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# Analysis of Enterprise Digital Transformation on the Investment Behavior of Institutional Investors

——Empirical tests based on multi-period double difference models

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## ABSTRACT

Serving as a pivotal avenue for fostering seamless integration between the digital economy and the real economy, enterprise digital transformation assumes a pivotal role in shaping a novel development paradigm and advancing the economy towards high-quality growth and as an important part of China's stock market, it is vital to develop the power of institutional investors and guide them to make rational decisions. Considering the characteristics of enterprise digital transformation comprehensively, using the method of financial report mining to measure enterprise digital transformation, and taking A-share listed companies from 2008 to 2021 as sample data, the impact of enterprise digital transformation on the investment behavior of institutional investors is examined by using a multi-temporal DID model. It is found that corporate digital transformation can increase the shareholding ratio of institutional investors.

## KEYWORDS

Enterprise digital transformation; Institutional investors; Multi-period double-difference modelling

## 1. INTRODUCTION

In the context of the swiftly advancing digital economy, the digital transformation of enterprises has taken center stage as a vital path towards enhancing the quality of economic development. By incorporating advanced technologies, such as artificial intelligence, big data, cloud computing, etc., digital transformation helps enterprises realize the upgrading of their operation mode, improve management efficiency, reduce transaction costs, and enhance their competitiveness. However, the impact of digital transformation is still insufficient in existing studies, especially on the investment behavior of enterprises, which has not been fully explored. Thus, on the basis of previous studies, this paper takes A-share listed companies from 2008 to 2021 as a sample, and adopts a multi-temporal double-difference model to explore the impact of corporate digital transformation on institutional investors' investment behavior.

Based on empirical analyses, this paper introduces novel viewpoints that deepen our comprehension of how corporate digital transformation influences the dynamics of the capital market. Should corporate digital transformation lead to an enhancement in the proportion of institutional investor ownership, this revelation may serve as a valuable navigational tool for enterprises seeking to garner the sustained interest of long-term investors throughout their digital transformation endeavors. The research in this paper also provides a reference for institutional investors. If digital transformation can increase the investment value of enterprises, then institutional investors should pay attention to and select enterprises with better digital transformation for investment. In order that the research in

this paper can provide some help for the implementation of policies, the effective digital transformation of enterprises, and the correct investment of investors.

## 2. LITERATURE REVIEW

### 2.1. Study on the Influencing Factors and Economic Consequences of Digital Transformation of Enterprises

In analyzing the influencing factors of enterprise digital transformation, studies have shown that executive decision logic is the starting point for enterprises to move towards digital transformation [1]. Managers play an indispensable role in promoting the process of enterprise digital transformation [2]. Studies based on the innovation ecosystem theory point out that national policy support, industrial value leadership, active participation of agricultural management subjects, and the intrinsic demand for enterprise development are the four key elements that drive Chinese agriculture to realize digital transformation [3].

For the economic consequences of the digital transformation of enterprises, the three main areas are enterprise performance, productivity and corporate governance. In terms of enterprise performance, the study confirms that digital transformation has a positive impact on enhancing the financial performance of SMEs. Digital transformation significantly improves enterprise core business performance [4] and enhances the integration of enterprise supply chain, which further improves enterprise performance [5]. In addition, digital transformation can also improve the informationization level of enterprises and reduce the information asymmetry of market transactions, thus reducing transaction costs and thus enhancing business performance in production and sales [6].

In terms of production efficiency, the study points out that the intelligent and automated characteristics of digital technology will reduce the size of the low-end labor market, optimize the labor allocation of enterprises, and thus significantly increase the labor productivity of enterprises. The digital transformation of enterprises significantly improves the level of specialization and division of labor, which in turn promotes the increase of total factor productivity [7]. Digital empowerment helps to promote the deep integration of digital technology and the real economy, realizing the intelligence of production and management, thus improving enterprise productivity [8].

From a corporate governance lens, enterprise digital transformation revolutionizes value creation, bolstering organizational performance. It enhances information flow efficiency, addressing governance challenges, and refining internal control systems for smoother operations. Moreover, it fortifies risk oversight mechanisms, enabling dynamic process management. [9].

Overall, the influencing factors and economic consequences of enterprise digital transformation are multifaceted, involving multiple dimensions such as the logic of executive decision-making, the driving role of managers, the support of national policies, the leadership of industrial values, the active participation of agricultural business entities, and the intrinsic needs of enterprise development. Digital transformation not only enhances enterprise performance and productivity, but also improves corporate governance, thus bringing overall economic benefits to enterprises.

### 2.2. Research on Factors Influencing the Investment Behavior of Institutional Investors

There is a large amount of current literature examining the stockholding behavior of institutional investors, but there are fewer studies that specifically explore their influencing factors. The main influencing factors include liquidity, performance and risk, and disclosure quality.

From the perspective of liquidity, the study found a significant positive relationship between institutional holdings and stock market capitalization and liquidity. In comparison to individual

investors, institutional investors exhibit a higher frequency of investment activities, prompting them to place greater emphasis on the liquidity of stocks, as it directly impacts their ability to efficiently manage their portfolios [10]. Stocks with lower liquidity have larger bid-ask spreads, resulting in correspondingly higher transaction costs, to which institutional investors will be more sensitive [11].

In terms of performance and risk, studies have shown that funds prefer to hold stocks with good operating performance and good growth. Companies with strong short-term solvency and high profitability are more likely to attract institutional investors when the market is highly volatile [12]. In the market downturn, institutional investors prefer companies with strong profitability and good growth, while in the period of market upturn, the companies in which institutional investors concentrate their holdings are still those with strong profitability [13]. In addition, QFIIs prefer to hold larger and less risky listed companies in the A-share market [14].

From the perspective of information disclosure, it is found that institutional investors' shareholding is directly proportional to the number of analysts following. Due to the existence of information asymmetry, foreign investors prefer to invest in companies whose headquarters are established locally [15]. The quality of information disclosure is an aspect that foreign institutional investors attach great importance to when making investment decisions [16]. Based on signaling theory, firms' improved disclosure can alleviate information asymmetry, reduce the risk of adverse selection, and provide institutional investors with strategically valuable information [17]. Analysts' rating adjustments can lead to positive excess returns and downward adjustments the opposite. The information content of analyst revision information suggests that investors can earn excess returns by investing in accordance with analyst revision information [18]. In addition, the study found that analysts' rating recommendations have some predictive value [19].

### 2.3. Enterprise Digital Transformation and Institutional Investors

Within the framework of enterprise digital transformation, the integration of big data technology serves as a potent catalyst, markedly bolstering the enterprises' capacity for data mining and analysis. The aforementioned enhancement, facilitated by big data technology, enables enterprises to access vast amounts of unstructured data, thereby effectively augmenting the information disclosed through traditional financial accounting practices. This augmentation aligns more closely with the information disclosure preferences and needs of institutional investors [20]. In addition, digital transformation enables efficient, real-time information interaction between investors and enterprises, completely breaking down market information barriers. This enhanced information interaction helps to improve the investment precision of institutional investors and may enhance their investment returns. Therefore, enterprises with a higher degree of digital transformation are more likely to be favored by institutional investors [21].

Further examination reveals that companies, which have been vigorously digitally transforming, are able to reduce their financing costs and alleviate their funding difficulties by leveraging their advantageous social network connections. This strategic advantage solidifies their position in the financing arena, making them more competitive and thus more likely to secure the favor and support of institutional investors [22]. Digital transformation not only improves the quality and efficiency of corporate disclosure, but also provides significant advantages in financing, making these companies more attractive in the capital market.

## 3. THEORETICAL ANALYSIS AND HYPOTHESIS FORMULATION

The process of digital transformation seamlessly integrates a myriad of advanced technologies, including artificial intelligence, big data, and cloud computing, into the core of enterprises' daily operations. This integration fosters a seamless, real-time, and bidirectional flow of information between investors and investee entities, ensuring a constant and uninterrupted dialogue Through this

transformation, companies can reduce information asymmetry and enhance the effectiveness of their disclosures. By leveraging the extensive connectivity of the Internet, enterprises can strengthen the flow of information between internal and external parties; and by utilizing big data and cloud computing technologies, enterprises can enhance their data mining, storage and analysis capabilities, and provide internal and external parties with more high-quality and comprehensive data resources. At the same time, the introduction of blockchain technology provides enterprises with chained data storage services, effectively prevents data from being tampered with, thus ensuring the authenticity and integrity of the data, which in turn enhances the ability of enterprises to access resources and significantly improves the overall value of the enterprise. In contrast to companies that have not embarked on digital transformation, organizations that have successfully implemented digital transformation strategies have demonstrated significant advantages in data mining, acquisition, identification and storage. Their information structure is more timely, coherent and comprehensive, which leads to a significant increase in information availability. For institutional investors, digital transformation can effectively increase corporate accounting robustness and stock price synchronization, thus reducing the investment risk of institutional investors, and providing support for institutional investors to hold shares to obtain stable returns [23], At the same time, with the support of digital transformation, corporate information disclosure is more accurate, and the probability of institutional investors judging the value of corporate investment failures is lower, and the risk is also smaller [24-25], Thus, based on the above, the information structure is more timely, coherent and comprehensive, which makes the information available has been greatly improved.

As a result, based on the above analysis, this paper puts forward the following hypothesis:

H: the implementation of digital transformation by enterprises can increase the shareholding ratio of institutional investors

# 4. RESEARCH DESIGN

## 4.1. Data Acquisition and Sample Identification

The data sample utilized in this research includes listed A-share companies spanning the years 2008 to 2021.Preprocessing steps include eliminating financial companies, ST-designated firms, and those with incomplete key variables, ultimately yielding 38,197 valid samples. To diminish the effect of outliers, Winsorization has been utilized on all continuous variables, trimming them at the 1% and 99% thresholds to exclude the most extreme values. The entirety of the data used in this paper comes from the CSMAR database.

## 4.2. Acquisition and Measurement of Enterprise Digital Transformation Indicators

Regarding the measurement of enterprise digital transformation, the existing body of literature lacks a consensus, with most approaches relying primarily on the analysis of annual reports from listed companies. These methods can broadly be categorized into two distinct groups: one is to use the employee resume data and recruitment data related to AI skills to do text analysis, extract keywords, and then the keyword lexicon and compute the metrics to measure the digital transformation of the enterprise; the other is to use text analysis, the enterprise uses the keywords of information from various AI applications. The second is to use text analytics, in which enterprises use information from various AI applications for keyword phrases and calculate metrics. As text analysis only relies on text mining to extract keywords, the lack of professional subjective judgment is likely to cause misjudgment. Therefore, this paper chooses the first way.

### 4.3. Model Configuration and Variable Specification

Since the different capabilities of enterprises are taken into account during the sample selection period, the point of time when they start digital transformation may be different for different enterprises, to examine the stated hypothesis, we construct and apply the subsequent multi-period DID model within the context of this paper.

$$Pro_{i,t} = \beta_0 + \beta_1 Digit_{i,t} + \beta_2 Controls + Year_t + Firm_i + \varepsilon$$

Where, Explanatory variables: Whether the enterprise carries out digital transformation (Digit), if the enterprise carries out digital transformation in the year, then take 1 otherwise take 0. Explained variables: the proportion of institutional investor's shareholding (Pro), Building upon previous research, the study has identified and selected the control variables listed below: the proportion of the first largest shareholder's shareholding (Top1), the balance sheet ratio (Lev), the current ratio (CR), working capital (WC), fixed assets to revenue ratio (RPC), capital intensity (CI), total asset turnover (TAT).

## 5. EMPIRICAL RESULTS AND ANALYSIS

### 5.1. Descriptive Statistics

This phrasing emphasizes that the table is a concise overview or summary of the key statistical characteristics of the variables being analyzed the average shareholding of institutional investors in the sample companies is 45.56%, and there are large differences between the samples. The mean value of the explanatory variable enterprise digital transformation is 0.716, indicating that more than half of the companies in the sample have carried out digital transformation.

**Table 1.** Descriptive statistics

| Variable Name | Sample size | Mean | Standard deviation | Minimum value | Max |
|---|---|---|---|---|---|
| Pro | 38,182 | 45.56 | 25.17 | 0.000100 | 100 |
| Digit | 38,182 | 0.716 | 0.451 | 0.451 | 0.4510 |
| Top1 | 38,182 | 34.69 | 15.25 | 0.290 | 100 |
| CR | 38,182 | 2.684 | 3.995 | -5.132 | 190.9 |
| WC | 38,182 | 16.56 | 8.150 | 0 | 26.81 |
| Lev | 38,182 | 0.460 | 1.438 | -0.195 | 178.3 |
| RPC | 38,182 | 0.673 | 13.50 | 0 | 2256 |
| CI | 38,182 | 21.32 | 8.15 | 0 | 13.42 |
| TAT | 38,182 | 0.679 | 0.567 | -0.0479 | 12.37 |

### 5.2. Multiple Regression Analysis

In this paper, we use the individual-level clustered robust standard error modified fixed effects model for testing, and Table 2 reports the regression results of firms undergoing digital transformation and institutional investors' shareholding. The analysis reveals a statistically significant regression coefficient of 1.099 for the Digit variable, which is indicative of a strong positive relationship at the 1% level of significance. The current discovery highlights a notable trend: the digital transformation pursued by businesses results in a notable rise in the proportion of shares held by institutional investors.

**Table 2.** Multiple regression analysis

| | Pro |
|---|---|
| Digit | 1.099*** |
| | (3.75) |
| Top1 | 0.595*** |
| | (21.31) |
| CR | 0.098** |
| | (2.48) |
| WC | 0.000** |
| | (2.38) |
| Lev | -0.123 |
| | (-1.10) |
| RPC | -0.026* |
| | (-1.77) |
| CI | 0.004 |
| | (1.51) |
| TAT | 1.674*** |
| | (3.95) |
| constant | 24.439*** |
| | (19.96) |
| Individual | Control |
| Time | Control |
| N | 38182 |
| R2 | 0.163 |
| t statistics in parentheses<br>* p < 0.1, ** p < 0.05, *** p < 0.01 | |

## 5.3. Robustness Tests

### 5.3.1. Parallel trend test

Before the sample companies embarked on digital transformation, no discernible differences were observed among them, as evidenced by Figure 1. after the companies undergo digital change, there is a significant difference between the sample companies; indicating that the companies' choice to undergo digital transformation creates a systematic distinction observed between the group undergoing experimentation and the group serving as a point of comparison, unexposed to the experimental treatment. Therefore, the multi-period DID model constructed in this paper passes the parallel trend hypothesis.

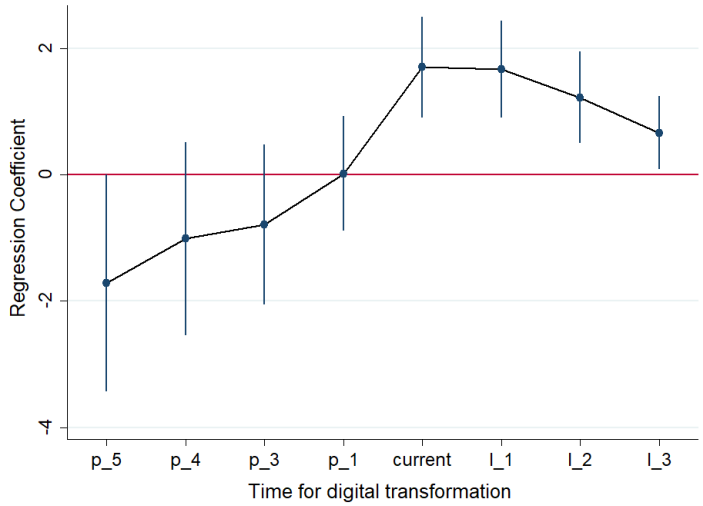


**Figure 1.** Parallel trend diagram of multi-period DID model

### 5.3.2. Virtual policy time

Based on the start time of enterprise digital transformation, this paper constructs the virtual policy time processing term, postpones the enterprise digital transformation time backward for two years, constructs the virtual policy time variable, and then constructs the interaction term with the processing group to generate the Digit 1 variable, and then conducts regression analysis again. Through the regression results can be seen, after the introduction of the dummy policy time variable, the regression analysis revealed a loss of statistical significance, suggesting that the influence of digital transformation on institutional investors' investment behavior is primarily attributable to the initial phase of the transformation, marked by the timing of the 'change.' This finding effectively confirms that digital transformation does indeed have a measurable impact on the investment behavior of institutional investors within the model's framework.

### 5.3.3. Virtual processing group

On the basis of the virtual policy time, the virtual treatment group is used for further robustness testing. Randomly generate a total of 38,144 values in the [0, 1] interval, re-set the value of the first 10% and the last 10% as the treatment group, multiply with the start time of the digital transformation of each treatment group, construct a Digit 2 variable, and carry out the did model regression to further validate the robustness of the model, and the regression outcomes detailed in Table 3 demonstrate that the virtual treatment group test results are also not significant, and also further verify the robustness of the regression results in this paper.

### 5.3.4. PSM-DID

In our analysis, we employed Propensity Score Matching (PSM) with a 1:5 nearest neighbor ratio for robustness validation. The main regression's control variables served as the basis for matching, and a caliper of 0.01 was set to refine the process. Post-matching, the Average Treatment Effect on the Treated (ATT) was found to be -8.99, exceeding the 1.96 threshold for statistical significance at the 5% level. This underscores a significant influence of corporate digital transformation on the institutional investors' shareholding percentage.

Upon conducting the PSM-DID regression analysis, the results indicate that after the Propensity Score Matching (PSM) process, the variable Digit retains a notable positive influence on the variable Pro. This correspondence with the initial regression outcomes underscores the strength of our model and the credibility of our regression results. These findings are summarized in Table 3.

**Table 3.** Robustness tests

| | Virtual policy time | Virtual processing group | PSM-DID |
|---|---|---|---|
| | Pro | | |
| Digit 1 / Digit2 / SHUZI | -0.300 | 0.105 | 1.112*** |
| | (-1.14) | (-0.68) | (4.04) |
| Top1 | 0.596*** | 0.597*** | 0.596*** |
| | (22.58) | (22.70) | (22.75) |
| CR | 0.095** | 0.099*** | 0.145*** |
| | (2.53) | (2.66) | (3.06) |
| WC | 0.000** | 0.000** | 0.000*** |
| | (2.51) | (2.52) | (2.62) |
| Lev | -0.126 | -0.127 | -0.672*** |
| | (-1.19) | (-1.20) | (-3.75) |
| RPC | -0.026* | -0.026* | -0.236 |
| | (-1.88) | (-1.88) | (-1.64) |
| CI | 0.004 | 0.004 | 0.033*** |
| | (1.59) | (1.59) | (2.61) |
| TAT | 1.686*** | 1.695*** | 1.729*** |
| | (4.24) | (4.26) | (4.14) |
| constant | 25.080*** | 25.075*** | 24.694*** |
| | (22.16) | (22.17) | (21.22) |
| Individual | Control | | Control |
| Time | Control | | Control |
| N | 38144 | 38144 | 38000 |
| R2 | 0.169 | 0.169 | 0.173 |
| t statistics in parentheses<br>* p < 0.1, ** p < 0.05, *** p < 0.01 | | | |

## 6. CONCLUSION AND IMPLICATIONS

This research delves into the implications of enterprise digital transformation on the investment patterns of institutional investors. Through a comprehensive analysis of A-share listed company data spanning from 2008 to 2021, leveraging a multi-temporal difference-in-differences model for empirical validation, it emerges that digital transformation undertaken by enterprises notably elevates the shareholding percentage held by institutional investors. This insightful discovery holds significant value in elucidating the ramifications of digital transformation on the capital market landscape and serves as a pivotal reference point for enterprises contemplating their digital transformation strategies

The paper begins with a literature review to explore the influencing factors and economic consequences of enterprise digital transformation, as well as the influencing factors of institutional investors' investment behavior. The digital transformation journey undertaken by organizations encompasses factors like the strategic logic behind executive decision-making, the pivotal role of managerial leadership in driving change, and the supportive framework provided by national policies, among others. The economic repercussions of this transformation are predominantly visible in the form of improved organizational performance, heightened productivity levels, and optimized business operations and management practices. The affecting factors of institutional investors' investment behavior mainly include liquidity, performance and risk, and information disclosure quality.

Drawing on A-share listed company data from 2008-2021, a multi-temporal DiD analysis revealed that enterprises' digital transformation significantly increases institutional investor shareholding.

Extensive validation, including parallel trend, placebo, hypothetical treatment, and PSM-DID tests, ensured the model's robustness. This study empirically supports the advantages of digital transformation, offering enterprises practical guidance on attracting investors during transformation. It also establishes a basis for institutional investors to identify and select optimal investment targets.

However, there are some shortcomings in the study. First, the measurement of digital transformation still has limitations, and future research can further improve it. Second, the mediation effect test and heterogeneity analysis have not been conducted, and future research can further delve into the mechanism of the impact of corporate digital transformation on the investment behavior of institutional investors and the heterogeneous impact of different types of enterprises. Furthermore, it's important to acknowledge that the data sources utilized in this study possess certain constraints. To bolster the reliability and comprehensiveness of future investigations, it is advisable to broaden the scope of data sources. This approach can help mitigate any limitations posed by the current dataset and contribute to more robust and insightful findings.

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