

The Impact of Digital Transformation on the Performance of Manufacturing Enterprises

Yixiao Sun *

School of China University of Geosciences Beijing, Beijing, China

* Corresponding Author Email: sunyixiao2005@outlook.com

Abstract. Amid the rapid expansion of the digital economy, there remains no clear consensus on whether manufacturers' adoption of digital initiatives ultimately enhances overall performance. Drawing on panel data of A-share manufacturing firms from 2014 to 2023, this study captures the intensity of digital transformation by measuring the frequency of digital-related keywords disclosed in firms' annual reports, and systematically examines its consequences for both market performance and financial performance. The empirical results reveal a striking divergence: while digital transformation significantly improves firms' market performance by enhancing visibility, reputation, and investor recognition, it simultaneously exerts a materially negative effect on financial performance due to high costs, resource misallocation, and implementation frictions. Further heterogeneity analyses indicate that these contrasting effects are more pronounced for state-owned enterprises, which face institutional pressures and resource abundance, and for firms located in economically developed regions, where digital competition and innovation expectations are particularly intense.

Keywords: Digital transformation, manufacturing industry, market performance, financial performance.

1. Introduction

Swift technological refresh cycles have recast digital transformation as a structural driver of China's growth. Globally, digitised output now powers expansion and frames geopolitical rivalry, mediating industrial renewal, business-model redesign and competitive repositioning. Within China, diffusion is accelerating; for manufacturing, digitisation is treated less as an efficiency option than as a prerequisite for quality upgrading and value-chain ascent [1].

Productivity gains are documented, yet bottlenecks persist in innovation, coordination, ecosystem governance and regulation. Empirical findings diverge: one strand reports monotonic improvements, risk appetite and inventive capacity lift valuations, while governance refinements, risk reductions and financing relief raise accounting returns; another detects curvilinearity. an initial earnings dip followed by recovery; a third records asymmetric outcomes, financial metrics advance as market indicators retreat [2].

Following the sequence, the study contributes: Tobin's Q and return on total assets are deployed to refine theoretical links between transformation and performance; ownership and regional heterogeneity tests yield disaggregated guidance for distinct manufacturing segments [3].

2. Theoretical Analysis and Research Hypotheses

2.1. Digital Transformation and Market Performance

Defined as the economic return generated by firm conduct within a given market structure, market performance is raised through digital transformation. Efficiency gains and a larger service-input share translate into cost-based price advantages [4]. Digitisation also strengthens collaboration and financing capacity, lowers costs, and curbs asymmetry, thereby expanding revenue [5]. Digital capital expenditures further enhance performance, with information symmetry mediating the effect [6]. Hence:

Manufacturing enterprises' digital transformation significantly improves market performance (H1).

2.2. Digital Transformation and Financial Performance

Financial performance condenses the monetary results and economic value produced by corporate activities within a stated period, summarising effectiveness in capital employment, resource deployment, cost control, earnings creation and growth. Evidence indicates an initial inverse link between transformation depth and accounting returns: intensified digitisation weakens short-run profitability [7]. During the first three years, digital adoption significantly reduces financial indicators; thereafter, the relationship becomes U-shaped. Up-front managerial and operating expenses depress margins, yet once the ramp-up phase ends, these costs fall and performance recovers [8]. Hence:

Manufacturing enterprises' digital transformation significantly impairs short-term financial performance (H2).

3. Data Sources and Research Design

3.1. Data Sources

A-share manufacturing firms listed in China during 2014–2023 form the initial sample. After excluding ST/ST designations, missing or extreme values, observations with 12 months of listing, and winsorising tails at 1%, 8371 firm-year records sourced from CSMAR remain.

3.2. Variable Definition and Explanation

3.2.1 Market Performance

Tobin's Q (tobin), the quotient of market value to asset replacement cost, serves as the market-performance proxy.

3.2.2 Financial Performance

Financial performance is gauged by ROA, net income divided by average total assets and scaled to 100, capturing the return per currency unit of resources under control.

3.2.3 Digital Transformation

A set of 99 digitisation-related terms, extracted from annual reports and summed as Digital_transformationB, proxies transformation intensity; higher frequencies signal deeper digital adoption [9].

3.2.4 Control Variables

Eight controls and year dummies are employed. Age (age1) equals current year minus founding plus one; govcon1_p indicates state ownership. Size is $\ln(\text{assets})$, leverage(F011201A) is liabilities/assets, and growth(F081701B) is revenue expansion. Ownership concentration (Shrcr1), board size (ExecutivesNumber_101), and top-three executive pay (TOP3ManageSumSalary_57) complete the set.

4. Empirical Analysis and Testing

4.1. Descriptive Statistics

Table 1 shows that, among 2023 A-share manufacturers, most enterprises have adopted digital technologies, yet a subset remains untransformed, and notable dispersion exists in both market and financial performance.

Table 1. Descriptive Statistics

Variables	N	mean	sd	min	max
Digital_transformationB	8371	3.236	1.063	0.000	6.999
ROA	8371	4.361	7.585	-164.791	78.587
tobin	8371	2.229	1.522	0.681	22.572
age1	8371	10.023	6.840	2.000	33.000
govcon1_p	8371	0.222	0.416	0. 000	1.000
size	8371	22.208	1.146	19.349	27.122
F011201A	8371	0.393	0.181	0.009	0.990
F081701B	8371	0.244	2.229	-0.913	171.745
Shrcr1	8371	32.468	13.790	2.122	87.705
ExecutivesNumber_101	8371	15.665	3.423	3.000	35.000
TOP3ManageSumSalary_57	8371	3.13e+06	3.51e+06	1.48e+05	7.99e+07

4.2. Regression Analysis

Table 2 indicates that, as digital transformation deepens, Tobin's Q rises monotonically; the corresponding coefficient is positive and significant at the 5% threshold, leading support to H1.

Table 2 shows that intensified digitisation (Digital_transformationB) is accompanied by a monotonic fall in ROA; the coefficient is negative and significant at the 1% level, supporting H2.

Table 2. Regression Results

Variables	tobin	ROA
Digital_transformationB	0.032** (2.18)	-0.252*** (-2.98)
age1	0.004 (1.16)	-0.097*** (-5.92)
govcon1_p	0.030 (0.70)	-0.859*** (-3.94)
size	-0.335*** (-13.48)	1.437*** (11.16)
F011201A	-1.311*** (-10.37)	-16.375*** (-21.96)
F081701B	0.009 (1.13)	0.186 (1.52)
Shrcr1	-0.002 (-1.43)	0.060*** (11.74)
ExecutivesNumber_101	-0.003 (-0.63)	0.055** (2.37)
TOP3ManageSumSalary_57	0.000*** (7.62)	0.055** (2.37)
Year Fixed	Yes	Yes
Constant	9.892*** (20.34)	-22.485*** (-8.88)
N	8371	8371
R-squared	0.177	0.188

5. Further Analysis

5.1. The Impact of Different Enterprise Ownership Types

Table 3 indicates that digital transformation yields significantly larger valuation and profitability gains for state-owned enterprises than for non-state enterprises, plausibly because SOE managers' mandates to safeguard employment and social stability intensify their commitment to digitisation initiatives [10].

Table 3. The Impact of Different Enterprise Ownership Type

Type	SOEs		Non-SOEs	
	tobin	ROA	tobin	ROA
Digital_transformationB	0.120*** (4.75)	-0.252* (-1.74)	0.007 (0.44)	-0.230** (-2.31)
age1	0.002 (0.38)	0.040* (1.80)	0.005 (1.24)	-0.174*** (-7.68)
size	-0.381*** (-9.12)	0.619*** (4.11)	-0.323*** (-10.27)	1.895*** (10.77)
F011201A	-1.402*** (-5.35)	-13.105*** (-11.35)	-1.274*** (-8.88)	-17.465*** (-19.23)
F081701B	0.023 (1.28)	0.657* (1.96)	0.008 (1.00)	0.162 (1.43)
Shrcr1	0.003 (1.26)	0.036*** (3.65)	-0.003** (-2.04)	0.064*** (10.98)
ExecutivesNumber_101	0.006 (0.84)	0.122*** (3.34)	-0.009 (-1.29)	0.048 (1.62)
TOP3ManageSumSalary_57	0.000*** (5.44)	0.000*** (6.28)	0.000*** (6.21)	0.000*** (5.93)
Year Fixed	Yes	Yes	Yes	Yes
Constant	10.719*** (13.58)	-9.195*** (-3.07)	9.702*** (15.45)	-31.373*** (-8.94)
N	1860	1860	6511	6511
R-squared	0.232	0.204	0.161	0.190

5.2. The Impact of Enterprises' Different Located Regions

Splitting provinces by digital depth, Table 4 shows significant valuation and profitability gains in the high-tier (Beijing, Guangdong, Shanghai, Jiangsu, Zhejiang, Shandong, Tianjin, Fujian, Hubei, Sichuan) but null effects elsewhere, reflecting superior markets, innovation and talent in the former and infrastructure gains in the latter [11].

Table 4. The Impact of Enterprises' Different Located Regions

Type	Developed Regions		Underdeveloped Regions	
	tobin	ROA	tobin	ROA
Digital_transformationB	0.037** (2.24)	-0.280*** (-2.85)	0.003 (0.10)	-0.094 (-0.62)
age1	0.003 (0.94)	-0.120*** (-5.99)	0.002 (0.42)	-0.039 (-1.41)
govcon1_p	0.039 (0.77)	-0.715*** (-2.66)	-0.025 (-0.32)	-1.222*** (-3.32)
size	-0.322*** (-10.53)	1.579*** (10.05)	-0.374*** (-9.65)	1.079*** (4.92)
F011201A	-1.431*** (-9.26)	-16.732*** (-19.97)	-0.846*** (-4.80)	-15.291*** (-8.82)

F081701B	0.008 (0.97)	0.170 (1.37)	0.018 (1.08)	0.311 (1.35)
Shrcr1	-0.002 (-1.35)	0.066*** (11.31)	-0.001 (-0.50)	0.036*** (3.51)
ExecutivesNumber_101	-0.005 (-0.77)	0.029 (1.05)	-0.000 (-0.02)	0.121*** (2.62)
TOP3ManageSumSalary_57	0.000*** (6.32)	0.000*** (5.80)	0.000*** (4.22)	0.000*** (9.99)
Year Fixed	Yes	Yes	Yes	Yes
Constant	9.634*** (16.08)	-24.913*** (-8.16)	10.707*** (13.94)	-16.439*** (-3.59)
N	6599	6599	1764	1764
R-squared	0.163	0.186	0.245	0.210

6. Conclusions

Employing 8371 manufacturing firm-years (2014-2023), we examine how digitisation reshapes market performance and financial performance. Market-to-book ratios rise monotonically with transformation intensity, whereas return on assets deteriorates in the short run. Heterogeneity tests reveal that state-owned enterprises and enterprises located in high-digitisation provinces absorb the greatest performance swing.

Given the unresolved empirical debate, longitudinal designs that track post-adoption trajectories and pinpoint mediating mechanisms are warranted. Policy implications are threefold: first, strategic road-maps should embed sustained R&D expenditure and attract plural financing channels; second, large enterprises can leverage ecosystem leadership, while SMEs should prioritise modular, low-cost pilots; third, public support must combine competitive grants, fiscal incentives and IP safeguards to expand basic-research funding and complete the institutional infrastructure.

References

- [1] Zhang Xiaoheng, Xiao Lin. Digital transformation empowering the emergence of new-quality productive forces: Logical framework, existing problems and optimization strategies. *Academic Journal*, 2024, (01): 73-85.
- [2] Bi Jinling, Dong Shuyue. Can digital transformation help improve the performance of cultural and tourism companies? *Tourism Tribune*, 2023, 38(09): 91-103.
- [3] Wang Kaiyang, Sun Zhuo, Chen Pengcheng. The impact of digital transformation on corporate financial performance: The mediating and moderating roles of corporate dynamic capabilities. *Management Review*, 2024, 36(12): 249-262.
- [4] Li Xiumin, Chen Zishuo, Chen Yaqi. Corporate digital transformation and financial performance: Evidence from digital patent data of listed companies. *Technology Economics*, 2024, 43(01): 73-87.
- [5] Hu Yuanlin, Yuan Chuxiang, Zhu Yanchun. The non-linear impact of digital transformation on corporate performance. *Statistics & Decision*, 2025, 41(10): 160-165.
- [6] Liang Linna, Zhang Guoqiang, Li Hao, et al. Research on the economic effects of corporate digital transformation: Analysis based on market performance and financial performance. *Modern Management Science*, 2022, (05): 146-155.
- [7] Tan Hong, Li Kunyu. Can digital transformation promote the performance of sports enterprises? An empirical test based on listed companies in the sports industry. *Journal of Wuhan Institute of Physical Education*, 2024, 58(09): 41-50.
- [8] Tang Haodan, Fang Senhui, Jiang Dianchun. Market performance of digital transformation: Can digital mergers and acquisitions enhance the market power of manufacturing enterprises? *Journal of Quantitative & Technical Economics*, 2022, 39(12): 90-110.

- [9] Zhao Erkui, Song Yiwen, Liu Jing. Research on the impact of digital transformation on the market performance of cultural enterprises: Empirical evidence from A-share listed cultural enterprises. *Science & Technology and Economy*, 2024, 37(04): 11-15.
- [10] Zhao Chenyu, Wang Wenchun, Li Xuesong. How does digital transformation affect total factor productivity of enterprises? *Finance & Trade Economics*, 2021, 42(07): 114-129.
- [11] Wang Wenhua, Zhou Liuyao. How does digital transformation of the logistics industry improve financial performance? Dual paths based on financing costs and management efficiency. *Communication of Finance and Accounting*, 2022, (20): 44-48.