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# Level Characteristics and Influencing Factors of High-tech Industry Development Level in China

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**Abstract:** Identification of influencing features of high-tech industry transferring is a necessary step for industry transfer analysis. In order to identify the level characteristics and influencing factors of high-tech industry in China, this article studies the features influencing Chinese industry transferring. All the features include the level of economic development, demand changes, research and development expenditures and human resources. By means of standard sorting selection model and generalized ordered model, this study analyzes how the Chinese high-tech industry development level is influenced by all the influencing factors. The results show that the development level of economic has a negative effect in the low level of high-tech industry and a positive influence in the high level. The industrial development exerts an impact on the high-tech industry. The expenditure of research and development becomes more and more effective with the ascent of the high-tech industry level. The human capital has an uncertain influence on the high-tech industry. It means that all the influencing features which affect high-tech industry's transferring in China are uncertain. Degree of influences depends on the complexity of the external environment. This research can help the Chinese government formulated a series of policies to help high-tech industry transfer in a more efficient way.

**Key words:** High-tech industry, influencing factors, human capital

## INTRODUCTION

High-tech industry, as the most active industry in technological innovation in the knowledge economy activities, is the new growth point during the economic development. China has experienced 20 years of rapid development. From 1995 to 2010, the average annual growth rate of China's high-tech industrial output value is 22.46%. China's high-tech industry has got the fixed assets growth rate of 18.08% during 1996-2010. High-tech industry's role, which is for the China's economic and social development "booster", has become increasingly evident. It is helping China shift from extensive economic mode to intensive economic mode. However, nearly in two decades, the gap between the developing levels of the high-tech industry in China's the different regions had preached greater and greater.

Based on the relevant literature, this study firstly discusses the level characteristics of the different regions of China high-tech industry as well as the major elements which have a certain impact to the level of development of high-tech industry. And then, this article builds the influencing factors on regional developing level of high-tech industry model and adopts the goprobit method to analyze the influencing factors on regional developing level of high-tech industry. Finally, by summing up the results of the previous analysis, this study presents the specific methods and policy direction to improve the developing level of China's high-tech industry. This research has a great influence on developing the national high-tech industrial zone development policy and achieving sustainable development of the regional high-tech industry.

Up to now, the studies about regional developing level of high-tech industry are mainly concentrated on the following two aspects: The evaluation of the developing level of high-tech industry; the influential factors on the developing level of high-tech industry.

General methods for the evaluation of the developing level of high-tech industry are about to construct a high-tech industry competitiveness evaluation index system, using analytic hierarchy process, fuzzy analytic hierarchy process method to judge (Kamieniecki and Lackie, 1992; Pan, 2011). Raad used the general method to evaluate the high-tech industry more efficiently (Raab and Kotamraju, 2006). Specifically there are two types of methods: non-parametric method and parametric method. The non-parametric method has been realized by DEA (Data Envelopment Analysis) method (Jie *et al*., 2012). The parametric method has been applied by SFA (Stochastic Frontier Approach) method (He and Chen, 2011; Odeck and Brathen, 2012). However, in the

conditions of model setting reasonable and using panel data, the SFA method can get better estimates than the DEA (Data Envelopment Analysis) method (Sueyoshi and Goto, 2013). Some scholars had made an international comparison of high-tech industry to determine the state of development of high-tech industry (Frenkel *et al*., 2003).

Many scholars have conducted a deep research about the influential factors on the developing level of high-tech industry. Czarnitzki pointed out that the main factors, which affecting the development of high-tech industry, include government policies, demand factors, the region 's technology level and infrastructure (Czarnitzki and Thorwarth, 2012). Besides this, Czarnitzki emphasized the role of government in the development of high-tech industries in the region (Czarnitzki and Thorwarth, 2012). Some scholars believe that the R and D (Research and development) and technological innovation are the most important factor affecting the development of high-tech industry (Jin, 2012; Huang and Chi, 2013). In addition, from the existing literature, the main factors affecting the developing level of high-tech industry mainly include market structure, firm size and firm's Ownership Structure. (1) Schumpeter (2010) has proposed a theory about the relationship between market structure and research and development. He believes that monopoly and research and development are closely linked, high market concentration in the industry helped to inspire the research and development of enterprises. Arrow (1962) thinks that the competitive environment will give corporate research and development greater incentives. The studies believes that even in a monopolistic market the research and development of enterprises isn't always efficiency. (2) The relationship between firm size and R and D efficiency is debated. Clark (2005) believes the efficiency of research and development requires a certain amount economies of scale (Ferrer-i-Carbonell and Frijters, 2004). Large-scale manufacturing enterprises are easy to obtain a higher return due to the advantage of research and development cost-sharing. When companies are over expanding, or reduced capacity of management control, or in excessive bureaucratic control, research and development efficiency will be compromised (Mathrani and Mathrani, 2013). Pavitt *et al*. (1987) thinks that the smaller and larger corporate have higher research and development efficiency than the medium enterprises, which presents "U" relationship between research and development efficiency and enterprise scale.

From the existing literatures, the method for the evaluation of the developing level of high-tech industry is mainly focused on building a different evaluation index system to measure the level of competitiveness. The influencing factors of the developing level of high-tech industry are mainly concentrated in the size of the role on the development of high-tech industry. This article will focus primarily on the level of development of different regions of the high-tech industry in China with the level of features, as well as how the external factors affect the levels these two issues.

## MATERIALS AND METHODS

**Selecting the variables and setting the measurement model:** According to the research focus, this article is ready to select the following parameters for explanatory variables of the model to be discussed.

**Level of regional economic development (RGDP):** The region with a higher developing level of economic can provide favorable conditions for the development of regional high-tech industry. The region with a high developing level of economic generally has excellent infrastructure and social service environment. This feature will guarantee the high-tech industry's elements flow frequently. In the meantime, good industry structure is also able to generate regional economic externality (Hoff, 2007). In generally areas with higher levels of economic development usually have more developed traditional industries and these local traditional industries' growing has also led to the rapid development of high-tech industry (Hu and Jefferson, 2004).

**Demand (DM):** Market demand and the capacity of the market size determine the degree of commercialization of high-tech industrial products and thus determine the growth of high-tech industry output capacity and innovation ability. China is in the stage of industrialization and rapid urbanization, most of the industry demand for the product in the high-tech industry comes from industrial development.

**Research and development (R andD):** R and D investment has become the most important part of the development of high-tech industry and it is also the power source of high-tech enterprises technological innovation and profits (Guellec and van Pottelsberghe, 2004). The high-tech industry is the high capital-intensive, high R and D investment industry. The regional scientific and technological resource endowment is the decisive force for the development of high-tech industry in the region. The technological change and research development of the high-tech industry have a strong dependence on the R and D expenditure.

**Human capital (HC):** Human capital is the premise condition of enterprise knowledge creation. Human capital accumulation can continually enhance the sustainable competitive advantage of high-tech enterprises (Cooper *et al*., 2007). High level of Human capital has a key role on the operational efficiency and technological innovation of high-tech industry and it is the main source of revenue of the high-tech industry innovation.

In general, the developing level of high-tech industry in different regions can be reflected through the level of high-tech industry and by the high-tech industry's benefit. This article categorizes the developing level of China's regional high-tech industry into five levels. These levels can clearly distinguish the developing level of the high-tech industry in China's different region. All the data is coming from the ranking of the high-tech industrialization the various regions. The level,in which regional monitoring ranking is in 1-6, is sorted to the first level, known as the highest developing level of high-tech industry. The level, in which regional monitoring ranking is in 7-12, is sorted to the second level, known as the higher developing level of high-tech industry. Ranking in 13-18, or in 19-24 is the third or the fourth level, known as the lower level or medium level of high-tech industry. Ranking in 25-31 is the lowest level, which is known as the most backward developing level of high-tech industry. The level value will be known as a parameter, GRAD, in this article.

In this study, the panel data are sorted in 29 provinces in China in 2000-2010. The dependent variable is defined above as the developing level of high-tech industry in China, denoted by GRAD. The province's per capita Gross Domestic Product (GDP) is used to be on behalf of the level of economic development in the region, denoted by RGDP. The Provincial per capita added value of the secondary industry is on behalf of high-tech industries' demand factors, denoted by DM. The R and D intramural expenditure is on behalf of the high-tech industry's R and D funding, denoted by R and D. The number of people involved in the industries' R and D activities is on behalf of the high-tech industry investment in human capital, denoted by HC. All the data is coming from the China Economic Information Network statistics database and high-tech industry in China Statistical Yearbook (2000-2010). In addition, because most of the data are nominal values, need to be adjusted to remove price factors.

In this study, the Fisher-ADF unit root test methods for panel data is adopted to make stationary test for each variable. After the test, each variable is the same order number sequence and the Kao Co integration test for panel data prove the co integration relationship existing between the various variables, which is in line with the conditions of the econometric models .

**Construction model of high-tech industry the level of regional development impact factor:** Based on the above analysis, building a model as follows:

$$GRAD_{it} = \alpha_1 \ln RGDP_{it} + \alpha_2 \ln DM_{it} + \alpha_3 \ln R \text{ and } D_{it} + \alpha_4 \ln HC_{it} + \mu_{it} \quad (1)$$

In the model (1); i represents the location; t represents the year; represents the residuals.

Model (1) can be transformed to:

$$GRAD_{it} = X'_{it}\alpha + \mu_{it} GRAD_{it} = X'_{it}\alpha + \mu_{it} \quad (2)$$

$X_{it}$ representatives explained variable vector; $X_{it}$ = (In RGDP, InDM, InR and D, InHC)' represents the location; t represents the year; $\alpha$ is the vector of coefficients of the explanatory variables, $\alpha = (\alpha_1, \alpha_2, \alpha_3, \alpha_4)$; $\mu_{it}$ represents the disturbance and satisfies $N(0, \sigma^2)$ distribution.

Further more, since the variable GRAD is in ordered discrete form, the sorted selection method should be adopted to estimate this model. Because of using the sorted selection method for the estimation of the model, the standard sort selection method or the generalized Sort selection method should be adopted to test .The nature, of which in the sort selection model estimated coefficients $\alpha$ is not changing with different threshold, is called parallel assumptions. In the case of testing to meet the parallel assumption, criteria sort model should be used. Otherwise, the generalized sort selection model should be adopted.

**Standard sorting selection model:** Assuming $GRAD_n$ has J values, respectively, 1, 2,..., J (J = 5).

An unobserved continuous variable $GRAD^*_{it}$ makes:

$$GRAD_{it} = j \Leftrightarrow k_j = <GRAD^*_{it} < k_{j+1} \quad (3)$$

$$j = 1, 2, \ldots, 5; k1 = -\infty, k6 = +\infty_0$$

Define:

$$GRAD^*_{it} = X'_{it}\alpha + \mu^*_{it} \quad (4)$$

k2, k3, k4, k5 are four fixed thresholds:

$$P(GRAD_{it} = j | X_{it}) = F(k_{j+1} - X'_{it}\alpha) - F(k_j - X'_{it}\alpha) \quad (5)$$

$$F(k_6 - X_{it}'\alpha) = 1$$

$$F(k_1 - X_{it}'\alpha) = 0$$

F(•) is a cumulative probability distribution function of the standard normal function.

Using maximum likelihood estimation method to estimate the coefficients α and then calculate the marginal probability of effect:

$$MPE_{jk} = \frac{\partial(P(GRAD_{it} = j|x_{k,it}))}{\partial_{x_k}}$$

$$= (f(k_j - X_{it}'\alpha) - f(k_{j+1} - X_{it}'\alpha)) \times \alpha_k \quad (6)$$

MPE is a function of $X_{it}$, with each sample points obtained, seeking the sample expectations:

$$AMPE_{jk} = E\left\{\frac{\partial(P(GRAD_{it} = j|x_{k,it}))}{\partial_{x_k}}\right\}$$

$$= E\left\{[f(k_j - X_{it}'\alpha) - f(k_{j+1} - X_{it}'\alpha)] \times \alpha_k\right\} \quad (7)$$

f is the F probability density function, the Eq. 7 is the j-th threshold k explanatory variable's marginal probability value.

**Generalized ordered chosen model:** Under the parallel assumption, an estimated value of coefficient values and marginal probability effect tends to produce biased estimates, which cannot be ignored (Boes and Winkelmann, 2004; Clark *et al*., 2005). But in Generalized ordered probit method (Go probit); the estimated coefficients can vary with different threshold:

$$k_{it,j} = \tilde{k}_j + X_{it}'\gamma_j$$

$$\tilde{k}_1 = -\infty, \tilde{k}_6 = +\infty \quad (8)$$

represents the i-th individual in the period t, the j-th gate limits. Take the Eq. 8 into 5:

$$P(GRAD_{it} = j|X_{it}) = F(\tilde{k}_{j+1} - X_{it}'\alpha_{j+1}) - F(\tilde{k}_j - X_{it}'\alpha_j) \quad (9)$$

$$\alpha_j = \alpha - \gamma_j$$

$$F(\tilde{k}_6 - X_{it}'\alpha_6) = 1, F(\tilde{k}_1 - X_{it}'\alpha_1) = 0$$

Using maximum likelihood estimation method can estimate the coefficient values of $\alpha_j$. Further calculate the marginal probability effect:

$$AMPE_{jk} = E\left\{\frac{\partial(P(GRAD_{it} = j|x_{k,it}))}{\partial_{x_k}}\right\} \quad (10)$$
$$= E\left\{f(\tilde{k}_j - X_{it}'\alpha_j) \times \alpha_{j,k} - f(\tilde{k}_{j+1} - X_{it}'\alpha_{j+1}) \times \alpha_{j+1,k}\right\}$$

Impose constraints on the generalized method, that is, parallel assumptions:

$$\alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 \quad (11)$$

When the Eq. 11 is established, this method is equivalent to the standard sort of selection method. Maximum likelihood estimation can test the validity of the constraint Eq. 11. Test statistic obey the $\chi^2$ distribution, in which degrees of freedom is k (J-2) and the number of explanatory variables is k.

Compared with the standard ranking selection model, the effect of marginal probability value of generalized sort selecting model is more complex, more flexible probability of occurrence of the impact on the dependent variable.

In this study, the standard sort selection model and generalized sort selection model are both estimated. The results show that, the parallel assumptions constraint likelihood estimation statistic for the 22.20, p of 0.0397 at 5% significance level, which is to reject the assumptions in parallel constraint, indicating the presence of a generalized effect . So, this article chooses the generalized sort selection model.

Using the generalized sort selection method to estimate the Eq. 1, the coefficients estimated values are shown in Table 1. All the estimated values shows the impact of influencing factors on different coefficients level to high-tech industry.

On the basis of coefficient estimate, further calculation of the marginal probability effect is needed. The effect marginal probability values are calculated by the Eq. 10 as shown in Table 2.

## RESULTS

**Relationship between levels of economic development and high-tech industrial development:** Table 2 shows the estimates of the influencing factors on the regional development of high-tech industry under different levels. In the 3-5 hierarchical level, the lower-level development of high-tech industry, coefficient value of lnRGDP is negative. With the rise of the hierarchical level, the negative impact of economic development on the

Table 1: Impact of influencing factors on different coefficients level to high-tech industry

| | Estimated coefficients | Estimated coefficients level | | |
|---|---|---|---|---|
| Influencing factors | $\alpha_2$ | $\alpha_3$ | $\alpha_4$ | $\alpha_5$ |
| lnRGDP | -5.083***(-2.74) | -9.656***(-6.16) | -5.469***(-4.86) | -6.851***(-3.62) |
| lnDM | 3.149**(1.99) | 8.480***(5.83) | 4.331***(4.67) | 5.940***(3.94) |
| LnR and D | -1.144***(-2.77) | -1.518***(-4.26) | -1.056***(-4.13) | -9.040***(-3.23) |
| LnHC | 0.588(1.45) | 0.651**(2.05) | 0.711***(2.72) | 0.637**(2.30) |

*: Indicates significantly in the 10 % significance level, **Significant at the 5 % significance level ***Significant at 1% significance level; the values in brackets are the t statistics, RGDP means the gross domestic product in special region, DM means the market demand in special region, R and D means research and development expenditure, HC means human capital level. lnRGDP, lnDM, lnR and D and lnHC are defined and used in Eq. 1, Their meanings are described in the selecting the variables and setting the measurement model part, The $\alpha_2$, $\alpha_3$, $\alpha_4$ and $\alpha_5$ are the vector of coefficients of the explanatory variables, They are defined and used in Eq. 1 to 10

Table 2: Impact of various factors on different high-tech industry level

| | Hierarchical level of the high-tech industry development (GRAD) | | | | |
|---|---|---|---|---|---|
| Influencing factors | 1 | 2 | 3 | 4 | 5 |
| lnRGDP | 0.271*(1.73) | 3.002***(5.82) | -1.409***(-4.86) | -1.087***(-3.08) | -0.796***(-3.72) |
| lnDM | -0.168(-1.52) | -2.724***(-5.89) | 1.400***(4.67) | 0.801***(2.66) | 0.691***(3.58) |
| LnR andD | 0.061*(1.89) | 0.457***(4.06) | -0.154(-4.13) | -0.258***(-2.99) | -0.105**(-2.37) |
| LnHC | -0.031(-1.29) | -0.191*(1.86) | -0.023(-0.12) | 0.171**(2.01) | 0.074*(1.92) |
| Sample:203 | | LR statitics(16 df) 258.42 | Log likelihood values-197.07 | | |

*Indicates significantly in the 10 % significance level, **Significant at the 5 % significance level ***Significant at 1% significance level, the values in brackets are the t statistics, RGDP means the gross domestic product in special region, DM means the market demand in special region, R and D means research and development expenditure, HC means human capital level, lnRGDP, lnDM, lnR and D and lnHC are defined and used in Eq. 1, Their meanings are described in the selecting the variables and setting the measurement model part, GRAD means the developing level of high-tech industry in China, The value of GRAD can be ranked from 1 to 5

development of high-tech industry is gradually increased. This is because in the levels of development, level of economic development is backward, to some extent, which restricts the development of the local high-tech industry.

Specifically, the degree of openness, in which the economy is relatively backward, is not enough. In 3-5 high-tech industrial development level areas, these provinces are mostly in central and western area, due to geographical conditions, the degree of openness of the economy is relatively backward. It led to the introduction of foreign high-tech industries less. The fewer foreign capital inflow and foreign technology spillover, which are caused by the economic openness relatively backward, are probably conducive to the development of high-tech industry of these areas.

The developed social service system is mainly a technology service system. It has an important role in promoting the proliferation of technology in high-tech industry, innovation rational allocation of resources and technological achievements into economic benefits. Economically backward areas usually have fewer social services and inadequate infrastructure. The majority regions of relatively regional economic development backward are tend to have a small amount of R and D center, business service center and conversion centers. Backward infrastructure limits the region's high-tech industry development, which become the necessary elements of an adequate flow of circulation and the flow of key bottlenecks. In recent years, Chinese government vigorously into the construction of infrastructure in the central and western regions is expected to ease this constraint of the high-tech industry development.

The government system and legal environment are also the important factors constraining high-tech industry economy development in the relatively backward areas. The high-tech industry needs the support of government policy, in large part due to the high input, high-risk characteristics. For example, small and medium-sized high-tech enterprises need financing loans, technological innovation subsidies, tax incentives and other support from government. Economically backward often accompany with a backward system, which makes the system environment of the high-tech industry is relatively poor. In addition, because the central and western regions have not formed a complete system of high-tech industry covered by intellectual property rights and patent protection, the innovation uncertainty of income is increasing. The enthusiasm of the innovators is slow down. Innovation hovers at a low level.

In 1-2 high-tech industry level, coefficient value of lnRGDP is significantly positive, indicating that the economic development has a positive impact on high-tech industry in these areas. Good economic and social environment, a sound industrial development mechanism, a complete legal system of intellectual property protection to promote the rapid development of high-tech industry in these areas. And in the 2 developing level of high-tech industry, the influence of economic development in the

region is greater than in the first-level high-tech industry. This is because the high-tech industry develops to a certain extent, that is the mature stage of the cycle of the high-tech industry, high-tech industry achieves a stable development, reduce uncertainty, smaller influence by the environment.

**Relationship between changes in demand caused by the industrial development and high-tech industrial development:** In 3-5 levels of the high-tech industry development, the industry had a positive role in promoting the development of high-tech industry. In 1-2 level, industry has a crowding-out effect on high-tech industry. Thus, with the level of high-tech industry upgrading, the development of high-tech industry is influenced by industrial developing from driven to squeeze.

In 3-5 level, coefficient values of lnDM are significantly positive, which are 0.691, 0.801, 1.4. The values are in increasing trend. This indicates that the level of regional industrial development has played a positive role in promoting the development of high-tech industry. And within a certain range of high-tech industry development, industry's role in promoting high-tech industry is gradually increasing. Industry is the main body of the demand for high-tech industry. Industry provides the broad market and good opportunities for development for the high-tech industry to a certain extent. Industrial development and industrial production efficiency are increasing demand for new technologies and high-tech, thus contributing to the product development and technological innovation of high-tech industry.

However, in the 2 level, coefficient value of lnDM is -2.724. In the 1 level, the coefficient value of lnDM is not significant. After the high-tech industry develops to a certain extent, the impact of industry on high-tech industry changes from driving to inhibiting. China is currently in the stage of rapid advance of industrialization, the development of high-tech industry, to some extent, plays an alternative role on the industrial capital. In addition, industry and high-tech industry carry out a certain degree of competition in the elements of resources configuration, the common market, innovation proceeding. To some extent, industry and high-tech industry shows a shifting relationship. Therefore, at this stage in the development of industry and high-tech industry, both industries will produce a crowding-out effect. Thus in the 1 level, the influence between industry and high-tech industry becomes non-significant. High-tech industry penetration and industrial demand for high-tech are the main motivation of industrial integration.

**Relationship between changes in effectiveness of R and D spending and high-tech industrial development:** From Table 2, in the 4-5 level, the coefficient values of LNR and D are -0.258 and -0.105. R and D expenditures have a negative impact on the development of high-tech industry. This is because the R and D expenditures for R and D output and high-tech industry output increases do not play the desired effect, or refer to the effectiveness of R and D spending is low. In the 3 level, the coefficient value of LNR and D is not significant. R and D spending in a positive impact on the 1-2 level of development, the coefficient values LNR and D are 0.061 and 0.457. R and D spending has a higher effectiveness.

In the lower level of the high-tech industry, regional R and D spending does not always play a positive role. Sometimes it is even negative. This will make the high-tech industry output decline. And it is because the area with low level of development tends to pay more attention to the introduction of technology. On the basis of the introduction of technology digestion, enhance innovation capability through absorption, rather than focus on independent research and development. From R and D expenditures to technological innovation, then to the realization of the value of technology innovation diffusion and technological innovations, it needs a certain time lag. As the last link of technological innovation, the effectiveness of the technology diffusion largely determines the effectiveness of R and D spending. In the 3-5 levels, the areas need focus on the promotion and application of technological achievements, which hinders the effectiveness of R and D expenditures and R and D results.

In 1-2 level, R and D spending on the development of high-tech industry has played a positive role in promoting the effectiveness of R and D expenditures. In the 2 level, the coefficient value of LNR and D is 0.457. R and D spending has a great influence on the level of development of high-tech industry. More investment in research and development to bring greater technological progress led to higher output growth. This is consistent with the analytical framework of endogenous growth theory. In the higher level, the areas often promote and encourage research and development of enterprises through a variety of ways constantly, promote technological innovation, promote combination and technology transfer.

**Relationship between human capital (HC) and high-tech industrial development: The impact is uncertain:** The traditional view is that human capital is the foundation of high-tech enterprises' research and innovation, which is critical to the development of high-tech industry. The

estimation results in Table 2 show that, in the 4-5 level, the coefficient values of lnHC are 0.171 and 0.074. Human capital has a positive role in promoting the development of high-tech industry. But in the second hierarchical level, the coefficient value of lnHC is -0.191, human capital has a negative impact on the development of high-tech industry. In the 1-3 level, the impact of human capital on the level of development of high-tech industries is not significant. The impact of human capital on the level of development of high-tech industry shows uncertainty. In the 4-5 level, human capital's contribution to the development of high-tech industry is reflected. In the low level, the role of human capital becomes more apparent.

In addition to human capital, the development of high-tech industry is also constrained by the various conditions. The growth of human capital is not always a positive relation with high-tech industrial development. The non-significant impact in 1 level (2) and the negative effect in 2 level of Human capital on high-tech industry have proved it. The workers move frequently. And they finally gather in some areas. Some of the high-tech industry investment in human capital did not increase the income of the high-tech industry. By the meantime, the opportunity cost of the innovation of high-tech industries is also increased. Human Capital expenditure risk is the main reason for uncertainty lead to the impact of human capital on the development of high-tech industry. Human capital, on the other hand, will have a positive effect until accumulating to a certain extent. The expenditure of human capital has resulted in high-tech enterprises' current earnings decline. The uncertainty of the time lag caused by human capital impact is more obvious in the case of human capital in China's high-tech industry output contribution to the overall lower.

## DISCUSSION

Discuss and co-relate the results of this study with other reviews of different authors. This article reveals that all the results are partly consistent with other previous. In conclusion, this article makes the following results. (1) The development level of economic has a negative effect in the low level of high-tech industry and a positive influence in the high level. This conclusion is partly consistent with Arrow (1962). Arrow believes the level of economic can influence the industry transferring positively in most situation. (2) The industrial development exerts an impact on the high-tech industry. But the impact can be determined. This conclusion is generally consistent with Raab and Kotamraju (2006). (3) The expenditure of research and development becomes more and more effective with the ascent of the high-tech industry level. This conclusion is generally agreed with Frenkel *et al.* (2003). Frenkel believes research and development can prompt most industry developing. (4) The human capital has an uncertain influence on the high-tech industry. This result is partly agreed with Cooper *et al.* (2007). Cooper believes the human capital sometimes plays a different role on different industry.

Through the discussion, it means that all the influencing features which affect high-tech industry's transferring in China are uncertain. Degree of influences depends on the complexity of the external environment.

## CONCLUSION

This study, through the analysis of influencing factors in the different levels of the high-tech industry, gets the following conclusions. In the low level, the level of economic development plays a certain inhibition on the development of high-tech industry. But only when the high-tech industry has developed to a certain extent, it will be positively affected by the local economic development level. The influence between level of industrial development and the development of high-tech industry is to the contrary. With the ongoing improvement of the level of high-tech industry, industrial development was driven by the development of high-tech industries to extrusion. The effectiveness of R and D spending in the level of development of the various high-tech industries is quite different. In general, with the upgrading of the level of development of high-tech industry, the effectiveness of R and D spending gradually increases. The Human Capital expenditure risk and human capital accumulation delay led to uncertainty about the impacts of the level of development of the human capital on high-tech industry.

In conclusion, this article makes the following results. (1) The development level of economic has a negative effect in the low level of high-tech industry and a positive influence in the high level. This conclusion is partly consistent with Arrow (1962). Arrow believes the level of economic can influence the industry transferring positively in most situation. (2) The industrial development exerts an impact on the high-tech industry. But the impact can be determined. This conclusion is generally consistent with Raab and Kotamraju (2006). (3) The expenditure of research and development becomes more and more effective with the ascent of the high-tech industry level. This conclusion is generally agreed with Frenkel *et al.* (2003). Frenkel believes research and development can prompt most industry developing. (4) The human capital has an uncertain influence on the high-tech industry. This result is partly agreed with

Cooper *et al.* (2007). Cooper believes the human capital sometimes plays a different role on different industry.

Through the discussion, it means that all the influencing features which affect high-tech industry's transferring in China are uncertain. Degree of influences depends on the complexity of the external environment.

Combined with the conclusion, this study puts forward several suggestions about the high-tech industry development policies and strategic direction.

Firstly, deepen the revolution about the science and technology management system of the high-tech industry. China's high-tech industry in the future needs to improve science and technology management system. The government should make the technological development management and speed of technological development in harmony.

Secondly, it is important to increase independent research and development investment and actively participate in international competition in order to promote the industrialization of R and D output. Investment, exports and technological innovation are the three most important factors to promote the rapid development of China's high-tech industry.

Finally, improving innovation mode and constructing the production, teaching and research system. The ability of independent innovation is obviously insufficient, which is connected with the innovation foundation and innovation mode. The management of technology introduction and digestion should be strengthened. Restrict the blind and repeated introduction. Strongly support the construction of production, teaching and research system, government needs to focus on the development of independent intellectual property rights innovation, to encourage new innovative mode.

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