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FIRM INTERNATIONALIZATION STRATEGY IN THE CONTEXT OF DIGITIZATION: MANAGERIAL INSIGHTS BASED ON AI INVESTMENT

Rapid digitalization has changed how firms organize production, manage information, and operate across national borders, raising growing interest in how digital technology shapes international expansion. While existing studies have discussed the role of digital transformation in firm performance, empirical evidence on how specific digital investments relate to firm internationalization remains limited, particularly in emerging-market contexts.

Using panel data from Chinese A-share listed companies between 2015 and 2024, this study examines the relationship between artificial intelligence (AI) investment and firm internationalization. A fixed-effects regression model is employed to account for unobserved firm heterogeneity, and a series of robustness checks are conducted to ensure the stability of the results. Firm internationalization is measured by overseas income, while AI investment captures firms' engagement in digital transformation.

The empirical results show that firms with higher levels of AI investment tend to generate greater overseas income, indicating a positive association between digital investment and internationalization. This relationship remains stable across alternative model specifications and sample adjustments. In addition, firm size and profitability are positively related to internationalization, suggesting that resource availability and financial capacity support overseas expansion. By contrast, firms experiencing rapid growth in the domestic market are less active internationally, reflecting potential trade-offs in strategic focus.

Overall, the findings provide firm-level empirical evidence on how digital investment relates to internationalization outcomes. The results also suggest that digital transformation is more likely to support international expansion when it is aligned with firms' resources, technological capabilities, and organizational structures, rather than treated as an isolated technological initiative.

Keywords: digital transformation, international management, artificial intelligence, internationalization strategy, Chinese firms.

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Цифрландыру жағдайындағы кәсіпорындардың интернационалдану стратегиясы: инвестициялар негізінде жасанды интеллектке басқарушылық қорытындылар

Жеделдетілген цифрландыру өндірісті ұйымдастыру, ақпаратты басқару және компаниялардың қызметін ұлттық шекарадан тыс жүзеге асыру тәсілдерін өзгертті, бұл цифрлық технологиялардың бизнестің халықаралық кеңеюіне қалай әсер ететініне қызығушылықты арттырды. Дегенмен қолданыстағы зерттеулер цифрлық трансформацияның компаниялардың тиімділігіне әсерін кеңінен талқылайды, нақты цифрлық инвестициялардың фирмаларды интернационалдандырумен қалай байланысты екендігі туралы эмпирикалық дәлелдер шектеулі болып қалады, әсіресе дамушы нарықтар жағдайында.

Бұл зерттеуде 2015-2024 жылдар аралығындағы А-акциялар нарығында тізімделген қытайлық компаниялардың панельдік деректері негізінде жасанды интеллектке (AI) инвестициялар мен компаниялардың интернационалдандыру деңгейі арасындағы байланыс талданады. Бақыланбайтын фирмалық гетерогенділікті есепке алу үшін тұрақты әсерлері бар регрессия моделі қолданылады, сондай-ақ алынған нәтижелердің сенімділігін растау үшін бірқатар тұрақтылық тексерулері жүргізіледі. Компаниялардың интернационалдандыру деңгейі шетелдік кірістер көлемімен өлшенеді, ал AI инвестициялары компаниялардың цифрлық трансформация процестеріне қатысу дәрежесін көрсетеді.

Эмпирикалық нәтижелер жасанды интеллектке инвестиция деңгейі жоғары компаниялар шетелдік кірістердің жоғары көлемін алуға бейім екенін көрсетеді, бұл цифрлық инвестициялар мен интернационалдандыру арасындағы оң байланысты көрсетеді. Бұл байланыс модельдердің

балама сипаттамаларын пайдалану және үлгіні түзету кезінде сақталады. Сонымен қатар, компанияның мөлшері мен оның кірістілік деңгейі интернационалдандырумен оң байланысты, бұл халықаралық экспансияны қолдаудағы ресурстармен қамтамасыз ету мен қаржылық мүмкіндіктердің рөлін көрсетеді. Сонымен қатар, ішкі нарықта жылдам өсуді көрсететін компаниялар халықаралық нарықтарда аз белсенділік танытады, бұл стратегиялық басымдықтарда ықтимал компаға келуді (trade-off) көрсетеді.

Жалпы алғанда, зерттеу нәтижелері цифрлық инвестициялардың компанияларды интернационалдандыру нәтижелерімен қалай байланысты екендігі туралы фирмалық эмпирикалық дәлелдер береді. Нәтижелер сонымен қатар цифрлық трансформация оқшауланған технологиялық бастама ретінде қарастырылмай, компанияның ресурстарымен, оның технологиялық мүмкіндіктерімен және ұйымдық құрылымымен келісілген жағдайларда халықаралық экспансияға көбірек ықпал ететінін көрсетеді.

Түйін сөздер: цифрлық трансформация, халықаралық менеджмент, жасанды интеллект, интернационалдандыру стратегиясы, Қытай кәсіпорындары.

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Стратегия интернационализации предприятий в условиях цифровизации: управленческие выводы на основе инвестиций в искусственный интеллект

Ускоренная цифровизация изменила способы организации производства, управления информацией и осуществления деятельности компаний за пределами национальных границ, что усилило интерес к тому, как цифровые технологии влияют на международную экспансию бизнеса. Несмотря на то, что в существующих исследованиях широко обсуждается влияние цифровой трансформации на эффективность деятельности компаний, эмпирические доказательства того, каким образом конкретные цифровые инвестиции связаны с интернационализацией фирм, остаются ограниченными, особенно в контексте развивающихся рынков.

В данном исследовании на основе панельных данных китайских компаний, котирующихся на рынке А-акций, за период 2015–2024 гг. анализируется взаимосвязь между инвестициями в искусственный интеллект (AI) и уровнем интернационализации компаний. Для учета ненаблюдаемой фирменной гетерогенности используется модель регрессии с фиксированными эффектами, а также проводится серия проверок на устойчивость для подтверждения надежности полученных результатов. Уровень интернационализации компаний измеряется объемом зарубежных доходов, в то время как инвестиции в AI отражают степень вовлеченности компаний в процессы цифровой трансформации.

Эмпирические результаты показывают, что компании с более высоким уровнем инвестиций в искусственный интеллект, как правило, получают более высокий объем зарубежных доходов, что свидетельствует о положительной связи между цифровыми инвестициями и интернационализацией. Данная взаимосвязь сохраняется при использовании альтернативных спецификаций моделей и корректировке выборки. Кроме того, размер компании и уровень ее прибыльности положительно связаны с интернационализацией, что указывает на роль ресурсной обеспеченности и финансовых возможностей в поддержке международной экспансии. В то же время компании, демонстрирующие быстрый рост на внутреннем рынке, проявляют меньшую активность на международных рынках, что отражает возможный компромисс (trade-off) в стратегических приоритетах.

В целом результаты исследования предоставляют фирменно-ориентированные эмпирические доказательства того, каким образом цифровые инвестиции связаны с результатами интернационализации компаний. Полученные выводы также свидетельствуют о том, что цифровая трансформация с большей вероятностью способствует международной экспансии в тех случаях, когда она согласована с ресурсами компании, ее технологическими возможностями и организационной структурой, а не рассматривается как изолированная технологическая инициатива.

Ключевые слова: цифровая трансформация, международный менеджмент, искусственный интеллект, стратегия интернационализации, китайские компании.

Introduction

The expansion of the digital economy has gradually altered firms' production processes, organizational structures, and competitive strategies. (Plekhanov et al., 2023). With the continuous development of the digital economy, digital transformation increasingly shapes how firms reorganize internal processes, reduce coordination frictions, and support cross-departmental decision-making (Vial, 2019). Existing studies have examined the economic consequences of digital transformation, focusing primarily on firm performance and innovation outcomes.

Existing research has mainly focused on traditional determinants of internationalization such as firm size, ownership structure, institutional distance and market conditions. Recent research has begun to focus on the importance of digitization, but systematic firm-level empirical evidence on how specific digitization investments translate into international market outcomes remains fragmented, particularly in the context of emerging economies.

This limitation is particularly evident in the study of Chinese firms. Over the past decade, China has developed into one of the world's major digital economies, and many firms have increased their AI investment, data analytics, and digital platforms. At the same time, Chinese firms expanding into international markets face institutional differences, competitive pressures, and uncertainty related to changes in the global economic environment. Under these conditions, it remains unclear whether digital transformation helps firms improve their internationalization outcomes, particularly in emerging economies.

This study examines the relationship between digital transformation and firm internationalization. Specifically, it focuses on whether firm-level investment in AI is associated with internationalization outcomes, measured by overseas income. AI investment is used as an observable indicator of digital transformation, as it more directly reflects firms' engagement with digital technologies than composite indices or qualitative descriptions.

The research object of this study consists of Chinese A-share listed companies during the period 2015-2024. These firms operate in a rapidly digitizing environment and disclose standardized financial information, which allows for firm-level panel analysis. Using this sample, the study examines whether AI investment is related to firms' international expansion and provides empirical evidence relevant to internationalization strategies in the digital era.

Literature review

The impact of digital transformation on firm internationalization: Prior studies document that digital technologies influence firms' operations in industries such as energy, mining, and manufacturing, albeit through different mechanisms. (Ionascu et al., 2005) emphasize the importance of institutional distance (including normative, regulatory and cognitive dimensions) in shaping international business strategies. As firms expand globally through digital means, they navigate through different regulatory environments and normative expectations. This broader understanding of institutional factors becomes increasingly important. In terms of industry-specific impacts, (Dragičević et al., 2019) emphasize that digital transformation in the mining industry involves a fundamental reassessment of strategy, value streams and operating models. In particular, it has a significant impact on customers, partners and employees. As well, (Balashova et al., 2019) discuss how digital technologies enable new ways of communicating with consumers and transform the energy industry by developing advanced digital platforms to maintain competitive advantage. (Gutman et al., 2019) further explore the role of digital transformation in improving operational efficiency and strategic management. They propose simulation models to assess the combined impact of internal and external environmental factors on business value. This kind of models is useful for firms operating internationally as they help to understand complex interactions and support strategic decision making in a rapidly digitizing environment. Furthermore, (Tuan et al., 2021) showed that digital transformation streamlines business processes such as cash accounting and document digitization, which improves operational efficiency and decision-making. This is in line with the general trend of digitizing core business activities to support international operations. As stated by Ochara (2016) who illustrated how social firms can utilize online platforms to expand market reach and increase sales, exemplifying digital transformation at the firm level. (Murahovscaia, 2021) conducted a study on the development of logistics infrastructure, an important component of international business operations. He noted that digital technologies help to optimize operational activities and people management at regional and global levels. This emphasized the importance of digital infrastructure in supporting seamless international supply chains and logistics. The study by (Chintalapati et al., 2021), exemplified how digital

technologies are reshaping marketing strategies for more targeted and efficient participation in international markets. They categorize marketing activities into digital, content, experiential, operational, and research themes, highlighting the multifaceted impact of digital transformation on firms' global competitiveness. In the international business environment, digital transformation is a catalyst for strategic alignment, operational efficiency and market expansion. It entails adapting to institutional differences, industry-specific changes and infrastructure developments, ultimately shaping the future trajectory of global business operations.

The role of artificial intelligence in internationalization: Integrating AI into business operations is increasingly seen as a key factor in improving competitiveness and supporting internationalization efforts. (Sharp, 2018) highlighted that disruptive technologies such as AI are fundamentally transforming the workplace by introducing advanced analysis, algorithms and robotics, challenging traditional human roles and driving organizational change. This technological change is seen as a catalyst for organizations to maintain a competitive edge in a fast-moving global environment. To support this view, (Strusani et al., 2019) present the potential of AI to augment human intelligence and revolutionize access to products and services, especially in emerging markets. They argued that private sector solutions utilizing AI are essential for the promotion of innovative business models, more efficient service delivery and increased competitiveness in local markets, thus facilitating international expansion. In terms of national strategies, (Fatima et al., 2020) analyzed how countries can use AI to modernize the public sector and improve industry competitiveness. Their content analysis of strategic plans shows a focus on responsible data and algorithm management, governance and capacity development. This is critical to creating an environment that is conducive to both business development and international engagement. Furthermore, the role of AI in specific industries highlights its importance in business competitiveness. (Indriasari et al., 2019) explored AI and big data analytics in the Indonesian banking industry, demonstrating how digital innovation can improve customer experience and operational efficiency. This is a key factor in maintaining a competitive edge in the international market.Artificial intelligence-driven customer relationship management can improve sustainable business performance by strengthening relationship capital and organizational coordination (Wang et al., 2020; Rehman & Anwar, 2019). (Roy, 2021) examined the use of AI in workforce management in India, noting that AI tools are transforming the HR function and have the potential to reshape the global labor market. (Baothman, 2021) further noted the disruptive impact of AI on legal contracts. He believed that firms need to develop tailored AI strategies to optimize legal processes and contractual efficiencies, which are critical for international business operations. Finally, (Trad, 2021) explored educational and conceptual frameworks to support AI-driven business transformation. The study pointed to models that integrate AI with business architecture and educational systems. These frameworks are critical for fostering innovation, ensuring responsible AI deployment, and maintaining firm agility in a competitive global environment. These studies paint a picture of AI as more than just a technological tool; it emerges as a strategic enabler that helps firms innovate, plan, adapt to specific industries, and build the capabilities necessary to compete beyond domestic borders. As a result, the integration of AI is positioned as a key driver for businesses to thrive in the global economy.

Firm internationalization management strategy: Strategic corporate management in the context of internationalization covers a multifaceted approach. These include innovation, functional coordination, human resources, risk management, branding, project maturity and knowledge sharing. A foundational framework is provided by (Miller, 1992), who suggested that risk management is at the core of an effective international management strategy. Firms must develop a comprehensive approach to the multifaceted risks inherent in global operations. (Gerybadze et al., 2010) emphasized the importance of technology strategy and innovation management in global business research centers. They suggested that innovation practices are critical to sustaining international growth. More specifically, technological innovation and disclosure practices significantly influence the ability of firms to expand globallyIn an increasingly globalized marketplace, firms must strategically coordinate multiple functional areas to sustain competitiveness. The integration of technological, financial, and operational functions enhances firms' ability to adapt to international market demands (Gerybadze et al., 2010; Vial, 2019). (Chen et al., 2015) found that flexible HRM can enhance innovation performance by improving organizational learning capabilities. This suggests that adaptive HR practices can help to enhance firms' innovation and international competitiveness. At the same time,

the role of internal capabilities in supporting global strategies is emphasized. Risk management is another key element which is influenced by organizational culture and leadership. (Yilmaz et al., 2017) explored how firm risk management fits with strategic management and organizational culture. They pointed out that effective ERM practices can cope with the uncertainty of international markets. Rehman and Anwar (2019) noted that formal risk management mediates between business strategy and SME performance. This suggests that strategic risk practices are critical for achieving superior international market outcomes. Brand management has become a powerful tool in the internationalization strategy of SMEs (Couto et al., 2017) . They discussed the importance of brand creation and management to enhance international competitiveness. They pointed out that a good brand facilitates a strong foothold in overseas markets. This is complemented by (Xu et al., 2020). They proposed a "five-ification" management strategy for energy firms, focusing on standardization, platform operation and industrialization. These are aimed at building international influence and competitiveness. (Schelini et al., 2017) analyzed how project management capabilities can be a competitive advantage for Brazilian firms' international expansion from a Resource-Based View (RBV). Their findings suggest that mature project management practices can facilitate the implementation of strategic internationalization plans by optimizing resource utilization and project execution. (Chatterjee et al., 2021) examined the role of firm social networks (ESNs) in facilitating cross-border knowledge transfer. They emphasized the importance of effective knowledge management among subsidiaries for the implementation of international strategies and the promotion of innovation. In short, firm internationalization management strategies are comprehensive. These elements are interrelated and are essential for firms to enhance their global competitiveness and sustain growth in international markets.

Existing studies mainly examine the effects of digitalization on firm performance, innovation, and organizational capabilities. Other studies focus on firms' internationalization paths and influencing factors from a macro-level perspective. However, fewer studies explore how digitalization supports firm internationalization in practice, especially from the perspective of management strategy. In particular, the interaction between digital strategy and internationalization strategy at the firm level has not been sufficiently examined.

To address this gap, this study uses firm-level panel data to examine the relationship between AI investment and firm internationalization from a management perspective. By focusing on AI investment, the study provides empirical evidence on how digital transformation is associated with firms' international expansion.

Overall, although prior research suggests that digital transformation is related to internationalization, existing findings are not fully consistent and are often limited to specific contexts. Therefore, further empirical analysis based on Chinese firms is needed. Based on the above discussion, the following hypothesis is proposed:

H1: Digital transformation, measured by AI investment, promotes firm internationalization.

Methodology

Sample selection and data processing: This paper takes Chinese A-share listed companies from 2015 to 2024 in the CSMAR database as its research subjects. It explores the impact of corporate digital transformation on their internationalization development levels and provides management recommendations. Based on the original sample, the following sample selection criteria were applied: excluding samples from the financial, insurance, and securities industries; excluding samples subject to special treatment; and excluding bankrupt samples. Ultimately, 37883 observations are obtained, covering 3790 listed companies.

The study examines the relationship between firms' AI investment (representing the level of digitization) on the degree of internationalization (measured by overseas income) by constructing a fixed-effects panel regression model and introducing the variables of firm size, profitability, leverage level, capital structure, cash ratio, Tobin's Q, board size, and proportion of independent directors as control factors.

In order to comprehensively assess the impact of digital transformation on firm internationalization, this paper constructs the following fixed effects panel regression model:

$$\ln(\text{Income}_{i,t}) = \alpha + \beta \ln(\text{AI}_{i,t}) + \\ + \gamma^{\text{T}}\text{X}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

Where:

$\text{Income}_{i,t}$: logarithm of overseas income, representing the internationalization level of firm i at year t, measured by the log of overseas income

ln $AI_{i,t}$: logarithm of AI investment of firm *i* in year *t*, representing the level of digital transformation.

$X_{i,t}$: vector of control variables, including firm size (Ln_Size), leverage (LEV), return on equity (ROE), cash ratio, growth rate, Tobin's Q, board size, and board independence.

μ_i: firm fixed effects.

λ_t: time fixed effects

$\varepsilon_{i,t}$: error term.

To determine whether the fixed effects (FE) model or the random effects (RE) model is more appropriate, this study conducted Hausman tests on Model: $\chi^2(9) = 458.92$, $p < 0.01$, so we select the fixed effects model.

Table 2 shows the descriptive statistics of the main variables in this paper. All variables were winsorized to reduce the interference of extreme values in the analysis.

Table 1 – Variable definitions and measurement

Variable Name	Symbol	Measurement
Overseas income	Ln_income	Natural logarithm of main business income from overseas, reflecting the degree of internationalization of the firm
AI Investment	Ln_AI	Natural logarithm of firm digital transformation scores based on annual report keyword word frequencies. This variable reflects the intensity of a firm's investment in digital technology.
Firm Size	Ln_Size	Total asset size of the firm during the reporting period, used to account for firm scale effects.
Profitability	ROE	Return on equity, calculated as net profit divided by shareholders' equity. This measures a firm's financial efficiency and ability to return on investment.
Leverage	LEV	Debt-to-asset ratio, calculated as total liabilities divided by total assets. This indicates the financial risk and capital structure of the firm.
Cash Ratio	CashRatio	Cash and cash equivalents divided by current liabilities. This measures a firm's liquidity and ability to meet short-term obligations.
Growth Rate	GrowthRate	Annual growth rate of operating income, capturing the expansion speed of the firm.
Tobin's Q	TobinQ	Ratio of market value of the firm to the replacement cost of its assets. Reflects market expectations and firm valuation.
Board Size	BoardSize	Total number of board members in the firm.
Board Independence	BoardIndep	Proportion of independent directors in the board, expressed as a percentage.
Note – completed by the authors		

Table 2 – Descriptive statistics

Variable	Number	Mean	Std. Dev.	Min	P50	Max
Ln_income	20157	19.2184	2.2773	12.3755	19.4675	24.2152
Ln_AI	24051	15.6593	1.9119	10.4346	15.7007	20.2969
Ln_Size	27935	21.9989	1.3171	18.8495	21.8734	25.9707
LEV	27910	0.3916	0.1980	0.0559	0.3777	0.9164
ROE	27803	0.0541	0.1561	-0.9087	0.0708	0.3616
CashRatio	23235	0.9361	1.3939	0.0193	0.4467	8.5933
GrowthRate	17524	0.2383	0.5887	-0.6297	0.1037	3.6728
TobinQ	17035	2.0639	1.2632	0.8667	1.6518	8.2042
BoardSize	17140	8.1354	1.4762	5.0000	9.0000	12.000
BoardIndep	17140	37.9908	5.3500	33.33	36.36	57.140
Note – completed by the authors based on the CSMAR data						

Table 2 presents the descriptive statistics for key variables. Overall, the means, medians, and standard deviations of all variables fall within reasonable ranges. The sample firms exhibit notable variation in their levels of digital transformation and international market involvement.

As shown in Table 2, the mean value of internationalization level (Ln_income) is 19.2184, the median is 19.4675, the standard deviation is 2.2773, the minimum value is 12.3755, and the maximum value is 24.2152. This explains that the overseas income of the sample firms varies significantly, with some firms exhibiting a high degree of internationalization, but the overall distribution remains relatively concentrated.

The mean value of the digitization level (Ln_AI) is 15.6593, with a median of 15.7007, a standard deviation of 1.9119, and maximum and minimum values of 20.2969 and 10.4346, respectively. It is clear that there are significant differences among firms in their investment in artificial intelligence. This indicates that a small number of firms have invested far beyond the average level in digital transformation, potentially gaining a first-mover advantage.

Regarding control variables, firm scale reveals significant disparities in distribution. The mean value of LEV is 0.3916 with a standard deviation of 0.1980, primarily distributed between 0.056 and 0.916, indicating that most firms maintain a moderate debt-to-equity ratio. The mean value of ROE is only 0.0541, yet the minimum value reaches -0.9087 and the maximum value is 0.3616, suggesting that some firms are operating at a loss.

Other variables such as Cash Ratio, Growth Rate, and Tobin's Q exhibit greater volatility. It is evident that the sample firms show remarkable levels of variation in liquidity, growth potential, and market valuation. The mean value for BoardSize is 8.1354 with a standard deviation of 1.4762. Most corporate boards comprise between 5 and 12 members, indicating minimal variation. The mean proportion of BoardIndep is 37.99 %, with a maximum of 57.14 %. This suggests that most sample firms meet regulatory requirements, with a reasonable distribution of independent director ratios. Descriptive statistics reveal significant variations among firms in both internationalization levels and digital investment, providing robust data support for subsequent empirical analysis.

Overall, the paper employs a fixed-effects model to control for firm-level variation and conduct our analysis step-by-step through descriptive statistics, correlation analysis, and benchmark regression. And we further conduct multiple robustness tests. Considering that digital investments may exhibit a lagged effect on firm internationalization, we regress the core explanatory variable Ln_AI on its lagged value Ln_AI(-1). If the lagged variable remains significant, it indicates that the promotional effect of digital transformation on firm internationalization is persistent. Also we exclude observations from the COVID-19 pandemic period of 2021-2022 to verify whether the conclusions hold outside of exceptional years. Empirical results indicate that the core findings from these robustness tests align with those of the benchmark regression. This enhances the reliability of our causal inference.

Results and discussion

Firstly, we conducted correlation tests between the variables, with the results shown in Table 3.

Table 3 – Variable correlation analysis

	Ln_income	Ln_AI	Ln_Size	LEV	ROE	CashRatio	Growth-Rate	TobinQ	BoardSize	Board-Indep
Ln_income	1									
Ln_AI	0.40***	1								
Ln_Size	0.56***	0.63***	1							
LEV	0.30***	0.36***	0.52***	1						
ROE	0.13***	0.00	0.06***	-0.25***	1					
CashRatio	-0.16***	-0.19***	-0.25***	-0.58***	0.10***	1				
Growth-Rate	-0.16***	0.02**	-0.01	0.06***	-0.02**	-0.03***	1			
TobinQ	-0.14***	-0.10***	-0.22***	-0.22***	0.12***	0.14***	-0.01	1		

Continuation of the table

	Ln_income	Ln_AI	Ln_Size	LEV	ROE	CashRatio	Growth-Rate	TobinQ	BoardSize	Board-Indep
BoardSize	0.12***	0.17***	0.25***	0.12***	0.01	-0.07***	0.04***	-0.04***	1	
Board-Indep	0.02**	0.04***	0.03***	0.03***	-0.02*	-0.01	-0.02**	-0.01	-0.58***	1

Note – * p < 0.1, ** p < 0.05, *** p < 0.01.
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Table 3 presents the correlations among key variables. Overall, both the signs and significance levels of the correlation coefficients align with expectations. The correlations between the vast majority of variables fall within a reasonable range.

First of all, regarding core variables, digitization level (Ln_AI) exhibits a significant positive correlation with internationalization level (Ln_income) (correlation coefficient approximately 0.40, p<0.01). We observe that firms with higher digital investment demonstrate higher levels of overseas income, providing preliminary evidence to validate the hypothesis that "digitalization promotes internationalization" in subsequent regression analysis.

Secondly, the correlation coefficient between firm size and internationalization level (Ln_income) is relatively high (approximately 0.56, p<0.01), which indicates that larger firms possess greater advantages in the internationalization process. Simultaneously, a strong positive correlation also exists between Ln_Size and Ln_AI (approximately 0.63, p<0.01), reflecting that larger firms tend to increase their digital investment.

Regarding financial variables, LEV exhibits a significant positive correlation with Ln_income (0.30, p<0.01). This suggests that moderate debt levels may support a firm's internationalization activities. ROE shows a significant positive correlation with internationalization level (0.13, p<0.01), indicating that firms with stronger profitability are more likely to achieve international expansion. However, it is noteworthy that the correlation coefficient between LEV and ROE is negative (-0.25, p<0.01), consistent with the logic that high debt ratios may suppress profitability.

Among liquidity and growth indicators, the cash ratio exhibits a negative correlation with internationalization level (-0.16, p<0.01). This suggests that firms holding substantial cash reserves do not necessarily pursue aggressive overseas market expansion. Growth rate is negatively correlated with internationalization level (-0.16, p<0.01). This reveals that high-growth firms may focus more on domestic market expansion rather than overseas markets.

In the relationship between market valuation and governance structure, Tobin's Q exhibits a negative correlation with Ln_income (-0.14, p<0.01). We observe that highly valued firms do not necessarily exhibit greater internationalization. Board size exhibits a significant positive correlation with internationalization level (0.12, p<0.01), reflecting that larger boards may facilitate resource allocation and overseas market decision-making. The correlation between the proportion of independent directors and internationalization level is weaker (0.02, p<0.05), yet still indicates a certain positive effect.

In summary, the correlation analysis results provide preliminary support for the notion that digital investment promotes firm internationalization. Simultaneously, it reveals the potential influence of firm size, financial structure, and governance factors on internationalization levels. This establishes a data foundation for subsequent regression analysis and robustness testing.

Table 4 presents the benchmark regression results of digital investment (Ln_AI) on firm internationalization level (Ln_income). To verify the mechanism through which digital transformation influences internationalization, the study constructed separate regression models for the core explanatory variable and the control variable.

In the regression model containing only core explanatory variables, the regression coefficient for digital investment is 0.1327 and is statistically significant at the 1 % level. This indicates that enhancing an firm's digitization level can significantly promote its internationalization development. Digital transformation enables firms to accelerate their entry into overseas markets and boost international income by enhancing information processing capabilities, reducing cross-border transaction costs, and optimizing resource allocation.

Table 4 – Benchmark regression results

Variables	(1) Ln_income	(2) Ln_income
Ln_AI	0.1327*** (0.0138)	0.0334*** (0.0125)
Ln_Size		0.9292*** (0.0534)
LEV		0.0847 (0.1903)
ROE		0.4439*** (0.1150)
CashRatio		-0.0122 (0.0126)
GrowthRate		-0.1014*** (0.0301)
TobinQ		0.0083 (0.0127)
BoardSize		-0.0006 (0.0170)
BoardIndep		-0.0050 (0.0039)
_cons	17.1414*** (0.2176)	-1.7912 (1.1842)
Year_FE	Yes	Yes
Firm_FE	Yes	Yes
N	18029	11767
Adj. R2	0.8813	0.9053
F	92.5749	50.1709
Note – Robust standard errors in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. Completed by the authors.		

Furthermore, after incorporating other control variables, the regression coefficient for digital investment was 0.0334 and remained statistically significant at the 1 % level. This indicates that regardless of corporate characteristics and governance factors, the role of digital transformation in promoting internationalization remains robust.

From the results of controlling variables, firm scale exhibits a significant positive relationship with internationalization levels. Large firms possess more resources and channels for cross-border operations, making it easier for them to achieve international expansion. ROE also significantly remained positive, indicating that firms with higher profitability possess greater capacity to bear the capital and risk costs associated with internationalization. In contrast, operating income growth rate showed a negative correlation with internationalization level, suggesting that firms in the rapid expansion phase of the domestic market tend to focus on consolidating their domestic presence rather than immediately expanding into overseas markets. Other variables such as capital structure, cash ratio, Tobin's Q ratio, board size, and proportion of independent directors did not exhibit significant effects.

To further validate the reliability of the benchmark regression results, this study conducted robustness tests. Specifically, on one hand, considering that digital investments may have a lagged effect on firm internationalization, the AI investment variable was regressed after being lagged by one period. On the other hand, samples from the pandemic years of 2021-2022 were excluded to avoid interference from these exceptional years on the results. The results are presented in Table 5.

Table 5 – Robustness test: lagged variable and excluding pandemic years

Variables	(1) **One-period Lag of AI Investment**	(2) **Excluding 2021- 2022**
Ln_AI (-1)	0.0307** (0.0142)	
Ln_AI		0.0308** (0.0140)
Ln_Size	0.9276*** (0.0576)	0.9115*** (0.0576)
LEV	0.0428 (0.1896)	0.1093 (0.2125)

Continuation of the table

Variables	(1) **One-period Lag of AI Investment**	(2) **Excluding 2021- 2022**
ROE	0.4694*** (0.1065)	0.2726** (0.1285)
CashRatio	0.0043 (0.0148)	-0.0062 (0.0149)
GrowthRate	-0.0830*** (0.0320)	-0.0987*** (0.0356)
TobinQ	0.0072 (0.0120)	0.0175 (0.0151)
BoardSize	0.0058 (0.0167)	-0.0104 (0.0187)
BoardIndep	-0.0068* (0.0037)	-0.0059 (0.0044)
_cons	-1.6655 (1.2770)	-1.2737 (1.2704)
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	10,113	8,528
Adj. R^2	0.9121	0.8980
F-statistic	41.4163	39.6951

Note- Robust standard errors in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01
Completed by the authors

In Model (1), after lagging the AI investment variable by one period, its regression coefficient is 0.0307 and is statistically significant at the 5 % level. The result shows that AI investment not only effectively promotes firm internationalization in the current period but also continues to exert a positive effect in the following year. The impact is persistent.

In Model (2), the study excluded observations from the pandemic period of 2021-2022. The regression coefficient for AI investment (Ln_AI) is 0.0308, which remains statistically significant at the 5 % level. This demonstrates that our findings are not confounded by the sample from the exceptional pandemic years, and the positive effect of AI investment on firm internationalization remains robust.

Additionally, the results for control variables in both sets of models are largely consistent: firm size consistently exerts a significant positive effect on internationalization levels (0.9276*** and 0.9115***).

ROE remained positive and significant in both robustness tests (0.4694*** and 0.2726**). In contrast, the growth rate exhibited a significant negative effect in both tests (-0.0830*** and -0.0987***), suggesting that faster-growing firms are not necessarily more inclined toward international expansion, possibly constrained by resource allocation or external environments.

Overall, the robustness test results align with the benchmark regression. This further confirms that the promotional effect of AI investment on firm internationalization is robust and reliable.

Conclusion

This study addresses the research question by examining whether digital transformation, reflected by firm-level AI investment, promotes firm internationalization. The empirical findings reveal the following results:

Empirical results indicate that digital transformation significantly enhances a firm's level of internationalization. Whether in regression models incorporating only core variables or after controlling for firm size, profitability, capital structure, liquidity, and corporate governance, the impact of digital investment (Ln_AI) on internationalization level (Ln_income) consistently remains significantly positive. This suggests that firms' continuous investment in digital technologies, such as AI, can effectively enhance their multinational operation capability and competitiveness in the global market.

According to the analysis of controlling variables, firm scale and profitability exert a significant positive influence on internationalization development. Larger total assets correlate with higher levels of overseas income, reflecting that resource base, organizational capabilities, and risk tolerance serve as crucial safeguards for advancing internationalization strategies. Large firms and those with stronger profitability are more likely to achieve successful international expansion. Meanwhile, the growth rate of operating income shows a significant negative correlation with the level of internationalization. This may reflect that during China's rapid domestic

market growth phase, some firms tend to concentrate resources on the local market rather than actively expanding into international markets.

Additional robustness tests further support the above conclusions. Whether incorporating AI with a one-period lag or excluding samples from the 2021-2022 pandemic period, regression results consistently indicate that digital transformation exerts a significant positive effect on internationalization levels. This demonstrates that the findings of this study are not coincidental but exhibit strong robustness and reliability.

Theoretically, this study contributes by providing large-sample, firm-level evidence that clarifies AI investment as a concrete channel through which digital transformation is associated with firms' internationalization outcomes.

Management Insights

Based on these findings, this paper makes the following strategic recommendations for business managers: Firms should incorporate digital transformation into the core of their long-term strategy, especially by continuing to invest in AI, data analytics, smart manufacturing, and cross-border e-commerce platforms. Digital transformation can improve international market responsiveness and operational efficiency. It is not only a cost tool, but also a new engine for global competition.

Firms should formulate their internationalization paths in phases and match their resources and capabilities. Large firms can accelerate overseas market mergers and acquisitions, brand export and global industry chain integration; while SMEs can prioritize "asset-light going overseas" through digital technology, such as cross-border e-commerce, SaaS services or online content to enter the international market and reduce risks.

Firms should make reasonable use of leveraged financing while maintaining financial soundness. firms should formulate strategies to support the construction of AI infrastructure, data platforms and the expansion of internationalization teams, so as to form a new growth model with the synergy of "digital + global".

In the process of promoting digital transformation, firms should simultaneously build an internationalized management talent team and IT capability system. In particular, strengthening the cultivation of IT collaboration ability, language and cultural integration ability of overseas teams is the key to improving internationalization performance.

Limitations and outlook

Although this paper draws a series of robust conclusions, certain limitations remain. The measurement of AI investment primarily relies on financial data and has yet to fully encompass firms' digital practices at the application level. Future research could incorporate more non-financial indicators. At the same time, the relationship between digital transformation and internationalization may exhibit heterogeneity across different industries and firms with varying ownership structures, warranting further research through groups. Finally, this paper examines only the Chinese sample. As the global geopolitical and trade landscape evolves, further research is needed on how digitization can help firms navigate external changes.

Briefly, firms should leverage digitization as their foundation and AI as their core driver to address information asymmetry and operational efficiency challenges in international expansion. In this way, they can gain sustainable competitive advantages in the global marketplace.

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