per capita disposable income has a significant influence on the coordinated coupling between higher education and regional economy in adjacent cities, which means that the per capita disposable income has significant negative spatial spillover effect, that is, cities with high per capita disposable income have a certain inhibitory effect on the coordinated development of higher education and regional economy in the surrounding areas.

Table 3. *Direct, indirect, and total effects of the spatial Dubin model.*

Variable	Effect					
	Direct effect		Indirect effect		Total effect	
	coefficient	Z score	coefficient	Z score	coefficient	Z score
the number of practicing doctors	-0.0415*	-1.83	-0.1220***	-2.67	-0.1636***	-3.20
foreign direct investment	-0.0002	-0.06	0.0001	0.02	-0.0001	-0.02
urbanization rate	-0.0723	-1.52	0.0515	0.56	-0.0209	-0.20
per capita disposable income	-0.0308**	-2.00	0.0428**	2.15	0.0120	-0.29

Note: *, * *, * * * are significant at the 10%, 5%, and 1% levels.

3.3. Heterogeneity Analysis

Considering that the Ministry of Education officially implemented the double first-class construction in 2016 and the first round of double first-class construction cycle is 2016-2020, this paper conducts the heterogeneity test in 2010-2016 and 2017-2021, so as to reflect the impact of the implementation of the higher education reform on the coordinated development of higher education and regional economy in Yunnan Province. The results are shown in Table 4. It can be seen that during the period from 2010 to 2016, the direct, indirect and total effects of per capita disposable in-

come were not significant, while during 2017-2021, the direct and indirect effects of per capita disposable income were significant, but the total effect was still not significant. The results show that after the double first-class construction, urban residents per capita disposable income restrained the uncoordinated coupling between the local higher education and regional economy, but improved it in the neighboring areas, which means that the neighboring economy developed cities backward areas, should pay attention to improve the local residents per capita disposable income, so as to ensure the coordinated development of higher education and regional economy.

Table 4. Test of heterogeneity in 2010-2016 and 2017-2021.

	2010-2016			2017-2021		
	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect
the number of practicing doctors	-0.0081	0.0025	-0.0056	-0.0548*	-0.1066**	-0.1614***
foreign direct investment	0.0018	0.0022	0.0040	-0.0069	-0.0023	-0.0092
urbanization rate	-0.0365	0.1775	0.1410	-0.0653	0-0.1522	-0.2176*
per capita disposable income	-0.0025	0.0307	0.0284	-0.0315*	0.0468*	0.0153

3.4. Robustness Test

The analysis results were tested for robustness using the independent variable lag phase I, and the results are shown in Table 5. It can be seen that the direct and indirect effects of per capita disposable income are still significant, and the symbols is consistent with the base regression, which indicates that the analysis results of the spatial Dubin model in Table 1 are robust.

Table 5. Results of the robustness test for independent variables.

Variable	Effect					
	Direct effect		Indirect effect		Total effect	
	coefficient	Z score	coefficient	Z score	coefficient	Z score
the number of practicing doctors	-0.0614**	-2.20	-0.1064*	-1.67	-0.1677*	-1.83
foreign direct investment	-0.0036	-0.18	-0.0279	-0.97	-0.0305	-0.15
urbanization rate	0.0453	1.20	0.2198*	1.68	0.2651	-0.29
per capita disposable income (A lag phase)	-0.0501**	-2.22	0.0337*	1.65	-0.0164	-0.16

3.5. Mediation Effect Test

According to the previous analysis, expenditure on education and science were mediator variables, and the results of the mediation effect test are shown in Table 6 and Table 7. It can be seen from Table 6 that after adding variable of the expenditure on education, both the direct effect and the indirect effect of per capita disposable income are no longer significant. Meanwhile, the direct effect of expenditure on education is significant, but both the indirect effect and the total effect are not significant. The results show that the expenditure on education has a positive effect on the coordinated coupling between higher education and regional economy. At the same time, expenditure on education plays a completely mediating role in the relationship between the uncoordinated coupling of higher education and regional economy. This means that cities should not only pay attention to increase the per capita disposable income, but also focus the reasonable distribution of public financial expenditure, such as appropriately increase education expenditure, so as to promote the coordinated development between higher education and regional economy. In addition, for the backward areas adjacent to cities with high per capita disposable income, the negative impact of neighboring developed cities on the coordinated development of local higher education and regional economy can also be reduced by increasing education expenditure.

Table 6. Results of the mediation effect test of expenditure on education.

| Variable | Effect | | | | | |
| | Direct effect | | Indirect effect | | Total effect | |
	coefficient	Z score	coefficient	coefficient	Z score	coefficient
the number of practicing doctors	-0.0489*	-2.29	-0.1287***	-2.78	-0.1776***	-3.41
foreign direct investment	-0.0031	0.65	-0.0006	-0.09	-0.0025	0.31
urbanization rate	-0.0409	-0.84	0.1110	0.0957	-0.0209	-0.20
per capita disposable income	-0.0689	-1.47	-0.0626	-0.77	-0.1315	-1.43
expenditure on education	-0.0944**	-2.49	-0.0651	-0.94	-0.0707	0.63

As can be seen from Table 7, after adding variable of the expenditure on science, the direct effect of expenditure on science is significant, but the indirect effect and the total effect are not significant, and the effects of per capita disposable income are no longer significant. The above results show that scientific expenditure has a positive role in promoting the coordinated development between higher education and re-gional economy, and plays a complete mediating role in the relationship between the per capita disposable income and uncoordinated coupling. Therefore, the increase of urban scientific expenditure will promote the coordinated development between local higher education and regional economy.

Table 7. Results of the mediation effect test of expenditure on science.

| Variable | Effect | | | | | |
| | Direct effect | | Indirect effect | | Total effect | |
	coefficient	Z score	coefficient	coefficient	Z score	coefficient
the number of practicing doctors	-0.0415*	-1.83	-0.1220***	-2.67	-0.1636***	-3.20
foreign direct investment	-0.0002	-0.06	0.0001	0.02	-0.0001	-0.02
urbanization rate	-0.0723	-1.52	0.0515	0.56	-0.0209	-0.20
per capita disposable income	-0.0133	0.44	-0.1242	0.99	-0.1375	1.35
expenditure on science	-0.0323***	-3.03	0.0107	0.82	-0.0216	0.97

4. Conclusion

In this paper, the spatial Dubin model is used to examine the effect of per capita disposable income on the uncoordinated coupling between higher education and regional economy. This study found that per capita disposable income has a significant inhibitory effect on the uncoordinated coupling between higher education and regional economy, But at the same time, it can promote the uncoordinated coupling of neighboring areas. Heterogeneity analysis result showed that, during the period of 2010-2016, the direct, indirect and total effects of per capita disposable income were not significant, While during the 2017-2021 period, both the direct and indirect effects were significant, and the total effect was still not significant; The mediation effect test results showed that, expenditure on education and science both play a completely mediating role in the relationship between the per capita disposable income and uncoordinated coupling.

Abbreviations

DFr　Double First-rate (The construction of "Double First-class" aims to cultivate world-class universities and disciplines, and enhance the strength of China's higher education and international competitiveness. By increasing investment, strengthening scientific research innovation, optimizing management and evaluation, the overall level of higher education in China has been significantly improved, and a number of universities have become world-class universities, providing talent and intellectual support for economic and social development.)

Acknowledgments

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Zhang Wenli. Study on the influence of local higher education on the structure transformation and coordinated development of regional economic [J]. Journal of Jilin Agricultural Science and Technology University, 2024, 33(01): 13-18.

[2] Sun Gangcheng, Yang Hua. The coupling of urban clusters and higher education clusters and their impact on economic development —— Based on the empirical analysis of the statistical data of the three major urban clusters from 2012 to 2021 [J]. Journal of Tianjin Academy of Education and Science, 2024, 36(01): 33-46.

[3] Song Meizhe, Li Mengsu. Analysis of the coupling and coordination relationship between higher education, scientific and technological innovation and economic development [J]. Modern Education Management, 2019, (03): 19-25. https://doi.org/10.16697/j.cnki.xdjygl.2019.03.004

[4] Zhou Lifeng, Lin Yang. Study on the coupling and coordination between higher education and regional economic development in Hubei Province [J]. Yangtze River Technical Economy, 2023, 7(02): 117-123. https://doi.org/10.19679/j.cnki.cjjsjj.2023.0220

[5] CAI Wenbo, Chen Niannian. Coupling and coordinating effect of higher education, scientific and technological innovation and economic growth in urban agglomeration of Yangtze River Economic Belt [J]. Modern Education Management, 2022, (11): 33-42. https://doi.org/10.16697/j.1674-5485.2022.11.005

[6] Guo Shuya, He Yunfeng, Xu Yunfang. The pling coupling of higher education and economy in six central provinces under the integration of education science and technology talents [J]. Research on Education and Accounting, 2023, 34(03): 3-13.

[7] Zhang Maocong, Xue Xiangyu. Study on the Mechanism of Higher Education Scale, Urbanization and Regional Economic Growth —— Evidence based on provincial panel data [J]. Journal of Yantai University (Philosophy and Social Sciences Edition), 2024, 37(01): 19-28 + 93. https://doi.org/10.13951/j.cnki.issn1002-3194.2023.1204.03

[8] Wang Yiran, Xu Wenqi, Zhang Lihua. The interaction mechanism and coupling strategy of higher education, scientific and technological innovation ability and regional economy [J]. Journal of the National School of Education Administration, 2023, (03): 51-59.

[9] Zhu Yingchun, Wang Dapeng. Empirical study on the impact of economic development on the scale of higher education [J]. Statistics and Decision Making, 2010, (10): 78-80. https://doi.org/10.13546/j.cnki.tjyjc. 2010.10.028

[10] Miao Wenli, Bu Jing. Empirical study on the influencing factors of college enrollment scale in China —— Based on the coordinated development of higher education and economy and society [J]. Journal of China University of Mining and Technology (Social Science edition), 2013, 15(02): 59-66.

[11] Bai Xue, Zhang Xiang, Cui Naipeng. Study on the external influence mechanism of open education enrollment scale [J]. Chinese journal of distance education, 2022, (10): 40-47+75. https://doi.org/10.13541/j.cnki.chinade.2022.10.008

[12] Zhang Da. Study of the difference in the coordination between habitat environment and economic development in the central cities of the Yangtze River Economic Belt and Its influencing factors [J]. 2020, 42(06): 79-88. https://doi.org/10.13718/j.cnki.xdzk.2020.06.010

[13] Gao Nan, Zhang Xincheng, Wang Linyan, et al. An Empirical Study on the Coupled and Coordinating Relations between Rural Tourism and Rural Economy in China [J]. Journal of Shaanxi Normal University (Natural Science Edition), 2018, 46(06): 10-19.

[14] Gu Haoxin, Qin Weishan, Zhao Mingming, Sun Haiyan, Wang Fuxi. Spatial and temporal evolution and influencing factors of coordinated development of tourism economy and ecological environment in the Yellow River Basin [J]. Arid Land Geography, 2022, 45(02): 628-638.

[15] Li Qiong. The spatial and temporal characteristics and driving force analysis of the coupling between social security and economic development in China [J]. Geographical Research, 2020, 39(06): 1401-1417.

[16] Liu Hui, Ma Junfeng. Competitive Government: An explanation for the expansion of China's Higher Education [J]. Journal Of East China Normal University, 2022, 40(10): 42-53. https://doi.org/10.16382/j.cnki.1000-5560.2022.10.004

[17] Chen Wen Bo. A comparative study of the structure of Higher Education funds input and expenditrue: Based on OECD country data analysis [J]. China Economics of education review, 2021, 6(05): 42-65. https://doi.org/10.19512/j.cnki.issn2096-2088.2021.05.003

[18] Zhang Tonggong, Zhang Long, Zhao Dezhi. Public education expenditure, human capital accumulation and Economic Growth: The perspective of regional differences [J]. Macroeconomic Research, 2020, (03): 132-144+175. https://doi.org/10.16304/j.cnki.11-3952/f.2020.03.012

[19] Qi Chang Hou, Yue Xi Ming. Structure of fiscal expenditrue and economic development: A new interpretation of Wagner's Law. Economic Theory and Business Management, 2020, (07): 43-57.

[20] Zhang Jun, Zhang Yan. Measurement and analysis of the coupling and coordination between ecological agriculture and ecological tourism based on the gray system theory —— Take Hunan Province as an example [J]. Eco-economy, 2020, 36(02): 122-126 + 144.