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The Influence of Artificial Intelligence on Firm Value: An Empirical Study

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Abstract: *Artificial intelligence has emerged as a pivotal driver in developing China's new quality productive forces, serving as a critical catalyst for corporate digital transformation and high-quality growth. Based on a sample of China's Shanghai and Shenzhen A-share listed firms from 2001 to 2022, this study employs firm-level AI data to empirically examine the impact of AI on enterprise value and its underlying mechanisms. The results demonstrate that AI significantly enhances firm value, a finding that remains robust across a battery of rigorous tests. Heterogeneity analysis further reveals that the value-enhancing effect of AI is more pronounced among private enterprises. This paper provides micro-level empirical evidence on the value creation effects of AI, offering important theoretical and practical implications for facilitating the effective integration of AI into corporate operations and achieving sustainable value appreciation.*

Keywords: *Artificial Intelligence (AI); Firm Value; Digital Technologies*

1. Introduction

The 2024 National People's Congress emphasized the need to further promote the innovative development of the digital economy. According to the China Digital Economy Development Research Report (2023) released by the China Academy of Information and Communications Technology (CAICT), China's digital economy reached 50.2 trillion yuan in 2023, with a nominal year-on-year growth of 10.3%, accounting for 41.5% of GDP—equivalent to the proportion of the secondary industry in the national economy—and has become a crucial engine for China's economic growth. In the era of the digital economy, the 2023 China Artificial Intelligence Industry Development Report (IV) reveals that China's AI industry reached 213.7 billion yuan in 2023 and is projected to grow to 811 billion yuan by 2028, indicating that AI has become a pivotal driver of China's digital economic expansion. As a new-generation general-purpose information technology, AI has been widely applied across various industries[1]. It serves not only as a critical tool for traditional enterprises undergoing digital transformation but also as a key lever for China's economic reform and innovation. Enterprises, as vital microeconomic entities, are the main force in accelerating the development of new quality productive forces. They should actively increase investments in R&D and applications of big data and AI to achieve excess returns and enhance firm value. However, the McKinsey Global AI Survey 2022 found that while 60% of firms in leading economies have adopted AI, only 41% of Chinese firms have done so, with a mere 9% successfully leveraging AI to drive revenue growth and profit contributions. Therefore, this study investigates how AI affects firm value, exploring whether and through what mechanisms AI can enhance corporate performance. Addressing these questions will help enterprises achieve value creation and sustainable development, contributing significantly to advancing China's new quality productive forces.

Early research on artificial intelligence (AI) primarily focused on macroeconomic theoretical frameworks. Existing literature, employing neoclassical economic growth models and novel theoretical constructs, has demonstrated that AI can drive comprehensive economic growth, optimize factor allocation, enhance aggregate labor demand[2], improve production processes[3], and facilitate labor substitution to promote industrial redistribution and economic expansion. With advancing methodologies and improved data availability, empirical studies on AI at the micro-firm level have gradually increased. Leveraging the comprehensive data on industrial robots, scholars have predominantly examined AI’s economic consequences within the manufacturing sector, focusing on industrial robotics. Existing studies suggest that AI enhances corporate technological innovation and

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facilitates green transformation. Although prior literature posits a positive relationship between AI and firm value, few studies directly investigate this linkage. Moreover, discussions on their relationship largely rely on theoretical models and case studies, lacking robust empirical evidence. Therefore, this study utilizes annual reports of listed companies to measure firm-level artificial intelligence adoption through textual analysis and empirically examines the relationship between AI and corporate value. The findings demonstrate that AI significantly enhances firm value, and this conclusion remains robust after a series of tests including instrumental variable approaches and alternative measurements of firm value. In further analysis, focusing on the efficiency mechanism of AI, this paper investigates heterogeneous effects across different ownership structures.

2. Theoretical Analysis And Research Hypothesis

Based on the strategic idea of manufacturer theory and cost minimization, enterprises can actively use the advantages of economies of scale and production technology to reasonably reduce costs to obtain price competitive advantages, that is, enterprises can use artificial intelligence technology to reduce production and operation costs, improve production and operation efficiency to enhance enterprise value.

From a production perspective, AI can optimize corporate production processes and reduce operational costs, thereby enhancing firm value.On the one hand, AI-powered robots possess autonomous capabilities[4], enabling them to replace human labor in performing repetitive and tedious tasks such as assembly, material handling, and welding. This automation reduces labor input, improves production efficiency, and lowers labor costs. Additionally, AI systems can monitor and analyze production workflows while autonomously optimizing power distribution and equipment operations, thereby minimizing energy waste and further reducing production costs.On the other hand, enterprises can use artificial intelligence's deep learning models and image processing technology to detect product quality and defects in real time, find and correct nonconforming products in time, reduce scrap rate and rework rate, and reduce production costs.

From a marketing perspective, AI can innovate marketing products, reduce sales costs, and increase corporate value. On the one hand, AI can help enterprises efficiently and quickly organize, collect and analyze large amounts of unstructured customer personal data, which can not only reduce the cost of information search[5], but also help designers better grasp the consumption behavior and preferences of key customers, improve product design quality, and increase marketing revenue. On the other hand, based on big data and artificial intelligence algorithms, by analyzing customers' purchase history and browsing records, customer needs are predicted, so as to accurately recommend products or services, and reduce promotion costs to a certain extent. In addition, chatbots can communicate with customers online 24 hours a day through self-learning, replacing human customer service. Enterprises can not only reduce labor costs in the sales process, but also improve customer satisfaction.

From a management perspective, AI can help enterprises achieve intelligent management, improve the efficiency of internal governance, and enhance enterprise value. On the one hand, artificial intelligence can help enterprises establish a centralized data management system, centrally process, analyze, store, and feedback important information of various departments, and generate visual reports and charts to facilitate the query and understanding of various departments and improve management efficiency. At the same time, this synergy of AI can also ensure the accuracy and consistency of data across departments[6], improve the transparency of internal data, and reduce the cost of internal communication. On the other hand, AI can empower managers to optimize supply chain management. For example, AI analyzes indicators such as sales data, customer service demand, and inventory turnover rate to provide feedback to enterprises on the optimal inventory level to reduce inventory costs and supply risks, and improve the overall efficiency of the supply chain.

Hypothesis:Artificial intelligence can increase the value of enterprises.

3. Research Design

3.1 Data and Sample Selection

This paper selects China's Shanghai and Shenzhen A-share listed companies from 2001 to 2022 as the research object, and conducts the following screenings: first, ST and * ST companies are excluded; Second, exclude financial and real estate companies; Third, the sample with serious lack of financial

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data was eliminated, and finally 27,063 sample observations were obtained. In addition, in order to avoid the influence of extreme values on the empirical results, the Winorized method is used to shrink all continuous variables at the 1% and 99% quantiles.

3.2 Variable Definitions

3.2.1 Dependent Variables

Firm value (TobinQ):The market value of an enterprise is an important indicator to measure the growth ability of an enterprise, and the Tobin Q value not only includes the value evaluation of the capital market on the development status of the enterprise, but also contains the reasonable expectation of the future growth potential of the enterprise.

3.2.2 Independent Variables

Artificial intelligence (AI):The natural logarithm of 73 keyword frequencies plus 1 in the annual report of listed companies is used to measure the level of enterprise artificial intelligence. Table 1 lists the definitions of all variables in this document.

Table 1 Variable definition

	Variable Name	Variable Symbol	Definition
Dependent Variable	Firm value	TobinQ	(Market Value + Total Liabilities) / Total Assets
Independent Variable	Artificial Intelligence	AI	Natural logarithm of (AI-related keyword count + 1)
Control Variables	Firm Size	Size	Natural logarithm of total assets
	Leverage Ratio	Lev	Total Liabilities / Total Assets
	Revenue Growth Rate	Growth	Current Year Revenue / Previous Year Revenue
	Cash Flow Ratio	Cashflow	Net Cash Flow from Operating Activities / Total Assets
	Management Fee Ratio	Mfee	Management Expenses / Operating Revenue
	Largest Shareholder Ownership	Top1	Number of Shares Held by Largest Shareholder / Total Shares Outstanding
	Firm Age	FirmAge	Years since company establishment
	Proportion of Independent Directors	Indep	Number of Independent Directors / Total Board Members
	Institutional Ownership	INST	Number of Shares Held by Institutional Investors / Total Shares Outstanding
	Major Shareholder Fund Occupation	Occupy	Other Receivables / Total Assets
	Inventory Ratio	INV	Net Inventory / Total Assets

3.3 Model Specification

To test Hypothesis 1, this paper constructs the following model:

$$\mathrm{TobinQ}_{i,t} = \alpha_0 + \alpha_1 \mathrm{AI}_{i,t} + \sum_k \varphi_k \mathrm{Controls}_{i,t} + \gamma_{i,t} + \mu_{i,t} + \varepsilon_{i,t} \quad (1)$$

Among them, the explanatory variable is enterprise value (TobinQ), the explanatory variable is artificial intelligence (AI), and the control variable is a series of other variables that may affect enterprise value, and the annual dummy variable γ and industry dummy variable μ are also introduced, and α0 and β0 represent the intercept. α1 and β1 represent factor estimation coefficients; i and t denote the company and year, respectively; ε represents a random error term.

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4. Empirical Results And Analysis

4.1 Descriptive Statistics

Maintaining The descriptive statistical results for the main variables are shown in Table 2. The mean value of enterprise value (TobinQ) is 2.034 and the standard deviation is 1.288, indicating that there is a large difference in the value of enterprises in the sample of listed companies. The median value of enterprise artificial intelligence (AI) is 0, and the mean value is 0.805, indicating that most enterprises have a low level of AI application, with a standard deviation of 1.174, indicating that there are significant differences in AI utilization among different enterprises.

Table 2 Descriptive Statistics

VarName	Obs	Mean	SD	Min	P25	Median	P75	Max
TobinQ	27063	2.034	1.288	0.866	1.234	1.607	2.325	8.110
AI	27063	0.805	1.174	0.000	0.000	0.000	1.386	4.454
Size	27063	22.050	1.228	19.707	21.165	21.879	22.734	25.946
Lev	27063	0.413	0.197	0.051	0.255	0.408	0.559	0.881
Growth	27063	0.174	0.367	-0.542	-0.012	0.118	0.282	2.235
Cashflow	27063	0.050	0.068	-0.155	0.011	0.048	0.089	0.248
Mfee	27063	0.088	0.070	0.008	0.043	0.070	0.110	0.437
TOP1	27063	0.337	0.146	0.087	0.225	0.313	0.431	0.740
FirmAge	27063	2.853	0.382	1.386	2.639	2.890	3.135	3.497
INST	27063	0.436	0.251	0.001	0.226	0.450	0.638	0.957
Occupy	27063	0.016	0.027	0.000	0.003	0.007	0.017	0.192
INV	27063	0.128	0.098	0.000	0.059	0.110	0.173	0.511

4.2 Foundation Regression

The In this paper, a fixed-effect model was used for basic regression, and the regression results are shown in column (1) of Table 3. According to the regression results, the estimated coefficient of artificial intelligence (AI) on enterprise value (TobinQ) is 0.0586, which is significantly positive at the 1% confidence level. The above regression results show that AI can enhance enterprise value, so the hypothesis H1 is true.

4.3 Robustness Test

4.3.1 Replace The Explanatory Variable

As a common standard method to reflect the profitability of enterprises, ROE is highly comprehensive and comparable. Therefore, the return on equity (ROE) is used to replace the TobinQ value to measure the value of the enterprise, and the regression results are shown in column (2) of Table 3. According to the regression results, the regression coefficients of artificial intelligence on enterprise value (ROE) are all significantly positive, which is consistent with the benchmark regression results, indicating that the conclusions of this paper are robust and reliable.

4.3.2 Instrumental Variable Method

The results of this paper show that AI can significantly improve enterprise value, however, there may be a reverse causal problem between this effect: enterprises with high enterprise value may have more resources such as manpower, capital and technology, and have more ability and opportunity to realize profits with AI in production and business activities. Therefore, this paper adopts the instrumental variable method to alleviate the endogeneity problem.

In this paper, the average number of AI keywords plus 1 in the annual reports of enterprises in the same industry in the same year is selected as the instrumental variable (AI_IV). On the one hand, AI technology has a peer effect, which is often affected by the AI application level of other enterprises in the same industry, that is, the tool variable meets the relevance requirement. On the other hand, the average data of AI of other enterprises in the industry in the current year will not directly affect the current market value of the company, that is, it meets the exclusivity requirement.

The regression results are shown in columns (3) and (4) of Table 3. Column (3) reports the correlation between instrumental variables and explanatory variables, and the regression coefficient is

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significant at the 1% level, indicating that the instrumental variables are properly selected. Column (4) reports the regression results of the instrumental variables of artificial intelligence on enterprise value, and the regression coefficient is 0.2608, which is significant at the 1% level, which is consistent with the benchmark regression results of this paper, indicating that the research conclusions of this paper are robust and reliable.

4.4 Property Heterogeneity Analysis

Table 3 Empirical Results

	Robustness Test					
	Foundation Regression	Replace The Explanatory Variable	Instrumental Variable Method		Property Heterogeneity Analysis	
	(1)	(2)	(3)	(4)	(5) State-owned enterprises	(6) Private enterprises
	TobinQ	ROE	AI	TobinQ	TobinQ	TobinQ
AI_IV			0.4411***			
			(40.3592)			
AI	0.0586***	0.0022***		0.2608***	0.0364	0.0340**
	(5.6631)	(2.6919)		(7.4094)	(1.6037)	(2.2204)
Size	-0.5276***	0.0168***	0.2091***	-0.7307***	-0.5728***	-0.7218***
	(-25.4937)	(13.0560)	(21.0311)	(-44.8818)	(-10.9167)	(-19.1721)
Lev	-0.0022	-0.2394***	0.0200	0.2361***	-0.0219	0.3237***
	(-0.0266)	(-26.3316)	(0.5146)	(4.2825)	(-0.1065)	(2.7003)
Growth	0.1690***	0.0819***	-0.0135	0.1497***	0.0726***	0.1533***
	(8.8259)	(33.2965)	(-1.2561)	(9.7874)	(2.7892)	(5.9365)
Cashflow	1.8848***	0.4073***	-0.1432**	1.5122***	1.2397***	1.4880***
	(14.4559)	(25.0424)	(-2.1245)	(15.7632)	(5.8368)	(9.8029)
Mfee	1.0447***	-0.4541***	-0.4591***	0.5113***	0.3472	0.5318*
	(5.2081)	(-19.2908)	(-4.8299)	(3.7567)	(0.8000)	(1.9125)
TOP1	-0.0135***	0.0003***	-0.0040***	-0.0142***	-0.0113***	-0.0177***
	(-13.1796)	(4.4325)	(-6.1784)	(-15.1579)	(-4.7069)	(-8.7372)
FirmAg	0.2987***	-0.0020	0.0861*	0.7614***	0.7879***	0.6843***
	(7.0663)	(-0.6377)	(1.6610)	(10.3217)	(3.8850)	(4.5360)
INST	0.0138***	0.0004***	-0.0019***	0.0164***	0.0133***	0.0179***
	(20.0601)	(8.4176)	(-4.9587)	(29.3852)	(8.1061)	(14.6974)
Occupy	-0.0692	-0.3212***	0.3165*	-0.3176	-0.7426	-0.1338
	(-0.1748)	(-6.6099)	(1.6966)	(-1.1962)	(-1.5719)	(-0.2117)
INV	0.7025***	0.0912***	-0.0316	0.6889***	0.2459	0.7267***
	(4.5327)	(7.2967)	(-0.4277)	(6.5608)	(0.6470)	(3.2662)
Cons	11.2946***	-0.2118***	-4.0453***	14.4746***	11.5380***	14.1827***
	(28.8273)	(-8.0140)	(-17.9630)	(40.7447)	(10.7803)	(18.4548)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes	Yes	Yes
N	27063	27063	26811	26811	8980	17673
R^2	0.3006	0.3206	0.3939	0.2608	0.2755	0.2476

Note: *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

Enterprises with different attributes may show different preferences when using digital technology, which makes the value enhancement effect of AI may have an asymmetric effect between state-owned enterprises and non-state-owned enterprises. Compared with state-owned enterprises, private enterprises are facing greater market pressure, and private enterprises need to be more flexible and efficient to respond to fierce market changes. The application of artificial intelligence technology can help private enterprises to automate production processes, optimize supply chain management, improve production efficiency, etc., so as to gain an advantage in the competition. Therefore, private enterprises pay more attention to the application of artificial intelligence to enhance their market value. Based on this idea, this paper divides enterprises into state-owned enterprises and private enterprises for sample

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regression. As shown in columns (5) and (6) of Table 3, the value coefficient of AI to private enterprises is significant at the 5% level, while the regression coefficient is not significant in the sample of state-owned enterprises. This shows that artificial intelligence has a more significant value-enhancing effect for private enterprises.

5. Conclusions And Implications

As an important driving force for technological change in the era of digital economy, artificial intelligence has an important impact on the economic growth of Chinese enterprises. This paper takes A-share listed companies in Shanghai and Shenzhen from 2001 to 2022 as a research sample to empirically explore the impact of artificial intelligence on enterprise value and its mechanism. The conclusions of the study are as follows: (1) Artificial intelligence significantly improves enterprise value. (2) The heterogeneity test shows that the nature of enterprise property rights and scientific and technological attributes will have a differentiated impact on the promotion of enterprise value by artificial intelligence.

Based on the above research conclusions, this paper puts forward the following suggestions: (1) Enterprises should fully recognize the effect of artificial intelligence on enterprise value, incorporate it into their long-term strategic planning, and continuously increase the development and application of AI to enhance their core competitiveness. (2) The government should pay more attention to the utilization level of artificial intelligence in state-owned enterprises, and give certain innovation incentives to state-owned enterprises to promote their R&D investment and digital transformation.

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