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The Influencing Factors of Changes in Patent Application Volume in China

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Abstract: This study aimed to investigate the trend of patent acceptance, regional characteristics and influencing factors, as well as the relationship between acceptance and grant. This report first surveys the early research in this field and summarizes the literature, then collects the required data from the China National Intellectual Property Administration of China and the China Statistical Yearbook, and adopts the secondary data analysis method. Through the analysis, a comprehensive understanding of the dynamic changes in patent acceptance, regional characteristics, and their influencing factors was achieved. This provides data support and decision-making references for the further development of patent policies and strategies.

Keywords: Influencing Factors; Changes; Patent Application

1. Introduction

This article will discuss the influencing factors of changes in patent application volume. Patents not only protect the rights of inventors, especially in the field of patents, but also play a crucial role in promoting innovation, technological progress, and policy-making (Langinier and Moschini, 2002; Hall, 2007). The purpose of this study is to evaluate the impact of patent application volume on economic growth, technological progress, and overall competitiveness. This article attempts to explore these factors and their impacts, focusing on three main objectives, analyzing the trends and regional characteristics of patent acceptance, and identifying the factors that affect the relationship between patent acceptance and authorization.

2. Literature review

While patent acceptance trends and regionality are not novel, their connection is unexplored. Patents safeguard IP, fostering innovation (Hall, 2007). Comprehending these trends and distribution reveals insights into global innovation, tech progress, and economic growth. Patent apps & approvals have risen ~5% annually (WIPO, 2019), fueled by globalization, tech advancements, and IP's growing significance.

Acceptance rates are impacted by tech, institutional, legal, economic, and geographic factors. Tech progress, a key driver, positively correlates with patent apps (Hall & Harhoff, 2012; Griliches, 1990). Fields like biotech & IT, renowned for rapid tech advancements, see higher acceptance rates (Baxter, 1984). Market demand, industry profitability, and economic growth also influence patent filings (Jaffe, 1986).

3. Methodology

3.1 Research method

Using secondary data for patent research due to resource limitations, saving costs and enhancing efficiency. Additionally, secondary data provides a larger sample size for trend analysis and comparisons across different regions and time periods. However, Johnston (2014) warns of potential biases and inaccuracies in non-tailored secondary data.Therefore, it is important to evaluate the data carefully to ensure its reliability when using it for analysis.

3.2 Data sources

Objective 1	China National Intellectual Property Administration
Objective 2	China Statistical Yearbook

3.3 Data analysis methods

In this study, a one-way ANOVA was conducted based on the 'Five Year Plan' and regional characteristics, which revealed significant differences in patent acceptance rates across different regions and times (F-value of 45.947, Sig. value of. 000, significance level less than 0.05). And different geographical regions and times exhibit different characteristics in the number of patent applications. Meanwhile, through correlation analysis between patent acceptance and R&D investment intensity, it was found that there is a significant positive correlation (Pearson

Correlation coefficient is 0.471, Sig. is 0.000, less than 0.01 significance level). However, the correlation between patent acceptance and technology transaction activity is not significant.

4. Result

4.1 The changing trend and regional characteristics of patent acceptance volume

In order to study the impact of different time periods on the number of domestic patent applications, we conducted a one-way analysis of variance with the number of domestic patent applications as the dependent variable and time periods as the factor.

Table 1: One-way ANOVA results of domestic patent applications in different time periods

Year	N	Mean	SD	Sig
2000-2005	155	7658[3]*	10563.90	0.000
2006-2010	155	23461[3]	36309.71	
2011-2015	155	66949[2]	95673.87	
2016-2020	155	129572[1]	171934.89	

***Note:** The smallest to largest number indicates the number of patent applications from high to low. If the number is the same, there is no significant difference, and vice versa.*

The analysis results are shown in Table 1. From the table, it can be seen that there are significant differences in the number of domestic patent applications during different time periods.

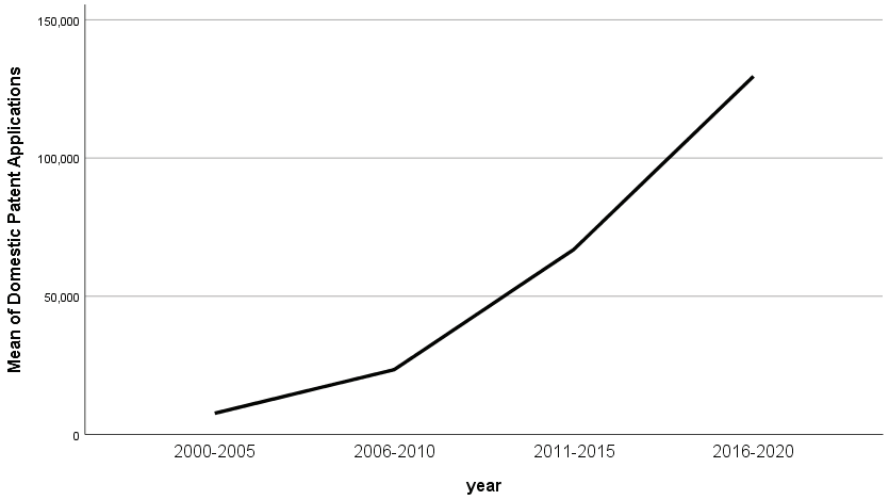

Figure 1: Trend curve of domestic patent application volume in different time periods

In order to explore the impact of different regions on the number of domestic patent applications, we grouped them into Northeast China, North China, East China, Northwest China, Southwest China, and Central South China, and conducted a one-way analysis of variance based on this factor.

Table 2: One-way ANOVA results of domestic patent applications in different regions

Region	N	Mean	SD	Sig
Northeast region	60	22320[5]	18658.93	0.000
North China	100	38932[3]	53702.33	
East China	140	121713[1]*	150134.25	
Northwest Territories	100	12189[6]	21643.21	
Southwest region	100	25742[4]	38081.35	
South Central Region	120	76824[2]*	156105.19	

***Note:** The smallest to largest number indicates the number of patent applications from high to low. If the number is the same, there is no significant difference, and vice versa.*

There is a significant difference in patent acceptance between different geographical regions (with a Sig. value of. 000, which is less than the significance level of 0.05). This indicates that different geographical regions exhibit different characteristics in patent acceptance.

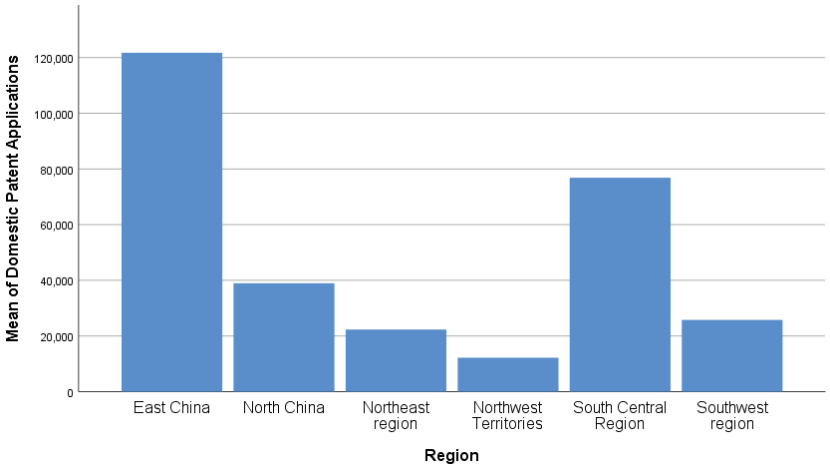

Figure 2: Histogram of domestic patent application volume in different regions

4.2 Factors affecting patent acceptance volume

In order to study the relationship between research and development intensity, technology trading activities, and the number of domestic patent applications, we conducted a correlation analysis.

Table 3: Correlation analysis between R&D intensity and technology trading activities

		R&D Intensity	Technology Transaction Activity
Domestic Patent Applications	Pearson Correlation	0.471**	0.059
	Sig. (2-tailed)	0.000	0.143
	N	620	620

There is a significant positive correlation between patent acceptance and R&D intensity (Pearson Correlation coefficient 0.471, Sig. 0.000, less than 0.01 significance level).

The correlation between patent acceptance and technology transaction activity is not significant (Pearson Correlation coefficient is 0.059, Sig. is 0.143, greater than the significance level of 0.05).

Through clustering analysis, we divided the data into three levels: low, medium, and high, and calculated the mean and sample size of R&D investment intensity at each level.

Table 4: K-means clustering results of R&D intensity

		Cluster		
		Low level	Medium level	High level
R&D Intensity	Mean	0.008	0.021	0.054
	N	419	177	24

For R&D investment intensity, cluster analysis divides the sample data into three levels: high level, medium level, and low level. From the perspective of sample distribution, the majority of samples (419) are concentrated in low-level clusters, followed by medium level clusters (177), and the number of samples in high-level clusters is the least (24)

In order to explore the impact of different levels of R&D investment intensity on the acceptance of domestic patent applications, a one-way analysis of variance was conducted.

Table 5: one-way ANOVA results of R&D investment intensity level and domestic patent application acceptance volume

	R&D Intensity	N	Mean	SD	Sig
Domestic Patent Applications	High level	24	108903[2]	79268.29	0.000
	Medium level	177	147627[1]	168508.76	
	Low level	419	15610[3]*	21176.21	

***Note:** The smallest to largest number indicates the number of patent applications from high to low. If the number is the same, there is no significant difference, and vice versa.*

According to the results of one-way analysis of variance (ANOVA), different levels of R&D investment intensity have a significant impact on patent acceptance.

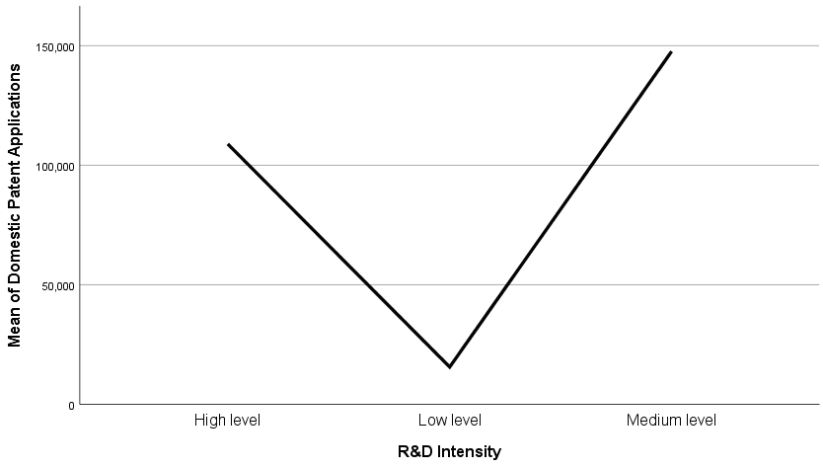

Figure 3: Curve of the degree of impact of R&D investment intensity on patent acceptance volume

5. Discussion

5.1 Analysis of Patent Application Trends

This study used one-way ANOVA to show that the number of patent applications in China varies with different political periods and geographical regions, with the highest number of applications occurring between 2016 and 2020 and in the East China region, with an overall upward trend in patent applications. This conclusion is consistent with previous research that the increase in patent applications is positively correlated with adjustments in national policies, accelerated economic development, and improved levels of technological innovation. Secondly, this study demonstrates significant differences in patent acceptance rates across different geographical regions. This discovery was compared with the research of WIPO (2021) and Bransteter et al (2014), and the results showed that the East China region has attracted more patent applications due to strong intellectual property protection laws and enforcement mechanisms, as well as government policies and incentives to promote innovation and research.

5.2 Analyzing the driving mechanism behind the number of patent applications

This study found a positive correlation between research and development intensity and the number of domestic patent applications through correlation analysis, cluster analysis, and one-way ANOVA. Firstly, this means that companies or industries that invest more in research and development typically have higher patent acceptance rates. This finding is consistent with existing research by Hall and Harhoff (2012) and Griliches (1990), indicating that technological innovation drives patent applications. Secondly, cluster analysis can provide a deeper understanding of the distribution of research and development intensity and technology trading activity levels, providing a new perspective for the current market and enterprise development (Smith, 2003). Most of the samples are concentrated at low to medium levels, indicating a certain degree of market failure or insufficient policies, leading to a lack of competitiveness in most companies or industries, resulting in low research and development intensity or technology trading activity levels.

6. Conclusion

This report focuses on the trend and regional characteristics of patent application volume, and uses statistical methods analysis to study the outcome variable “China’s patent application acceptance volume”. The results indicate that, firstly, the number of patent applications varies in different periods and regions due to national policy adjustments, accelerated economic development, improved technological innovation levels, as well as differences in intellectual property protection and government incentive policies in different regions. Secondly, high R&D intensity factors and the breadth and depth of technology transactions have a positive impact on the number of patent applications. In addition, the study should broaden sample range, diversify patents, deeply analyze variables, track long-term trends & cycles, to mitigate current factors’ impact on patent acceptance.

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