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Talent Attraction and Its Influence on Regional Unbalanced Innovation

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Abstract

This paper analyses the impact of talent attraction on regional innovation with the panel data of patent application in 30 provinces in China from 2005 to 2014. The result shows that the attraction of talent platform, medical level as well as the quality of fundamental education promote regional innovation. Besides, talent economic platform plays the most important role among all indicators of the competitiveness of talent development. Furthermore, the influence of talent platform attraction reaches the maximum in the following year.

Keywords

Talent attraction, talent introduction, regional innovation.

1. INTRODUCTION

1.1. Related Researches

Schumpeter (1911) considers that the main body of innovation is entrepreneur and the emergence of innovation activities depends on innovative spirit of entrepreneurs. Even thought it does not indicate the connection between talent and innovation directly, entrepreneur is essentially a talent. Through the growth accounting regression implied by the Cobb-Douglas production function, Benhabib and Spiegel (1994) conclude that human capital determines the ability of innovation in a country, thereby determining a country's total factor productivity growth. After that more and more scholars begin to investigate the relationship between human capital and innovative ability and find that human capital improves or determines innovation (Dakhli&Clercq,2004; Gallie&Legros,2012; Qian, Chi&Li,2010; Liang,2012).

How can human capital promote innovation? Nelson and Phelps (1966) believe that human capital has absorption effect so that technically backward countries can improve their abilities of learning and absorbing technology through accumulating human capital. According to the Theory of Endogenous Growth, human capital is often considered to promote technological innovation through technology diffusion. At the same time immigrant with various cultural backgrounds would bring unique ideas and concepts to their work places, which may create infiltrations, collisions of ideas, and thus result in innovation (Berliant&Fujita,2012; Bove&Elia,2017).

Apart from human capital, related factors also include R&D, infrastructure, technology market turnover and other physical capital. Aghion and Howitt (1992) use R&D expenditure to measure innovative input. Bérubéc and Mohnen(2009)propose that government investing more in R&D can reduce the pressure on corporate innovation investment while some studies show that government R&D investment causes market imbalance and then leads to higher innovative costs (Doraszelski and Jaumandreu, 2013).Besides, FDI (Chen, 2000; Zhao&Jiang, 2018), higher education investment (Fritsch, 2002; Bai,2009), informatization (Black&Lynch, 2004) and so on also play important roles of regional innovation.

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1.2. Talent and Regional Innovation in China

When making locational decision of development, talent would take personal development opportunity, income, medical level, education for children etc. into consideration. Shen (1999) finds that the economic development and industrialization level are the main factors which lead to immigration. Zhai et al. (2007) also find that the main reason of migration is economic advantage through investigating the structure of floating population in Beijing. We can conclude that different cities have different levels of talent attraction with their own economic and social environment. And it is the various levels of attraction that lead to population distribution differences.

Table 1 provides the proportion of inter-provincial immigrants with different levels of education in different regions. We find that people in all levels are tend to move to eastern coastal area and people with higher education are more unwilling to live in west.

Table 1. Proportion of inter-provincial immigrants in different regions during the sixth census period

	Eastern coastal area	Central area	Western area	North-east area
Illiteracy	68.37	12.51	15.82	3.30
Primary School	76.47	10.23	9.84	3.46
Junior School	82.72	8.32	5.99	2.98
High School	80.58	11.47	5.54	2.41
University and above	68.65	21.17	5.17	5.00

Source: Spatial Distribution Characteristics and Related Issues of Provincial Population Migration in China.

In addition to the above reasons, the provincial talent program is another major reason for promoting the flow of high-end talent. According to statistics, as of 2014, there are more than 200 national talent programs, including more than 60 in Jiangsu Province, 21 in Zhejiang Province and 19 in Shandong Province, attracting a large number of talents at home and abroad. China government announces National Program for Medium and Long-term Talent Development (2010-2020) in 2010 and then provinces released a large amount of personnel policies which can improve attraction of talent. We find that there is some connection between talent distribution and patent application. Does the change of regional talent attraction really affect the choice of places where talents settle? And do talents really affect regional innovation?

2. METHODOLOGY

2.1. Indicators

Regional attraction of talent refers to the strength of attracting and retaining talents in a region. But measuring talent attraction in a region is not easy because it involves so many factors and we can't measure it in one of aspects. Therefore, we have to build a system as table 2 to calculate it. This index system includes eight first-level indexes, thirty-two second-level indexes, all dates come from China Statistical Yearbook, China Technological Yearbook, China Education Statistical Yearbook. The missing dates mainly come from Province Statistical Yearbook.

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Table 2. Index system of talent platform competitiveness

First - level	Weight	Second-level	Weight
Talent Economic Platform (ECO)	0.2541	GDP	0.3877
		GDP per capita	0.1854
		Productivity of Labor	0.4269
Talent Investment Platform (INV)	0.0468	Fixed Assets Investment	0.4025
		Total capital formation	0.5975
Talent Technology Platform (TEC)	0.2658	National industrialization plan project funding	0.1254
		Number of R&D institutions	0.0926
		External R&D expenditure	0.1302
		Asset expenditure for R&D	0.0837
		R&D expenditures for projects	0.0879
		Large and medium-sized industrial enterprises have R&D institutions (%)	0.1081
		Expenditure on R&D projects of large and medium-sized industrial enterprises	0.1525
		Average funding for R&D projects in large and medium-sized industrial enterprises	0.1173
		Technology acquisition and technical renovation costs for large and medium-sized industrial enterprises	0.1023
Talent Education Platform (EDU)	0.0493	Number of students in colleges and universities	0.3147
		Number of graduate students	0.5092
		Number of students in secondary vocational and technical schools	0.1761
Talent Information Platform (INF)	0.0406	Number of international Internet users	0.4874
		Number of mobile phones	0.2508
		Number of fixed phones	0.1252
		Total amount of post and telecommunications business	0.1366
Talent Transport Platform (TRA)	0.0397	The amount of passenger transport	0.6793
		The amount of freight transport	0.3207
Talent International Trade Platform (INTER)	0.0468	The total amount of imports and exports	0.1027
		Foreign direct investment in fixed assets investment in the whole society (%)	0.3286
		Total investment of foreign-invested enterprises	0.1325
		The total output value of foreign-funded enterprises in the total output value of industrial enterprises above designated size	0.1638
		The total output value of foreign-funded enterprises in the total output value of industrial enterprises above designated size	0.2724
Talent Industry Platform (IND)	0.2569	Gross output value of industrial enterprises above designated size	0.1287
		Per capita output value of employees in industrial enterprises above designated size	0.2638
		Profits and taxes of industrial enterprises above designated size	0.1866
		Per capita profits and taxes of employees in industrial enterprises above designated size	0.4209

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Note: This system comes from Report of Regional Talent Competitiveness in China. ECO is the primary concern of talents, and it is the basic needs of talents for income and living standards;

2.2. Data Processing

Because there are many indicators to measure the competitiveness of talent platform and the strength of each indicator is different, we have to index them firstly. The formula for the indexation is following:

$$X_i = x_i/x_{0i} \quad \mathrm{X_i} = \mathrm{x_i}/\mathrm{x_{0i}} \tag{1}$$

Where $x_i$and x_{0i}represent the initial value and the maximum of the secondary index i. X_i is the result of indexation for secondary index which range from 0 to 1.

$$Y_s = \sum X_i * Q_i \tag{2}$$

We use Eqs. (2) to calculate the first-level indicators Y_s for the competitiveness of talent platform. Next, the different weights Q_s are given to each indicator. Finally, the competitiveness of talent platform can be aggregated as the attraction of talent platform.

$$Attract_d = \sum_{s=1}^{8} Y_s * Q_s \tag{3}$$

According to the method above, we can measure the attraction of talent platform in each province.

3. MODEL

In order to study the relationship between talent attraction and regional innovation, in this paper we build up the model as following:

$$\begin{aligned} lnPatent_{dt} = \beta_0 + \beta_1 lnAttract_{dt} + \beta_2 lnEdu_{dt} + \beta_3 lnBed_{dt} + \beta_4 lnProtect_{dt} \\ +\beta_5 lnMarket_{dt} + \beta_6 lnDist_d + \beta_7 Award_{dt} + \varepsilon_{dt} \end{aligned} \tag{4}$$

Here, Patent is the amount of patent application which denotes the ability of innovation in region d at time t; Attract is the result in chapter 2.2 which represents the attraction of talent platform; Edu denotes the quality of basic education which is calculated using ratio of teacher and students in elementary school, junior high school and high school; Bed represents the medical level which is calculated using the number of beds per ten thousand people in medical institution. Protect denotes the degree of patent protection which is represented by patent litigation settlement in region d at time t. Market is the total amount of foreign technology import contracts. Award is a virtual variable when region d set up award for patent application it would be 1, otherwise 0. Finally, Dist represents the distance from region d to coast.

4. EMPIRICAL RESULTS

4.1. Panel Regression for Talent Attraction for Regions

To measure the influence of talent attraction on innovation we first have to choose a proper model from mixed effect, fixed effect and random effect. From the result in table 3, the p value

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of F test is 0 so the fixed effect is better than mixed effect. Besides, we also find that the p value of the most virtual variables is 0 in LSDV test. At the mean time we use Hausman check and find that the Prob>chi2 is 0. In conclusion we choose the fixed model.

Table 3. Regression result of the talent attraction

Variables	(1) Mixed effect	(2) Fixed effect	(3) Random effect
lnAttract	2.025***	0.960***	1.237***
	(0.315)	(0.288)	(0.231)
lnEdu	1.499	-1.111***	-0.634
	(0.712)	(0.389)	(0.388)
lnBed	-0.138	1.108***	0.808**
	(0.413)	(0.341)	(0.284)
lnProtect	0.241***	0.657***	0.095***
	(0.069)	(0.019)	(0.018)
lnMarket	0.263***	0.226	0.046**
	(0.058)	(0.022)	(0.023)
lnDist	0.091		-0.065
	(0.092)		(0.207)
Award	-0.033	0.340	0.070
	(0.190)	(0.087)	(0.092)
Constant	3.445	10.865***	10.552***
	(3.854)	(1.925)	(2.213)
Observations	300	300	300
R-squared	0.837	0.886	0.881
F test	63.26(p=0.0000)		
Hausman test		59.46(p=0.0000)	

Note: The standard errors are in parentheses. ***<0.01, **<0.05, *<0.1.

The regression results in table 3 show a clearly significant correlation between talent attraction and regional innovation. The value of Attract is 0.96. When the attraction of talent platform is increased by 1%, the innovative ability in a region would be improved by 0.96%. Furthermore, the values for Protect, Bed, Edu are 0.657, 1.108 and 1.111 respectively. Market and Award show a positive impact on innovation but they can not reach the 10% significance. In this study we assume that the most important reason why talents stay in a region is the personal development. Apart from it they also take the family living and education for children into consideration. Therefore, we add medical level and education in our regression which may help to consist a whole talent attraction system.

4.2. Robustness Checks

Considering the implementation of talent policies, settlement, research and development would take a long time for talents, we test the lags of three phases for Eqs.(4) to explore the long-term impact of talent attraction on ability of innovation in each province. In table 3 it shows that the impact of province's innovation capacity in the year of talent introduction is 0.96%. We find that talent platform attraction has steady influence especially in the next year after introducing talents, the value of impact reaches the highest (1.115%). Besides, medical level also has continuous impact denoting that talents generally value personal development

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most at the beginning but then would pay more attention to the local medical standard in the future. (Table 4)

Table 4. Test for lag

Variables	(1) T=-1	(2) T=-2	(3) T=-3
lnAttract	1.115***	1.093***	1.026***
	(0.303)	(0.305)	(0.281)
lnEdu	-0.489	-0.357	-0.176
	(0.416)	(0.453)	(0.506)
lnBed	1.226***	1.370***	1.462***
	(0.369)	(0.407)	(0.392)
lnProtect	0.031*	-0.004	-0.032
	(0.017)	(0.019)	(0.020)
lnMarket	0.013	0.001	-0.002
	(0.022)	(0.020)	(0.020)
Award	0.008	-0.0004	-0.033
	(0.087)	(0.090)	(0.100)
Constant	8.691***	8.065***	7.260***
	(2.154)	(2.543)	(2.783)
Observations	300	300	300
R-squared	0.887	0.880	0.871

Note: The standard errors are in parentheses. ***<0.01, **<0.05, *<0.1.

5. CONCLUSION

In this paper we develop an analytical framework and apply it to the analysis of the relationship between talent attraction and regional innovation ability. In order to build up talent attraction system, we measure the regional talent platform attraction, basic education standard as well as medical level and use them as talent attraction system. And the conclusions are following:

Firstly, talent attraction plays an important role in promoting regional innovation capability.

Secondly, talent attraction has continuous impact on regional innovation especially in the next year after improving that attraction.

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