An empirical analysis of the prosperity of tertiary sector and residents' income and employment--Sample data of Zhejiang, Anhui and Sichuan provinces from 2006 to 2020, for example

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Abstract. With the rapid development of China's economy, the tertiary industry has become the main force driving China's economic growth and absorbing employed people. The article conducts an empirical analysis of the relationship between the development of China's tertiary industry and residents' income and employment. This paper applies the panel data of a total of 48 cities in Zhejiang, Anhui and Sichuan provinces from 2006 to 2020 to regress the tertiary industry development on residents' income and residents' employment respectively, obtaining three results: (1) the tertiary industry has the most significant pulling effect on residents' income in each province.(2) the output value of the tertiary industry shows a negative correlation with the number of residents' employment, but the number of employed people in the tertiary industry is negatively correlated with the number of employed people. (3) there is regional heterogeneity in the income and employment of residents in different regions affected by the development of the tertiary industry. Finally, the paper proposes policy implications for the development of tertiary industry in China.

Keywords: Tertiary industry; Residential employment and income; Fixed-effect Model.

1. Introduction

These days, the tertiary industry has become the main force driving China's economic growth and absorbing employed people.In order to guide the development of the tertiary industry to promote the development of China's residents' income and employment, the relationship between the development of the tertiary industry and China's residents' income and employment needs to be urgently explored.

This paper firstly compares the literature related to the development of tertiary industry and residents' income and employment, which provides a theoretical basis for this paper to study the relationship between the development of tertiary industry and residents' income and employment. Secondly, it selects the indicators that affect residents' income and employment and reflect the development of tertiary industry, organizing the data based on the statistical yearbook and Guotaian database, so as to provide support and help for the subsequent research work. Finally, the relationship between tertiary industry development and residents' income and employment is modeled by the stepwise forward-fixed-effects model.The impact of tertiary industry development on residents' income and employment is analyzed in detail from the perspective of economics.The robustness of the model and regional heterogeneity are examined by robustness test and heterogeneity analysis, respectively. Conclusions and policy inspirations are put forward comprehensively.

2. Literature review

By analyzing the existing scholarly literature at present, its found that the output value of tertiary industry, the number of employed persons in tertiary industry, per capita disposable income, the

number of employed persons and employment elasticity are often selected as indicators for research. To explore the link between the tertiary sector and residents' income situation, Wang Di (2017)[1] established a fixed effect model, Huang Yongkang and Lu Zhiguo (2018)[2] established a VAR model with Granger causality test. Kang Yuhao (2019)[3] used regression analysis with correlation analysis, Dang Xinxin, Zhou Lijuan and Wang Kangquan (2021)[4] established a semi-parametric regression model. The conclusions state that the tertiary industry plays a significant positive role on the income of urban residents.

To explore the link between the tertiary sector and employment of residents, Li Jing and Yu Hua (2022) [5] used correlation analysis with coordination coefficient analysis, Wang Shuyao (2020) [6] used the cointegration test, stationarity test and Granger causality test, Zheng Linlin and Lv Yueying (2010)[7] used ordinary linear regression, and Cui Lixin and Wu Xinqian (2021)[8] used multiple linear regression. The conclusions state that the tertiary industry has great potential to drive employment of residents, but the growth rate is sometimes in significantly reflected.

The literature has basically given the preliminary conclusions of the study, but there are still shortcomings: the sample selection is relatively limited and small, besides, the consideration of other control variables is insufficient. In this paper, we select the data samples of three provinces in the east-west and central regions of China for the past 15 years, determine a better variable system, establish a stepwise fixed-effects regression model combined with correlation analysis, so as to present the link between the development of tertiary industry and residents' income and employment in a comprehensive manner.

3. Selection of variables and samples and corresponding analysis

3.1 Variable selection

Explained variables: disposable income of residents Y1 and the number of urban residents employed Y2.

Core variable: tertiary industry output value L3 is selected to reflect the level of tertiary industry development.

Control variables: output value of primary industry L1, output value of secondary industry L2, average annual wage of urban population AAS, urban per capita consumption expenditure PCE, urban permanent population POP, and employment population of tertiary industry ET.

3.2 Sample selection and data sources

In order to conduct the study more comprehensively, this paper select the data of 48 cities from 2006 to 2020 in China, Zhejiang Province (Eastern Region), Anhui Province (Central Region) and Sichuan Province (Western Region), with the help of statistical yearbook and Guotaian database platform. The data is arranged in descending order according to the average value of GDP, and the stratified sampling is performed respectively to select a total of 135 samples of panel data from 9 prefecture-level cities. These cities are: Hangzhou, Taizhou, and Zhoushan; Hefei, Chuzhou, and Huangshan; Chengdu, Neijiang, and Ganzi Tibetan Autonomous Prefecture.

3.3 Research data and descriptive statistics

In order to make the data more stable, the index data is processed logarithmically in this paper. Descriptive statistics were conducted on the processed data again, and the results are shown in Table 1:

Table.1. Descriptive statistics of processed data

Variable	Mean	Std. Dev.	Min	Max
lnL1	4.90	0.806	2.56	6.48
lnL2	6.50	1.40	3.09	8.78
lnL3	6.48	1.52	3.22	9.36

lnAAS	10.76	0.480	9.56	11.8
lnPCE	9.80	0.455	8.66	10.6
lnPOP	5.93	0.916	4.53	7.65
lnET	4.46	1.08	2.45	6.50

According to the results in Table 1, it can be concluded that the highest natural logarithm mean value is the AAS index while the lowest is the ET index, and the natural logarithm mean values of the secondary and tertiary industries in the three major industries are higher than those of the primary industry, of which the maximum and minimum values of the tertiary industry are higher than those of the secondary industry. Besides, after logarithmic processing, the standard deviation of each data is between 0.45 and 1.55, which means the volatility is weak.

4. Empirical analysis of tertiary industry and residents' income and employment

4.1 Regression analysis of the fixed effects of tertiary industry development on residents' income and employment

A fixed-effects model is constructed to estimate the influencing factors of residents' income and residents' employment. Forward stepwise regression was used and each group of variables was put into logical order according to economic output, income expenditure, population size, employed persons and education level.

Set the explanatory variables Yn (n=1, 2) with each variable fixed effects model equation as follows.

$$lnY1 = \alpha_0 + \beta_1 ln\mathrm{L1}_{it} + \beta_2 ln\mathrm{L2}_{it} + \beta_3 ln\mathrm{L3}_{it} + \beta_4 ln\mathrm{AAS}_{it} + \beta_5 ln\mathrm{PCE}_{it} + \beta_6 \mathrm{lnPOP}_{it} + \varepsilon_{it} \quad (1)$$

$$lnY2 = \alpha_0 + \beta_1 ln\mathrm{L1}_{it} + \beta_2 ln\mathrm{L2}_{it} + \beta_3 ln\mathrm{L3}_{it} + \beta_4 ln\mathrm{PCE}_{it} + \beta_5 ln\mathrm{POP}_{it} + \beta_6 ln\mathrm{ET}_{it} + \varepsilon_{it} \quad (2)$$

where α is the constant term, β is the regression coefficient, ε is the random disturbance term, while i is the unit of each municipality.The regression results are shown in Table 2 below.

Table.2. The fixed effect model of tertiary industry on residents' income and employment

	lnY1				lnY2		
Code	(1)	(2)	(3)	Code	(4)	(5)	(6)
lnL1	0.352***	0.216***	0.232***	lnL1	0.298	0.419	0.075
	(0.053)	(0.048)	(0.049)		(0.215)	(0.232)	(0.073)
lnL2	0.095*	0.008	0.018	lnL2	0.320*	0.385*	0.088
	(0.037)	(0.033)	(0.033)		(0.149)	(0.157)	(0.050)
LnL3	0.390***	0.217***	0.234***	LnL3	-0.249*	-0.197	-0.253***
	(0.029)	(0.034)	(0.036)		(0.119)	(0.125)	(0.039)
lnAAS		0.371***	0.340***	lnPCE		-0.290	-0.027
		(0.062)	(0.064)			(0.216)	(0.068)
lnPCE		0.115*	0.112*	lnPOP			0.316***
		(0.047)	(0.046)				(0.096)
lnPOP			-0.101	lnET			0.875***
			(0.061)				(0.029)
Cons	5.288***	2.535***	3.243***	Cons	3.530***	5.020***	0.632
	(0.097)	(0.372)	(0.563)		(0.396)	(1.178)	(0.627)
R-sq	0.971	0.980	0.981	R-sq	0.162	0.174	0.922
Adj.R-sq	0.968	0.978	0.978	Adj.R-sq	0.087	0.093	0.912

Standard errors in parentheses * p<0.05, ** p<0.01, *** p<0.001

According to the results in Table 2, in terms of residents' income, the values of lnL1, lnL2 and lnL3 in model (1) show significance, but the variable coverage is not comprehensive.The model should be excluded; in model (2), the control variable lnL2 turns from significant to insignificant .The

model should be excluded; in model (3), the overall goodness-of-fit of the model has been greatly.Besides, the overall goodness of fit of the model is improved, and the variables are covered comprehensively.Considering the significance of the core explanatory variables, control variables and the goodness-of-fit values of the model, model (3) is taken as the final model.According to the results of model (3), lnL1, lnL2, and lnL3 are all significantly positive at the 0.1% level, indicating that the development of primary, secondary, and tertiary industries has a significant positive effect on residents' income. lnAAS and lnPCE are significantly positive at the 0.1% and 5% levels, respectively, indicating that the increase in residents' average annual wages and residents' per capita consumption expenditure has a positive effect on the overall.This indicates that the increase in annual average wage and per capita consumption expenditure has a positive pulling effect on the overall income of the residents, which is consistent with the objective economic law.Apart from this, the negative effect of lnPOP on residents' income is due to the increase of urban residents' income, which makes the surplus labor in the countryside attracted to the city by high wages and increases the labor supply, which has a negative effect on the increase of urban residents' income[9] , so lnPOP has a negative effect on residents' per capita disposable income in this model.

Similarly, we selected the employment models (4), (5), and (6) based on the overall significance of the model and the significance of each variable, and selected model (6) as the final model.According to the result of model (6), lnL3 is significantly negative at the level of 0.1%, here are the reasons. Firstly, in recent years, China's primary and secondary industries have been transformed into tertiary industries, and the employment structure has changed from labor-intensive to capital-intensive, resulting in a decline in the demand for jobs. Secondly, some of the sample cities selected in this paper have the problem of loss of employment population. Finally, due to various social factors, China's labor force has been declining since 2012, and the COVID-19 epidemic has further accelerated the decline in total employment, which has led to a slight decline in employment data while the output value of the tertiary industry has steadily increased.

At the same time, lnPOP and lnET are significantly positive at the level of 0.1%, indicating that the return of population growth and the increase of employment in the tertiary industry have a positive pulling effect on the overall employment of residents. In addition, PCE does not show a significant and negative effect, because the increase of household consumption level is often accompanied by various lag factors, which may have a crowding-out effect on employment in the short term[10].

4.2 Robustness tests

In this paper, a random effects model is used to test the robustness of the final model, and the results are shown in Table 3.

Table.3. Robustness test results

Code	lnY1	Code	lnY2
lnL1	0.203***	lnL1	-0.002
	(0.048)		(0.046)
lnL2	-0.023	lnL2	-0.021
	(0.032)		(0.041)
lnL3	0.183***	lnL3	-0.246***
	(0.033)		(0.032)
Con	YES	Con	YES
prob＞F/chi2	0.000	prob＞F/chi2	0.000
adj. R-sq	0.98	adj. R-sq	0.92

Standard errors in parentheses *** p<0.1, ** p<0.05, *** p<0.01**

From the test results, it is clear that the significance of the regression coefficients of the variables is not affected, the standard errors of most of the explanatory variables are reduced, and the model is robust.

4.3 Heterogeneity analysis of residents' income and employment

In order to compare the impact of tertiary industry on residents' income and employment in different cities, this paper conductes fixed effects regressions on lnY1 and lnY2 .The paper conductes heterogeneity analysis by comparison.The results are shown in Table 4.

Table.4. Heterogeneity analysis of resident income and employment

	lnY1				lnY2		
region	Zhejiang	Anhui	Sichuan	region	Zhejiang	Anhui	Sichuan
lnL1	0.056	0.188*	0.002	lnL1	0.026	-0.043	-0.027
	(0.095)	(0.078)	(0.063)		(0.093)	(0.312)	(0.063)
LnL2	-0.113	-0.067	0.169***	LnL2	0.105	0.203	0.104*
	(0.090)	(0.042)	(0.038)		(0.094)	(0.161)	(0.040)
LnL3	0.245	0.197***	0.210***	LnL3	-0.058	-0.310***	0.023
	(0.177)	(0.027)	(0.041)		(0.177)	(0.082)	(0.042)
Con	YES	YES	YES	Con	YES	YES	YES
R-squ	0.99	0.99	0.99	R-squ	0.62	0.96	0.91

Standard errors in parentheses * p<0.05, ** p<0.01, *** p<0.001

As can be seen from Table 4, there are differences in the influence of residents' income and employment by the development of tertiary industry in different regions.In terms of residents' income, the impact of tertiary industry development on residents' income in Anhui and Sichuan provinces both pass the significance test at the 0.1% level, implying that residents' income in Anhui and Sichuan provinces will rise significantly with the development of tertiary industry.The impact of Zhejiang Province's resident income on the development of tertiary industry does not pass the significance test, but the coefficient of impact is significantly higher than that of Anhui and Sichuan provinces.

In terms of resident employment, the effect of tertiary industry development on resident employment in Anhui Province passes the significance test at the 0.1% level with a regression coefficient of -0.310, implying that resident employment in Anhui Province decreases significantly with the development of the tertiary industry.The employment of residents in Zhejiang Province is also negatively affected by the development of tertiary industry.The employment of residents in Sichuan province is positively affected by the development of tertiary industry with an impact coefficient of 0.023. The regression results show that there is regional heterogeneity in the income and employment of residents in different regions influenced by the development of the tertiary sector.

5. Research Findings and Policy Recommendations

5.1 Research findings

In this paper, the panel data of nine cities in Zhejiang Province, Anhui Province and Sichuan Province from 2006 to 2020 were selected through stratified sampling, and a fixed-effects model was constructed to empirically analyze and heterogeneously analyze the impact of the development of the tertiary industry on residents' income and employment, and the conclusions are as follows.

(1) Residents' income: Among the three major industries, the tertiary industry has the most significant effect on promoting residents' income in each province, its contribution to the development of national economy is getting bigger and bigger.

(2) Residents' employment: China is in the stage of transformation and upgrading from labor-intensive to resource-intensive[11], employment changes lag behind industrial structure changes, and the output value of tertiary industry is negatively correlated with residents' employment; the development of tertiary industry creates many new jobs and gradually becomes the main channel of absorbing labor force employment,the number of employment in tertiary industry is significantly and positively correlated with residents' employment.

(3) Heterogeneity: the development of tertiary industry has the most obvious pulling effect on residents' income in Zhejiang Province; the development of tertiary industry has the most obvious pulling effect on residents' employment in Anhui Province. The development of industrial structure in the east, middle and west of China is regional in nature.

5.2 Policy recommendations

Based on the above conclusions, this paper puts forward the following three policy recommendations.

(1) The government should increase the support for the tertiary industry. In order to promote the healthy development of capital-intensive industries, the government should introduce preferential policies for introducing high-skilled talents to inject innovative power into regional development. The government should promote the transformation of consumption structure and expand residents' consumption demand for modern service industries.

(2) Promote the optimization and upgrading of the tertiary industry and play the role of creating new jobs by the development of the tertiary industry.[12] While tapping the employment potential of the traditional tertiary industry, it should vigorously promote the development of modern tertiary industries such as new service industries, so as to fully release the potential of the tertiary industry to absorb employment and pull the regional economic development.

(3) Develop the tertiary industry according to local conditions and strengthen economic cooperation among regions. The east, central and west of China should strengthen economic exchanges and complement each other's advantages to promote the coordinated development of China's regional economy.

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