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Research Article

The Effect of Firm Innovation Outputs: A Survey Study of Intellectual Property Protection

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ABSTRACT

The aim of this study is to investigate the impact of intellectual property protection on firm innovation outputs. By analysing the survey data from firms in Sichuan Province, China, it was found that the level of intellectual property protection is significantly and positively related to firm innovation outputs. Further analyses show that the level of intellectual property protection has a non-linear relationship with firm innovation outputs, and the impact of intellectual property protection on firm innovation outputs has an inverted U-shaped relationship. These research results are of great significance for a deeper understanding of the influence mechanisms of intellectual property protection on firm innovation outputs. Additionally, this study also identified the limitations of intellectual property protection on firm innovation outputs. Therefore, future research should further explore ways to address these limitations in order to promote a better role of intellectual property protection in firm innovation outputs.

Keywords: intellectual property protection, firm innovation outputs, effecting factors.

1. Introduction

The market is the decisive force that promotes innovation and firms, as the main body of market competition and at the same time, the main body of innovation (Hu, 2024). The strategies to improve the motivation of firms to innovate and increase their innovation outputs are not only crucial to economic development, but also have become an important research topic that has attracted widespread attention.

Numerous scholars have studied the factors affecting firm innovation in China from various perspectives, including market size, government subsidies, intellectual property protection, industry competition, executive incentives, and financial development, among which intellectual property protection is a key external factor affecting firm innovation (Feng & Zheng, 2021). Although the intellectual property protection system in Sichuan Province, China, started late, it has been highly valued since its establishment and has been continuously improved and developed (Ma, 2018). In the existing literature, there is no unanimous consensus on the effect of intellectual property protection on firm innovation (Qin & Liu, 2023). On the one hand, enterprises need to invest significant manpower and material resources in innovation activities, and R&D innovation activities are uncertain, requiring the bearing of huge costs. An intellectual property protection system can give firm innovators a specific period of time for the monopoly of their innovative products and improve the innovation revenue to protect the economic benefits of corporate innovation, so as to incentivise firms to carry out innovation activities (Pan & Ren, 2024). On the other hand, intellectual property protection strengthens the innovator's monopoly, raises imitation costs, inhibits technological spillovers, and reduces firms' innovative activities (Shen & Gao, 2023). Therefore, this study will address the research question of whether intellectual property protection has a linear or non-linear relationship with firms' innovative activities in Sichuan Province, China in order to clarify the specific relationship between intellectual property protection

and firms' innovative activities in this province. Intellectual property protection, as one of the key elements of the innovation system, plays a central pillar role in the process of implementing the innovation-driven development strategy, and is an important strategic resource for a firm. or even a country, to enhance its core competitiveness and sustainable development. Therefore, individuals, firms, and the state must thoroughly understand intellectual property, fully realise the importance of intellectual property protection, and establish an awareness of intellectual property protection (Wu, 2022).

2. Literature review

Intellectual property protection and firm innovation have recently been the focus of attention of scholars at home and abroad. Due to the differences in the establishment and development of intellectual property systems, the public's awareness of the rule of law and the operation of the market, as well as the level of economic development and the effect of the intensity of intellectual property protection on the innovative activities of firms has not reached a unanimous conclusion. The relationship between the two can be broadly divided into three categories: one is to strengthen intellectual property protection to promote firms' innovative activities, the second is to strengthen intellectual property protection to inhibit firms' innovative activities, and the third is that there is no linear relationship between the two. This paper mainly focuses on the above three aspects to review the existing related literature.

2.1 There is a linear relationship between intellectual property protection and firm innovation outputs

Intellectual property awareness determines the quality and efficiency of firm innovation. As the economic development in the current era is based on the accumulation of knowledge, a more complete awareness of intellectual property protection protects the profits generated by the creative knowledge achievements of firms, reduces or avoids the infringement behaviour of "free-riding", greatly ensures the benefits of research and the development of firms, enhances the willingness of firms to innovate, and is conducive to the development of the market economy (Wang & Hu, 2022). On the contrary, if the intensity of intellectual property protection is not strong enough, it will allow "free-riding" behaviours to flourish, which will lead to a lack of motivation for firms to innovate, or even a stagnation of innovation, which is not conducive to the development of the economy (Tang, 2023).

Strengthening the intensity of intellectual property protection promotes innovative activities. It was argued that analyses of developing countries had led to the conclusion that improving the strength of intellectual property protection in the region could significantly increase innovation capacity (Li & Xue, 2023). Gala and Lu (2020) found that when intellectual property protection is stricter, incidents of the infringement of copying, imitation and other infringements suffered by firms in the fierce competition in the market are reduced, which minimises the risks taken by firms when they carry out innovative activities and protects the expected benefits of their innovations, thus enhancing the innovation enthusiasm of firms.

Therefore, this study proposes the following hypothesis:

H1: Intellectual property protection directly affects firm innovation outputs.

2.2 There is a non-linear relationship between intellectual property protection and firm innovation outputs

Firm innovation outputs are one of the indicators that are used to judge how efficient firms are in terms of innovation, and it has been argued that the role of intellectual property protection on the number of firm innovations shows an inverted U-shape change (Yu & Wang, 2021), which means that the role of intellectual property protection on the number of firm innovations will inevitably have a peak demarcation line, and if it is on the left side of the peak demarcation line, it means that intellectual property protection is strongly and linearly increasing, and it will lead to an increase in the number of firm innovations; whereas, if it is on the right side of the peak demarcation line, it means that the intensity of intellectual property protection is too strong, which will increase the difficulty of corporate innovation and hinder the pace of corporate innovation and development (Tang, 2023). Although there is some disagreement in the academic research on the relationship between intellectual property protection and the number of firm innovations, there is no doubt that moderate intellectual property protection is conducive to the increase in the number of firm innovations.

Therefore, this study proposes the following hypothesis:

H2: There is an inverted U-shaped relationship between intellectual property protection and firm innovation outputs.

3. Materials and methods

3.1 Sample and procedure

In this paper, a five-part online survey was designed, consisting of demographic information, intellectual property protection, technological innovation, R&D innovation, and the dependent variable, firm innovation outputs. To address the issue of questionnaire retrieval, the authors hired a professional survey firm to assist

in the data collection from SOEs and private firms in the Sichuan Province region of China. The firm contacted the senior managers of SOEs and private firms in Sichuan Province, China, and collected data mainly through online questionnaires. Calculations were made to ensure that the number of responses was at least five times the number of individual questions. In total, the study consisted of 28 questions requiring a minimum of 140 responses. A total of 1,559 questionnaires were distributed and 502 were successfully returned, giving a response rate of 32 per cent. This exceeded the minimum requirement and provided a sufficiently reliable sample for the study. Of the 502 questionnaires returned, 397 (79%) were male and 105 (21%) were female. The participants were mainly in middle and senior management positions, totalling 428 (85.20%), while the rest were general managers. SPSS version 21 was used for data collection, screening, demographic analysis and descriptive analysis. In addition, model analysis using Mplus was conducted.

3.2 Description of the variables

The aim of this study is to determine the relationship between intellectual property protection and firm innovation outputs. By examining intellectual property protection and firm innovation outputs in China, this paper explores the innovation activities of firms in different perspectives, which provides some insights into promoting firm innovation and improving firm competitiveness and productivity. Tang (2023) and Wang and Hu (2022) argued that having a more complete awareness of intellectual property protection protects firm innovation outputs and directly promotes higher profits. Yu and Wang (2021) and others believe that whether the intensity of intellectual property protection is too low or too high, it will cause the reduction of firm R&D investment and intellectual property protection and firm innovation outputs to have an inverted U-shaped relationship, thus affecting the output of firm innovation efficiency, which is one of the important reasons for the increase of knowledge diffusion costs and technological regression. Therefore, a moderate and ideal intellectual property protection system is a strong support for the transformation of R&D results and the promotion of firms' innovation outputs. Intellectual property protection is divided into three factors: firms' understanding of intellectual property laws, firms' knowledge of intellectual property protection, and innovation incentives, which provide a complete picture of intellectual property protection awareness. Technological innovation and R&D capability are mainly explored and analysed from the perspective of importance perception, the degree of firms' awareness of the importance of technological innovation, and the degree of importance perception of R&D capability. Furthermore, the market performance of new products reflects firm innovation outputs.

4. Results

4.1 Descriptive statistics

Descriptive statistics are used to analyse the various characteristics of a set of data, including the mean, standard deviation, and the minimum, maximum and median of the whole set of data, which are often used to test the stability of the sample data to facilitate the accuracy of the later research steps. Therefore, it is essential to carry out descriptive statistics analysis on the variables before conducting the subsequent investigation. The specific results are shown in Table 1.

Table 1 Results of descriptive statistics analysis of variables

Variable	Min	Max	SD	Mean
Legislative Level（IPP-LEL）	1	5	1.323	3.666
Level of Law Enforcement (IPP-LLE)	1	5	1.304	3.686
Level of Economic Development (IPP-LED)	1	5	1.372	3.588
Firm Innovation Outputs (FIO)	1	5	1.311	3.677

Statistical indicators for the four variables are presented in Table 1, including minimum (Min), maximum (Max), standard deviation (SD) and mean (Mean). These variables represent different aspects of intellectual property protection and firm innovation outputs, respectively.

For the legislative level (IPP-LEL) variable, the values range from 1 to 5, with a standard deviation of 1.323 and a mean of 3.666. This suggests that there is some variation in the level of firms' perceptions of their knowledge of intellectual property laws in the sample, but that it is generally at a moderate level.

For the level of law enforcement (IPP-LLE) variable, the values also range from 1 to 5, with a standard deviation of 1.304 and a mean of 3.686. Similar to the level of legislative level, the level of firms' perceptions of intellectual property production varies somewhat but is generally at a moderate level.

For the level of economic development (IPP-LED) variable, the values also range from 1 to 5, with a standard deviation of 1.372 and a mean of 3.588. There is also some variation in the degree to which firms perceive that the level of economic development of the region in which they are located affects the incentives to innovate, but in general it is at a moderate level.

Finally, for the firm innovation outputs (FIO) variable, the values again range from 1 to 5, with a standard deviation of 1.311 and a mean of 3.677. Firms' new product market performance also varies somewhat across the sample but is generally at a moderate level.
These statistical indicators in Table 1 provide basic information about the variables in the research sample and provide an important reference for subsequent data analysis and research.

4.2 Quantile regression analysis

Table 2 Results of normal distribution testing

Variable	Mean	SD	Sk	Ku
Legislative Level（IPP-LEL）	3.666	1.323	-0.731	-0.659
Level of Law Enforcement (IPP-LLE)	3.686	1.304	-0.794	-0.504
Level of Economic Development (IPP-LED)	3.588	1.372	-0.676	-0.818
Firm Innovation Outputs (FIO)	3.677	1.311	-0.763	-0.573

Statistical indicators for the four variables, including mean (Mean), standard deviation (SD), skewness (Sk) and kurtosis (Ku), are presented in Table 2. These variables represent different aspects of intellectual property protection and firm innovation outputs, respectively.
For the legislative level (IPP-LEL) variable, it has a mean of 3.666, a standard deviation of 1.323, a skewness of -0.731, and a kurtosis of -0.659. The skewness and kurtosis indicators suggest that the data exhibits a slight negative skewness and low kurtosis, which may be a slight deviation from a normal distribution.
For the level of law enforcement (IPP-LLE) variable, it has a mean of 3.686, a standard deviation of 1.304, a skewness of -0.794, and a kurtosis of -0.504. The skewness and kurtosis indicators show that the data exhibit negative skewness and low kurtosis, but the skewness value is slightly more prominent than that of the legislative level. For the level of economic development (IPP-LED) variable, it has a mean of 3.588, a standard deviation of 1.372, a skewness of -0.676, and a kurtosis of -0.818. The skewness and kurtosis indicators show that the data exhibit a negative skewness and a low kurtosis similar to the level of legislative level and law enforcement.
Finally, for the firm innovation outputs (FIO) variable, it has a mean of 3.677, a standard deviation of 1.311, a skewness of -0.763, and a kurtosis of -0.573. The skewness and kurtosis indicators show that the data exhibit negative skewness and low kurtosis, similar to the other variables.
The normal distribution of the 502 samples was tested by examining the skewness and state of all observed variables in the model. According to Hair et al. (2010), a variable is considered normally distributed if the skewness value is between -2 and +2. The results presented in Table 2 show that the skewness values of all the observed variables are within the critical value of -2 to +2. Therefore, all the observed variables are normally distributed.
In addition, the boundaries are a measure of relative kurtosis or flatness with respect to the normal distribution. Meyer and Herscovitch (2001) argued that if the standardised values exceed the critical values of -5 and +5, then the pooled values of all the observed variables are within the range of the critical values of -5 to +5. This indicates that they have a normal distribution.

4.3 Exploratory factor analysis

4.3.1 Exploratory factor analysis of intellectual property protection

Table 3 Exploratory factor analysis - IPP

Rotated Component Matrix[a]

	Component			Commonalities	KMO	Approx. Chi-Square
	1	2	3			
IPP-LEL1		.824		0.742	.822	1902.951***
IPP-LEL2		.820		0.747		
IPP-LEL3		.652		0.637		
IPP-LLE4			.848	0.753		
IPP-LLE5			.699	0.642		
IPP-LLE6			.729	0.665		
IPP-LED7	.873			0.764		
IPP-LED8	.866			0.750		
IPP-LED9	.919			0.845		

Table 3 shows the rotated component matrix including factors (Components), commonalities, KMO (Kaiser-Meyer-Olkin) measure, and approximate chi-square statistic.
In the first column, the ordinal number of each factor is listed. Then below each factor, the commonalities of the variables of interest are provided. The covariance indicates the proportion of variance in each variable that can be interpreted as the contribution of that factor.
The KMO measure is used to assess the suitability of the data, with a value between 0 and 1, and a value closer to 1 indicating that the data are more suitable for factor analysis. In this table, the KMO values are all above 0.6, indicating that the sample data are suitable for factor analysis.
The approximate chi-square statistic, on the other hand, provides the metrics used to assess the fit of the model and is shown as "***" to indicate a highly significant fit. The validity of this analysis was 0.822, indicating that the data were suitable for factor analysis, and the odd-square value of the Bartlett's test of dispersion was 1902.951, $p < 0.01$, indicating that there was a good relationship between the items and that factor analysis could be performed. The variance of the common factor for all variables was greater than 0.2, indicating a high degree of commonality between the variables and suitability for factor analysis. The factor loadings of the items in each dimension were greater than 0.5, and the items were all within their originally defined dimensions, with no confounding of the variables, indicating that the model has high construct validity.

4.3.2 Exploratory factor analysis of firm innovation outputs

Table 4 Exploratory factor analysis - FIO

Component Matrix[a]				
	Component 1	Commonalities	KMO	Approx. Chi-Square
FIO1	0.811	0.658	.875	1223.881***
FIO2	0.804	0.647		
FIO3	0.784	0.615		
FIO4	0.885	0.783		
FIO5	0.814	0.663		

As seen in Table 3, the validity of this analysis was 0.875, indicating that the data were suitable for factor analysis, and the odd-square value of the Bartlett's test of dispersion was 1223.881, $p < 0.01$, indicating that there was a good relationship between the items and that factor analysis could be performed. The variance of the common factor for all variables was greater than 0.2, indicating a high degree of commonality between the variables and suitability for factor analysis. The factor loadings of the items in each dimension were greater than 0.5, and the items were all within their originally defined dimensions, with no confounding of the variables, indicating that the model has high construct validity.

4.4 Confirmatory factor analysis

4.4.1 Confirmatory factor analysis of intellectual property protection

Table 5 Confirmatory Factor Analysis - IPP

	Factor Loading	R^2	CR	AVE
IPP-LEL			0.789	0.553
IPP-LEL1	0.730	0.533		
IPP-LEL2	0.750	0.563		
IPP-LEL3	0.751	0.564		
IPP-LLE			0.766	0.522
IPP-LLE4	0.688	0.473		
IPP-LLE5	0.738	0.545		
IPP-LLE6	0.741	0.549		
IPP-LED			0.867	0.686
IPP-LED7	0.785	0.616		
IPP-LED8	0.766	0.587		
IPP-LED9	0.925	0.856		

Table 5 shows the metrics such as Factor Loading, R^2, CR (Composite Reliability), and AVE (Average Variance Extracted). Factor Loading indicates the degree of correlation between each variable and the corresponding factor. Under each factor, the factor loading values for each variable are listed. R^2 is the proportion of variance explained by the factor and indicates how well the factor explains the variable. CR (Composite Reliability) is an indicator used to assess the internal consistency of the construct, with higher values indicating greater internal consistency of the construct. AVE (Average Variance Extracted) is the average variance extracted value for each variable, which indicates the extent to which the construct explains the variable. The closer the value is to 1, the better the ability of the concept to explain the variables.
The factor loadings of all variables in Table 5 ranged from 0.730 to 0.925, with the combined reliability from 0.766 to 0.867 and the mean variance extracted from 0.522 to 0.686, which indicates that the parameters satisfy the requirements of the structural model, suggesting that the model has good internal quality.

4.4.2 Confirmatory factor analysis of firm innovation outputs

Table 6 Confirmatory factor analysis - FIO

	Factor Loading	R^2	CR	AVE
FIO			0.879	0.594
FIO1	0.746	0.557		
FIO2	0.748	0.560		
FIO3	0.713	0.508		
FIO4	0.879	0.773		
FIO5	0.758	0.575		

As in Table 5, the factor loadings of all variables in Table 6 are between 0.713–0.879, with a combined reliability of 0.879 and an average variance extraction rate of 0.594, which suggests that the parameters satisfy the parameter requirements of the structural model, indicating that the model has good internal quality.

4.5 Correlation Analysis

Table 7 Results of correlation analysis validation

		Intellectual Property Protection	Firm Innovation Outputs
Intellectual Property Protection	Pearson Correlation	1	.463**
	p		.000
	N	502	502
Firm Innovation Outputs	Pearson Correlation	.463**	1
	p	.000	
	N	502	502

Table 7 shows the Pearson correlation coefficient between the two variables and the significance level of the correlation. This correlation coefficient table has an N value of 502, indicating that 502 data points were used in the calculation of the correlation coefficient.
Between Intellectual Property Protection and Firm Innovation Outputs, the Pearson correlation coefficient is 0.463 ($p < 0.01$), indicating that there is a correlation between the two.

4.6 Hypothesis testing

Table 8 Results of hypothesis testing

Parameter	Model_0.5		Model_0.75		Model_0.9	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
(Intercept)	2.606	0.239	3.771	0.175	4.415	0.190
Intellectual Property Protection Square	-0.309***	0.055	-0.376***	0.040	-0.118**	0.043
Intellectual Property Protection	0.416***	0.059	0.219***	0.043	0.100*	0.047
Pseudo R Squared	0.121		0.071		0.033	

Table 8 presents the results of the parameter estimates in the three models (Model_0.5, Model_0.75, Model_0.9), including the coefficients (Coefficient) and standard errors (Std. Error). The parameter estimation results for each model include the coefficients of the intercept term (Intercept) and Intellectual Property Protection and its squared term.

In all models, the coefficient of Intellectual Property Protection is positive and statistically significant ($p < 0.001$), indicating a significant effect of intellectual property protection on the dependent variable firm innovation outputs. This verifies the correctness of Hypothesis 1.

The coefficient of Intellectual Property Protection Square is negative and significant ($p < 0.001$) in Model_0.5 and Model_0.75, and negative but not significant in Model_0.9, which suggests that the effect of Intellectual Property Protection on the dependent variable is nonlinear. This indicates that the effect of Intellectual Property Protection on the dependent variable has a non-linear relationship, and the effect is weakened when Intellectual Property Protection is higher. This confirms the correctness of Hypothesis 2.

5. Discussion and implications

5.1 Discussion

Based on the above results, this paper provides an in-depth discussion of the impact of intellectual property protection on firm innovation outputs. We found several important trends and relationships.

Firstly, we note that intellectual property protection (IPP) has a significant positive effect on firm innovation outputs. The coefficient of Intellectual Property Protection is positive and significant regardless of the model, which demonstrates that the protection of intellectual property helps to drive the increase of firm innovation outputs. This is consistent with the research of Pan and Ren (2024) and Shen and Gao (2023) and others and the existing literature on the positive impact of intellectual property protection on firm innovation.

Secondly, we observe that the impact of intellectual property protection exhibits a specific non-linear relationship. In the squared term of Intellectual Property Protection, we find that its coefficient exhibits a consistent negative relationship in different models, which implies that the impact of intellectual property protection on firm innovation outputs may have a certain saturation effect. As the level of intellectual property protection increases, its contribution to firm innovation outputs gradually diminishes and may even have a negative effect. Thus, this paper. is in agreement with Hu (2022), Tang (2023), and Wang (2021).

Taken together, although intellectual property protection has a positive impact on firm innovation outputs, its effects may be moderated by non-linear factors. Therefore, the linear and non-linear effects of intellectual property protection should be considered comprehensively in firms' decision-making and practices, so as to better promote the development of the innovation activities of firms.

5.2 Theoretical implications

The significant positive impact of intellectual property protection on firm innovation outputs further strengthens the perception in the established literature of the positive effects of intellectual property protection on firm innovation. This finding not only deepens the understanding of the importance of intellectual property protection, but also provides firms with suggestions for effectively promoting innovation. The research in this thesis reveals a possible non-linear relationship between intellectual property protection and firm innovation outputs. Specifically, as the level of intellectual property protection increases, its promotional effect on firm innovation outputs diminishes and may even turn negative. This finding provides researchers with a more in-depth understanding of the effects of intellectual property protection policies, suggesting the need to comprehensively consider the changes in the effects at different stages when making decisions. In addition, our study highlights the importance of the further exploration of the mechanisms of intellectual property protection. Although intellectual property protection has a catalytic effect on firm innovation outputs, the mechanisms of its impact are not yet fully understood. Future research could further explore the specific paths through which intellectual property protection mechanisms affect firms' innovation activities to better guide practice.

5.3 Management implications

Intellectual property protection has a significant positive impact on firm innovation outputs, which means that firms can increase their own innovation activities by strengthening intellectual property protection, thus improving the level of innovation outputs. Therefore, firm managers should fully recognise the important role of intellectual property protection in innovation and incorporate it into their strategic planning and management practices.

A possible non-linear relationship exists between intellectual property protection and firm innovation outputs. As the level of intellectual property protection increases, its promotional effect on firm innovation outputs gradually diminishes or may even develop into a negative effect. Therefore, when formulating intellectual property protection strategies, firm managers need to carefully consider the implementation effect of the policy and adjust the strength and manner of the strategy according to the actual situation in order to give full play to the promotional effect of intellectual property protection.

In addition, our study reveals the importance of intellectual property protection mechanisms. Although intellectual property protection can promote firm innovation outputs, the mechanism of its impact is not yet fully understood. Therefore, firm managers need to enhance their research and understanding of the

mechanisms of intellectual property protection and explore the specific paths of its impact on firms' innovation activities to better guide their management practices. Our study provides important insights for firm managers into the impact of intellectual property protection on innovation output management. By fully understanding and utilising the facilitating effect of intellectual property protection on innovation, firm managers can better supervise their innovation activities and enhance their competitiveness and sustainable development.

6. Conclusions and recommendations

6.1 Conclusions

Intellectual property protection has a significant positive impact on firm innovation outputs. The results of the study show that strengthening intellectual property protection can improve firms' innovation activities and increase the level of firm innovation outputs. In addition, it was found that there is a non-linear relationship and an inverted U-shaped relationship, between intellectual property protection and firm innovation outputs. As the level of intellectual property protection increases, its facilitating effect gradually diminishes or even changes into a negative effect. Therefore, when formulating intellectual property protection strategies, we should consider their implementation effects and flexibly adjust the strategies.

In conclusion, intellectual property protection has a positive impact on firm innovation outputs, but in practice it is necessary to give full consideration to its non-linear effects and influence mechanisms in order to develop more effective management strategies to promote firms' continuous innovation and development.

6.2 Limitations and further research

Firstly, although intellectual property protection can promote firms' innovative activities, not all firms can benefit from its implementation. Some SMEs may face problems such as the high costs of intellectual property protection and insufficient enforcement, leading to limitations in their innovative capacity. In addition, an increase in the level of intellectual property protection may trigger increased competition among firms, which may affect innovation cooperation and sharing, and thus dampen the overall level of firm innovation outputs. In addition, there are some limitations of this study that need to be further considered. Firstly, there may be limitations in the sample data adopted in this study, such as limitations in the sample source and in the data collection method, which may affect the generalisability and credibility of the research results. Secondly, the research methodology adopted in this study may not be comprehensive enough to take into account all of the factors that may affect the relationship between intellectual property protection and firm innovation outputs, such as external environmental factors and industrial characteristics. Therefore, future research can further expand the sample size and adopt multiple research methods to more deeply explore the mechanisms of the impact of intellectual property protection on firm innovation outputs.

In conclusion, despite the positive impact of intellectual property protection on firm innovation outputs, its limitations should be given our attention. Future research needs to further explore ways to address these limitations in order to provide an improved role of intellectual property protection in the innovation outputs of firms.

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