Research on the Relationship Between the Science and Technology in Zhejiang Province and Regional Economic Development

Ma Lina

Ningbo University of Finance & Economics, Ningbo, Zhejiang, China

Keywords: leading talents in science and technology; talent gathering; regional economy

Abstract: As the standard-bearer in science and technology talent pool, the leading talents determine where they head. Zhejiang Province is home to numerous talents and always pays much attention to bringing into a large number of scientific and technological talents in general, the leading scientific and technological talents in particular. Based on the status quo of Zhejiang Province, this paper finds out what problems lie in science and technology cluster with Hangzhou, Ningbo and Wenzhou as examples, promoting the concentration of leading talents in science and technology and the gathering of high-end industries and providing useful information for the economic growth.

1. Introduction

As the National Medium- and Long-Term Talent Development Plan (2010-2020) document rolls out, the competition for scientific and technological talents has become the focus of regional economic growth. Discovering, training and introducing a group of leading talents and teams have become one of the main tasks of the 13th Five-Year Plan for Talent Development in Zhejiang Province. As the spearhead of the talent team, leading talents in science and technology determine where and what the scientific and technological talents will be. Only by continuously pooling wisdom to lay a solid foundation for high-end industries clusters can the economy booms.

Therefore, identifying the key factors that lie behind the gathering of leading talents in science and technology in Zhejiang Province and finding the relationship between the leading talents of science and technology and regional economic development are of great significance for making suggestions for quality and quantity of leading talents in Zhejiang Province and upgrading their talent policy system.

2. The evaluation system for leading talents in science and technology

Talent gathering means economies of scale, whose process involving changes from quantity to quality shows combined effect. Factors such as time, region, organization and social economic landscape combined will influence the transformation course. Environmental is closely related to the gathering of talents in science and technology and different surroundings have different effects on the aggregation effect. Based on the reality of Zhejiang Province, this paper will build a scientific and systematic index evaluation system for talent cluster, which start from the analysis of environmental. In addition, this paper takes into account the carrying capacity and expansion capabilities of the regional environment, which can be shown on some corresponding indicators.

2.1 Principle for evaluation system building

(1) Scientific: Be Scientific first. Follow the basic elements and the scientific laws of talent gathering.

(2) Representative: The indicator can reflect the main aspects of the aggregation effect.

(3) Accessible: Indicators should be easy to access. Those collected data can basically reflect the relationship between talents clusters and the regional economic development.

(4) Comparable: Choosing Ningbo, Hangzhou and Wenzhou as research samples, this paper will find the level of the leading talents of science and technology through horizontal analysis.

  DOI: 10.25236/icetem.2019.165

2.2 Evaluation index system

When building the evaluation system, demand on intellects in the 13th Five-Year Talent Planning in Zhejiang Province is taken into account. Referring to the research on the factors affecting talent gathering by Liu Bing(2013),this paper also draws on Zhenfeng Ge(2017) on the evaluation index building. Based on what talent management is in Zhejiang Province, the evaluation index system based on the three dimensions of scale, structure and level is built.

(1) Size of science and technology leading talents clusters

The size of the science and technology leading talent cluster mainly refers to four indicators including the size of the number of scientific and technological leaders in a region, the scale of the project, the scale of the carrier, and the corresponding proportion, which mainly reflects the level of the number of leading scientific and technological talents in the region and the carrying capacity of regional scientific and technological talents. At the same time, the number of talent cluster in the region is related to the number of platforms and environmental carrying capabilities .

(2) Gathering structure for science and technology leading talent

Influenced by regional industrial structure and policy factors, the gathering effect of leading talents in science and technology is far more greater than the aggregation effect of general talents. On the other hand, industrial policies and the economic development models can also be changed by certain concentration of talents. Therefore, the evaluation and management of the talent aggregation structure should weigh heavily in the formulation of regional industrial policies.

(3) Level of science and technology leading talent cluster

The level of the leading talents of science and technology cluster mainly describes the management and development of talent gathering in a region, which will be used as an indicator that implies platform level of talents, the administrative level of talent management, the level of talent circulation and growth, and the policy for talent development.

After investigating Hangzhou, Ningbo and Wenzhou, this paper has extracted the key indicators through the VOC method. Centering on “scale, structure and level”, this paper has build the primary and the secondary levels of evaluation index. By rolling out the secondary indicators, the writer obtained specific evaluation factors. As shown in the Table below.

Table1: Index Evaluation system for leading talents cluster in science and technology

Primary Indicator	Secondary Indicator	Details
Size	Hardware	Number of scientific research institutes, number of high-level parks, various science and technology project projects, high-tech enterprises and number of large-scale enterprises
	Environment	Industrial park, Commercial housing, Per capita housing area
Structure	Number	Number and proportion of leading talents in science and technology
	Education	The number of leading talents in science and technology with doctors degree and above
	Profession	Mix of professions in leading talents
Level	Carrier	Number of key research institutes and laboratories, national industrial parks, and post-doctor student
	Development	Leading talent conversion rate
	Input	Fiscal income
	Administration	Integrity and execution efficiency of local government talent policy system

3. Empirical analysis and Comparison of Hangzhou, Ningbo and Wenzhou in leading talents clusters

3.1 Hypothesis

H1: Complementary talent structure has a positive impact on talent gathering

H2: The level of industrial accumulation has a positive impact on the homogeneous talents

gathering

H3: The level of economic development has a positive impact on talent cluster

H4; The cluster of leading talents in science and technology has a positive impact on the regional industries development

H5; The specialization of regional economic development has a positive impact on the gathering of leading talents in science and technology.

3.2 Comparative Study on the Development of Economic and Technological Leaders in Zhejiang Province from 2015 to 2018

This paper has chosen three samples, Hangzhou, Ningbo and Wenzhou to go on collection and research on relevant data, and has removed impact of short-term talents gathering such as academicians and overseas experts, increasing the stability of research results.

Hangzhou's GDP has seen a rapid growth During the 13th Five-Year Plan period, and industrial output has increased steadily but in small quantity. Input in social R&D is increasing year by year, accounting for 3.4% of GDP in 2018, which is a high level of R&D investment, and the absolute value also ranks first within the province. The overall landscape of science and technology leading talents remains strong but lacks stability in the growth rate, indicating that there is no positive correlation between input of R&D investment and talent cluster.

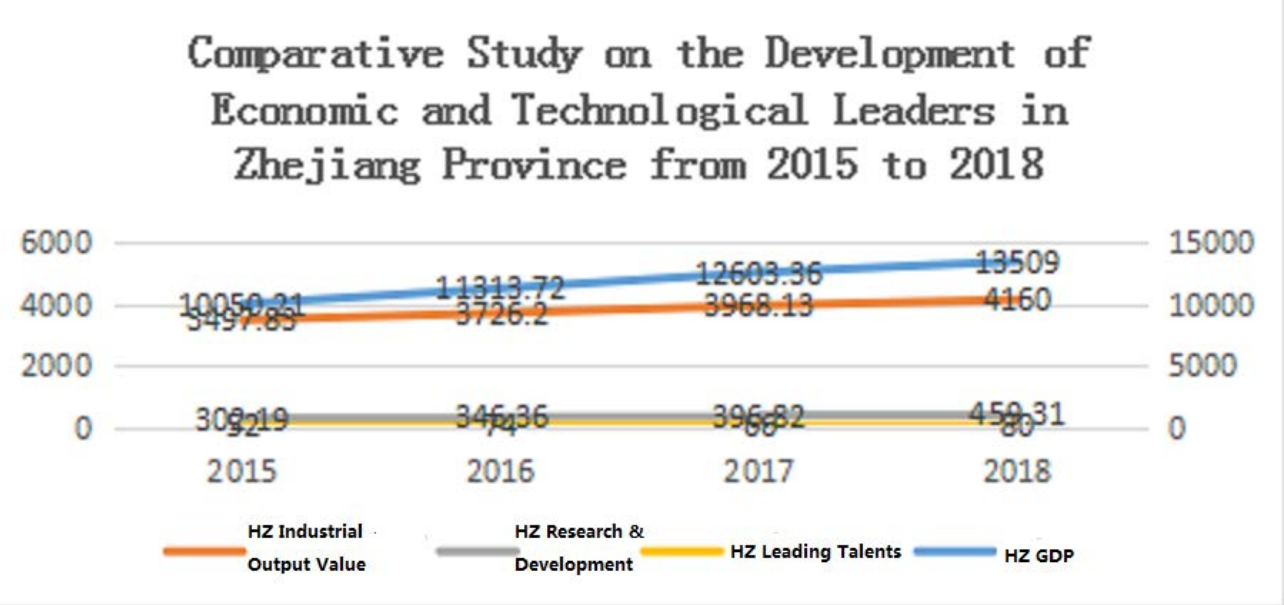

Figure 1: Comparison of the development trend of Hangzhou's economy and leading talents in 2015-2018

Comparing social and economic development, R&D investment, and the gathering of leading talents in science and technology during the 13th Five-Year Plan period in Ningbo shows all indicators are steadily on the rise. The scientific research investment and talents gathering in Ningbo have positive correlation. In 2018, R&D investment accounts for about 2.6% of GDP and industrial output weighs heavily in the GDP mix, implying that the introduction of technology leading talents in industrial enterprises is more critical to the economic development of Ningbo. It shows a trend of steadily increasing both in terms of quantity and quality of talents year by year ,but the growth rate is slower, making gap with Hangzhou is larger.

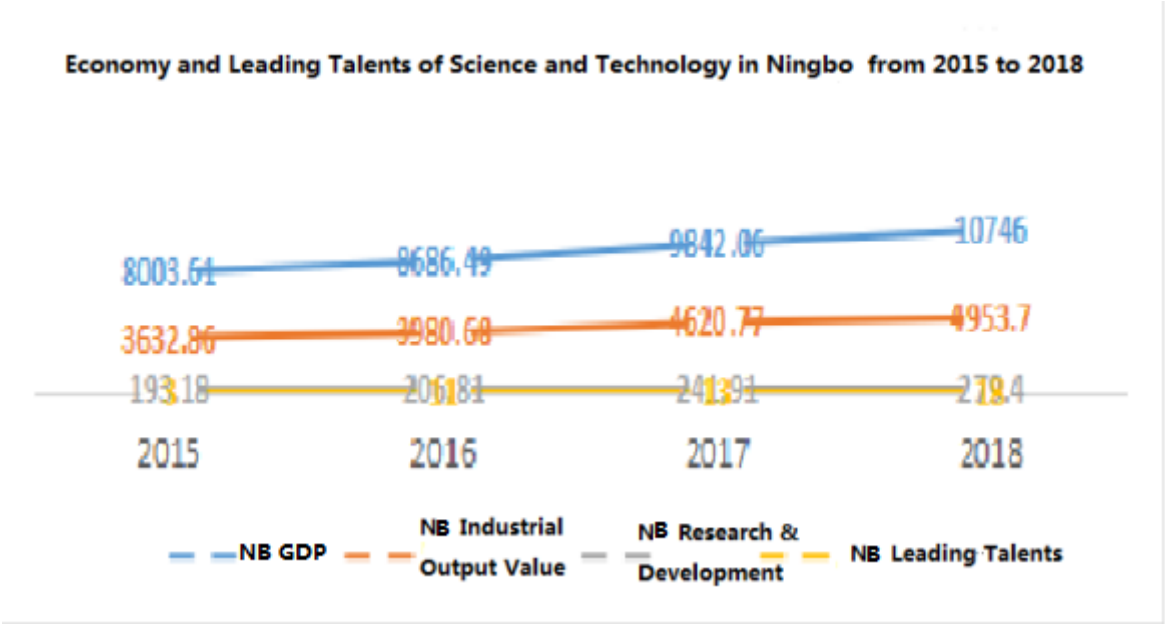

Figure 2: Comparison of the development trend of Ningbo economy and leading talents in 2015-2018

Comparing social and economic development, R&D investment, and the gathering of leading talents in science and technology during the 13th Five-Year Plan period in Wenzhou shows GDP indicator is growing rapidly. The scientific research investment and talents gathering in Wenzhou have implicit correlation. In 2018, R&D investment accounts for about 2.4% of GDP(statistics of Wenzhou has yet to be indentified) and industrial output grows steadily but weighs little in the GDP mix, it shows a trend of slow increasing both in terms of quantity and quality of talents ,making a huge gap with Hangzhou and Ningbo.

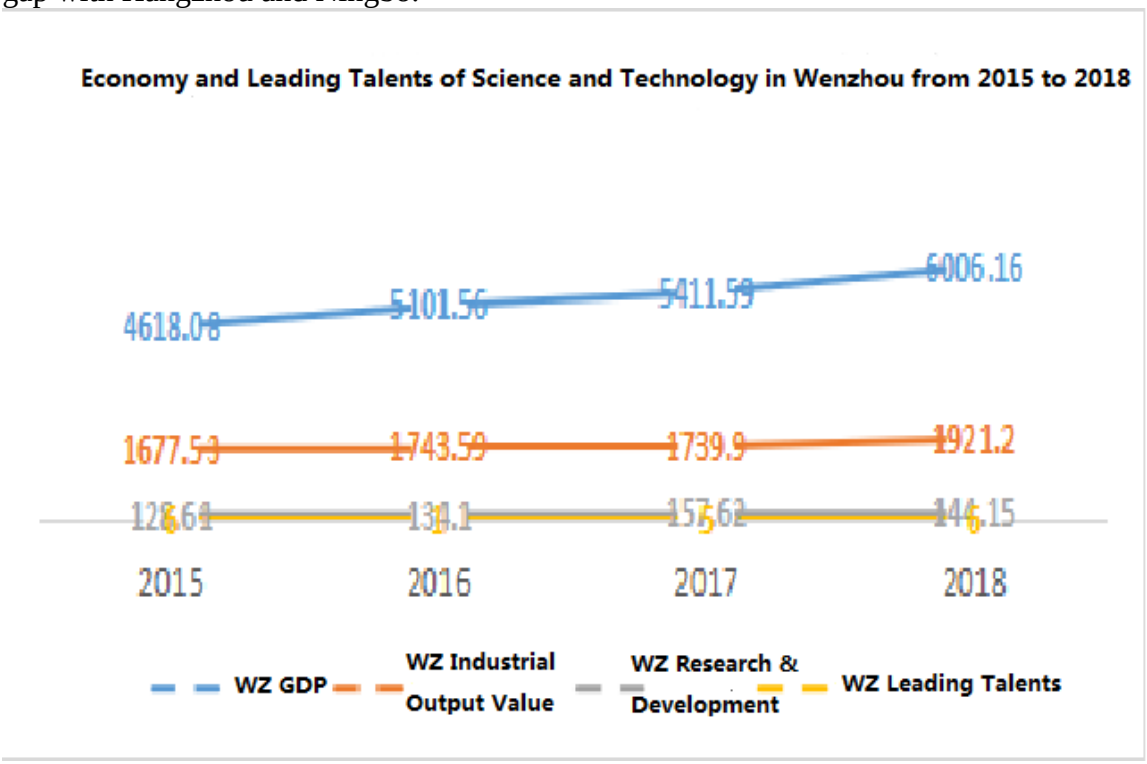

Figure 3: Comparison of the development trend of Wenzhou's economy and leading talents in 2015-2018

3.3 Regression analysis of the leading talents in science and technology and regional economic

The elements involved in the regression analysis are mainly based on the research hypothesis

and the evaluation indicators of the leading talents of science and technology, and this paper also refer to the “13th Five-Year” talent development planning document and the characteristics of indicators, research conditions, and the accessibility of data. The basic model Y=a+bX1+cX2+dX3+ε was constructed to perform regression analysis. The regression analysis will focus on regional GDP, industrial output, R&D investment, number of leading talents in science and technology, and carrier platforms, which includes national high-tech parks, characteristic industrial bases, productivity centers, incubators, agricultural science and technology parks, and sustainable testing district, key laboratories (including the provincial and the governmental), technology center.

Table 2 2015-2018 Related indicators on technology leading talent in Hangzhou, Ningbo, Wenzhou GDP

variable year	2015	2016	2017	2018	Region
Y/X: GDP	10050	11314	12603	13509	Hangzhou
X:GY Industrial Output	3498	3726	3968	4160	
Y/X:RC Talent	52	74	66	80	
X:YF R&D Input	302	346	397	459	
X:ZT Carrier	111	116	116	116	
Y/X: GDP	8004	8686	9842	10746	Ningbo
X:GY Industrial Output	3633	3981	4621	4954	
Y/X:RC Talent	3	11	13	18	
X:YF R&D Input	193	207	242	279	
X:ZT Carrier	26	27	27	27	
Y/X: GDP	4618	5102	5412	6006	Wenzhou
X:GY Industrial Output	1678	1744	1740	1921	
Y/X:RC Talent	6	1	5	6	
X:YF R&D Input	129	134	158	144	
X:ZT Carrier	10	11	11	11	

To make the regression analysis more accurate, the dummy variables, obtained by calculating the mean values, are introduced to increase the number of samples in the regression calculation

Table 3: Coefficient on Regression Analysis

Model	R	R-squared	Adjusted R-Square	Estimated error
1	.991a	.982	.977	4.01043
a. Expected variable :(constant), GDP, carrier, industrial output, R&D				

Judged from adjusted R-Square, the overall explanatory of the model is strong, and it can reflect the direct relationship between the independent variable and the dependent variable.

Table 4: Independent Variable Coefficient Distribution Table

Model		Unstandardized Coefficient		Standardized Coefficient	t	Significance
		B		Beta		
1	(constant)	-15.725	6.392		-2.460	.028
	GY	-.007	.005	-.268	-1.332	.204
	YF	.123	.101	.438	1.219	.243
	ZT	.342	.067	.534	5.137	.000
	GDP	.002	.005	.205	.397	.697
Independent variable :average number of talents						

The regression equation established by the leading talents of science and technology and various factors is standardized as y=-15.725-0.268x+0.438x+0.534x+0.205x. From the esults, the talent carrier index (ZT) is the most prominent for the gathering of leading talents in science and technology.

For the study of gathering of science and technology leaders' impact on GDP ,the normalized equation of the regression model is y=1070+0.384x+0.054x+0.623x+0.028x.The results show that industrial production indicators and R&D investment have a significant impact on GDP growth. With an increase of about 5 person-times in science and technology, the GDP will rise by one unit accordingly.

Table 5: Regression Analysis Table of influences of Variables to GDP

Model		Unstandardized Coefficient		Standardized Coefficient	t	Significance
		B	Standard error	Beta		
1	(constant)average	1070.643	265.231		4.037	.001
	Industrial output	.969	.100	.384	9.684	.000
	talents	5.383	13.555	.054	.397	.697
	R&D	17.311	2.785	.623	6.215	.000
	carrier	1.801	5.742	.028	.314	.758
a. Independent variable:GDP						

Based on the overall applicability of the model, the adjusted R-square is 0.994, and the model can explain the relationship between the dependent variable and the independent variable to a large extent.

Table 6: Model fitness judgment Table

Model	R	R-square	Adjusted R-square	Standard error of estimate
1	.998a	.995	.994	204.54290
expected variable:(constant), carrier, industrial output, R&D, talent				

4. Conclusion

From the results of the research, Hangzhou has a great advantage both in the quantity and quality of leading talents in science and technology. High concentration of talents and quality, sophisticated talent structure and obvious aggregation effect are all vivid evidence. The gathering of leading talents in science and technology in Ningbo has shown a steady growth but the talent carrier is relatively weak in general, high-end talent carriers in particular. Wenzhou fares badly in every indicator, causing unnoticeable gathering of leading talents in science and technology and shortage of talents

Judging from relevant research, the overall GDP level of the region and the number and quality of talent carriers in the region are more closely related to the gathering of talents in science and technology. GDP and technology leaders gathering can have mutual influence on each other. And R&D has an impact on the gathering of talents in science and technology through talent carriers. Hangzhou weighs heavily in the GDP of Zhejiang Province, and has obvious advantages in talent carrier platform. All these assets make Hangzhou a city of high concentration of talent gathering .There does exist a certain correlation between industrial production and the gathering of leading talents in science and technology, but it cannot directly reflect the gathering effect of leading talents in science and technology. Ningbo runs first in the proportion of industrial output, which has driven the gathering of leading talents in science and technology. And the same is true that the gathering effect of leading talents in science and technology in the industrial field will also promote the development of the industry. By comparison, Wenzhou lags behind in GDP, industrial output, and talent carrier, causing difficulties for its concentration on talents in science and technology. Against that backdrop, there shows no sign of gather effects that brought by talent cluster, which can fuel economic growth.

From the empirical research, it is found that the talent structure (H1) and the level of economic development (H3) have positive influence on the gathering of talents in science and technology; the

level of industrial concentration influences the talent structure (H2) and the gathering of talents in science and technology influences regional economic development, but both of them need further research .It can not be confirmed that the relationship between regional economic development that takes on specialization and the gathering of leading talents in science and technology (H5) .The ratio of technology leaders and economic development in the region is about 5:1, that is, for every 5 units added, GDP will increase by 1 unit (the ratio here is the standardized increase ratio instead of the absolute value). impact mentioned above also needs to involve the quality of the talent and the length of time, that is, stability.

Acknowledgement

In this paper, the research was sponsored by the Project of Zhejiang Provincial Human Resources and Social Security Department “Research on the Relationship between Talents of Science and Technology Leadership in Zhejiang Province and Regional Economic Development” (2018078).

References

[1] Wang Shiwen, Qiao Xiaoyan, et al. Summary of research on issues related to technological leading talents[J]. Journal of Suzhou University of Science and Technology. 2017,(11)

[2] Han Wenling, Chen Zhuo, Han Jie. Research on the concept, characteristics and training measures of technological leading talents[J]. Science and Technology Management Research. 2011,(22)

[3] A key factor analysis of the growth of technological leading talents: Based on the empirical analysis of technological leading talents in Tianjin[J]. Science and Technology Management Research. 2013,(8)

[4] Xu Guanglin, Wang Qingjun, Gan Ningyan. Study on the relationship between the concentration of scientific and technological talents and regional economic development:Take Anhui Province as an example[J]. Science Technology and Industry. 2014,(10)

[5] Niu Huaichong, Zhang Min, Li Gang, et al. Effect of talent accumulation and its evaluation[J]. Science and Technology Management Research. 2006,(04)

[6] Liu Yuan, Wu Fengbing. A comparative study of science and technology innovation talents policies in three major regions of Jiangsu Province[J]. Science and Technology Management Research. 2012,(01)

[7] A comparative study of sci-tech talents policies in high-tech zone of Bohai Rim[J]. Transactions of Beijing Institute of Technology(Social Science Edition). 2010,(04)

[8] Chen Yingying, Huang Yufang. Policies and enlightenment of developed countries to attract high-end talents in science and technology[J]. Chinese Talents. 2009,(05)

[9] Liu Bing, Liang Lin, Li Yuan. Research on the identification and driving mode of influencing factors of regional talent aggregation in China[J]. Population & Economics. 2013,(04)