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The Talents' Impact on China's Economic Development

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1. Introduction

This paper focuses on the role of talents and aims to extend the framework of economic development and innovation theory. The cause of issue in this paper comes from the empirical observation as following: talents are the most vital and scarce resources in the knowledge economy. They affect the regional economics in various aspects. The capability to attract these precious talents determines the competitiveness of one region. This lesson is useful for the developing and transforming country, like China. Since 2006, China's regional economy has been ongoing a nationwide industrial shift and upgrade, in which talents are highly valued, especially in the regions that aimed to move towards advanced industry system.

Based on the new trends of talents development and their role in industrial upgrading, we propose a new view of talents on how to promote the China's regional economic development. That means talents should not just a supporting element, but a leading role in the industrial upgrading for the transforming regions.

The first step to analyze is defining the talents. Generally speaking, we think labors who have college education experience or specialty and can enhance the production efficiency are talents. In china' statistical approach, there is one category called Professional technical personnel. But this range is narrow than talent we defined, also no standard can be used to international comparison. In this paper, we regard talents as labors who have bachelor degree or above, or have specialty education after high school. The core of talents is entrepreneur-related management and technical staffs. This data can illustrate the trend of Chinese labor structure transformation more clearly.

This kind of data is usually used to illustrate human capital of one country in economic growth theory and almost have the same meaning with what proposed by OECD for policy analysis. Also, it is one important indicator in talent geography and creative class ideas. The common of above philosophies is regarding talents as the most vital part of labors who have technology and higher education, conduct systematical creation, issue, promotion and application of knowledge, so they are the key factor for competition. The idea of talents of

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economic growth theory came from the human capital theory, and then further extended to creative department and scale economic effect. It explains that the labors who have more human capital and conduct knowledge creation and innovation have the crucial influence for high-tech department. Talents geography and creative class theory regard the talents as strategically resources. In the management field, talents with creation and leadership are the most important part of production factor, which influents regional competitiveness in Michael Porter' diamond framework. Peter Drucker proposed the concepts of Knowledge workers and Knowledge workers society. In additional, OECD proposed talents concept to aid government to promote the economics performance in mid-1990.

Based on the Schumpeterian endogenous growth theory and competitiveness theory, labor productivity or total factor productivity are driving force for the regional development. And, talents and knowledge innovation are the core factor for the enhancing total factor productivity. That's why governments pay much attention to talents supply.
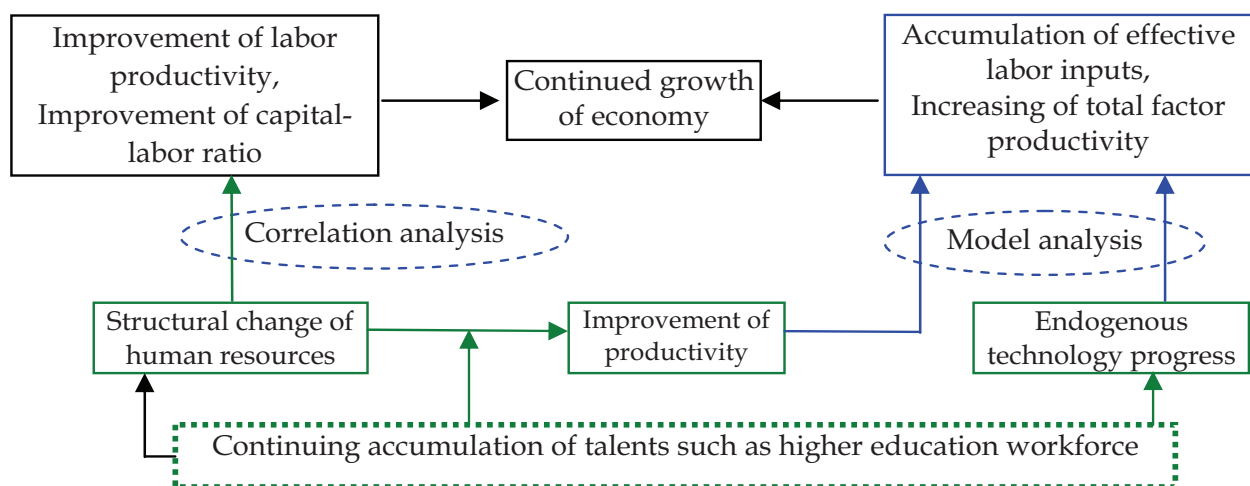

Fig. 1. Contents analysis and conceptual framework.

The logical framework is shown in Fig. 1. The point of left part is that, the continuing increase of labor productivity is the driving force of economic development, and the main cause of labor productivity is upgrading of labor construction, which means the proportion of talents who have better education experience and better technical skills is larger than before. You can see more details on the right of the chart. On one hand, the driving force of economic development is the total factor productivity, which is supported by endogenous technology progress (the production-possibility frontier is extended and the portfolio of factors is changed) and efficiency enhancement (the output become more close to the fixed production-possibility). On the other hand, Institutions are also very important factors in some developing countries. Talents can play a crucial role in both two aspects: more talents mean higher labor quality in technology progress and efficiency enhancement, and talents are the foundation of creative system of one country or region.

After the issue of this paper in the first section, the 2rd section describes the features of the talents in China based on a database from 1996 to 2007. It includes two parts: subsection 2.1 is concern about the overall structure: evolution of aggregate talent resource, structural change based on major categories like profession, industrial sector or research units and so on;

subsection 2.2 is concern about the spatial pattern, especially the extent of 'core-peripheral' pattern. In order to reveal the importance of the talent resource, some other economic inputs and outputs variables are introduced in the database to made comparison. Section 3 made empirical analyses on the talents' impact on China's regional economic development. We built a panel database from year 2001 to 2007 including major economic, social and innovative variables. The aim is to reveal the causation relationship of the talents and regional development, and the significant and extent of supporting and leading effects under different developing stage. A conclusion was made as the end of the Chapter in the last section.

2. Evolution of spatial pattern

This section describes both the aggregate structural features and the location distribution features of china' talents, analyzes the relationship between talents and other variables (e.g. output, capital), illustrates the differences of roles in core (developed regions) and periphery (developing regions).

2.1 The evolution of talents location distribution

The data in this section is the labors with education category in china' census every year. Till 2007, the total number of labors who have specialty or bachelor degree and above is 50.8134 million, and the population who have the same education background is 81.3444 million, so the participate ratio of this category is 62.47%.

2.1.1 The talents accumulate slower after one peak; The growth rate varies in different regions and negative growth rate emerges
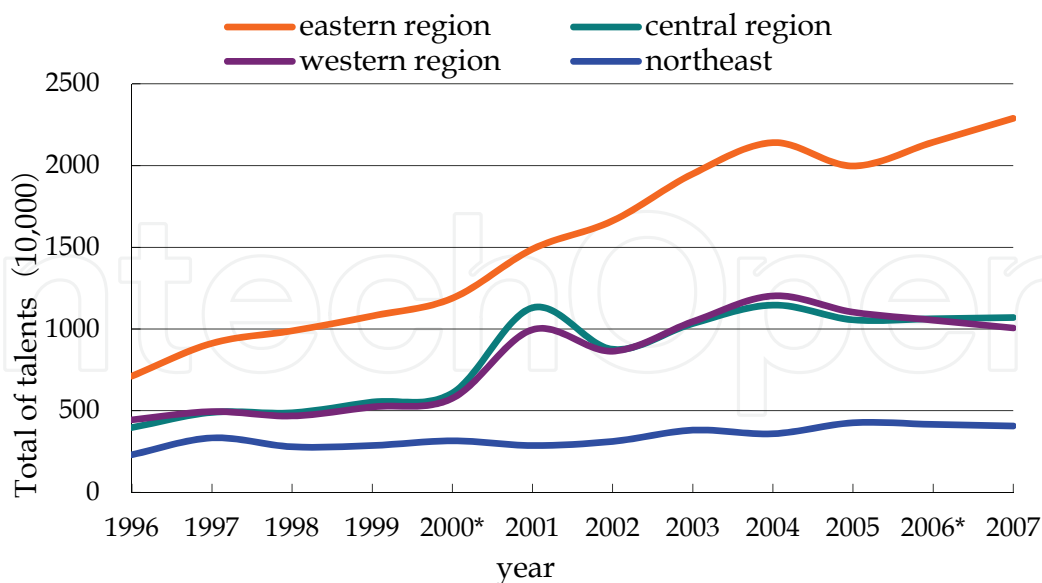

Fig. 2. The trend of total talents in four regions of China.

The trend in Fig. 2 shows that, from 1996, the talents in Eastern region have accumulated very rapidly, which is tripled among twelve years. The Central region and the Western

region are similar and doubled among twelve years. But the north-Eastern region has the lowest growth rate. What is more, from the curses, we also can see the apparent fluctuations both in east, west and Central regions.
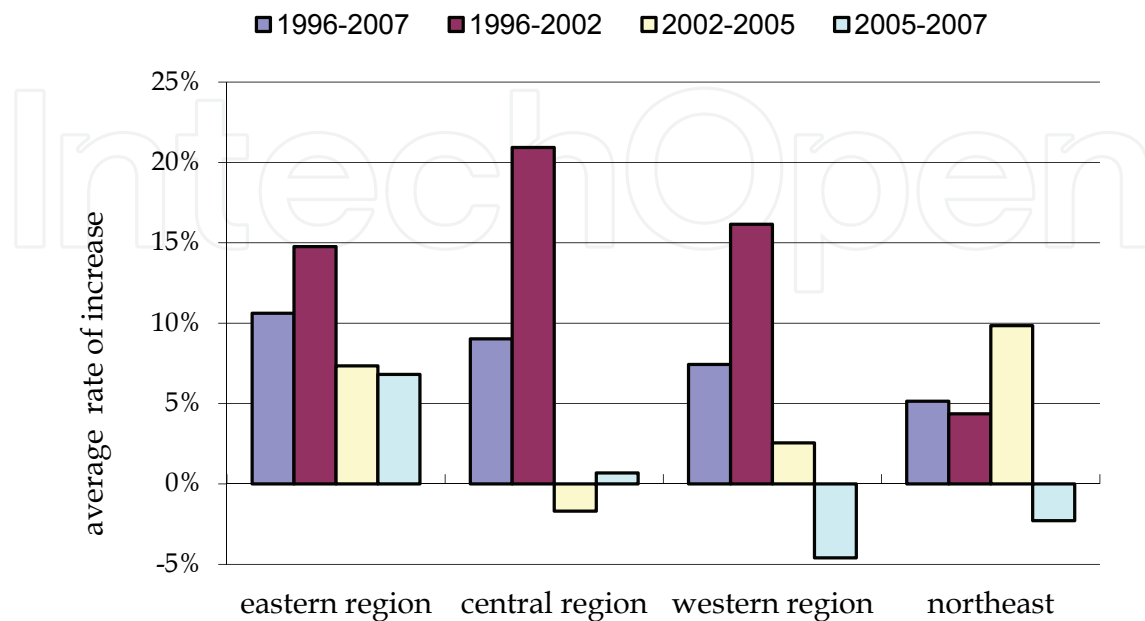

Fig. 3. The growth rate of talents in four regions of China.

We can observe the trend more clearly by dividing twelve years into three periods and calculating the compound annual growth rate (CAGR). Generally speaking, the CAGR of Eastern region is 10.62%, Central region is 9.02% and Western region 7.43%, the north-west is lowest, which is 5.15%. We can divide twelve years into three periods. The first period is 1996-2001, in which the most visible feature is Central region and Western region have the highest CAGR. The CAGR of Central region excess 20% and the Western region also excess 15%. The east, middle and Western region have the most rapid accumulation among this decade. The second period is 2001-2005, which is the tenth five-year development plan of china. The most significant feature of this period is the high CAGR in north-Eastern region, almost 10%, but the negative CAGR emerges in Central region. The Western region have very steady but lower CAGR than east and north-Eastern region. The third period is 2005-2007, in which the growth trend varies in different regions. Eastern region has steady CAGR for a long time, but other regions, like west and north-east, have negative CAGR.

2.1.2 The changes of talents' education level is different significantly

According to the national census' data, we can describe and analyze the education level of talents. Here we emphasize three categories of education: specialty, who mainly receives skills training after high school, the labor who have bachelor degree and who have master degree or above. The following analyses just cover the period since 2001 because of the data quality.
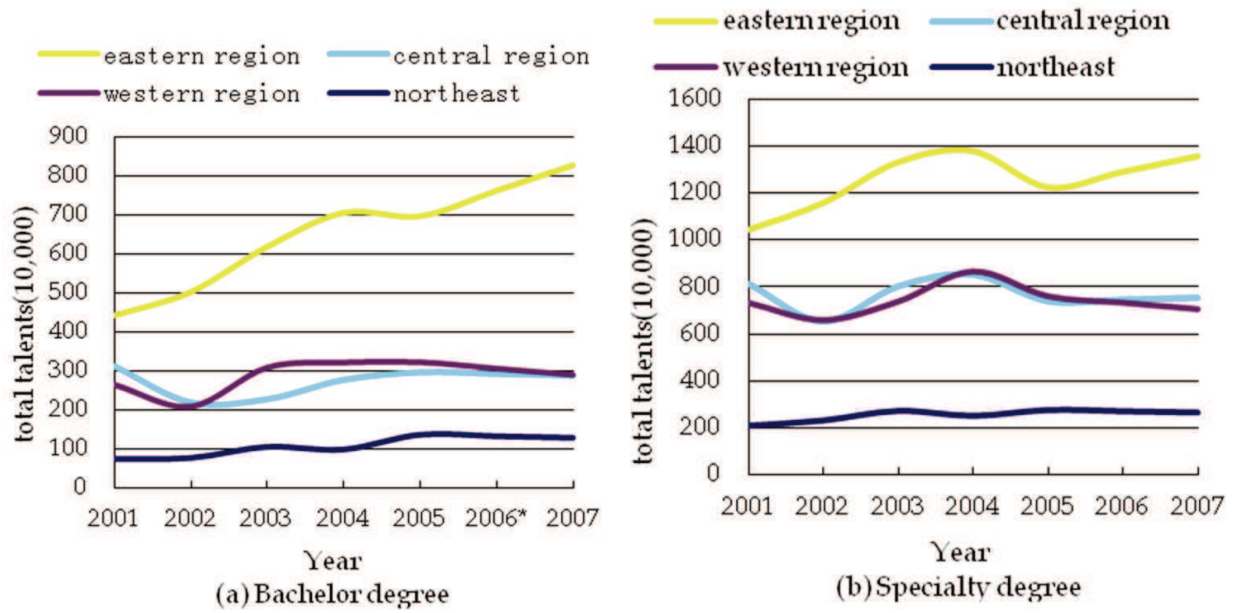
Fig. 4. The trend of talents with bachelor degree and specialty in four regions from 2001.

In china's talents, the percentage of labors that have specialty and bachelor degree is higher than 90%. With the development of china' education, these two group of labors have very outstanding growth. During the period of 2001-2007, the average growth rate of bachelor degree is 3.77%, and the specialty is 0.11%. in the same time , the growth rate of total talents is only 1.65%. So we can infer that the accumulation of china' talents almost means the bachelor degree's rapid growth.

Because of this fact, the growth rate of bachelor degree is higher than that of specialty, which is still has a large proportion, but the trend of decreasing is ongoing, especially in Eastern region and north-Eastern region. Only in Central region this trend is not very significant. In general, the education experience of specialty is shorter than who get bachelor degree, so we can get the conclusion that the talents' education structure is improving.
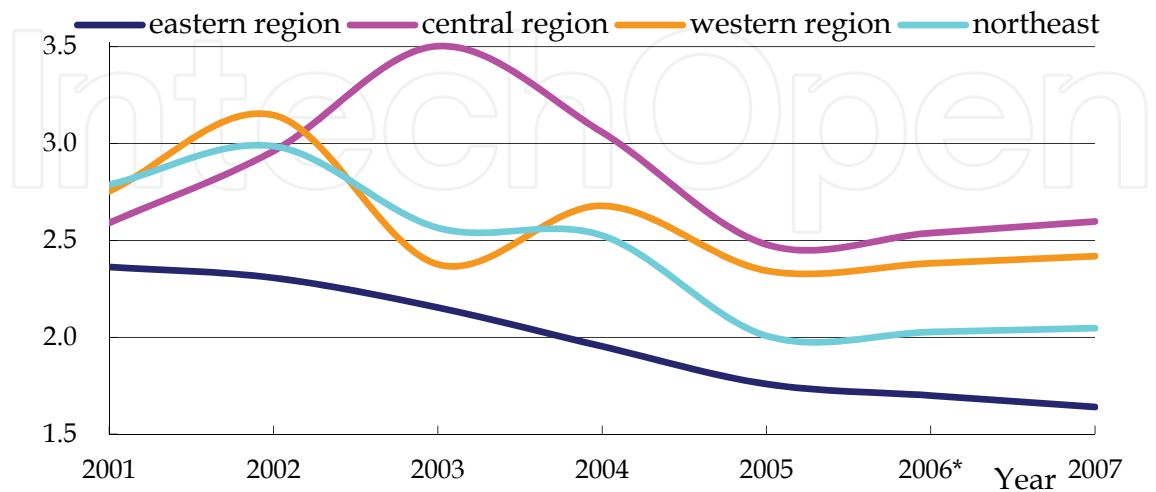

Fig. 5. The ratio of talents with specialty to talents with bachelor degree in four regions in China.
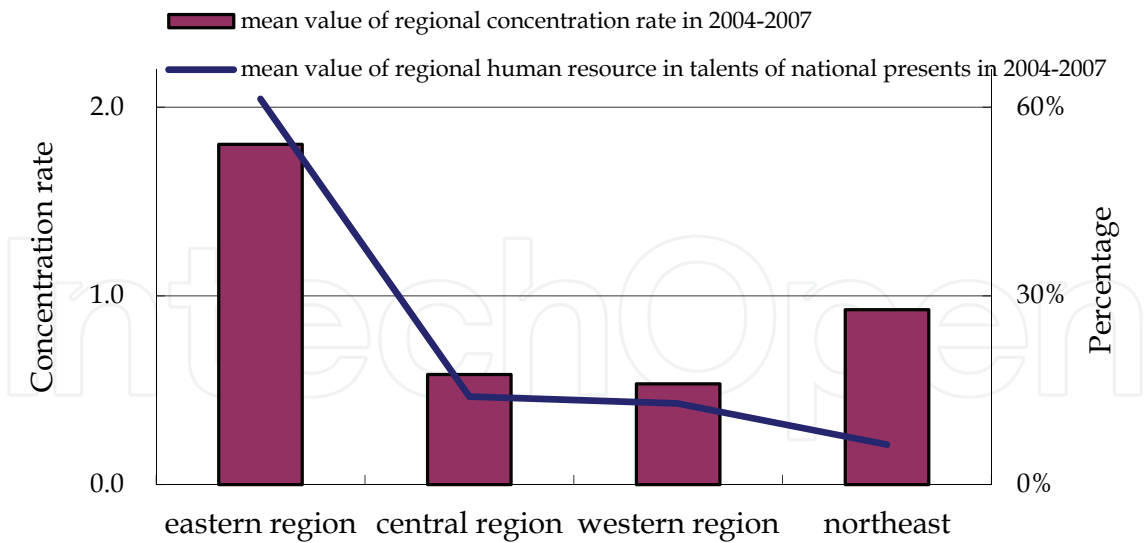
Fig. 6. Spatial distribution characteristics of post-graduates in four regions in China.

The labors with master degree or above have a very low proportion, only 3.03% in 2007. But this group of labors has better education experience, get science and technology training more systematically, so they are more likely the key element of jobs, especially in technology innovation and knowledge creation.

From the location distribution of master degree or above, the most significant feature is that Eastern region has the highest proportion, almost 61.32%. As to the concentration rate based on the total labors, this indicator is about 1.8 in Eastern region. So Eastern region have huge scale advantage of talents.

2.1.3 The distribution difference between province varies like "W"

This part analyzes the location distribution from the unit of province. We calculate two indicators to illustrate the concentration situation and evolution of regional difference: the proportion of high education experience labors, and the polarization rate.
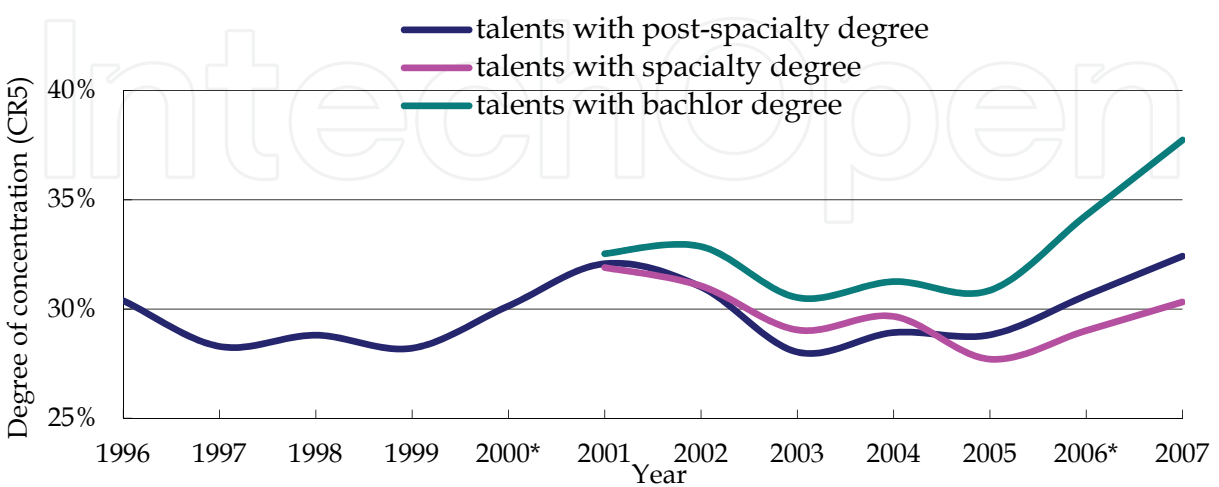

Fig. 7. The trend of degree of concentration of talents' spatial distribution characteristics in China.

Here we use the indicator of CR5, which means sum up the highest five province percentage. In 2007, the total CR5 of talents is 32.42%, and the CR5 of master degree is 61.17%, bachelor 37.74% and the specialty 30.32%. Since 1996, the total CR5 have a little increase. But when we analyze the detailed level, we can find the CR5 of bachelor is significantly rising, but the CR5 of specialty is decreasing.

The second indicator is polarization rate. The chart can tell us the education level is higher, the polarization rate is higher. From the trend since 1996, the total polarization rates of total talents, specialty, and bachelors are almost 2.5-4.0, which means a relative significant polarization. Judging from the curves, it varies like "W".
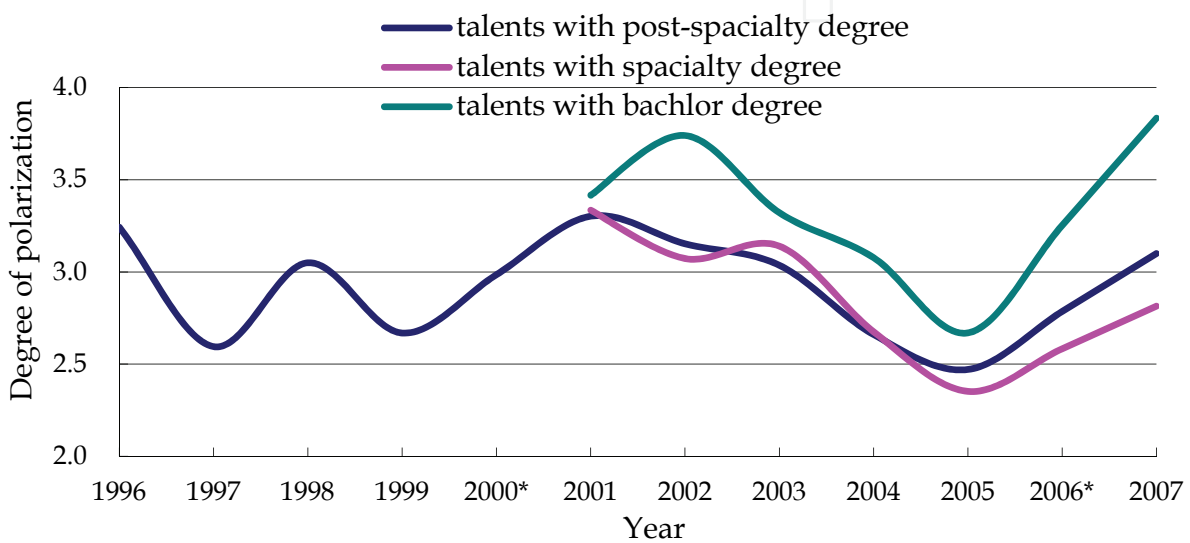

Fig. 8. The trend of degree of polarization of talents' spatial distribution characteristics in China.

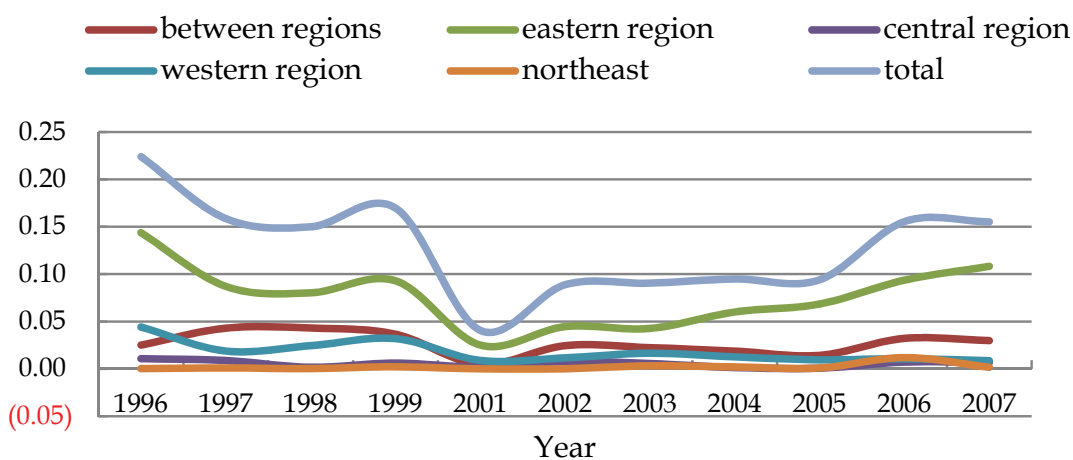## 2.1.4 The coefficient of talents between province varies like "V"

Fig. 9. The changing trend of Theil and its decompose of talents' spatial distribution characteristics.

This part we calculate the coefficient of talents based on the total labors to analyze the difference variance. From the difference variance of total talents, the turning point occurs during 2001, when the difference between provinces began to grow larger. Before 2001, the talents in Central region and Western region have the significant accumulation, but after this time, the situation reversed. Because of the small proportion of talents in middle and Western region, the rapid accumulation before 2001 means smaller difference between regions. In addition, the coefficient illustrates that the main difference comes from the inner difference in Eastern region and have an increase trend. The difference inter-regions are not very significant. So we can infer that with the high difference inter-regions, a higher difference inner Eastern region also cannot be ignored.

2.2 The correlation between talents and region development

The paragraphs above have explained the scale and distribution feature of China' talents. As the logic framework has showed, the accumulation of talents will improve the regional labors structure and the proportion of labors with high education will increase. This will lead to extend the scale of effective labor input and promote the technology innovation. Aiming to verify this logic thinking, we calculate the correlation of variables and conduct a multivariate model in the following sections.

2.2.1 Talents density and the labor productivity

1.   The correlation based on region samples

Productivity illustrates the capability of one state or region to capture wealthy. The main channel to increase the total wealth of one country is improving the quality of input (labors and capital, etc) and enhancing the efficiency, not just simply increasing the input. From this idea, we have the hypothesis that the quality of talents has positive correlation with productivity. We separate China' province into four regions: east, west, middle and northeast, and then make the scatter based on the data from 2001 to 2007. This figure supports the hypothesis partly, especially in the Eastern region. The positive correlation means with the accumulation of talents, the labor productivity is rising. But this significant correlation does not appear in three other regions.

Units of measurement: 1) "talents' density": 1 person per 1000 population, 2) "labor productivity": 10,000 RMB per capita.
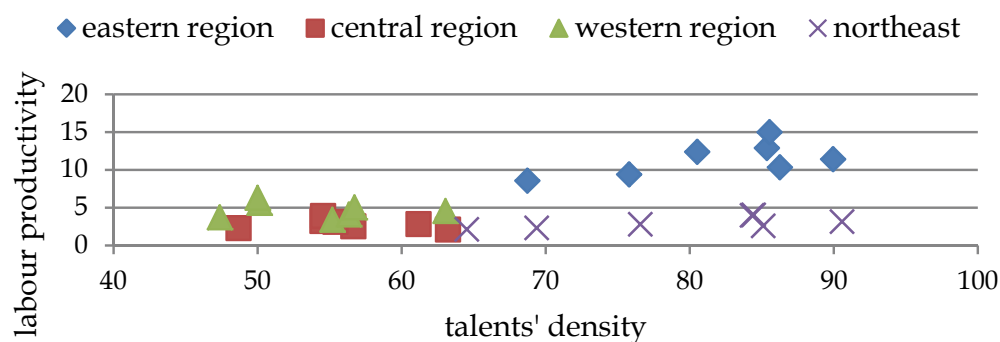

Fig. 10. Correlation of talent density and labor productivity under belt scales.

2. The correlation based on province sample

In addition to the correlation of region samples, we want to test the logic framework on a more detailed level. So we calculate the average value of talents density of each province and make a scatter (Figure 11). From this chart, we can see most of the provinces have relative low talents density and productivity. Three provinces differ with other samples significantly: Beijing, Shanghai and Tianjin, their density of talents and productivity is much higher that the average level. But no significant positive correlation appears from the province samples. so in our opinion, the correlation between talents density and labor productivity is disturbed by the heterogeneity of province samples.

Units of measurement: 1) "talents' density": 1 person per 1000 population, 2) "labor productivity": 10,000 RMB per capita.
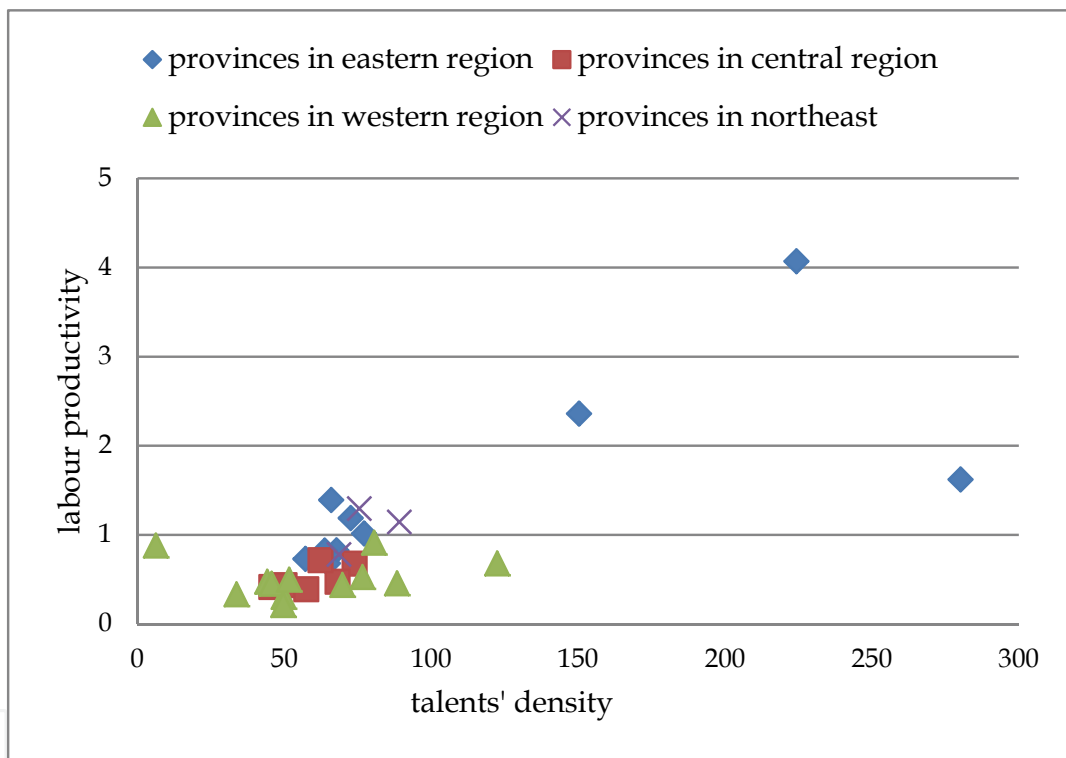
Fig. 11. Correlation of talent density and labor productivity under provincial average.

2.2.2 Talents density and capital per labor

This section we use the same approach to verify the correlation between talents density and capital per labor. Now the scatter chart tells us the significant positive correlation appears in Eastern region and north-Eastern region. With the accumulation of talents, the capital per labor is rising. In addition, the slope of estimated trend line of Eastern region is larger than that of north-Eastern region. But in west and Central region, there is no significant correlation between these two variables.

Units of measurement: 1) "talents' density": 1 person per 1000 population, 2) "per capita capital stock": 10,000 RMB per capita.

Fig. 12. Correlation of talent density and labor capital stock under belt scales.

1.   The correlation based on province samples

We also use the average value of talents density of each province to match the capital per labor. From the chart, Beijing, Shanghai and Tianjin are different from other province. Their talents density and capital per labor are higher significantly than other provinces. What is different from above scenario is that, there is relative positive correlation between talents density and capital per labor in Eastern regions. But in other regions, on obvious trend appears.

Units of measurement: 1) "talents' density": 1 person per 1000 population, 2) "per capita capital stock": 10,000 RMB per capita.

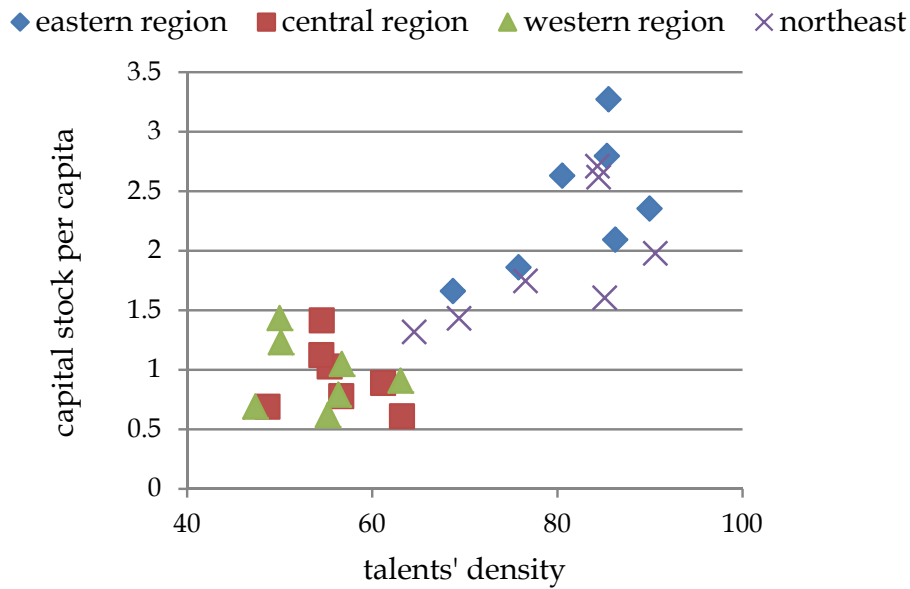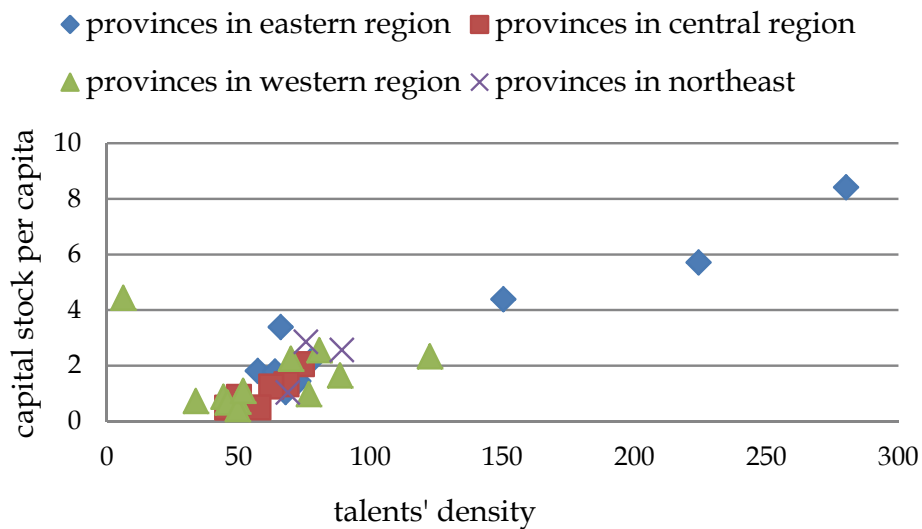Fig. 13. Correlation of talent density and labor capital stock under provincial average.

2.2.3 Talents agglomeration and regional economic development

The agglomeration of talents is also one important aspect. In this section, we use the talents agglomeration indicator(Wang Fen, 2006), which formula is, here is the total number of talents in region i, is the total population of region i.GDP per capita is used to illustrate the regional economic development. This part not only pays attention to the total talents, but the core of talents, scientists and engineers, who are the key factor for the innovation and high-tech industry.

2.   The correlation based on region samples
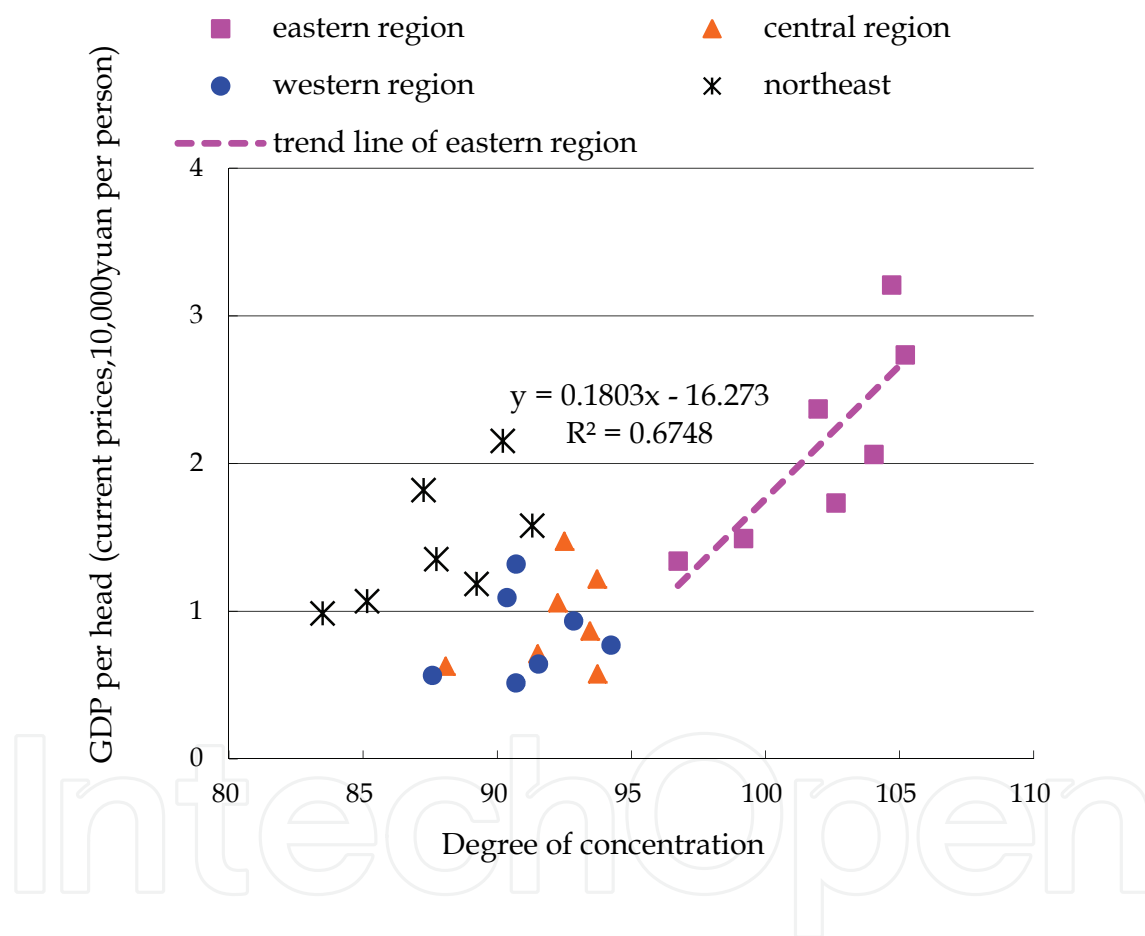
Fig. 14. The Trend of connections between talents concentration and total per capita output in four regions in 2001-2007.

We make a figure using the agglomeration indicator and GDP per capita of four regions since 2001. A obvious positive correlation can be seen about the Eastern region. As for three other regions, the slope of curves is larger, which mean no significant agglomeration occurs there, but the GDP per capita is rising. So there is no obvious interaction between these two variables.
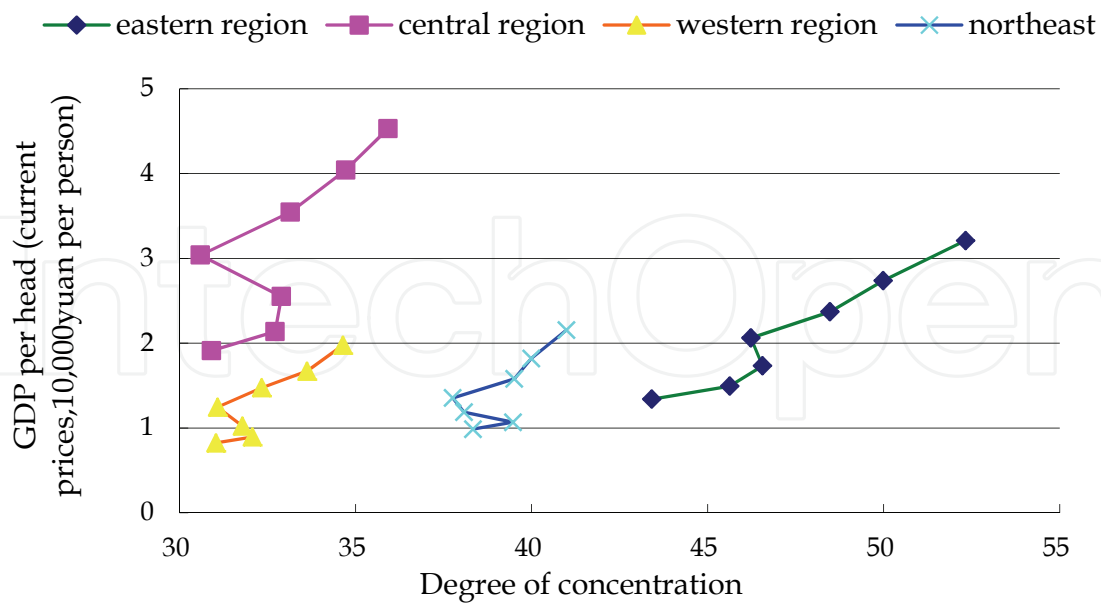
Fig. 15. The Trend of connections between R&D concentration and total per capita output in four regions in 2001-2007.

Now we pay attention to the scientists and engineers of each region. From the figure 16, we can see the rapid accumulation of core talents since 2001, which is similar with the growth trend of GDP per capita. Also a visible "gradient" among regions is a very important feature, which means the very different correlations between talents agglomeration and economic development in each region.

3.   The correlation based on province samples
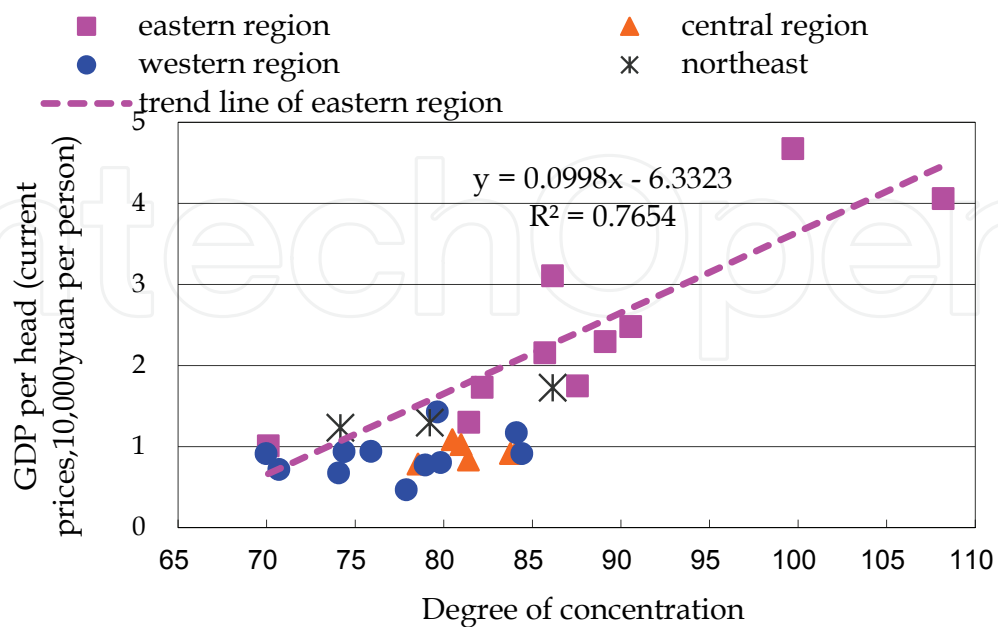
Fig. 16. The connections between talents concentration and per capita output in provinces of china in 2001-2007.

This part we use the average value of each province from 2001 to 2007 as samples. The scatter chart shows that the correlation in Eastern region is very obvious, which means with the agglomeration of talents in Eastern region, its output per capita is higher and higher. But we do not notice the same feature in other regions. Especially in Central region and Western region, the elasticity between agglomeration indicator and GDP per capita is very small.
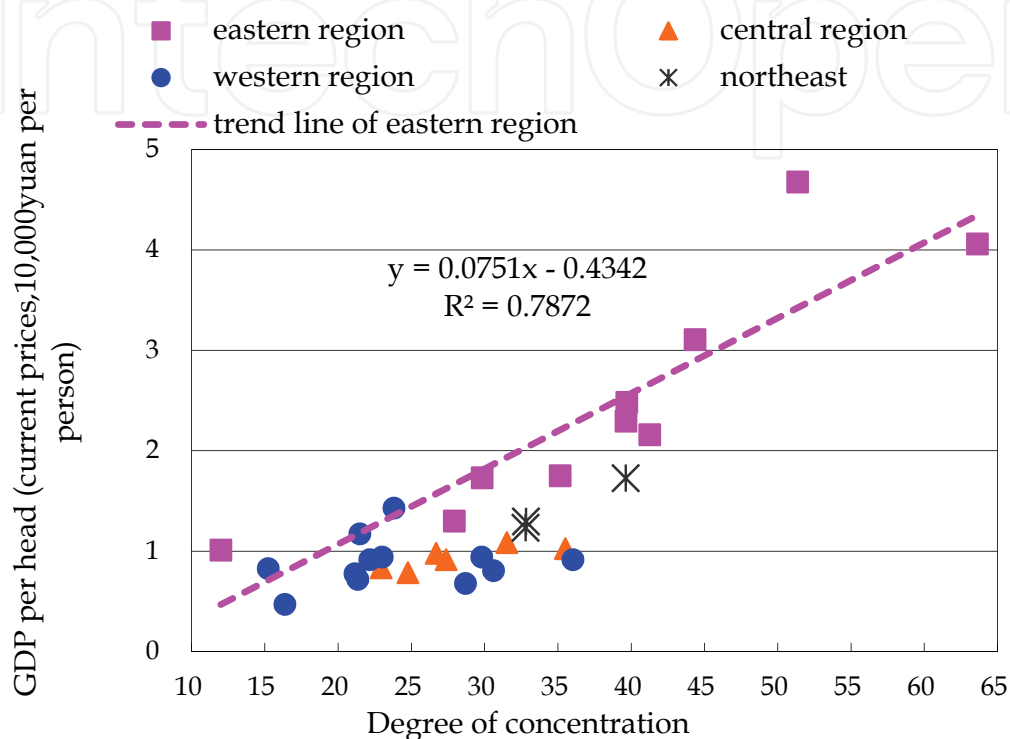
Fig. 17. The connections between R&D concentration and per capita output in provinces of china in 2001-2007

We also can use the same method to test the correlation of core talents and economic output. The result is similar: only the Eastern region has obvious correlation between core talents agglomeration and GDP per capita. No obvious interaction can be seen in other regions. This conclusion is stated in above analysis.

3. Impacts on regional economic development

In this section, we construct the panel data of province samples from 2001 to 2007. According to the location and economic development level, we can separate the province samples into different groups and analyze the mechanism of talents' influence on competitiveness. The final conclusion is that, the influence of talents on regional competitiveness is not very significant from the empirical analysis, even in the Eastern region. The section 3.1 is a brief data description. 3.2 is the process to select the optimal model. In 3.3 sessions, we add province heterogeneity into the basic model to double check the talents' influence.

3.1 Data description

3.1.1 Indicators

This paper constructs the panel database of 31 provinces from 2001 to 2007 (Tibet is not a sample because of its bad data quality). In the Table 1, the GDP per capita illustrates the economic development and is the criterion of different regions.

Index	Variable
Economic aggregate	Reality area GDP (rGDP)[1]
Material capital	Capital stock (K)[2]
Talent	Labor force with junior college and above degree (H)
Total of labor force	Total of the employed (L)
Investment in science and technology	Scientists and engineers (S&E), R&D labor force (Full-time equivalent: R&D), R&D **research** and **development spending** (R&D_Exp)
Index of regional development	Urbanization (Urb), Rate of non-agricultural (Including: Industrialization (Ind) and Service rate (Ser), S&T_Mark[3]
Average area GDP	Permanent resident population (P), Name area GDP (nGDP)

[1] With the comparable prices based on year 2000.

[2] We estimated the capital stock of each province from 1993 to 2007 based on Sustainable filing method. We took 1993 as base year and the data estimated by Zhang et al (2004). Then based on the "China's GDP accounting history information: 1952-2004" and "China Statistical Yearbook(1995-2008)" we collect data "Gross fixed capital formation" and "fixed-asset depreciation" of each province from year 1994, with which we calculate the "net investment flows". With the "Fixed asset price indices" and the transform ratio of year 1952, 1978 and 2000 estimated by Zhang et al (2004), we got the net flow with comparable price and accumulation each year net flow from the base year to get the results.

[3] Urbanization variable use the share of urban population which is the inhabitant live in cities and towns. Industrialization rate and Service rate is the share of the second industry and tertiary industry. S&T_Mark is the growth of regional technology market which is measured by the share of Total technology market transactions on GDP.

Table 1. Indicator system.

The regional economy develops very rapid since 2001. The real GDP of provinces have increased two times, and the capital stock increased 1.38 times. At the same time, the quality of labors has improved obviously. The growth rate of high education experience is two times than that of total labors. The budget of R&D also increases a lot and the nominal expenditure for R&D have increased 2.56 times. The growth rate of labor in technology field excess the average value three to four times. In addition, a fierce urbanization is ongoing and the urbanization rate increase 6%, but the service rate decreased 2.6%. the market of technology is developing a little slow. As to the regional difference, the difference of economic output is increasing, and the difference of capital is almost the same, but the difference of labors is decreasing, especially in some province with low proportion of talents. The labor input of technology and the difference of regional market have the largest change, which means the agglomeration in advanced region is very obvious. In the end, the difference of urbanization rate is lower.

(1) Statistical information of data base in 2007

Variable	Unit	Mean value	SD[1]	Maximum	Minimum
rGDP	100 million RMB, 2000 comparable price	7490	0.8112	26299	587
K		16926	0.6561	46306	2580
H	100 thousand person	159	0.6225	424	22
L		2365	0.6397	5560	253
S&E	1 person	104086	0.8477	327712	4677
R&D	Hour[2]	57804	0.9032	199464	1262
R&D_Exp	10,000 RMB, 2000 comparable price	1236516	1.1010	5053870	26020
Urb		48.0	0.3006	88.7	28.2
Ind	%	48	0.1504	60	27
Ser		39	0.1879	72	30
S&T_Mark		0.77	2.2202	9.44	0.02

(2) Statistical information of data base in 2001

Variable	Unit	Mean value	SD	Maximum	Minimum
rGDP	RMB100m, at 2000 price	3596	0.7785	11868	295
K		7099	0.6530	18272	1082
H	10,000 person	132	0.6674	350	10
L		2153	0.6503	5405	246
S&E	person	68136	0.7317	194793	3154
R&D	hour	30687	0.7970	95255	927
R&D_Exp	RMB 10,000, current price	347802	1.1779	1711696	8457
Urb		41.2	0.3926	88.5	24.0
Ind	%	42	0.1669	52	20
Ser		42	0.1476	67	32
S&T_Mark		0.73	1.3403	5.15	0.01

(3) Contrast 2007:2001

Contrast	Mean value	Maximum	Minimum
rGDP	1.0828	1.2160	0.9935
K	1.3844	1.5342	1.3840
H	0.2029	0.2114	1.2000
L	0.0984	0.0288	0.0249
S&E	0.5276	0.6824	0.4829
R&D	0.8836	1.0940	0.3614
R&D_Exp	2.5552	1.9526	2.0767

[1] SD: standard deviation

[2] full-time working hour

Appendix 1. Contrast of cross section library in 2001 and 2007.

(4) D-value 2007:2001

Contrast	Mean value	Variance	Maximum	Minimum
rGDP		0.0327		
K		0.0031		
H		-0.0449		
L		-0.0106		
S&E		0.1161		
R&D		0.1062		
R&D_Exp		-0.0768		
Urb	6.7700	-0.0920	0.2000	4.2000
Ind	6.4667	-0.0166	8.0000	7.0000
Ser	-2.6000	0.0403	5.0000	-2.0000
S&T_Mark	0.0351	0.8798	4.2881	0.0115

Appendix 1. Contrast of cross section library in 2001 and 2007. (Continuation)

In addition, the appendix 1 gives us the correlation matrix of these variables, and you may notice the correlation of three variables about technology is very high.

3.1.2 Separating provinces into groups

Two methods are used for separating the provinces into different groups, which criterion are regional difference and economic development. In the first method, regional difference, the most common results are three groups or four groups. The latter method, the GDP per capita is the main criterion. You can see the result of groups in appendix 2.

3.2 Selecting the basic model

The statistical model of this session comes from the macroeconomics product formula: .here is output per lobor, is capital stock per labor, is the proportion of labors with high education of total labors. Is the cob-Douglas and the A and the S is the compound indicators of technology input and social development. the formula of statistical is as following:

The variables are all Logarithm based on two causes, one is the deposition of product formula and the other is easy to understand the elasticity. In addition, because the indicators of S is ratio, its absolute change is already illustrate the same meaning with Logarithm.

Appendix 1 is already shows the correlation of variables and they are not significant except the three variable of technology. Selecting optimal basic model starts from the one variable fixed effect regression of panel data. Form 3 gives us the result. We can see the variable K is very significant, which illustrate the capital is still a very key drives in current economic development. the variable h is also significant, but the coefficient is only half of that of K. you may notice that the S&T market is not significant.

Table 3 gives the result of selecting process. Model 1 run the fixed effect regress on K and Urb, the adjusted R-square is 0.7823, and the variable Urb is not significant. So the model 0 with K is the optimal basic model. Model 2 adds the variable lnh, the adjusted R-square rises a little, and this variable is significant. So this new model can be accepted. The model 3 and model 4 adds the technology variable and regional development variable, and the model 3 have three technology indicator at the same time, but you can see the appendix 3, other

portfolios of variables are better. As to model 4, the adjusted R-square decreases, and the variable is not very significant. In the end, the model 5 is the compound model, which has not the S&T market variable, but every variable is significant.

Explanatory variable	(totality) Goodness of fit	Significance(t)	Estimate parameter
lnk	0.8074	86.11***	0.7706
lnh	0.4240	3.21***	0.2519
lnS&E	0.2089	11.65***	0.9102
lnR&D	0.2214	19.52***	0.8024
lnR&D_Exp	0.3587	34.72***	0.4437
Urb	0.8218	25.50***	0.0731
Ind	0.1218	21.87***	0.0620
Ser	0.1112	-11.40***	-0.0751
S&T_Mark	0.1996	-0.69	-0.0306

Significance level 1% (***) ,5% (**) and 10% (*) .

Table 2. Regression result of single factor panel data.

Ln(y)	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5
Goodness of fit	0.8074	0.7823	0.8083	0.8455	0.7921	0.8299
lnk	0.7706	0.7886	0.7671	0.7436	0.7813	0.7658657
	86.1***	38.2***	84.2***	29.3***	38.6***	26.03***
lnh			0.0225	0.0291	0.0178	0.0214362
			1.79*	2.3**	1.36	1.65*
lnS&E				0.0847		0.0985074
				3.0***		3.44***
lnR&D				-0.0869		-0.0973451
				(-3)***		(-3.3)***
lnR&D_Exp				0.0324		0.0193096
				1.68*		1.98**
Ind					-0.0034	-0.0063655
					(-1.2)	(-2.22)**
Ser					-0.0041	-0.0071026
					(-1.4)	(-2.37)**
S&T_Mark						
Urb		-0.0021				
		-0.97				
Constant term	1.636	1.536	1.6309	1.4183	1.8045	1.650106
	16.9***	10.9***	17.0***	6.2***	9.47***	6.15***

notes: (1) first line is 'estimate parameters', second line is 't test value': significance level 1%(***), 5%(**) and 10%(*) (2) concern about the spillover effect, the regression introduced national average value of each production factors. (3) we tried to test regional disparity on the four-region division, but the result is much less significance than the three-region division by which Liaoning Province belong to eastern region and other two northeast provinces belong to central region.

Table 3. Exploration for optimal basic model.

Although model 5 is a little weak that model 3, but it has technology and regional development variable, so model 5 is the optimal basic model of this paper.

This model can illustrates that the elasticity of capital input is very high in the improving labor productivity. In addition, the variable of talents is significant, but the influence is very limit. As for the technology, it is hard to judge the net influence of talents. But one puzzle you may notice, the coefficient of Urb is negative. One possible reason is that with the rapid urbanization of china's cities, the industrialization level is not very high.

3.3 The analysis of difference of regions

In order to analyze the detailed mechanism of talents, model 7-9 adds the dummy variables that can explain the difference of regions. The following regress is random effect. The statistical formula is as following:

Here is cross variable, is dummy variable is province i, is the proportion of talents of province i.

Ln(y)		Model 6(1)		Model 7(2)		Model 8(2)
Goodness of fit	Four regions	0.8805	Three districts	0.8785	Deviation group	0.8794
	lnk	0.7280685	lnk	0.730141	lnk	0.7313616
		27.23***		27.05***		27.78***
	lnh	0.0270291	lnh		lnh	0.0124749
		2.09**				0.92
	lnS&E	0.1159404	lnS&E	0.115227	lnS&E	0.1174038
		4.05***		4.00***		4.16***
	lnR&D	-0.0791509	lnR&D	-0.0792803	lnR&D	-0.0829923
		(-2.7)***		(-2.7)***		(-2.9)***
	lnR&D_Exp	0.0427174	lnR&D_Exp	0.0420618	lnR&D_Exp	0.0415296
		2.24**		2.2**		2.22**
	Ind	-0.0037026	Ind	-0.0038241	Ind	-0.0033463
		(-1.37)		(-1.4)		(-1.3)
	Ser	-0.0044396	Ser	-0.0045369	Ser	-0.0040317
		(-1.58)		(-1.6)		(-1.5)
	Eastern region d_h1	0.005523	East district d_h1	0.0312781	Super-mean d_h1	0.0173532
		2.0**		2.35**		3.4***
	Central region d_h2		Middle district d_h2	0.0266102	Below-mean d_h2	0.0160936
				2.05**		3.1***
	Western region d_h3		West district d_h3	0.029459		
				2.15**		
	NorthEastern region d_h4					
Constant	Constant	1.383922	Constant	1.38744	Constant	1.355763
		5.4***		5.35***		5.4***

Table 4.

From the regress result, we can see that the models with location groups are stronger. If we separate the provinces into four regions, the impact of Eastern region is higher 25% than other regions (see model 6(1)), but the north-Eastern region is not significant. If we separate the provinces into three regions, the difference of regions is very obvious. In model 7(2), the Eastern region's coefficient is highest, and that of Western region is higher than Central region. Because most of the rich provinces belong to Eastern regions, so we can infer that talents have stronger supporting effect in developed regions. (To refer to appendix 2)

On the other hand, the model with economic level groups is also shown in the result. Our purpose is to check whether the influence of talents is related to the economic development level. Generally speaking, the regress result gives us "yes" feedback, but this difference is very weak.

4. Conclusion

Talents have been concentrating absolutely in eastern region where is the most developed areas and the share increased by 8.06 percentage points from 1996 to 47.96% in 2007. The accumulation in other regions is stopped or negative, especially after 2004. The structure of education level of talents is promote robustly. From 2001 the accumulation of china' talents come from rapid growth of bachelor-degree talents and although the specialty-degree talents still has a large proportion the trend of decreasing is ongoing, especially in Eastern region and north-Eastern region. Considering the even larger concentration of post-graduates talents, the concentration of talents in eastern region and north-eastern region (the Old Industrial Base) is not only in the quantity but even more in quality.

The correlation test of talents with productive rate and factor shows in the Eastern region and north-Eastern region, the accumulation of talents correlated with the rise of labor productivity and capital per labor significantly, but the significant correlation does not appear in another two regions, and the degree related to the talents density is larger in eastern region than the north-Eastern. Considering the economic developing stage it is inferred that talents' effect is stronger in more developed regions. The interesting correlation is in the province-level, the concentration of talents and capital is positive related, and the difference is the regional disparity of scale of resources and degree of correlation.

The agglomeration of talents is also consider as an important aspect of regional development. Testing the correlation talents agglomeration degree with GDP per capita, it shows very different correlations between talents agglomeration and economic development in each region. In Eastern region, an obvious positive correlation is observed which means with the agglomeration of talents the output per capita in Eastern region is higher and higher. But the same feature can't be seen in other regions, especially in Central region and Western region, the elasticity between agglomeration indicator and GDP per capita is very small.

The empirical analysis based on optimal basic model method illustrates the influence of physical capital input is still dominant. And the effect of talents is significant thought is

much smaller relate to capital. This result is partially for the technology we used which can't extract the net influence of talents from the physical capital like the technique promotion or learning by doing. And another interesting result is the coefficient of urbanization is negative. One possible reason is relate to the rapid urbanization in China, the industrialization process is much slower recent years.

Introducing the regional disparity into the model, we can see that if we separate the provinces into four regions, the impact of Eastern region is higher 25% than other regions. If we separate the provinces into three regions, the difference of regions is very obvious. The Eastern region's coefficient is highest, and that of Western region is higher than Central region. Because most of the rich provinces belong to Eastern regions, so we can infer that talents have stronger supporting effect in developed regions. Generally the influence of talents is positive related to the economic development level.

To summary, although the input of technology increased rapidly and the market of technology is developing in china, the influence of talents for regional competitiveness is very limited. One possible reason is current develop stage of china is resource-driven, so the industry level is relatively low. And the different of talents' influence is very small among provinces, no matter we separate the provinces into policy-based location groups, or the economic development level groups.

In the end, we should pay attention to the limitation of this paper. The main point is we do not add the variable of talents' wage, which is the key difference of talents and ordinary labors. We hope to improve the analysis in the further study.

5. Acknowledgement

6. Appendix and results

Appendix 1. Dependence relation of major indicators.

	lny	Lnk	lnh	lnS&E	lnR&D	lnR&D_Exp	Urb	Ind	Ser	S&T_Mark
lny	1.00	0.90	0.65	0.46	0.47	0.60	0.91	0.35	0.33	0.45
lnk		1.00	0.69	0.17	0.20	0.36	0.82	0.24	0.36	0.47
lnh			1.00	0.17	0.19	0.27	0.73	-0.03	0.60	0.64
lnS&E				1.00	0.99	0.95	0.41	0.41	0.13	0.33
lnR&D					1.00	0.97	0.41	0.44	0.12	0.33
lnR&D_Exp						1.00	0.52	0.44	0.16	0.37
Urb							1.00	0.14	0.59	0.62
Ind								1.00	-0.53	-0.32
Ser									1.00	0.86
S&T_Mark										1.00

Appendix 2. Regional division of provinces.

Province	Four-region division	Three-region division	Deviation (related to the national average)
Beijing	eastern region	eastern part	above
Tianjin	eastern region	eastern part	above
Hebei	eastern region	eastern part	below
Shanxi	central region	central part	below
Neimenggu	western region	western part	above(after 2005)
Liaoning	northeast	eastern part	above
Jilin	northeast	central part	below
Heilongjiang	northeast	central part	below(after 2003)
Shanghai	eastern region	eastern part	above
Jiangsu	eastern region	eastern part	above
Zhejiang	eastern region	eastern part	above
Anhui	central region	central part	below
Fujian	eastern region	eastern part	above
Jiangxi	central region	central part	below
Shandong	eastern region	eastern part	above
Henan	central region	central part	below
Hubei	central region	central part	below
Hunan	central region	central part	below
Guangdong	eastern region	eastern part	above
Guangxi	western region	western part	below
Hainan	eastern region	eastern part	below
Chongqing	western region	western part	below
Sichuan	western region	western part	below
Guizhou	western region	western part	below
Yunnan	western region	western part	below
Shanxi	western region	western part	below
Gansu	western region	western part	below
Qinghai	western region	western part	below
Ningxia	western region	western part	below
Xinjiang	western region	western part	below

Appendix 3. Results of optimal basic model.

| Ln(y) varables	model 0	model 1	model 2	model 3	model 3(1)	model 3(2)	model 3(3)	model 4	model 4(1)	model 5	model 5(1)
R²	0.8074	0.7823	0.8083	0.8455	0.8631	0.8334	0.8228	0.7921	0.7908	0.8299	0.8314
lnk	0.7706	0.7886	0.7671	0.7436	0.7379	0.7768	0.7279	0.7813	0.7825	0.765857	0.7673352
	86.1***	38.2***	84.2***	29.3***	28.6***	48.73***	28.7***	38.6***	38.3***	26.03***	26.04***
lnh			0.0225	0.0291	0.0243	0.0319	0.0202	0.0178	0.0188	0.0214362	0.0233474
			1.79*	2.3**	1.9*	2.5**	1.6	1.36	1.42	1.65*	1.78*
lnS&E				0.0847	0.0386	0.093				0.0985074	0.1017325
				3.0***	1.6	3.3***				3.44***	3.53***
lnR&D				-0.0869		-0.0671	-0.0382			-0.0973451	-0.0977118
				(-3)***		(-2.5)**	(-1.5)			(-3.3)***	(-3.3)***
lnR&D_Exp				0.0324	0.0096		0.0424			0.0193096	0.0193119
				1.68*	0.54		2.18**			1.98**	1.99**
Ind								-0.0034	-0.0035	-0.0063655	-0.0066642
								(-1.2)	(-1.2)	(-2.22)**	(-2.3)**
Ser								-0.0041	-0.004	-0.0071026	-0.0069665
								(-1.4)	(-1.3)	(-2.37)**	(-2.3)**
S&T_Mark									-0.0037		0.0068528
									(-0.5)		
Urb		-0.0021									
		-0.97									
常数项	1.636	1.536	1.6309	1.4183	1.3985	1.1754	1.9091	1.8045	1.792	1.650106	1.610016
	16.9***	10.9***	17.0***	6.2***	6.0***	6.5***	11.6***	9.47***	9.31***	6.15***	5.93***

Appendix 4. Effect on regional competitiveness of talents based on three-region division.

Ln (y)	model 3re	model 5re	Four-region division	model 6 (1)	model 6 (2)	Three-region division	model 7 (1)	model 7 (2)	Deviation division	Model 8(1)	Model 8(2)	Model 8(3)
goodness of fit	0.8827	0.8782		0.8805	0.8749		0.8792	0.8785		0.8794	0.8794	0.8782
lnk	0.7190653 (31.1***)	0.7323106 (27.33***)	lnk	0.7280685 (27.23***)	0.7349688 (28.19***)	lnk	0.7291918 (27.07***)	0.730141 (27.05***)	lnk	0.7294284 (27.15***)	0.7313616 (27.78***)	0.7311175 (27.11***)
lnh	0.0313255 (2.4**)	0.0273513 (2.09**)	lnh	0.0270291 (2.09**)		lnh	0.0267909 (2.06**)		lnh	0.0271127 (2.09**)	0.0124749 (0.92)	0.0269549 (2.07**)
lnS&E	0.1072281 (3.8***)	0.1162145 (4.01***)	lnS&E	0.1159404 (4.05***)	0.1140766 (4.12***)	lnS&E	0.1151418 (3.99***)	0.115227 (4.00***)	lnS&E	0.1131494 (3.92***)	0.1174038 (4.16***)	0.113866 (3.92***)
lnR&D	-0.0732349 ((-2.47)**)	-0.0789909 (-2.66***)	lnR&D	-0.0791509 ((-2.7)***)	-0.0840587 ((-3.0)***)	lnR&D	-0.0792163 ((-2.7)***)	-0.0792803 ((-2.7)***)	lnR&D	-0.076687 ((-2.6)***)	-0.0829923 ((-2.9)***)	-0.0778442 ((-2.6)***)
lnR&D_Exp	0.0381256 (1.99**)	0.0405985 (2.11**)	lnR&D_Exp	0.0427174 (2.24**)	0.0442946 (2.40**)	lnR&D_Exp	0.0423167 (2.2**)	0.0420618 (2.2**)	lnR&D_Exp	0.041572 (2.17**)	0.0415296 (2.22**)	0.0411654 (2.14**)
Ind		-0.0037103 ((-1.36))	Ind	-0.0037026 ((-1.37))	-0.0036912 ((-1.40))	Ind	-0.0037203 ((-1.37))	-0.0038241 ((-1.4))	Ind	-0.0036085 ((-1.3))	-0.0033463 ((-1.3))	-0.0036878 ((-1.35))
Ser		-0.0043045 ((-1.52))	Ser	-0.0044396 ((-1.58))	-0.003512 ((-1.28))	Ser	-0.0044692 ((-1.58))	-0.0045369 ((-1.6))	Ser	-0.0042329 ((-1.5))	-0.0040317 ((-1.5))	-0.0042935 ((-1.52))
Cross of provinces grouped virtual variables and higher education workforce on numeric values			eastern region d_h1	0.005523 (2.0**)	0.0291506 (2.26**)	eastern part d_h1	0.0035632 (1.31)	0.0312781 (2.35**)	above average d_h1	0.0041176 (1.42)	0.0173532 (3.4***)	0.0020936 (0.73)
			central region d_h2		0.0285065 (2.28**)	central part d_h2		0.0266102 (2.05**)	below average d_h2		0.0160936 (3.1***)	
			western region d_h3		0.0264281 (2.00**)	western part d_h3		0.029459 (2.15**)				
			northeast d_h4		0.0104051 (0.78)							
constant	1.222441 (5.3***)	1.358113 (5.25***)	constant	1.383922 (5.4***)	1.32653 (5.29***)	constant	1.389729 (5.4***)	1.38744 (5.35***)	constants	1.377547 (5.34***)	1.355763 (5.4***)	1.375756 (5.31***)

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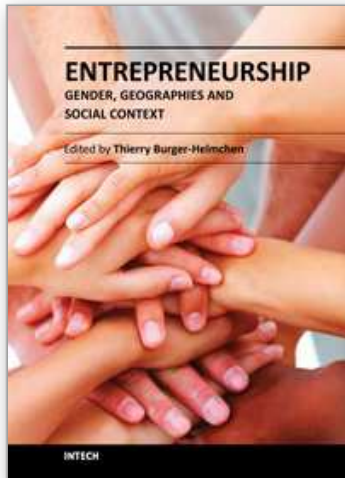
Entrepreneurship - Gender, Geographies and Social Context

Edited by Prof. Thierry Burger-Helmchen

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