Can Artificial Intelligence Enhance Firm Value?

Xiaolu Hu[1,2], Lina Jiang[2,3], Pin Shen[1,2,*]

[1] School of Accounting, Guangzhou College of Commerce, Guangzhou, Guangdong, China
[2] Faculty of Finance, City University of Macau, Taipa, Macao, China
[3] Nam Kwong Real Estate Company Limited, Macao, China
[*] Corresponding author: F23092100403@cityu.edu.mo

Abstract: The rapid development of artificial intelligence technology has provided enterprises with new growth momentum, facilitating the transformation and upgrading of China's domestic economy. Against this backdrop, this study empirically examines the impact of artificial intelligence patent applications on corporate value using a sample of A-share listed companies in China from 2012 to 2022. The key findings are as follows. First, artificial intelligence patent technologies significantly enhance corporate value, a conclusion that remains robust after a series of rigorous tests. Second, state-owned enterprises experience a more pronounced positive effect from artificial intelligence patent applications on corporate value compared to non-state-owned enterprises. Third, regional heterogeneity analysis reveals that the value-enhancing effect of artificial intelligence patents is statistically significant in eastern regions but insignificant in central and western regions. By exploring the relationship between artificial intelligence patent technologies and corporate value, this research contributes to the expanding literature on artificial intelligence and provides empirical evidence to support the advancement of AI-driven economic growth and high-quality enterprise development in China.

***Keywords*:** Artificial intelligence; Patented technology; Company value

1. Introduction

China's economy is currently in a critical period of advancing high-quality development, with the rapid development of artificial intelligence emerging as a new engine driving high-quality economic growth. As the core driving force of the new round of technological revolution and industrial transformation, artificial intelligence technology is profoundly reshaping global industrial patterns and economic structures. From the perspective of technological evolution, artificial intelligence has undergone three developmental waves: from symbolism to connectionism, and then to deep learning. Currently, new-generation artificial intelligence technologies represented by deep learning and reinforcement learning are promoting innovative development in fields such as intelligent manufacturing and smart finance. In 2016, the United States promulgated the "National Artificial Intelligence Research and Development Strategic Plan," the European Commission proposed an artificial intelligence legislative initiative, and the United Kingdom published "Artificial Intelligence: Opportunities and Implications for Future Decision Making". In China, artificial intelligence development exhibits significant institutional characteristics and regional disparities. On one hand, guided by the national innovation-driven development strategy, the "14th Five-Year Plan for National Economic and Social Development and the Long-Range Objectives Through 2035" emphasizes focusing on cutting-edge fields such as artificial intelligence and implementing a series of forward-looking and strategic national major science and technology projects. On the other hand, influenced by resource endowments and developmental foundations, the eastern coastal regions possess first-mover advantages in artificial intelligence industrialization, while the central and western regions still face challenges such as insufficient technological accumulation. This regional heterogeneity may lead to a gradient distribution in the value creation of artificial intelligence technologies. As the role of intellectual property in market competition becomes increasingly prominent, AI-related patent applications continue to grow. Whether artificial intelligence patents can enhance corporate value has become a noteworthy question.

The study of firm value, as a core topic of corporate finance, continues to drive the innovative development of modern financial theory. It provides an important theoretical foundation for understanding the market operation mechanism and has achieved fruitful results. However, the existing research on firm value still suffers from the following shortcomings: first, insufficient in-depth research on the impact of emerging technologies (e.g., artificial intelligence) on firm value and its transmission mechanism; second, lack of systematic analysis of the interaction between micro-level firm heterogeneity and macro-level institutional environment; and third, insufficient tracking research on the dynamic evolution law of firm value.

This article empirically examines the impact of artificial intelligence patent applications on corporate value using a sample of A-share listed companies in China from 2012 to 2022. The key findings are as follows. First, artificial intelligence

patent technologies significantly enhance corporate value, a conclusion that remains robust after a series of rigorous tests. Second, state-owned enterprises experience a more pronounced positive effect from artificial intelligence patent applications on corporate value compared to non-state-owned enterprises. Third, regional heterogeneity analysis reveals that the value-enhancing effect of artificial intelligence patents is statistically significant in eastern regions but insignificant in central and western regions. The significance of this study is twofold. First, while existing literature on artificial intelligence is growing, current domestic research primarily examines AI's impact on labor structure transformation from regional and industrial perspectives, with a notable scarcity of micro-level studies at the firm level. Second, there remains a critical gap in studying AI's influence on firm value through the lens of patented artificial intelligence technologies. Our study not only expands the artificial intelligence research domain but also provides theoretical foundations for promoting artificial intelligence development and facilitating high-quality enterprise growth in China.

2. Literature review and hypothesis development

Endogenous growth theory holds that technological innovation is the source of economic growth. Enterprises can not only improve production efficiency and eliminate the trend of diminishing marginal returns of the traditional production function through innovation, but also improve the quality of products and maintain sustainable competitive strength[1] [2]. Otherwise, it will be difficult for enterprises to adapt to the fiercely competitive market environment, and the market value is difficult to sustain. Artificial intelligence patent technology can break through the boundaries of the constraints of traditional factors of production and create a source of profit for the enterprise, which may help to increase the value of the enterprise. Enterprises continue to create innovative technologies such as artificial intelligence in the development process, which helps to promote innovation capacity [3], drive development with innovation, and provide new growth momentum for enterprises. The artificial intelligence patent technology applied for by independent research and development is one of the key elements of the core competitiveness of enterprises, reflecting the good innovation ability of listed companies as well as the great development potential, which can provide high-quality technical tools for listed companies themselves and help listed companies to improve their enterprise value. In summary, this paper puts forward the benchmark research hypothesis:

H1: The application of artificial intelligence patent technology can significantly improve the value of the company.

3. Research design

3.1 Data source

This study selects listed companies in China from 2012 to 2022 as the initial sample, excluding financial sector firms, ST/*ST/PT companies, and enterprises with missing key variable data. The raw patent data for listed companies comes from the China National Intellectual Property Administration, while all other data are sourced from the CSMAR database. Continuous variables were winsorized at the 1% and 99% levels to mitigate the influence of outliers.

3.2 Empirical models

$$TQ_{i,t} = \alpha_0 + \alpha_1 AI_{i,t} + \alpha_2 \text{Controls}_{i,t} + \sum Industry + \sum year + \varepsilon_{i,t} \quad (1)$$

The coefficient α_1 is the focus of attention in this paper. If the coefficient α_1 is significantly positive, it suggests that, other things being equal, AI can significantly increase firm value.

3.3 Key variables

(i) Explained Variables.

Firm value (TQ): this paper refers to related studies [4] and uses Tobin's Q (market capitalization divided by total assets) to measure the value of the firm.

(ii) Explanatory variables.

Artificial Intelligence (AI): Patent data were sourced from the China National Intellectual Property Administration. We initially conducted a manual search of patent applications filed by A-share listed companies from 2012 to 2022, using keywords such as "automatic," "intelligent," and "artificial intelligence." Subsequently, we aggregated the annual count of AI-related patent applications per firm to construct this variable.

(iii) Control variables.

In this paper, we refer to the existing literature [5] and select the control variables as shown in Table 1:

Table 1. Control variables

Variable name	Symbol	Explanatory variable
Enterprise size	Size	Natural logarithm of total assets at the end of the period
Shareholding ratio of the largest shareholder	TOP1	Ratio of shares held by the largest shareholder to total share capital
Management shareholding	Mshare	Ratio of management shareholding to total share capital
Whether the two positions are combined	Dual	Whether the chairman and general manager are combined
Year of listing	FirmAge	Ln (current year - year of listing + 1)

4. Empirical results

4.1 Descriptive statistical analysis

As is shown, the descriptive statistics of the indicators are not significantly different from the existing studies.

Table 2. Descriptive Statistical Analysis.

Variable	Mean	Std. Dev.	p50	Min	Max	N
TQ	2.032	1.315	1.605	0.842	8.600	30948
AI	1.276	4.055	0	0	29	30948
Lev	0.413	0.207	0.403	0.00836	0.998	30948
FirmAge	2.930	0.331	2.996	1.099	4.174	30948
Size	22.21	1.343	22.01	14.94	28.64	30948
Dual	0.302	0.459	0	0	1	30948
TOP1	0.339	0.150	0.316	0.00286	0.900	30948
Mshare	0.149	0.201	0.0172	0	0.900	30948

4.2 Variance inflation factor test

We conducted a variance inflation factor test for the main variables, and the results show that the VIF values of these variables are below 2, indicating that there is no obvious multicollinearity problem between the variables.

Table 3. Variance inflation factor test

Variable	VIF
AI	1.05
Lev	1.42
FirmAge	1.10
Size	1.58
Dual	1.08
TOP1	1.05
Mshare	1.27
Mean VIF	1.22

4.3 Regression analysis

The regression coefficient of AI is significant at the 1% level, indicating that AI patents significantly increase the firm value of listed companies.

Table 4. Results of basic regression analysis

	TQ
AI	0.011***
	(5.136)
Control variables	Control
Year	Control
Industry	Control
N	30948
R^2	0.271

Note: Robust t-statistics in parentheses. *** p < 0.01. ** p < 0.05. * p < 0.1.

4.4 Heterogeneity analysis

This paper carries out group regression analysis for listed companies in different regions. The results show that the promotion effect of AI patent applications on company value is significant in the eastern region, but not in the central and western regions.

Table 5. Regression results for different regions

	Eastern region	Central and Western region
	(1)	(2)
AI	0.011***	0.006
	(4.128)	(1.199)
Control variables	Control	Control
Year	Control	Control
Industry	Control	Control
N	22745	8203
R^2	0.271	0.328

4.5 Robustness Tests

In order to reduce the impact of measurement error, this paper uses return on equity (ROE) as a replacement variable to measure firm value, and the results are basically consistent with the previous findings.

Table 6. Results of regression with replacement variables

	ROE
AI	0.001**
	(2.422)
Control variables	Control
Year	Control
Industry	Control
N	30948
R^2	0.138

5. Conclusions and recommendations

5.1 Conclusions

This study empirically examines the impact of artificial intelligence patent applications on corporate value using a sample of China's A-share listed companies from 2012 to 2022. The main findings are as follows: First, there exists a significantly positive correlation between artificial intelligence patent applications and corporate value, which remains robust after a series of rigorous tests. Second, state-owned enterprises demonstrate a more pronounced positive effect from artificial intelligence patent applications on corporate value compared to non-state-owned enterprises. Third, regional heterogeneity analysis reveals that the value-enhancing effect of artificial intelligence patents is statistically significant in eastern regions but insignificant in central and western regions. By investigating the relationship between artificial intelligence patent technologies and corporate value, this research contributes to the growing body of AI-related literature and provides theoretical support for promoting artificial intelligence development and high-quality enterprise growth in China.

5.2 Recommendation

Based on empirical research findings, this paper proposes the following policy recommendations to fully leverage the value-enhancing effects of artificial intelligence patents on corporate value.

First, the government should adopt a top-level design approach to guide the further development of artificial intelligence technology at the macro level, establishing a robust institutional foundation for intelligent industrial upgrading and transformation. Listed companies should be encouraged to accelerate R&D and application of core artificial intelligence technologies to enhance production efficiency through artificial intelligence adoption. Given that artificial intelligence development requires a large pool of high-caliber talent — including technical, managerial, and innovative professionals — it is essential to promote the optimization and adjustment of academic disciplines in higher education institutions, with a

strong emphasis on cultivating interdisciplinary talent in big data, artificial intelligence, and digital technology-economics integration. Additionally, the government should implement talent attraction policies to draw in top domestic and international artificial intelligence professionals, while appropriately increasing support for innovation-driven industries to ensure active governmental involvement in artificial intelligence advancement.

Second, specialized policies should be introduced to support artificial intelligence patent deployment, including the establishment of an expedited artificial intelligence patent review process, fee reductions for patent applications in core artificial intelligence technology fields, and the creation of an artificial intelligence patent quality evaluation system. To capitalize on the comparative advantage of state-owned enterprises (SOEs) in artificial intelligence patents, the State-owned Assets Supervision and Administration Commission (SASAC) should incorporate artificial intelligence patent metrics into the performance evaluation system for SOE executives while refining incentives for commercialization of scientific and technological achievements. For private enterprises, it is recommended to foster industry-academia-research collaboration through joint laboratories, with a focus on patenting artificial intelligence applications in smart manufacturing and other key scenarios, adopting a combined strategy of core and peripheral patent protection.

Third, given regional disparities in the value creation of artificial intelligence patents, a coordinated regional development strategy should be implemented. In eastern regions, priority should be given to establishing artificial intelligence patent operation centers and providing subsidies for patent navigation projects to facilitate high-quality patent creation and utilization. In central and western regions, efforts should be made to achieve full artificial intelligence patent coverage among enterprises while constructing three to five regional artificial intelligence innovation centers. A cross-regional enterprise collaboration mechanism should be established, with the Ministry of Industry and Information Technology (MIIT) setting up an artificial intelligence patent trading platform and launching a dedicated western-region transformation fund.

Finally, to further refine the value realization mechanism for artificial intelligence patents, a multi-tiered support system should be developed. At the national level, the Ministry of Science and Technology (MOST) and MIIT should jointly formulate an AI patent development strategy, implementing patent quality enhancement programs in key technology areas such as natural language processing. Regionally, the National Development and Reform Commission (NDRC) should strengthen digital infrastructure construction in central and western regions under the “East Data, West Computing” project framework. At the enterprise level, an artificial intelligence patent valuation system should be established, along with improved profit-sharing mechanisms for patent commercialization and incentive policies for patent citations. Companies are encouraged to proactively develop artificial intelligence technologies based on their own conditions, strategically positioning themselves early. Furthermore, enterprises should enhance the transformation of AI-related technological achievements, driving artificial intelligence utilization and development to new heights to maximize corporate value through artificial intelligence applications, thereby contributing to China’s high-quality economic development. These measures will foster a virtuous cycle of policy guidance, regional coordination, and corporate innovation, providing robust support for the high-quality growth of China’s artificial intelligence industry.

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Author Bio

Xiaolu Hu, female, holds a Master’s degree. She is currently a Ph.D. candidate in Finance at City University of Macau, with research interests including capital markets and corporate governance.

Lina Jiang, female, holds a Master’s degree. She is currently a Ph.D. candidate in Finance at City University of Macau.

Pin Shen, female, holds a Master’s degree. She is currently a Ph.D. candidate in Finance at City University of Macau.