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Research and Analysis Of Patent Influence On The Development Of High-tech Industry

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Abstract

With the development of high-tech industry, the number of patent applications is also increasing, and the influence of patent research on the development of high-tech industry has a strong practical significance. According to the panel data of electronic and communication equipment manufacturing industry and electronic computer and office equipment manufacturing industry from 2012 to 2020, the two variables of patent application and main business income were analyzed by correlation analysis and causality test. The results show that the development of patent and the two industries are highly positively correlated, but only the electronic computer and office equipment manufacturing industry has a one-way causal relationship. In view of the above results, suggestions are put forward to improve the patent and promote the development of high-tech industry.

Keywords

Patent; high-tech industry; correlation analysis; causality test.

1. Literature review

It is of important reference value to study the influence of patent on the development of high-tech industry, and domestic scholars have done a lot of research on related issues. Du Yueping analyzed the relationship between the patent output and marketization and industrial innovation and development respectively through the construction of knowledge production function model; By studying intellectual property barriers, And analyze the export status of high-tech products, Find out the countermeasures to deal with the intellectual property barriers; Through the clustering analysis of high-tech industries, Analyzing patent data from key industries, Making suggestions for regional development; Fu Changqing et al. From the national patent strategy, industry patent strategy and enterprise patent strategy, Analyze the important role of patent information in the patent strategy of high-tech industry; Zhu Pingfang et al. verified that the patent output of large and medium-sized high-tech industry in Shanghai is not much, But it has a strong promoting effect to the industrial and economic growth.

2. Research design

2.1. Variable selection

On the basis of the existing research, this paper studies the relationship between patent and industry development of high-tech industry, considering the indicators need to be representative and overall, and avoiding time lag and ensuring wide information for the development of high-tech industry, considering the effective combination of high-tech industry and market, the index and the main business income is selected as the measurement index.

The data required in this paper are mainly from China Statistical Yearbook of High-tech Industry. Due to the rapid development of high-tech in recent years, the relevant data of electronic and communication equipment manufacturing industry and electronic computer and office equipment manufacturing industry from 2012 to 2020 are selected.

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2.2. Model setting

To facilitate the purpose of variable expression, the number of patent applications is referred to as X and the main business income is referred to as Y. To eliminate the heteroscedasticity in the data, take the natural log for two variables, namely:

$$LX=\ln(X), LY=\ln(Y)$$

3. Empirical analysis

3.1. Correlation analysis

Through the SPSS calculation of patent applications X and the main business income Y correlation coefficient, the results as shown in figure 1, electronics and communication equipment manufacturing and electronic computer and office equipment manufacturing patent applications and main business income are highly positive correlation, shows that there is high closeness between them, so can establish econometric model to further explain the relationship between them.

Table 1 The correlation coefficient table

Industry category	Electronics and communication equipment manufacturing industry	Electronic computer and office equipment manufacturing industry
The correlation coefficient of patent applications and main business income	0.931	0.914

3.2. Sequence stationarity test

Since the existence of non-stationary time series can lead to the failure of regression modeling, it is necessary to judge the stationarity of the time series before analysis, that is, the unit root test of the variable sequence. This paper conducts ADF test by Eviews, and the results are shown in Table 2.

Table 2. Results of the unit root test

Industry category	variable	Inspection type	ADF price	P price	conclusion
Electronics and communication equipment manufacturing industry	LX	(c,t,1)	-2.003997	0.5157	Not smooth
	LY	(c,t,1)	-1.140524	0.8478	Not smooth
Electronic computer and office equipment manufacturing industry	LX	(c,t,1)	-1.400499	0.5278	Not smooth
	LY	(c,t,1)	-1.596233	0.4397	Not smooth

According to the test results, the P-values of electronic and communication equipment manufacturing and electronic computer and office equipment manufacturing are 0.5157,0.8478,0.5278 and 0.4397 respectively, which are greater than 0.05, that is, the original hypothesis is accepted. Therefore, the LX and LY sequences of the two industry categories are non-stationary time series.

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3.3. Co-integration analysis

According to the above analysis results, the time series variables of the two industries are non-stationary sequence, but according to the requirements of Granger causality test, further cointegration analysis is needed, that is, to test whether the linear combination of the above two groups of non-stationary variables is a stationary sequence. This was tested by Johansen co-integration method and the results are as follows

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.750471	14.14741	15.49471	0.0790
At most 1 *	0.468940	4.430158	3.841466	0.0353

Figure 1 Johansen co-integration inspection results of electronic and communication equipment manufacturing industry

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.928423	22.98274	15.49471	0.0031
At most 1 *	0.476000	4.523845	3.841466	0.0334

Figure 2 Johansen Cointegration test results of electronic computer and office equipment manufacturing industry

The Johansen co-integration test can be used to determine the number of co-integration relationships between variables. The "None" in the figure indicates no co-integration relationship. If the P-value of the test result is less than 0.05, the original hypothesis is rejected. The "At most 1" indicates at most one cointegration relationship, and if the P-value of the test result is less than 0. 05, indicating the rejection of the null hypothesis that there is at most one cointegration relationship.

From the above Johansen cointegration test results, the results of figure 2 said the patent application and the main income there is at least one cointegration relationship between the two variables, so according to the sequence stability test results and the relationship between the judgment, can get the computer and office equipment manufacturing industry variable cointegration equation, specific as follows: LY=0.5154LX

Through the co-integration equation, it can be seen that LX and LY in the electronic computer and office equipment manufacturing industry are positive long-term equilibrium relationship, that is, for every 1% increase in the patent application of the electronic computer and office equipment manufacturing industry, the main business income of the high-tech industry increases by 0.5154%.

3.4. Granger causality test

To further clarify the causal relationship between the number of variable patent applications and the main business income, the Granger causality method was used for testing. Combined with the data period selected in this paper, the lag period of the minimum accompanying probability of 2 years was selected after multiple tests and comparison. The test results are shown in Table 3:

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Table 3. Results of the Granger causality test

Industry category	Causal relationship hypothesis	lag phase	number of variates	F-statistic	Companion probability
Electronic computer and office equipment manufacturing industry	The patent application is not the cause of the product revenue	2	7	10.0541	0.0905
	Product income is not the cause of patent applications	2	7	0.47403	0.6784

From the test results, it can be seen that the probability of the number of patent applications in electronic computer and office equipment manufacturing and the main business income P value =0.0905. When the significant level is 0.05, there is no obvious causal relationship between the two variables; when the significant level is 0.1, there is a single Granger causality between the two variables, that is, the growth of the number of patent applications promotes the growth of the main business income, but the growth of the main business income does not promote the growth of the number of patent applications.

4. Conclusion and suggestion

According to the correlation analysis and causal test analysis results, the patent and electronic and electronic electronics and communication equipment manufacturing and electronic computer and office equipment manufacturing two types of high-tech industry development are positive correlation between, but only the computer and office equipment manufacturing patent application number and main business income variables between one-way causal relationship, namely the development of the number of patent application has a significant effect on the development of industry development. For some industries with no obvious effect of patent application on industrial development, the following suggestions are put forward:

We will strengthen patent protection and encourage enterprise innovation. At present, the patent protection system in China is still imperfect, the phenomenon of patent infringement still exists, so to encourage enterprises to innovate, it is necessary to strengthen patent protection, increase the punishment of patent infringement; also, can increase the publicity of patent protection, enhance the awareness of the national knowledge protection.

Adopt diversified licensing mode to improve the effective patent conversion rate. Now, although the number of high-tech industry patent application in increasing year by year, but part of the patent application has not been effectively transformation, so can adopt diversified patent licensing model, improve the patent conversion rate, help enterprises to commercial patent, further patent technology to market, so as to promote the development of high and new technology industry.

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