Environment and Social Psychology (2024) Volume 9 Issue 8
doi: 10.59429/esp.v9i8.2883

RESEARCH ARTICLE

The association between CEOs' foreign experiences and the digital transformation of Chinese firms

Li Zhang

International College, Krirk University, Bangkok 10220, Thailand
*** Corresponding author:** Li Zhang, 258676177@qq.com

ABSTRACT

Leveraging the upper echelons theory, this paper investigates how CEOs' foreign experiences influence the digital strategic transformation of Chinese firms. The findings suggest a positive correlation between CEOs' foreign experiences and digital transformation. The firm's financialization has a negative moderating effect, while CEO duality and the presence of pressure-resistant institutional investors offer positive moderation. Notably, while financialization dampens digital innovation, pressure-resistant investors counter managerial short-sightedness, thus favoring digital transformation. CEO duality, on the other hand, ensures decisive and swift decision-making. Further analysis differentiates the impact of foreign work experiences from learning experiences on transformation, with the former showing a more significant effect.

Interestingly, these effects predominantly apply to state-owned firms and those with fewer financing constraints. These insights extend the upper echelons theory, offering guidance on CEO selection and digital transformation strategies. In this study, the mean of CEOs' foreign experience and the data lagged by one period are selected as exogenous instrumental variables, and the two-stage least squares and PSM methods are utilized to deal with the endogeneity problem; meanwhile, the conclusions are still robust after the robustness test is conducted by adding control variables and carrying out one period ahead of the explanatory variables.

Keywords: CEOs' foreign experiences; digital transformation; firm financialization; pressure-resistant institutional investors; CEO duality

1. Introduction

With the evolving competitive environment and the continuous development of digital information technology, digital technology is playing an increasingly important role in business operations. The constant emergence of artificial intelligence and information technology has challenged traditional business models, production processes, and organizational structures and opened up new business opportunities [1]. Digital technology enhances firm competitiveness. Firms' digital transformation has become vital for their survival and development. Schwab (2015) likened digitization to Industry 4.0, the fourth industrial revolution. Digital transformation is a strategic response to the digital technology trend[2] and a decision-making choice to adapt to the rapid changes in the digital environment[3]. It is a critical strategic decision for firms, but the unfamiliarity and complexity of the environment mean it carries certain risks[4].

ARTICLE INFO
Received: 7 June 2024 | Accepted: 8 July 2024 | Available online: 22 August 2024

CITATION
Zhang L. The association between CEOs' foreign experiences and the digital transformation of Chinese firms. *Environment and Social Psychology* 2024; 9(8): 2883. doi: 10.59429/esp.v9i8.2883

In China, the CEO often directly influences a firm, having more power and being a major driving force behind strategic choices and implementation[5]. Especially in recent years, the Chinese government has been implementing policies to attract outstanding talents from abroad to return to China, promoting high-quality economic development. Against this backdrop, more and more foreign talents are assuming the CEO role after returning to China, becoming drivers and decision-makers in implementing firm strategic decisions. Digital transformation reflects decision-makers ability to capture development trends, identify business opportunities, and innovate business models. It is a process of mindset and decision-making judgment. The digital transformation of most firms is proposed and promoted by top management[6]. Whether managers can perceive changes in the situation and make decision choices depends on their personal characteristics, values, experiences, and personal preferences. From a psychological perspective, managers' age, educational background, and learning experiences affect their strategic choices [7]. A CEO's past experiences can imprint on their behavior and values, forming a fixed cognitive framework that impacts their current behavior[8].

A large amount of literature has studied the role of CEOs' foreign experiences in accelerating firm innovation[9], foreign mergers and acquisitions [10], fulfilling social responsibility[11], improving corporate governance levels[12], firm performance[13], audit quality [14], suppressing earnings management[15], venture capital [16], tax aggressiveness[17], related party transactions[14], and more. However, no studies have established a relationship between CEOs' foreign experiences and digital transformation. This study focuses on the impact of a CEO's foreign experiences, as a form of learning and work imprint, on firm digital strategic decisions.

This research stands at the high-order theoretical level and uses web crawling technology to obtain annual reports of 3,814 listed firms in China. It uses Java PDFbox library, Jieba library, and Excel for data cleaning and Stata17 software for data processing to analyze the relationship between the CEO's foreign experience and the firm digital transformation. The research found a significantly positive correlation between the CEO's foreign experience and the firm's digital transformation. The test of the moderating effect found that the level of firm financialization had a negative moderating effect. In contrast, pressure-resistant institutional investors and CEO duality had a positive moderating effect. This suggests that the firm's internal and external environment moderates the relationship between the CEO's foreign background and digital transformation. A good corporate governance environment and strong CEO authority can ensure the effective implementation of decisions, and ample financial support is also a guarantee for the effective implementation of digital innovation strategies.

Further research found that foreign study experience and work experience positively promote firm digital transformation at the 5% and 10% levels, indicating that foreign work experience plays a bigger role than foreign study experience. This is because foreign work experience fosters creative thinking. Heterogeneity tests found significant heterogeneity under different property rights and financing constraints, indicating that the effect of a CEO's foreign background on a firm digital transformation varies among different types of firms. As the largest emerging economy, China is a very important research object.

The contributions of this study are: firstly, this paper analyzes the driving factors of firm digital transformation from the perspective of the CEO's foreign background for the first time, making an important contribution to the literature on the role of CEO's foreign experience in firm digital transformation. Through empirical tests, this study has demonstrated the relationship between the CEO's foreign experience and digital transformation, enriching the research on the impact factors of the CEO's characteristics on digital transformation and supplementing the specific application scope of the high-order echelon theory. Secondly, this study provides new insights into the literature on the internationalization of CEOs, as existing literature

on the internationalization of CEOs is increasingly numerous[18]. However, the impact of CEO internationalization on digital strategic transformation has not been established. Therefore, this paper explores the role of CEOs with foreign backgrounds as promoters of strategic change from a digital perspective. Thirdly, this study specifically investigates the returnee CEOs of Chinese listed firms, enriching the relevant research of emerging economic countries and expanding the research scope of existing literature by providing empirical evidence based on Chinese firms. Finally, this study identified three key moderating variables: the level of firm financialization, pressure-resistant institutional investors, and CEO duality. This study confirmed that when implementing a digital strategy, firms also need to consider these internal and external boundary conditions, which clarify the transmission path of the foreign experience CEO's role in the firm digital transformation.

The remaining structure of the study is organized as follows: Section Two conducts a literature review related to CEOs' foreign experiences and digitalization, financialization, pressure-resistant institutional investors, and CEO duality and presents the research hypotheses; Section Three covers the research design of this paper, introducing the design of the model and data acquisition; Section Four provides empirical analysis, discussing the robustness of the main regression effects, tests of endogeneity, and further heterogeneous analysis; Section Five presents the research conclusions and discussion.

2. Literature review, theoretical analysis, and research hypotheses

2.1. Upper echelons theory

The Upper Echelons Theory was first proposed by Hambrick and Mason in 1984, describing the impact of managerial traits on firm strategic decisions and operational performance. This theory suggests that organizational outcomes can, to some extent, be predicted through the characteristics of the top management team. Top managers use their cognitive base and values to filter information, interpret situations, and make decisions. The Upper Echelons Theory primarily reflects the impact of the management's past experiences, including macro, micro, and organizational environment experiences, on the formation of managers' values, cognitive structure, risk preferences, narcissism, overconfidence, and other invisible psychological traits, influencing firm decisions[7]. The theory deeply analyzes the external forms influencing firm decisions, including investment decisions (such as R&D expenditure, mergers and acquisitions, overinvestment, and internationalization level), financing decisions (like leverage ratio, debt financing, interest expenditure, long-term debt level), ethical decisions (such as earnings management, fraudulent behavior, corporate social responsibility, tax avoidance), human resources decisions (like employee compensation, leadership behavior), and other decisions (such as the choice of firm listing location, selection of business scope). The decision framework diagram based on the Upper Echelons Theory is shown in **Figure 1** below. Existing research based on the Upper Echelons Theory mainly focuses on team characteristics at the top level, including heterogeneity analysis[19], organizational innovation[20], and flexibility[21]. Research on CEOs' foreign backgrounds found that internationalized CEOs can effectively improve corporate governance levels[22] and firm performance [23], promote firm internationalization levels[24] and accelerate firm innovation and change[25]. As digitalization and internationalization of top management become increasingly common [26], existing research lacks an exploration of the relationship between firm digital transformation and CEOs' foreign backgrounds. This paper attempts to establish a connection between the two, fill the gap in the existing literature, and enrich the application scope of the Upper Echelons Theory.

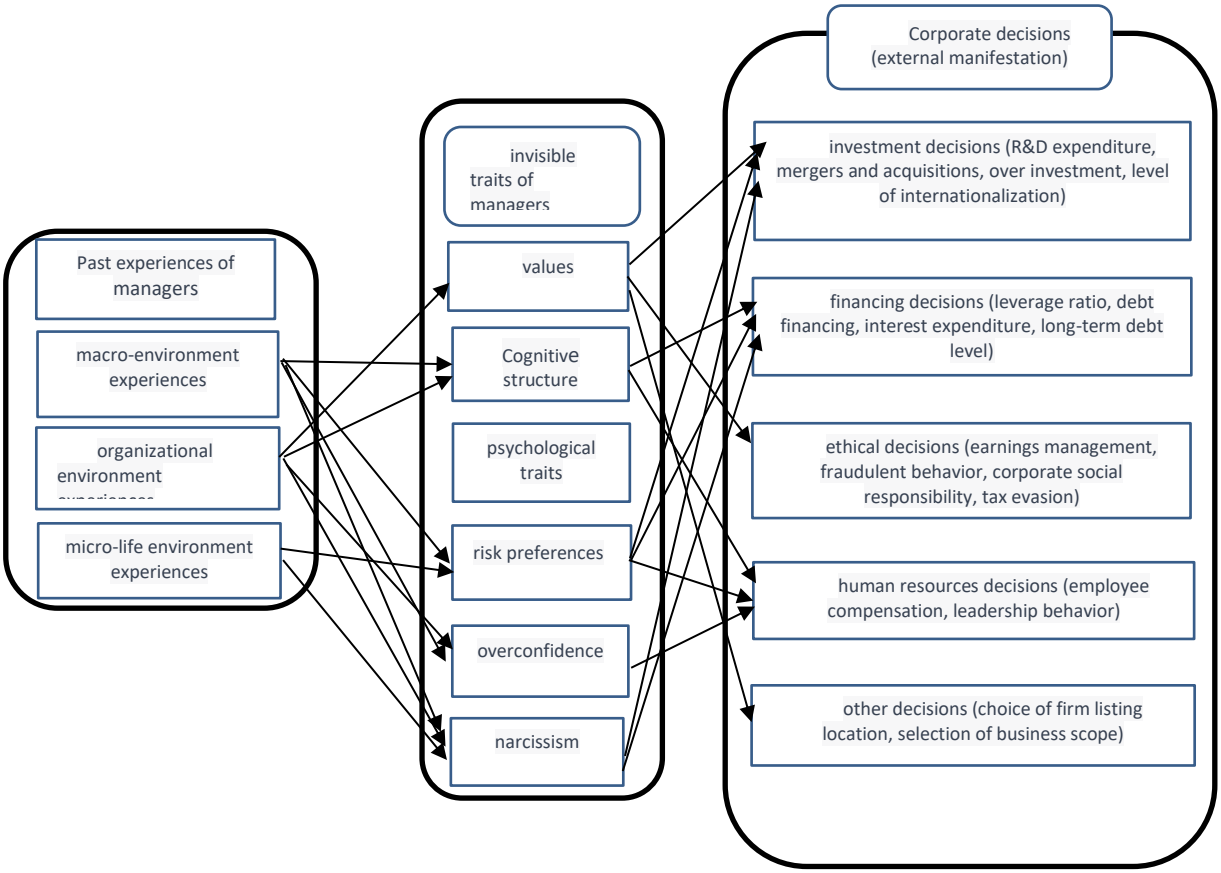

Figure 1. Decision-making framework based on the upper echelons theory.

2.2. CEO's foreign experience and firm digital transformation

2.2.1. CEO's foreign experience

With the rapid development of China's economy and the continuous strengthening of its economic power since 2008, China has prioritized the construction of innovative projects, subject laboratories, financial institutions, and industrial parks, attracting a large number of foreign experts, scholars, and leading talents to return to China for innovation and entrepreneurship. In December 2008, the Chinese government initiated the "Program for Attracting High-level Talents from Foreign". The China Unicorn Firm Development Report showed that as of the end of 2017, 60% of unicorn firms were founded or managed by returnees. In 2018, the number of Chinese returnees reached 500,000, and many returning talents played important roles in various industries, contributing to China's development.

Existing research has found that managers with foreign experience have advantages in corporate governance[27], regulatory compliance[28], foreign mergers and acquisitions [10], and internationalization strategy[29], and significantly enhance firm performance and competitiveness [30]. The literature has also found that CEOs with foreign experience can improve a firm's environmental performance[31] and social responsibility awareness[11], enhance investment efficiency and risk resistance and effectively increase the firm's value [32]. Compared with other executives, returnee CEOs can more significantly enhance the innovative ability of high-tech firms. The characteristics of returnees are often regarded as a symbol of human capital[32], and they play an important role in corporate governance[12]. Firms should focus more on developing and introducing human capital in continuous innovation activities [12].

2.2.2. Digital transformation

In 2008, the United States began to issue policies promoting the integration of information technology and manufacturing, including a series of digital support policies such as the "Federal Big Data R&D Strategic Plan", the "National AI Research and Development Strategic Plan", the "Intelligent Manufacturing Revival Plan", and the "Advanced Manufacturing American Leadership Strategy". Germany, with "Industry 4.0" at its core, has gradually perfected its digital transformation plan, launched the "Digital Strategy 2025", and implemented the "Digital Transformation Plan for Small and Medium-sized Firms". By providing investment subsidies for SMEs and setting up digital pilot projects, Germany offers multiple services to help SMEs better understand and apply new-generation information technology. China proposed accelerating digital development and building a digital China to promote the manufacturing industry's digital transformation in the "14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives Through the Year 2035".

Digital transformation has become increasingly important in academia and practice in the last ten years[33]. Digital transformation is a significant change triggered by information technology, defined as creating value-added products, services, and processes or improving business model novelty using digital technologies[34,35]. It is a new opportunity and challenge for firms to change products, processes, and business models using cloud technology, big data, interactive platforms, and predictive analytics[3]. Digital transformation is a major change in how organizations create value using digital technologies in response to changes in the market environment[36]. It is a strategic transformation. The digital economy is considered an important technological means to change the competitive landscape of firms, igniting a new industrial revolution, with no department or organization able to avoid the impact of digital transformation. More and more firms see digital technology as a significant resource and actively implement digital transformation and upgrading strategies[37].

The application of digital technology within organizations changes their business models. Business model innovation creates innovative value for customers and organizations through organizational innovation, enhancing the financial performance of organizations[38]. Digital interactive service innovation based on the service industry can enhance customer experience, improve customer retention rate, and increase interaction efficiency; digital process innovation based on the manufacturing industry can improve production efficiency, reduce production costs, and improve manufacturing quality [39]. Digital innovation is a model innovation and value creation that offers advantages in attracting customers with interactive services, artificial intelligence, environmentally friendly economics, and cost-saving. Digitalizing organizations, facilities, and activities can enhance production capacity and competitive advantage[40].

Much literature has found that digital technology helps firms reshape their value chains, simplify procedures, reduce error rates, save costs, improve customer relationships, respond quickly to market changes, enhance competitiveness, and achieve strategic goals[41]. It can also enhance firm transparency, increase information transparency, improve services, and increase efficiency[42]. Manufacturing firms can increase manufacturing flexibility to respond to rapid changes in the external market, narrow the technology gap, and improve firm efficiency [43]. Digital technology subtly influences a firm's internal processes and overall business model[44].

2.3. CEO foreign experience and digital transformation

Digital transformation has become a global trend [45]. Exploring driving factors for digital transformation has become a hotspot of attention for scholars. Existing research has found that the digital transformation of firms is influenced by multiple factors such as technology environment, technology resources[46], organizational culture[47], and digital leadership[6]. Digital transformation is a complex process influenced by

multiple organizational, group, and individual factors. To a large extent, digital transformation's success depends on leaders willing to support, organize, and promote digital transformation[48]. Whether the management can correctly perceive and accept the technological changes of digitalization is the most important factor at the individual level. The foreign experience of CEOs, as a characteristic of executive backgrounds, is an important manifestation of intangible human capital. So, in the current global digital era, are CEOs with foreign backgrounds willing to make and dare to make digital transformations?

Firstly, they are willing to undertake digital transformation. Diller (2020) pointed out that decision-makers with open and extroverted personality traits are more inclined to implement digital transformation. Foreign experience provides executive teams with broad thinking patterns, promotes open knowledge exchange, can respond quickly to information technology, is more willing to accept and motivate change, supports digital transformation initiatives, and is willing to create a digital vision[49]. Secondly, they dare to digitize transformation. Digital transformation is a high-risk firm innovation activity, and according to surveys, only about 30% of digital transformations are successful. At this time, the CEO's optimistic and positive attitude and strong risk response awareness become the key factors for transformation[50]. The influence of different countries makes the CEO more adventurous, more willing to bear the risks brought about by decision-making changes in different environments, and more capable of responding to complex environments and uncertain risks actively. People with international experience are more likely to create new business activities and products and promote them[51].

In addition to long cycles and high risks, strong capital demand is an important feature of digital transformation. This means that firms need continuous capital input to support digital transformation and upgrade. From the perspective of financing constraints, foreign experience enriches the functional background of the CEO, reduces financing constraints, is more likely to obtain external financing, and meets the large amount of capital demand required for innovation. The abundant human capital and social capital brought by the foreign-experienced CEO can help the firm obtain higher-quality external resources and venture capital[52].

A good corporate governance environment is also key to digital transformation decisions [22]. Under a good governance structure, managers will pay attention to the long-term value growth of the firm. Foreign returnee CEOs acquire advanced technical knowledge and excellent management experience from abroad through talent information technology transfer between countries, can better deal with uncertainties in operations, reduce governance risks, and alleviate agency problems. At the same time, the high-quality heterogeneous capital provided by foreign experience enriches the diversity of the management team, reduces information asymmetry and agency conflicts, and effectively improves the firm's governance capabilities and innovation.

There is a close relationship between the international experience of managers and firms' innovation. International experience can enrich managers' dynamic capabilities to handle complex information, making them good at identifying and accepting novel ideas, paying attention to these opportunities and trends, accepting key feedback, quickly adapting to changes, and introducing and formulating innovative measures. Studies have found a positive correlation between the foreign experience of the management and the number of patents owned by the firm [53]. This is because the difficulties or challenges experienced by foreigners can enhance their ability to withstand risks. At the same time, foreign experience can also provide valuable, scarce resources, a broad knowledge base, and active ways of thinking conducive to the firm's innovative activities. Based on the above analysis, this study proposes Hypothesis 1:

H1: There is a positive correlation between the foreign experience of CEOs and firm digital transformation.

2.4. The influence of the degree of firm financialization

The concept of firm financialization has been widely used in academic and practical fields since the beginning of the 21st century. Firm financialization can be defined from two aspects: behavior and outcome. From a behavioral perspective, firm financialization refers to firms excessively relying on resource allocation methods based on capital operations and asset models based on capital market financing [54]. It involves businesses using their assets for investment rather than traditional production and operation activities[55]. It reflects non-financial firms holding total financial assets in their investment portfolios. From an outcome perspective, firm financialization means that a firm's profits come more from investment and capital operations in non-production and operational businesses, pursuing pure capital appreciation rather than operating profits, and represents a mode change of accumulating profits through financial channels [54]. The benefit of this definition is that it clearly explains the process and consequences of firm financialization, making it easier to measure the degree of financialization.

As the influence of finance continues to expand, the new economic phenomenon of "financialization" is also becoming increasingly globalized. The concept of "financial globalization" implies an increasing role of financial markets in the operation of the international economy, with non-financial firms increasingly participating in financial activities. The methods of firm financialization include non-financial firms holding financial assets[55], and income gained through financial activities[54].

The academic community has conducted extensive research on the impact of financialization on physical investment, including studies focusing on developed economies and emerging economies [56]. Demir (2009) was the first to study financialization in emerging economies, and he found that increasing financial investment in emerging countries (such as Mexico, Turkey, and Argentina) would reduce fixed capital investment. Previous research primarily focused on the causes and effects of firm financialization, suggesting that it may stem from a decline in the profitability of the real economy[56], uncertain macroeconomic environment, financial crises, intensifying competition, shifts in shareholder value orientation, managerial short-termism [57], labor market flexibility, income inequality, and financing constraints[58], among others. A firm's size, profitability, and growth affect the degree of its financialization. Financialization can affect short-term performance, crowd out fixed investment, lower production efficiency, and constrain firm asset restructuring[59].

Especially in recent years, the Chinese economy has experienced a shift from a real economy to a virtual economy, with the proportion of financial assets held by Chinese listed firms continuously rising, leading to a prolonged downturn and recession in the real economy [60]. Firm financialization is a double-edged sword with both advantages and disadvantages. Due to the tug-of-war between savings and investment, the financial sector plays a crucial role in the investments of non-financial firms. Under the condition of limited firm resources, there exists a "substitute or crowding out effect" between the financialization of non-financial firms and investment, which negatively impacts technological change. Financialization influences real investment through crowding-out effects, debt traps, and shareholder value concepts. Some studies have pointed out that financial assets may not be entirely a response to financial accumulation but also other activities [61]. There is no obvious crowding-out effect on real investment. Moderate financialization can alleviate financing constraints, reduce financing costs, and have a reservoir effect[58]. It can also monitor investment through the financial sector, improve capital allocation efficiency, and reduce transaction costs. Related studies have not reached a consistent conclusion and need further research and discussion [62].

Based on resource theory and crowding-out effect theory, there are substitution and complementary effects between different resources within a firm. There is a "zero-sum" relationship between firm

financialization and digitization. Financialization has a crowding-out effect on digitization, and financial payments will negatively impact real investment in the long term. The digital transformation of firms is a digital innovation process characterized by long cycles, high risks, and strong capital demand, implying that firms need continuous capital input to support digital transformation upgrades. Suppose a firm overly focuses on financialization, pursuing quicker returns from financial assets, transferring internal funds from investment, and deviating from productive investment [63]. In that case, it will negatively affect real investment and make it harder to meet the financial demands of digital transformation. Especially when emphasizing speculation, excessive financialization with speculative motives hinders innovation and increases industry risk[64]. At the same time, financialization tends to cause managers' myopia, focusing only on short-term profits and performance, sacrificing long-term investment in technological innovation. Under such circumstances, the resources of returnee executives will be difficult to exert, weakening the positive promotion effect of returnee CEOs on firm digital transformation. Based on the above analysis, this study proposes hypothesis 2:

H2: The higher the degree of firm financialization, the less apparent the promotive effect of a CEO's foreign experience on firm digital transformation.

2.5. The impact of pressure-resistant institutional investors

In Europe, institutional investors are among the most important shareholders and are crucial to firm innovation and risk-taking. In recent years, the number of institutional investors in China has been rising, gradually becoming important participants in the market and playing an increasingly significant role in the Chinese stock market[65]. In addition to safeguarding the capital market, institutional investors can also improve the internal governance structure of firms as an external governance mechanism, alleviate principal-agent issues, enhance financial performance, and improve competitiveness. Existing research has found correlations between institutional investors and factors such as firm value, innovation activities, board compensation, risk-taking, financial reporting quality, and investment efficiency.

Institutional investors are divided into pressure-resistant and pressure-sensitive. Pressure-resistant institutional investors include foreign institutional investors (QFIIs), social security funds, and securities investment funds. Pressure-sensitive institutional investors include insurance, financial, trust, and banks. Studies have found that the two types participate differently in corporate governance. Pressure-resistant institutional investors often play a supervisory role.

In contrast, pressure-sensitive institutional investors tend to act more consultatively, having varying degrees of influence on corporate governance and financial performance. Pressure-resistant institutional investors maintain independence in corporate governance, actively participate in corporate governance, focus on long-term value growth, effectively supervise firms, and enhance competitiveness[66]. On the other hand, pressure-sensitive institutional investors have less independence and, due to business relationships with the firms they hold shares in, easily face conflicts of interest caused by these commercial relationships.

As a type of innovation, digitization is long-term and high-risk, requiring substantial capital investment. Managers' short-termism can reduce innovation activities, especially under information asymmetry. Managers pursue short-term profits and are less willing to research and invest in long-term projects. Institutional investors, as an effective external governance mechanism, can play a great mitigating role. However, literature has long recognized the heterogeneity among different institutional investors. Pressure-sensitive institutional investors, apart from caring about maximizing firm value, are more concerned about their private interest capture, which can easily lead to insider trading and hinder effective supervision.

Moreover, pressure-sensitive institutional investors are more likely to detest the risk of digital transformation, reduce R&D investment, and pursue conservative, short-term visible return projects, as they

inherently focus on short-term performance [67]. Pressure-resistant institutional investors, having no business interests with the firm, are not easily influenced by the investment firm. They have stronger independence, can supervise the management, restrain managerial opportunism and short-termism, and effectively alleviate agency problems. Moreover, pressure-resistant institutional investors are more inclined towards long-term investments and striving for long-term competitiveness. They will participate more actively in firm oversight and promote change, which is beneficial for implementing firm digital transformation. Based on the above analysis, this study proposes hypothesis 3:

H3: The higher the shareholding of pressure-resistant institutional investors, the more pronounced the facilitating effect of the CEO's foreign experience on the firm digital transformation.

2.6. The influence of CEO duality

CEO duality refers to a situation where a person holds the positions of both CEO and Chairman of the Board concurrently. Agency theory and stewardship theory propose differing views. Agency theory emphasizes that CEO duality can harm the board's oversight and control functions, damaging financial performance [68]. The theory suggests separating the two positions to prevent over-concentration and abuse of power. However, contrary to agency theory, stewardship theory believes that CEO duality creates strong leadership through unified command, contributing to the maximization of firm performance [69]. Oradi and Izadi (2019) pointed out that by providing comprehensive and effective communication channels, CEO duality reduces inconsistencies in expectations and actions between executives and the board, enhancing firm performance. Hence, combining the two roles allows leaders to make better and quicker decisions [70].

The contrasting viewpoints of agency and stewardship theories have sparked debate about CEO duality[71]. The dynamic roles of the CEO and Chairman of the Board within a firm are distinctly different. CEO duality can be seen as a governance mechanism of the board, granting CEOs structural power and discretionary authority. Existing literature has studied CEO duality's hindering or enhancing effect on organizational effectiveness from a corporate governance perspective. Agency theory posits that duality gives CEOs more power and freedom of action, which could reduce supervision, increase selfish behavior, and harm the organization's activities, leading to negative effects [72]

On the other hand, Stewardship theory contends that this freedom and power allow for better resource utilization while granting greater authority in allocating organizational resources. Zhang (2018) also supports the concept of stewardship theory and explains that a CEO with dual roles can manage and supervise a firm, maintaining alignment with firm performance and benefiting shareholders. Gillan (2006) demonstrated that CEO duality can produce better results due to the greater influence over firm decisions, enhancing their ability to act according to their interests.

CEO duality, representing its power, has been proven to influence strategic decision-making and the speed of decision implementation [68]. Duality bestows CEOs with greater power and discretion. This discretion enables CEOs to perceive action plans and execute those actions. CEOs are more likely to engage in aggressive product innovation when organizational discretion is high. Garg (2020) also indicated that CEO duality, directly related to CEO power, exerts greater authority and speed in formulating and implementing firm strategic decisions. It effectively solves communication obstacles brought about by competition between CEOs and board chairmen, amplifying its influence on firm risk-taking. Prior research has found that the centralized leadership structure formed by CEO duality positively impacts the sustainable innovation capability of Chinese-listed firms. CEO duality and external directors' ratio significantly increase the probability of adopting business model innovation[73].

The phenomenon of a CEO holding dual roles is still under discussion, as its role within the organization is unclear[68]. Existing literature has also overlooked the interaction between CEO duality and personal traits. This study examines the CEO duality's role in creating a relatively unstructured decision-making environment. CEO duality can provide clearer, stronger leadership, allowing for more efficient and effective decision-making[74]. Duality can effectively address potential decision ambiguities, prevent opportunism, ensure adequate rights to take action and explore feasible opportunities, contributing to the effective operation of digital transformation. Based on the above analysis, this study proposes Hypothesis 4.

H4: CEO duality positively moderates the relationship between CEO foreign experience and digital transformation.

3. Research design

3.1. Data source and sample selection

Digital transformation exists in all industries[75]. This study selected related data from Chinese A-share listed firms from 2007 to 2021. The Chinese accounting standard was reformed in 2007, so data selection began in 2007. The data mainly come from the CSMAR and Wind databases. Digital transformation data are sourced from the listed firms' annual reports, and senior executive foreign background data are sourced from the CSMAR database's characteristic database under the director, supervisor, and senior personal characteristic data. The data are then sorted as follows. First, firms with abnormal data are excluded. Second, firms with missing data are excluded. Third, firms in the financial sector are excluded. Fourth, firms listed as ST, *ST, or PT are excluded. Fifth, to mitigate the impact of outliers, relevant continuous variables are winsorized at the 1% and 99% levels. Finally, this study obtained 31,705 observations from 3,814 listed firms.

3.2. Variable definition

3.2.1. Dependent variable

Firm Digital Transformation (Dig). Existing measurements for firm digital transformation mainly fall into three categories. The first category measures it as a “0-1” dummy variable that indicates whether the firm has undergone digital transformation within the year [76]. The second category measures the proportion of digital-related projects in intangible assets[77]. The third category uses the frequency of digital-related keywords in firm annual reports as a proxy variable for digital transformation [78]. After considering existing studies, Wu et al. (2021) suggest that the third measurement method can demonstrate firms' overall strategic direction and future development path. Therefore, this study references keywords proposed in the existing literature on digital transformation and processes them as follows[78,79]:

First, this study used web scraping technology to gather all A-share listed firms' annual reports from the Shanghai Stock Exchange and the Shenzhen Stock Exchange. Next, this study used the Java PDFbox library to extract the text content of the annual reports. Afterward, based on existing literature, this study used the Jieba library to segment the text and extract the frequency of keywords such as “mobile internet”, “industrial internet”, “mobile interconnection”, “internet medical”, and “e-commerce”. During this process, keywords with negative prefixes were removed. The sum of the frequencies forms the total frequency. Due to the “right-skewness” and substantial variance of the frequency count, this study uses the logarithm of the total frequency count as a proxy for Firm Digital Transformation (Dig).

3.2.2. Independent variable

CEO Foreign Experience (Ceo). Following Lin et al. (2019), this study used a “0-1” dummy variable to represent whether the CEO has foreign experience[80]. This includes both study and work experience abroad.

If a listed firm's CEO has foreign experience, this study assigns a value of 1. Otherwise, the value is 0. Following[11], this study defines the CEO as the chief executive officer, general manager, and president.

3.2.3. Moderator variables

This study introduces modulating factors such as firm financialization, stress-resistant institutional investors, and the CEO duality structure representing CEO power. These considerations will allow us to empirically examine and test moderating effects and further discuss the mechanism of the pathway. Firm Financialization (Fin) is defined as the ratio of financial assets to total assets, following Denis & Siblkov (2009) and Du et al. (2019). Financial assets include trading financial assets, available-for-sale financial assets, investment property, held-to-maturity investments, dividends receivable, and interest receivable[81,82]. Stress-resistant institutional Investor Holdings (Res) is defined by the aggregate holding ratio of securities investment funds, social security funds, and QFII, considered to be stress-resistant, following Ferreira & Matos (2008) and Li Huamin et al. (2021). CEO duality, as an important structural feature of Chinese organizations, is determined by whether the CEO also serves as the chairman of the board. CEO Duality (Ctp) captures the CEO's power and is coded as a dummy variable. If the CEO is also the chairman, this study assigns a value of 1. Otherwise, the value is 0.

3.2.4. Control variables

Attention to digital issues should involve comprehensive judgments on firm conditions, financial constraints, and corporate governance (ownership). Based on existing literature, at the firm level, this study controlled for firm size (Siz), measured by the natural logarithm of total assets, as these factors may influence the capacity for innovative activities [83]. For instance, large firms tend to invest more in digital innovation than small ones, thus making them more likely to implement digital transformation. The firm's growth rate (Gro) is represented by the growth rate of the firm's current year operating income, reflecting the firm's growth condition. The worse a firm's growth condition, the more likely it is to stimulate to seek digital transformation actively.

To account for the financial constraints that digital innovation may face[84], on the financial level, this study controlled for return on equity (Roe), represented by net profit divided by average shareholder equity. The net cash flow ratio from operating activities to total assets represents the cash flow ratio (Cah). The inventory ratio (Inv) represents the inventory backlog situation, reflecting the firm's capital turnover. These variables reflect the efficiency of the firm's funds and profitability. The stronger the profitability, the more beneficial it is for the firm to make strategic choices for digital transformation actively.

Past research shows that firm ownership characteristics determine corporate governance's efficiency, thereby significantly affecting strategic transformation[85]. On the ownership side, this study controlled for the management shareholding ratio (Msh), the proportion of independent directors (Ind), the shareholding ratio of the largest shareholder (Top1), and the funds occupied by the major shareholders (Occ). The shareholding ratio of the largest shareholder is used to measure the firm's equity concentration. These variables may influence a firm's innovation efforts[86]. This study also controlled for two dummy variables, year and industry.

Table 1. Variable definitions.

Variable Type	Variable Name	Variable Meaning	Variable Measurement
Dependent Variable	Dig	Firm digital transformation	Ln (number of digital-related words in annual report + 1)

Independent Variable	Ceo	CEO with foreign experience	1 if the CEO has international experience; otherwise, 0
Moderating Variables	Fin	Financialization of the firm	(Trading financial assets + Available for sale financial assets + Investment real estate + Held-to-maturity investments + Receivable dividends + Receivable interests) / Total firm assets
	Res	Shareholding of pressure-resistant institutional investors	The shareholding ratio of investment funds, social security funds, QFII
	Ctp	CEO Duality	1 if the CEO is also the chairman of the board, otherwise 0
	Siz	Firm size	Ln (Total assets)
	Roe	Return on equity	Net profit / Average shareholder equity
	Inv	Inventory ratio	Net inventory / Total assets
	Occ	Major shareholder's fund occupation	Other receivables / Total assets
	Msh	Management shareholding ratio	Management shareholding quantity / Paid-up capital
	Ind	Independent director ratio	Number of independent directors / Total number of directors
	Bm	Book-to-market ratio	Total assets / Total annual stock market value
Control Variables	Ato	Total asset turnover	Operating income / Average total assets
	Gro	Operating income growth rate	Annual operating income / Previous year's operating income - 1
	Cah	Cash flow ratio	Net cash flow from operating activities / Total assets
	Age	Firm age	Ln (Current year - Year firm was established + 1)
	Top1	The shareholding ratio of the largest shareholder	Number of shares held by the largest shareholder / Total number of shares
	Year	Year dummy variable	Set up as a dummy variable starting from 2009
	Industry	Industry dummy variable	Set according to the standard set by the China Securities Regulatory Commission in 2001

3.3. Model construction

To test the hypotheses, this study constructed the following models:

Model (1) is used to test Hypothesis 1: The main hypothesis

$$\mathrm{Dig_{i,t}} = \alpha_0 + \alpha_1 \mathrm{Ceo_{i,t}} + \alpha_2 \mathrm{Controls_{i,t}} + \sum \mathrm{Year} + \sum \mathrm{Industry} + \varepsilon_{i,t} \quad (1)$$

Model (2) is used to test Hypothesis 2: The moderating effect hypothesis

$$\mathrm{Dig_{i,t}} = \delta_0 + \delta_1 \mathrm{Ceo_{i,t}} + \delta_2 \mathrm{R_{i,t}} + \delta_3 \mathrm{Ceo_{i,t}} * \mathrm{R_{i,t}} + \delta_3 \mathrm{Controls_{i,t}} + \sum \mathrm{Year} + \sum \mathrm{Industry} + \varepsilon_{i,t} \quad (2)$$

Where, $\mathrm{Dig}_{i,t}$ represents firm digital transformation, $\mathrm{Ceo}_{i,t}$ represents the CEO's foreign experience, $\mathrm{R}_{i,t}$ represents the moderating variables of firm financialization (Fin), shareholding by pressure-resistant institutional investors (Res), and CEO duality (Ctp). $\mathrm{Ceo_{i,t}} * \mathrm{R_{i,t}}$ represents the interaction terms of the CEO's foreign experience and moderating variables and $\mathrm{Controls}_{i,t}$ represents the control variables, which specifically include firm size (Siz), return on equity (Roe), inventory ratio (Inv), fund occupation by major shareholders (Occ), management shareholding ratio (Msh), independent director ratio (Ind), book-to-market ratio (Bm), total asset turnover (Ato), business income growth rate (Gro), cash flow ratio (Cah), firm age (Age), and shareholding ratio of the largest shareholder (Top1).

4. Empirical results and analysis

4.1. Descriptive analysis

Table 2 provides descriptive statistics for each variable based on statistical test theory [87]. The table shows that the maximum value of firm digital transformation (Dig) is 4.96, the minimum value is 0, the median is 0.69, and the standard deviation is 1.364. This suggests that there is a certain degree of variation in the level of digital transformation among different Chinese firms. Most firms' digital level is below the average level, and leading firms have improved the overall level of digitalization, which is consistent with the actual level of Chinese firms. The mean of the explanatory variable, CEO foreign experience (CEO), is 0.0747, and the standard deviation is 0.263, suggesting that Chinese firms generally lack CEO foreign experience, with an average of 7.47% of firms having CEOs with foreign experience.

Among the moderating variables, the maximum value of firm financialization (Fin) is 0.93, the minimum value is 0, and the standard deviation is 0.081, suggesting that the level of financialization is relatively similar across different firms. The mean of CEO duality (Ctp) is 0.2408, with a standard deviation of 0.428. The shareholding of pressure-resistant institutional investors (Res) is approximately 0.67, with a minimum value of 0 and an average of 0.0415. Other control variables, such as firm size (Siz), have a maximum value of 26.16, a minimum value of 19.78, and a standard deviation of 1.264. The book-to-market ratio (Bm) has a maximum value of 6.6 and a minimum value of 0.1, indicating a large gap. Other control variables, such as return on equity (Roe), inventory ratio (Inv), fund occupation by major shareholders (Occ), management shareholding ratio (Msh), and independent director ratio (Ind), all have standard deviations below 0.5. The overall volatility of the variables is not high, and there is not much difference between firms.

Table 2. Descriptive analysis of each variable.

Variable	Obs.	Mean	S.D.	Min.	Med.	Max.
Dig	31705	1.1992	1.364	0.00	0.69	4.96
Ceo	31705	0.0747	0.263	0.00	0.00	1.00
Fin	31705	0.0405	0.081	-0.00	0.01	0.93
Res	31705	0.0415	0.065	0.00	0.01	0.67
Ctp	31705	0.2408	0.428	0.00	0.00	1.00
Siz	31705	22.1224	1.264	19.78	21.94	26.16

Roe	31705	0.0638	0.132	-0.66	0.07	0.36
Inv	31705	0.1514	0.139	0.00	0.12	0.72
Occ	31705	0.0166	0.025	0.00	0.01	0.16
Msh	31705	0.1219	0.189	0.00	0.00	0.68
Ind	31705	0.3742	0.053	0.31	0.33	0.57
Bm	31705	0.9989	1.059	0.10	0.66	6.60
Ato	31705	0.6582	0.449	0.07	0.56	2.63
Gro	31705	0.1845	0.426	-0.58	0.12	2.73
Cah	31705	0.0470	0.071	-0.17	0.05	0.25
Age	31705	2.8445	0.345	1.79	2.89	3.50
Top1	31705	0.3415	0.147	0.09	0.32	0.74

4.2 Between-group difference analysis and correlation analysis

Table 3 presents the forbidden difference test of variables after grouping by whether the CEO has foreign experience. The table shows that the differences between groups in firms' digital transformation are quite significant. In the group where the CEO has foreign experience, the mean of digital transformation is 1.69, and it is significantly higher at the 1% level than the group where the CEO does not have foreign background. This preliminarily verifies the basic hypothesis of this paper and lays a foundation for subsequent regression. The results for control variables are consistent with the literature [88,89].

As shown in **Table 4**, the correlation coefficient between explanatory and explained variables is less than 0.2. In addition, the variance inflation factor test results show that the maximum VIF is 1.41, far less than 10. This indicates that the variable settings of this paper are reasonable, and there are no serious multicollinearity problems. The variables are suitable for further regression analysis.

Table 3. Between-group difference analysis.

Variable Name	No Foreign Experience (CEO)	Mean	With Foreign Experience (CEO)	Mean	Mean-Diff
Dig	29338	1.160	2367	1.690	-0.530***
Siz	29338	22.123	2367	22.121	0.001
Roe	29338	0.064	2367	0.066	-0.002
Inv	29338	0.153	2367	0.136	0.017***
Occ	29338	0.017	2367	0.014	0.002***
Msh	29338	0.118	2367	0.169	-0.051***
Ind	29338	0.374	2367	0.380	-0.007***
Bm	29338	1.010	2367	0.863	0.147***
Ato	29338	0.661	2367	0.620	0.041***
Gro	29338	0.184	2367	0.196	-0.012
Cah	29338	0.047	2367	0.052	-0.005**
Age	29338	2.845	2367	2.834	0.011
Top1	29338	0.343	2367	0.322	0.022***

Note: ***, **, * indicate significance at 1%, 5%, 10% levels, respectively. Values in parentheses are t-values.

Table 4. Correlation of key variables.

	Dig	Ceo	Fin	Res	Ctp	Siz	Roe	Inv	Occ	Msh	Ind	Bm	Ato	Gro	Cah	Age	Top1
Dig	1																
Ceo	0.102***	1															
Fin	0.123***	0.016***	1														
Res	0.011*	0.036***	-0.050***	1													
Ctp	0.136***	0.094***	-0.003	0.003	1												
Siz	0.083***	-0.0002	-0.003	0.130***	-0.134***	1											
Roe	-0.016***	0.004	0.006	0.290***	0.001	0.122***	1										
Inv	-0.125***	-0.032***	-0.046***	-0.005	-0.030***	0.107***	0.028***	1									
Occ	0.038***	-0.026***	0.017***	-0.042***	-0.023***	0.032***	-0.146***	0.099***	1								
Msh	0.150***	0.071***	-0.016***	-0.009	0.230***	-0.284***	0.072***	-0.100***	-0.101***	1							
Ind	0.084***	0.033***	0.025***	-0.019***	0.100***	0.004	-0.024***	0.006	0.012**	0.081***	1						
Bm	-0.065***	-0.036***	-0.029***	-0.133***	-0.121***	0.633***	-0.105***	0.224***	0.127***	-0.239***	0.001	1					
Ato	0.015***	-0.024***	-0.108***	0.133***	-0.035***	0.058***	0.200***	0.022***	-0.034***	-0.052***	-0.034***	-0.005	1				
Gro	0.020***	0.007	-0.041***	0.112***	0.014**	0.049***	0.262***	0.034***	-0.030***	0.052***	-0.002	-0.040***	0.129***	1			
Cah	-0.024***	0.018***	0.004	0.168***	-0.019***	0.045***	0.299***	-0.225***	-0.150***	0.005	-0.023***	-0.101***	0.132***	0.025***	1		
Age	0.138***	-0.008	0.145***	-0.118***	-0.076***	0.191***	-0.067***	0.037***	0.050***	-0.176***	0.016***	0.175***	-0.050***	-0.056***	0.002	1	
Top1	-0.119***	-0.039***	-0.020***	-0.054***	-0.045***	0.197***	0.141***	0.061***	-0.083***	-0.098***	0.034***	0.113***	0.084***	0.017***	0.084***	-0.129***	1

Note: ***, **, * denote significance at the 1%, 5%, and 10% levels respectively.

4.3. Basic regression analysis

This study performs regression analyses on Model (1) and Model (2), and the regression results are shown in **Table 5**. **Table 5-(1)** displays the basic regression results of the CEO's foreign experience and firm digital transformation. As shown in Table 5-(1), the CEO's foreign experience and the firm's digital transformation are positively correlated at the 1% level, validating Hypothesis 1 proposed in this study. Control variables like firm size, major shareholders' fund's occupation, and the total assets turnover rate (Ato) can significantly promote digital transformation. Conversely, the largest shareholder's inventory ratio, the ratio of independent directors, the book-to-market ratio, the cash flow ratio, and the shareholding ratio can significantly inhibit digital transformation. Other control variables are not significantly correlated.

To test the influence of firm financialization on the relationship between digital transformation and the CEO's foreign experience, an interaction term between the CEO's foreign experience and firm financialization is added to Model (1) to generate Model (2). The regression results shown in **Table 5-(2)** reveal that even after introducing the variable of firm financialization, the CEO's foreign experience still significantly promotes digital transformation at the 1% level. However, the interaction term between the CEO's foreign experience and firm financialization is significantly negatively correlated at the 5% level, validating Hypothesis 2 of this study. This means that the higher the degree of firm financialization, the less pronounced the promoting effect of the CEO's foreign experience on digital transformation.

Institutional investors also play a crucial role in restraining the decision-making power of firm management. To test the moderating effect of the holding of pressure-resistant institutional investors, the interaction term is replaced with the CEO's foreign experience and the holding of pressure-resistant institutional investors. As shown in **Table 5-(3)**, the holdings of pressure-resistant institutional investors have a positive moderating effect between the CEO's foreign experience and digital transformation. This validates Hypothesis 3, indicating that pressure-resistant institutional investors, due to their lower short-sighted tendencies and stronger risk resistance, can promote the CEO's commitment to digital transformation, exerting a positive moderating role.

The 5-(4) results test the CEO duality moderating variable. The results show that CEO duality promotes digital transformation, which is significant at the 10% level; also, the interaction between the CEO's foreign experience and CEO duality is positively significant at the 10% level. This demonstrates that considering the CEO's duality, the promoting effect of the CEO's foreign experience on digital transformation is more pronounced, validating Hypothesis 4 of this paper. That is, CEO duality plays a positive moderating role between the CEO's foreign experience and digital transformation. The power of the CEO moderates the influence of the CEO's foreign background on digital transformation. A powerful CEO with more resources can make decisions more confidently and better promote digital transformation. In the context of digital transformation, the power of the CEO has become a key factor.

Table 5. Regression results for the model.

	(1)	**(2)**	**(3)**	（4）
	Dig	**Dig**	**Dig**	**Dig**
Ceo	0.1071***	0.1310***	0.0785**	
	(3.1804)	(3.6260)	(2.0777)	
Fin		0.2116*		
		(1.7844)		
CEO*Fin		-0.5567**		

		(-2.0575)		
Res			-0.316**	
			(-2.4473)	
CEO*Res			0.6372*	
			(1.6576)	
Ctp				0.0374*
				(1.7233)
Ceo*Ctp				0.1170*
				(1.6871)
Siz	0.2918***	0.2934***	0.2958***	0.2921***
	(13.3977)	(13.4826)	(13.4862)	(13.4215)
Roe	-0.0468	-0.0472	-0.0369	-0.0475
	(-0.9525)	(-0.9601)	(-0.7528)	(-0.9696)
Inv	-0.2043*	-0.1866	-0.2037*	-0.2042*
	(-1.7145)	(-1.5635)	(-1.7098)	(-1.7156)
Occ	0.4879*	0.5081*	0.4888*	0.4909*
	(1.6675)	(1.7348)	(1.6609)	(1.6807)
Msh	0.0859	0.0909	0.0894	0.0903
	(0.6907)	(0.7327)	(0.7175)	(0.7234)
Ind	-0.4213**	-0.4165**	-0.4262**	-0.4316**
	(-2.4294)	(-2.3995)	(-2.4583)	(-2.4927)
Bm	-0.0871***	-0.0867***	-0.0924***	-0.0872***
	(-6.9250)	(-6.8684)	(-7.2427)	(-6.9259)
Ato	0.0920**	0.0948***	0.0981***	0.0925**
	(2.5537)	(2.6361)	(2.7088)	(2.5693)
Gro	0.0097	0.0094	0.0103	0.0096
	(0.8069)	(0.7842)	(0.8555)	(0.7965)
Cas	-0.2532***	-0.2479***	-0.2475***	-0.2514***
	(-3.0281)	(-2.9652)	(-2.9545)	(-3.0081)
Age	-0.1184	-0.1237	-0.1187	-0.1105
	(-0.7749)	(-0.8087)	(-0.7774)	(-0.7228)
Top1	-0.5703***	-0.5730***	-0.5846***	-0.5746***
	(-4.3366)	(-4.3645)	(-4.4343)	(-4.3684)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Constant Term	-5.6082***	-5.6467***	-5.6666***	-5.6415***
	(-9.8411)	(-9.9278)	(-9.9371)	(-9.9134)
N	31705	31705	31705	31705
r2	0.3788	0.3790	0.3790	0.3793

Note: ***, **, and * respectively denote significance at the 1%, 5%, and 10% levels. Values in parentheses are t-values

5. Endogeneity test and robustness test

5.1. Propensity Score Matching (PSM)

Considering the impact of certain characteristics of digital transformation at the firm level, this paper takes all the previously mentioned control variables as firm feature indicators. Using a logit model and due to the small number of CEOs with foreign experience in the sample, this paper performs 1:3 nearest neighbor matching based on the calculation of each firm's propensity score, thus alleviating the problem of endogeneity to a certain extent via PSM propensity score matching method.

Figure 2 shows the propensity branches of whether the CEO has foreign experience before and after matching using the nearest neighbor matching method. As can be seen, the kernel density curves of the two differ significantly before matching. **Figure 3** is the kernel density graph after matching, showing that after matching, the kernel density curves of whether the CEO has

Table 6. PSM + Fixed Effects.

	Dig
Ceo	0.1345***
	(2.9044)
Siz	0.2713***
	(7.1407)
Roe	-0.1548
	(-1.4195)
Inv	-0.0705
	(-0.3254)
Occ	0.1209
	(0.1681)
Msh	0.2368
	(1.3260)
Ind	-0.5773*
	(-1.8857)
Bm	-0.0830***
	(-2.8159)
Ato	0.1114
	(1.5609)
Gro	-0.0053
	(-0.1777)
Cas	-0.2862
	(-1.4735)
Age	0.2251
	(0.8094)
Top1	-0.5813**
	(-2.4993)
Year	Yes
Industry	Yes
Fixed Effects	Yes
Constant Term	-5.9252***
	(-5.8626)
N	8452
r2	0.3688

Note: ***, **, * indicate significance at 1%, 5%, 10% levels, respectively. Values in parentheses are t-values

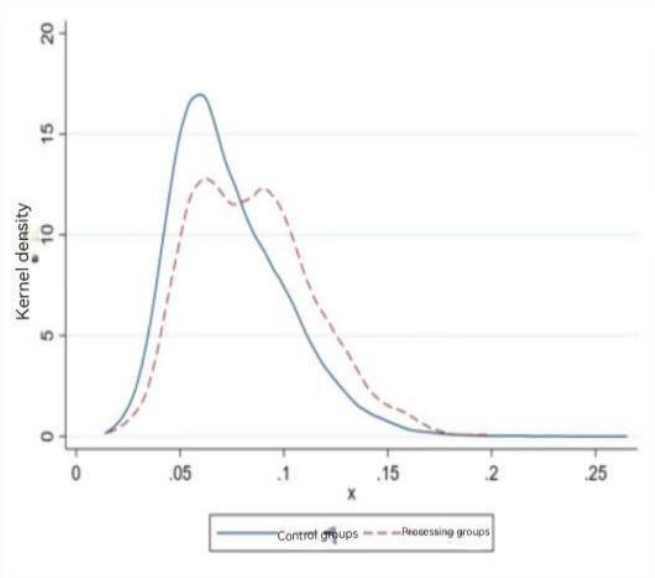

Figure 2. Before PSM matching.

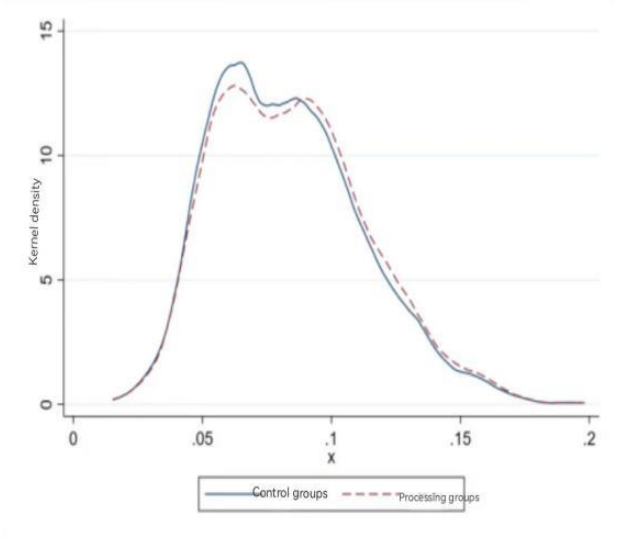

Figure 3. After PSM matching.

5.2. Heckman two-stage

Considering that the sample selection excluded the financial industry and missing or blank values, there may be some selection bias when measuring the related data. Therefore, this study constructs a Heckman two-stage model to address this issue and test for related endogeneity. In the first step, following the research of Lin et al. (2019), the mean of CEO foreign experience after excluding the firm according to year and industry (Mean_CEO) is chosen as the instrumental variable[80]. Therefore, using the instrumental variable as the explanatory variable and whether the CEO has foreign experience as the dependent variable, a Probit model is constructed based on the aforementioned control variables to calculate the inverse Mills ratio (Imr). If the inverse Mills ratio is not significantly different from 0, it indicates that there is no sample selection bias in the equation. If it is significant, it suggests that there is sample selection bias. **Table 7** reports the regression results of the Heckman two-stage model. As can be seen from the table, after calculating the inverse Mills ratio (Imr) and including it in the basic regression equation, CEO foreign experience can still significantly promote the digital transformation of firms at the 1% level, confirming the reliability of the conclusions of this study.

Table 7. Heckman two-stage test results.

	(1)	**(2)**
	Selection Equation	**Dig**
Mean_CEO	-5.7722***	
	(-8.9846)	
Ceo		0.1078***
		(3.2006)
Imr		0.1494**
		(2.5739)
Siz	0.0695***	0.3005***
	(5.5184)	(13.7468)
Roe	-0.0107	-0.0499
	(-0.1173)	(-1.0176)
Inv	-0.2029*	-0.2215*
	(-1.8782)	(-1.8607)
Occ	-1.1136**	0.3452

	(-2.2912)	(1.1634)
Msh	0.3251***	0.1249
	(5.2580)	(0.9940)
Ind	0.7227***	-0.3254*
	(3.7670)	(-1.8387)
Bm	-0.0786***	-0.0975***
	(-4.5891)	(-7.3629)
Ato	-0.0905***	0.0813**
	(-3.0134)	(2.2319)
Gro	0.0424*	0.0156
	(1.7008)	(1.2726)
Cas	0.3959**	-0.2030**
	(2.2896)	(-2.3446)
Age	-0.2164***	-0.1478
	(-5.4491)	(-0.9664)
Top1	-0.3912***	-0.6188***
	(-4.7991)	(-4.6504)
Year	Yes	Yes
Industry	Yes	Yes
Fixed Effects	Yes	Yes
Constant Term	-3.6771***	-6.1755***
	(-10.9935)	(-10.2089)
N	31705	31705
r2	0.0512	0.3790

Note: ***, **, * indicate significance at 1%, 5%, 10% levels, respectively. Values in parentheses are t-values.

5.3. Instrumental variable 2sls

Based on the research conclusions presented earlier, the foreign experience of a CEO can promote a firm's digital transformation. However, when considered from another angle, firms with a high degree of digital transformation may be inclined to hire CEOs with foreign experience to be responsible for firm management, which could cause endogeneity problems in the model. Therefore, following the approach used by Cui Xiumei (2021), this study takes the mean of CEOs' foreign experiences, excluding the firm itself by year and industry (Mean_CEO) and the lag of the CEO's foreign experience (Lceo) as instrumental variables[11]. This study adopts the instrumental variable 2sls regression to verify the reliability of the conclusions.

Table 8 reports that after incorporating the instrumental variables and performing 2sls regression, the foreign experience of the CEO still has a significant positive promotion effect on the firm's digital transformation, further demonstrating the robustness of the research conclusions in this study.

Table 8. Instrumental variable 2sls regression results.

	(1)	**(2)**
	Ceo	**Dig**
Mean_CEO	-0.2201***	
	（1.71）	
Lceo	0.7764***	
	（1.71）	
Ceo		0.2428***

		(6.8839)
Siz	0.0021*	0.1819***
	（1.71）	(24.0598)
Roe	.0002	0.0113
	（0.03）	(0.1953)
Inv	-.0006	-0.4255***
	（-0.07）	(-7.3024)
Occ	-.0536	2.4968***
	（-1.41）	(8.8747)
Msh	0.0158**	0.3940***
	（2.34）	(9.2327)
Ind	.0039	0.8273***
	（0.21）	(6.7829)
Bm	-0.0008	-0.1493***
	（-0.63）	(-17.7740)
Ato	-0.0021	0.1588***
	（-0.87）	(9.5363)
Gro	0.0021	0.0444***
	（0.78）	(2.6196)
Cas	0.0072	-0.7605***
	（0.45）	(-7.5069)
Age	-0.0069*	-0.1332***
	（-1.76）	(-5.4451)
Top1	-0.0135*	-0.3247***
	（-1.87）	(-7.2179)
Year	Yes	Yes
Industry	Yes	Yes
Constant Term	-.0668**	-2.3522***
	（-2.18）	(-12.2406)
N	27166	27166
r2	0.6131	0.4234

Note: ***, **, * indicate significance at 1%, 5%, 10% levels, respectively. Values in parentheses are t-values.

5.4. Robustness test

After addressing endogeneity issues in our model, this study continues with the following robustness checks: First, this study adds control variables CEO risk preference (Ceof), agency cost (Mfee), and CEO's technical background (Ceog) to consider the problem of omitted control variables. Second, this study regresses firm digital transformation one period ahead and the CEO's foreign background one period behind to test for the reciprocal causality between the explanatory and dependent variables. The results are presented in **Table 9**. Model (1) reports the regression results after adding explanatory variables, while Model (2) and (3) correspond to the regression results of the lagged explanatory variables and the advanced dependent variable, respectively. As shown in the table, under the considered conditions, the CEO's foreign experience still promotes firm digital transformation, affirming the robustness of our conclusions.

Table 9. Additional robustness tests.

	(1)	(2)	(3)
	Dig	**Dig**	**F. Dig**
Ceo	0.1024***		0.0780**
	(2.7391)		(2.1935)
Ceof	0.0503***		
	(2.8227)		
Mfee	0.1205		
	(0.7484)		
Ceog	-0.0089		
	(-0.2116)		
L.Ceo		0.0819**	
		(2.3180)	
Siz	0.3027***	0.2886***	0.2444***
	(13.1164)	(12.1072)	(10.8139)
Roe	-0.0451	-0.0537	0.0293
	(-0.8498)	(-1.0356)	(0.5157)
Inv	-0.1817	-0.2418*	-0.2352*
	(-1.5070)	(-1.9001)	(-1.9269)
Occ	0.6764**	0.1108	0.1738
	(2.2173)	(0.3578)	(0.5512)
Msh	0.0599	0.1274	0.1390
	(0.4503)	(0.9371)	(1.0470)
Ind	-0.4360**	-0.4717***	-0.2809
	(-2.3534)	(-2.6197)	(-1.5257)
Bm	-0.0913***	-0.0766***	-0.0801***
	(-7.0925)	(-5.8759)	(-6.0605)
Ato	0.1036***	0.0785**	0.0632
	(2.6389)	(1.9799)	(1.6162)
Gro	0.0042	0.0103	0.0173
	(0.3267)	(0.8036)	(1.2567)
Cas	-0.2131**	-0.2167**	-0.1428*
	(-2.4272)	(-2.4163)	(-1.6713)
Age	-0.0728	-0.1755	-0.2244
	(-0.4486)	(-1.0357)	(-1.4225)

Top1	-0.5708***	-0.5329***	-0.4078***
	(-4.1947)	(-3.7739)	(-2.8995)
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes
_cons	-5.9821***	-4.1148***	-4.4636***
	(-9.8579)	(-5.6155)	(-7.5379)
N	28244	27166	27166
r2	0.3753	0.3570	0.3480

Note: ***, **, * indicate significance at 1%, 5%, 10% levels, respectively. Values in parentheses are t-values.

6. Further analysis

6.1. Analysis based on the heterogeneity of foreign experience

The CEO's foreign experience can be categorized into foreign study experience and work experience. Although both belong to foreign experience, they do not produce the same effects [90,91]. Foreign work experience allows CEOs to embrace advanced foreign management ideologies and concepts and provides ample management practical experience and a broad perspective. As a result, CEOs with foreign work experience can bring advanced management ideas to their firms upon return[92]. They are more willing to increase investment in digital transformation. In addition, CEOs with foreign work experience are more open-minded, have higher risk tolerance, and are more willing to engage in digital transformation, a behavior associated with higher risk[93]. In contrast, while CEOs with foreign study experience possess advanced ideas, the positive effect still requires a certain resource base for their firms. Therefore, this paper distinguishes the CEO's foreign experience according to study (Cstudy) and work (Cwork) to examine the impact of different foreign experiences on firm digital transformation.

Table 9 reports the regression results of the heterogeneity of foreign backgrounds. The results show that CEOs' foreign study experience (Cstudy) and foreign work experience (Cwork) can promote a firm digital transformation. Specifically, a CEO's foreign work experience (Cwork) can promote a firm digital transformation at the 5% significance level. While the significance of a CEO's foreign study experience (Cstudy) is somewhat reduced, it can still play a main role in the firm's digital transformation at the 10% significance level, demonstrating the unique advantages of a CEO's foreign study experience.

Table 10. Analysis of the heterogeneity of foreign background.

	(1)	**(2)**
	Dig	**Dig**
Cwork	0.0904**	
	(2.2801)	
Cstudy		0.0903*
		(1.7600)
Siz	0.2918***	0.2926***

	(13.3907)	(13.4031)
Roe	-0.0464	-0.0470
	(-0.9452)	(-0.9562)
Inv	-0.2033*	-0.2025*
	(-1.7058)	(-1.6994)
Occ	0.4886*	0.4857*
	(1.6717)	(1.6587)
Msh	0.0840	0.0814
	(0.6745)	(0.6548)
Ind	-0.4219**	-0.4177**
	(-2.4349)	(-2.4100)
Bm	-0.0869***	-0.0869***
	(-6.8926)	(-6.8928)
Ato	0.0930***	0.0919**
	(2.5849)	(2.5487)
Gro	0.0098	0.0095
	(0.8133)	(0.7866)
Cas	-0.2545***	-0.2532***
	(-3.0413)	(-3.0256)
Age	-0.1201	-0.1152
	(-0.7851)	(-0.7522)
Top1	-0.5703***	-0.5674***
	(-4.3370)	(-4.3058)
Year	Yes	Yes
Industry	Yes	Yes
Fixed Effects	Yes	Yes
Constant Term	-5.6065***	-5.6276***
	(-9.8324)	(-9.8542)
N	31705	31705
r2	0.3785	0.3784

Note: ***, **, * indicate significance at 1%, 5%, 10% levels, respectively. Values in parentheses are t-values.

6.2. Heterogeneity analysis based on the nature of ownership

Regarding ownership nature, state-owned and non-state-owned firms have certain differences in their capital structure, operating environment, firm goals, and internal governance environment. Therefore, the impact of a CEO's foreign experience on firm digital transformation will have different effects between state-owned and non-state-owned firms. On the one hand, compared to non-state-owned firms, state-owned firms,

due to their state-owned equity, the embedded advantage of their national reputation chain can bring policy, financing, and operational advantages to state-owned firms and enjoy a superior external environment [64]. Digital transformation requires the firm to have certain resource support, so the firm's resource acquisition ability has a key impact on the firm digital transformation. Although the CEO's foreign experience can promote the firm's resource tilt towards digital transformation, if the firm itself does not have sufficient resources, the unique advantage of the CEO's foreign experience is also difficult to play out. Considering this, this paper divides state-owned and non-state-owned firms into groups and conducts regression analysis based on CEOs' foreign experience heterogeneity.

Table 10 reports the regression results after grouping according to property rights. The results show that the CEO's foreign study and work experience in state-owned firms can promote firm digital transformation. Still, in non-state-owned firms, this promotion effect is not significant. This indicates that in state-owned firms, the CEO can play the unique advantages of foreign experience to promote the firm's digital transformation process. However, non-state-owned firms may lack objective conditions for implementation due to resource constraints, even if the CEO has the subjective intention of digitization, and thus cannot play the promotional effect of the CEO's foreign experience on firm digital transformation.

Table 11. Heterogeneity analysis based on nature of ownership.

	State-owned Firms	**Non-state-owned Firms**	**State-owned Firms**	**Non-state-owned Firms**
	Dig	**Dig**	**Dig**	**Dig**
Cwork	0.1491*	0.0671		
	(1.8992)	(1.4766)		
Cstudy			0.2225**	0.0505
			(1.9693)	(0.8991)
Siz	0.2054***	0.3037***	0.2063***	0.3045***
	(5.8426)	(10.9080)	(5.8394)	(10.9186)
Roe	0.0776	-0.0853	0.0766	-0.0859
	(0.9996)	(-1.3860)	(0.9857)	(-1.3941)
Inv	-0.0498	-0.2756*	-0.0442	-0.2752*
	(-0.2739)	(-1.7628)	(-0.2439)	(-1.7609)
Occ	-0.1454	0.8352**	-0.1621	0.8358**
	(-0.3186)	(2.2211)	(-0.3553)	(2.2209)
Msh	-0.9214	0.2337*	-0.9337	0.2308*
	(-1.0868)	(1.7688)	(-1.0975)	(1.7479)
Ind	-0.2777	-0.6407***	-0.2720	-0.6387***
	(-1.1371)	(-2.6461)	(-1.1160)	(-2.6365)
Bm	-0.0445***	-0.1102***	-0.0446***	-0.1102***
	(-2.9451)	(-4.8205)	(-2.9472)	(-4.8345)

Ato	0.0782	0.0571	0.0758	0.0564
	(1.6322)	(1.0924)	(1.5789)	(1.0768)
Gro	0.0002	0.0187	0.0004	0.0184
	(0.0113)	(1.2134)	(0.0233)	(1.1924)
Cas	-0.1815	-0.2953***	-0.1823	-0.2941***
	(-1.4815)	(-2.6763)	(-1.4873)	(-2.6654)
Age	-0.8362***	0.0576	-0.8186***	0.0610
	(-3.3911)	(0.2989)	(-3.3017)	(0.3160)
Top1	-0.3636*	-0.5929***	-0.3537*	-0.5917***
	(-1.8536)	(-3.3730)	(-1.7964)	(-3.3613)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Constant Term	-2.5678***	-5.9423***	-2.6326***	-5.9517***
	(-2.7758)	(-8.3973)	(-2.8252)	(-8.4157)
N	11545	20160	11545	20160
r2	0.3616	0.3874	0.3618	0.3873

Note: ***, **, * indicate significance at 1%, 5%, 10% levels, respectively. Values in parentheses are t-values.

6.3. Heterogeneity analysis based on financing constraints

Existing studies suggest that the information asymmetry between firms and financial institutions is a major issue for financing constraints [94]. Due to the asymmetry of information, financial institutions will evaluate the actual operating conditions of a firm when reviewing its financing needs. Meanwhile, firms with poor operating conditions may disguise their actual state to qualify for financing, and truly excellent firms may have to bear certain costs to prove themselves. Therefore, financial institutions, high-performing firms, or low-performing ones incur some costs for financing, resulting in severe financing constraints. Digital transformation of firms relies on high levels of financial input, and the existence of financing constraints greatly inhibits the comprehensive ability of firms to obtain funds. Therefore, it is reasonable to believe that under high financing constraint conditions, the impact of a CEO's foreign background on digital transformation will be suppressed. However, when the financing constraint level is low, the promoting effect that a CEO can have on digital transformation will be more obvious. Hence, this study uses financing constraints for grouping and regression by year and industry to examine the heterogeneity of the impact of a CEO's foreign experience on digital transformation under different levels of financing constraints.

Table 11 presents the regression results based on groups with different financing constraints. As the table shows, in a state of low financing constraints, both can significantly promote digital transformation, whether it is the CEO's foreign learning experience or foreign working experience. The CEO's foreign working experience is significantly positive at a 5% level, and the CEO's foreign learning experience is significant at a 10% level. However, the CEO's foreign experience loses its promoting effect on digital transformation under high financing constraints. This suggests that the firm's financing environment can impact the relationship

between the CEO and digital transformation, and the CEO needs an appropriate level of financing constraint to exert its promoting effect on digital transformation.

Table 12. Analysis based on financing constraints.

	High Financing Constraints Dig	**Low Financing Constraints Dig**	**High Financing Constraints Dig**	**Low Financing Constraints Dig**
Cwork	0.0736	0.1261**		
	(1.2947)	(2.2504)		
Cstudy			0.0850	0.1253*
			(1.3218)	(1.7185)
Size	0.2714***	0.2876***	0.2714***	0.2893***
	(8.1319)	(9.9633)	(8.1226)	(10.0086)
Roe	0.0191	-0.0926	0.0196	-0.0954
	(0.2903)	(-1.3729)	(0.2979)	(-1.4100)
Inv	-0.1610	-0.3483**	-0.1631	-0.3410**
	(-1.0527)	(-2.1245)	(-1.0661)	(-2.0793)
Occ	-0.0406	0.6316*	-0.0478	0.6419*
	(-0.1002)	(1.6594)	(-0.1180)	(1.6780)
Msh	0.0253	-0.0075	0.0224	-0.0094
	(0.1041)	(-0.0598)	(0.0920)	(-0.0746)
Ind	-0.5765**	-0.4365*	-0.5745**	-0.4358*
	(-2.4126)	(-1.8993)	(-2.4056)	(-1.8930)
Bm	-0.0848***	-0.0690***	-0.0844***	-0.0694***
	(-4.3463)	(-4.5358)	(-4.3180)	(-4.5592)
Ato	0.1002*	0.0845	0.0988*	0.0821
	(1.9529)	(1.5743)	(1.9207)	(1.5297)
Gro	0.0182	-0.0125	0.0184	-0.0131
	(1.1620)	(-0.6837)	(1.1701)	(-0.7145)
Cas	-0.3013***	-0.2497**	-0.2977***	-0.2521**
	(-2.6780)	(-2.1244)	(-2.6442)	(-2.1483)
Age	-0.1774	0.1262	-0.1678	0.1290
	(-0.4360)	(0.5736)	(-0.4122)	(0.5852)
Top1	-0.6670***	-0.5086***	-0.6677***	-0.5032***
	(-3.5898)	(-2.7579)	(-3.5929)	(-2.7161)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Constant term	-5.2859***	-5.5441***	-5.2987***	-5.5811***
	(-4.1520)	(-7.1967)	(-4.1620)	(-7.2279)
N	15928	15777	15928	15777
r2	0.3710	0.3480	0.3710	0.3479

Note: ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively, and the values in parentheses are t-values.

7. Research conclusion and discussion

As digital technology sweeps the globe, it has revolutionized the formulation of firm strategies and organizational innovation[95], altering product and service structures to create value for firms[36]. The arrival of the digital economy presents new opportunities and challenges for firm technological innovation and value creation[96]. Organizations are urgently integrating new technologies and shifting patterns to maintain strategic competitive advantages[97]. Firms worldwide actively or passively choose to implement digital innovation and transformation strategies.

According to upper echelons theory, organizational outcomes can, to some extent, be predicted by the background characteristics of top management teams. Managers with different functional backgrounds differ in their attitudes toward objectives, leading to diverse strategic decisions. Senior managers utilize their cognitive base and values to filter information, interpret situations, and make strategic decisions. The internationalization of top management has become an increasingly common phenomenon. CEOs with foreign experience have a broader vision, higher risk tolerance, and interest in novel things and phenomena, and they can be exposed to advanced management practices.

This study discusses and investigates whether and how a CEO's foreign background influences a firm's digital transformation. By collecting data from 3,814 listed Chinese firms, this study empirically analyzed the relationship between a CEO's foreign experience and a firm's digital transformation in the context of digital technology.

This study has found a significantly positive correlation between a CEO's foreign experience and a firm digital transformation. The importance of managers in value creation has led to new crucial findings in the field of firm digital transformation. The knowledge, management premium, and financial and resource advantages obtained from a CEO's foreign experience can significantly promote digital transformation and lead to its success. By further emphasizing the importance of CEOs with foreign backgrounds in digital transformation, this study contributes to the literature on upper echelons theory. The trend of globalization suggests that the market needs more and more managers with foreign experience. Governments should pay attention to the introduction of returnee talents, introduce corresponding policies to attract excellent foreign talents to return to their home countries, improve the implementation of foreign talent strategies, and utilize human capital.

The relationship between a firm's internal and external factors is also crucial to its digital transformation. Firm financialization discusses the role of funds a firm owns in digital transformation. By inhibiting firm financialization and promoting financial services to shift towards physical investment, CEOs can obtain financial support for a firm digital transformation. At the same time, introducing stress-resistant institutional investors can reduce firm short-term behaviors.

From the perspective of CEO duality, this study explored possible boundary conditions that might affect CEOs' decisions on digitalization. The organizational discretion brought by duality strengthens the CEO's ability to respond quickly to fleeting opportunities and can guide resources into strategic transformation initiatives. The structure of CEO duality can enhance the positive role of the management team's human capital. This positive effect can promote communication and control mechanisms among managers and allows firms to invest in novel and breakthrough technologies continually.

In conclusion, our research indicates that the CEO's foreign experience is vital in promoting digital transformation. However, the influences are conditioned by factors such as the CEO's power status (e.g., CEO duality), the degree of financing constraints, and the nature of property rights, revealing a more nuanced and complex reality in the era of digitalization.

Amid the continuous development and promotion of digital technology, a firm's digital transformation can significantly enhance its competitiveness. An increasing number of firms are expected to join the digital transformation process. All countries should vigorously develop the digital economy, encourage digitalization, stimulate digital economic growth, accelerate successful transformation, enhance market competitiveness, and aid in high-quality economic development. The findings of this study not only advance the scientific understanding of the influence of CEOs with foreign backgrounds on firm digital transformation and its boundary conditions, but they also bear significant practical implications.

The practical significance of this study relates to the recruitment and selection of CEOs. The research results support the inclusion of more members with international experience in the CEO team. Therefore, at the national level, preferential and convenient policies should be introduced to attract high-end talent from foreign countries to return to China. At the firm level, executive team recruitment should emphasize team diversity. By incorporating outstanding returnee talents in CEO recruitment, this study can enrich the diversity of the management team, optimize internal talent structure, pay attention to the resource effects of returnees, and utilize the economic effects of returnee talents. Therefore, the results of this study can guide policy interventions to support the emergence of factors promoting digital transformation, such as the appointment of individuals with foreign backgrounds and experiences to the role of firm CEO.

The findings of this study provide managers, policymakers, and stakeholders with guidance on promoting a firm digital transformation. These beneficial moderating variables can further affect firm digital transformation and the high-quality economic development of the entire country. Digital innovation is a rapidly changing and growing research field and a common issue global firms face today. Substantial achievements have been made in related research over the past decade, and richer research results will emerge. Future research can further investigate the different impacts that cultural influences of different countries have on the imprint of CEO's experience, distinguish the influence of foreign experience from different countries on digital transformation, and consider validating these conclusions in other emerging economies.

Declaration of interest statement

All authors declare that No conflict of interest exists.

Data availability statement

The data supporting this study’s findings are available from the corresponding author upon reasonable request.

References

1. Kyriakou, H., Nickerson, J. V., & Sabnis, G. (2017). Knowledge reuse for customization: Metamodels in an open design community for 3D printing. MIS Quarterly, 41(1), 315–332. https://doi.org/10.25300/MISQ/2017/41.1.17.
2. Hess, T., Matt, C., Benlian, A., & Wiesboeck, F. (2016). Options for formulating a digital transformation strategy. MIS Quarterly Executive, 15(2), 123–139.
3. Jackson, N. C. (2019). Managing for competency with innovation change in higher education: Examining the pitfalls and pivots of digital transformation. Business Horizons, 62(6), 761–772.
4. Shih, W. (2018).“Why high-tech commoditization is accelerating”, MIT Sloan Management Review, 59. (4), 52-58.
5. Xiao,M.X., & Jin,Z.L. (2007). “A study on the relationship between CEO tenure and firm performance”, Foreign Economics &Management, 8, 45-50,57.
6. Singh, A., & Hess, T. (2017). How chief digital officers promote the digital transformation of their firms. MIS Quart. Exec, 16(1), 1–17. https://aisle.aisnet.org/misqe/vol16/iss1/5
7. Hambrick, D. C .,& Mason,P.A. (1984) .Upper Echelons： The Organization as a Reflection of Its Top Managers. Academy of Management Review,9(2):193-206

8. Dokko, G.,Wilk, S L., &Rothbard, N. P.(2009) .Unpacking prior experience: How career history affects job performance. Organization Science,20(1):51-68.
9. Lin, C., Lin, P., Song, F. M., & Li, C. (2011). Managerial Incentives, CEO Characteristics, and corporate innovation in China's private sector. Journal of Comparative Economics, 39(2), 176–190. https://doi.org/10.1016/j.jce.2009.12.001
10. Yang, N., Chen, Y., & Li, A. (2019). Executive foreign experience, management autonomy, and corporate subsequent foreign M&A waiting time. International Trade Issues, (09), 161-174. doi:10.13510/j.cnki.jit.2019.09.012.
11. Cui,X.M.,Wang,J.Y., & Wang,M.(2021). Environmental Investment, CEO Foreign Experience, and Corporate Value: Appreciation or Impairment? -- Analysis from the perspective of imprinting theory. Audit and Economic Research (05),86-94.
12. Smith, K. H. (2005). Measuring innovation. Oxford University Press, New York, US, pp. 148–177. http://www.oup.com/uk/catalogue/?ci=9780199264551.
13. Giannetti ,M., Liao, G., & Yu ,X. (2015)The brain gain of corporate boards: evidence from China. The Journal of Finance，70(4):1629-1682.
14. Zhang, J.W., &Tian, L.(2020). Research the relationship between equity incentives and the business performance of listed firms -- from the analysts' perspective. Nankai Economic Research, 215(05):173-186.
15. Du, Y., Zhang, H., & Chen, J. (2018). CEO foreign experience and corporate earnings management. Accounting Research, (02), 27-33.
16. Li, X., Feng, X., & Xu, C. (2021). The impact of CEO's foreign experience on the availability of venture capital for start-ups. Wuhan Finance, (01), 82-88.
17. Wang, Y. (2020). Returnee executives, corporate life cycle, and tax incentive behavior. Friend of Accounting, (15), 61-67.
18. Greve, P., Biemann, T. and Ruigrok, W. (2015), "Foreign executive appointments: a multilevel examination", Journal of World Business, 50(4), 674-686.
19. Bauweraerts, J., Colot, O., (2018). Exploring top management team composition in private family firms. Int. Adv. Econ. Res. 24 (3), 283–284
20. Li, Y., Cui, L., (2018). The influence of the top management team on Chinese Firms' FDI ambidexterity. Manag. Organ. Rev. 14 (3), 513–542.
21. Yoon, W., Kim, S.J., Song, J., (2015). Top management team characteristics and organizational creativity. Rev. Manag. Sci. 10 (4), 757–779.
22. Jaswadi, J., Purnomo, H. and Sumiadji, S. (2022), "Financial statement fraud in Indonesia: a longitudinal study of financial misstatement in the pre-and post-establishment of financial services authority", Journal of Financial Reporting and Accounting.
23. Mukherjee, D., Kumar, S., Mukherjee, D. and Goyal, K. (2022), "Mapping five decades of international business and management research on India: a bibliometric analysis and future directions", Journal of Business Research, 145,864-89.
24. Bužavait˙e, M.; Š˘ceulovs, D.; Korsakien˙e, R. (2019)Theoretical approach to the internationalization of SMEs: Future research prospects based on bibliometric analysis. Entrepreneurship Sustain. Issues 6, 1297–1311.
25. Li,H.M.,Long,K.J.,&Wu,F.(2021). Heterogeneous institutional investors and firm digital transformation. Financial BBS, 26 (11): 37-46 + 56. DOI: 10.16529 / j.carol carroll nki. 11-4613 / f 2021.11.005.
26. Schmid, S. and Mitterreiter, S. (2020), "International top managers on corporate boards: dissimilarity and tenure", Management International Review, 60(5), 787-825.
27. Lee, J. H., & Roberts, M. J. (2015). International returnees as outside directors: A catalyst for strategic adaptation under institutional pressure. International Business Review, 24(4), 594–604.
28. Cumming, D. J., Duan, T., Hou, W., & Rees, B. (2016). Do returnee CEOs transfer institutions? Evidence from newly public Chinese entrepreneurial firms. Available at SSRN.https://ssrn.com/abstract=2780680.
29. Chen, P. L., Tan, D., & Jean, R. J. (2016). Foreign knowledge acquisition through inter-firm collaboration and recruitment: Implications for domestic growth of emerging market firms. International Business Review, 25(1), 221–232.
30. Cao, H. M., Ding, X.Y & Cheng,S.(2020).CEO Foreign experience and corporate performance: from the perspective of property rights heterogeneity. Friends of Accounting (22),89-95.
31. Slater. D.J.,&Heather. D.F.,(2009).CEO international assignment experience and corporate social performance. Journal of Business Ethics,89(3):473- 489.
32. Dai, Y.H., & Kong, D.M. (2017). Whether Foreign experience of senior executives can improve firm investment efficiency. Journal of World Economy,(1): 168-191.
33. Babin, R., & Grant, K. A. (2019). How do CIOs become CEOs? Journal of Global Information Management, 27(4), 1–15.

34. Vial, G. (2019). Understanding digital transformation: a review and a research agenda. J. Strateg. Inf. Syst 28, 118–144. doi: 10.1016/j.jsis.2019.01.003
35. Axel, H., Heinz, T .W., Daniel B., &Tim, W. (2021)Digital innovation: Review and novel perspective, Journal of Strategic Information Systems 30.
36. Nambisan, S., Lyytinen, K., Majchrzak, A., &Song, M., (2017). Digital Innovation Management: Reinventing Innovation Management Research in a Digital World. MIS Quarterly 41 (1), 223–238.
37. Olsen, T.L. &Tomlin, B. (2020).“Industry 4.0: Opportunities and challenges for operations management”, Manufacturing and Service Operations Management, 22 (1), 113-122.
38. Foss, N. J., & Saebi, T. (2017). Fifteen years of research on business model innovation: How far have we come, and where should we go? Journal of Management, 43(1), 200–227. https://doi.org/10.1177/0149206316675927.
39. Kache, F.,& Seuring, S. (2017). “Challenges and opportunities of digital information at the intersection of Big Data Analytics and supply chain management”, International Journal of Operations and Production Management, 37 (1), 10-36.
40. Hinings, B., Gegenhuber, T., & Greenwood, R. (2018). Digital innovation and transformation: An institutional perspective. Information and Organization, 28(1), 52–61. https://doi.org/10.1016/j.infoandorg.2018.02.004.
41. Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges, and key themes. Research Policy, 48(8), Article 103773.
42. Gregory, G. D., Ngo, L. V., & Karavdic, M. (2019). Developing e-commerce marketing capabilities and efficiencies for enhanced performance in business-to-business export ventures. Industrial Marketing Management, 78, 146–157.
43. You, K., Dal Bianco, S., Lin, Z., & Amankwah-Amoah, J. (2019) .Bridging technology divide to improve business environment: Insights from African nations. Journal of Business Research, 97, 268–280.
44. Dao, T. T., & Yang, C. (2019). Impact of interactive service on international customers' behavior intentions regarding local tourism services in Vietnam: The mediating effects of pleasant arousal and memory. International Journal of Business & Information, 14(1), 145–167 https://10.0.26.46/ijbi.201903_14(1).0006.
45. Li, H., Long, H., & Wu, F. (2021). Heterogeneous institutional investors and corporate digital transformation. Financial Forum, (11), 37-46+56. doi:10.16529/j.cnki.11-4613/f.2021.11.005.
46. Dutta, G., Kumar, R., Sindhwani, R., & Singh, R. K. (2020). Digital transformation priorities of India’s discrete manufacturing SMEs — A conceptual study in perspective of Industry 4.0. Competitiveness Review, 30(3), 289–314.
47. Saarikko, T., Westergren, W. H., & Blomquist, T. (2020). Digital transformation: Five recommendations for the digitally conscious firm. Business Horizons, 63(6), 825–839.
48. Artemenko, E.(2020). The Roles of Top Management in Digital Transformation. IOP Conf. Ser. Mater. Sci. Eng. 940, 12-14.
49. Magnusson, J., Khisro, J., Bj¨orses, M., &Ivarsson, A.(2020). Closeness and distance: configurational practices for digital ambidexterity in the public sector. Transform. Government: People Process Policy.
50. He. Y., Yu .W. L., &Yang. M. Z. (2019).CEO compound career experience, corporate risk-taking, and corporate value. Chinese Industrial Economy,9:155-173.
51. Chen,J.,Sharma,P.,Z,han,W.,&Liu,L. (2019). Demystifying the impact of CEO transformational leadership on firm performance: Interactive roles of exploratory innovation and environmental uncertainty. J. Bus. Res, 96, 85–96.
52. Bai, W., Kao, P., & Wu, J. (2021). Returnee entrepreneurs and the performance implications of Political and business relationships under institutional uncertainty. Journal of Business Research, 128, 245–256. https://doi.org/10.1016/j.jbusres.2021.02.014.
53. Yuan, R., and W. Wen. (2018). Managerial foreign experience and corporate innovation. Journal of Corporate Finance 48:752–70. doi:10.1016/j.jcorpfin.2017.12.015.
54. Krippner, G. R. (2005). The financialization of the American economy. Socio-Economic Review, 3(2), 173–208. https://doi.org/10.1093/ser/mwi008
55. Davis, L. E. (2018). Financialization and the non-financial corporation: An investigation of firm-level investment behavior in the United States. Metroeconomica, 69(1), 270–307. https://doi.org/10.1111/ meca.12179.
56. Demir, F. (2009) “Financial Liberalization, Private Investment, and Portfolio Choice: Financialisation of Real Sectors in Emerging Markets.” Journal of Development Economics, 88 (2), 314–324.
57. Zhong, Y.X., & Lin, L. (2019). Financialization, life cycle, and persistent innovation: An empirical research based on the industrial difference. Journal of Finance and Economics, 45(08), 43–57. https://doi.org/10.16538/j.cnki.jfe.2019.08.003
58. Khan, H. U. R., Khidmat, W. B., & Awan, S. (2020). Board diversity, financial flexibility, and corporate innovation: Evidence from China. Eurasian Business Review, 11(2), 303–326. https://doi.org/10. 1007/s40821-020-00171-9
59. Xu, X.,&Xuan, C.(2021).A study on the motivation of financialization in emerging markets: The case of Chinese nonfinancial corporations. Int. Rev. Econ. Financ. 72, 606–623.

60. Zheng,J.X., Jiang .D .,&Yong. C . W(2022) Does financialization of nonfinancial corporations promote the persistence of innovation: evidence from A-share listed manufacturing corporations in China.Eurasian Business Review12:229–250 https://doi.org/10.1007/s40821-021-00193-x
61. Rabinovich, J. (2019). The financialization of the non-financial corporation. A critique of the financial turn of accumulation hypothesis.Metroeconomica, 70(4), 738–775.
62. Jibril, H., Kaltenbrunner, A., & Kesidou, E. (2018). Financialisation and Innovation in Emerging Economies: Evidence from Brazil. Leeds University Business School Working Paper, 18–09. https:// doi.org/10.2139/ssrn.3188021.
63. Hein, E., & Dodig, N. (2015).“Finance-Dominated Capitalism, Distribution, Growth, and Crisis: Long-run Tendencies.” In E. Hein, D. Detzer, and N. Dodig (eds.), The Demise of Finance-dominated Capitalism: Explaining the Financial and Economic Crises. Cheltenham: Edward Elgar, 54–114.
64. Wu, Z. (2022). Using machine learning approach to evaluate the excessive financialization risks of trading enterprises. Computational Economics, 59(4), 1607-1625.
65. Zhang, D., Ma, S., & Pan, X.(2019).Institutional investors, controlling shareholders and CEO pay-performance relationship: evidence from China, Accounting and Finance, https://doi.org/10.1111/acfi.12580
66. Zhang, F., Wei, L.,Yang, J.,&Zhu, L. (2018).Roles of Relationships between Large Shareholders and Managers in Radical Innovation: A Stewardship Theory Perspective. J. Prod. Innov. Manag. 35, 88–105.
67. Rong, Z., Wu, X., & Boeing, P. (2017). The effect of institutional ownership on firm innovation: Evidence from Chinese listed firms. Research Policy, 46(9), 1533–1551. https://doi.org/10.1016/j.respol.2017.05.013
68. Agha, M., & Hossain, M. M. (2022). Are board monitoring and CEO incentives substitutes for each other? Evidence from Australian market reaction to acquisition announcements. International Review of Financial Analysis, 81, Article 102042. https://doi.org/10.1016/J.IRFA.2022.102042
69. Gupta, N.; Mahakud, J.(2021) CEO characteristics and bank performance: Evidence from India. Manag. Audit. J, 35, 1057–1093.
70. Klepek, M., & Bauerova, R. (2020). Why do retail customers hesitate to shop for grocery shopping online? Technological and Economic Development of Economy, 26(6), 1444–1462. https://doi. org/10.3846/tede.2020.13970
71. Barszczewski, J. (2021). Creativity as neoliberal self-governance. Creativity Studies, 14(2), 593–603. https://doi.org/10.3846/cs.2021.12311
72. Khan, I.; Wang, M. (2021)Evaluating Corporate Performance and Bank Productivity in China: The Moderating Role of Independent Directors. Sustainability, 13, 3193. https://doi.org/10.3390/ su13063193
73. Michael. A. and Phyu P.A.A(2018)Board characteristics And the likelihood of business model innovation adoption: evidence from the smart home industry, International Journal of Innovation Management. 22, (1),28.
74. Hsu, S., Lin, S.W., Chen, W.P., et al., (2021). CEO duality, information costs, and firm performance. N. Am. J. Econ. Finance 55, 101011.
75. Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. Journal of Business Research, 122, 889–901.
76. He.F.,&Liu,H.X.(2019).Evaluation of the performance improvement effect of digital transformation of real firms from the digital economy perspective. Reform, (4): 137-148.
77. Qi. H.J., Cao. X.Q.,&Liu.Y.X.(2020). The impact of the digital economy on corporate governance from the perspective of information asymmetry and managers' irrational behavior. Reform, (4): 50-64.
78. Wu, F., Hu, H.Z., Lin, H.Y., &Ren., X.Y.(2021). Firm digital transformation and capital market performance: Empirical evidence from stock liquidity. Management World,37(07):130-144+10.
79. Ling Runze, Ailing, & Li,B.(2021). Can supply chain finance improve a firm's innovation level? Finance research, 47 (02): 64-78. The DOI: 10.16538 / j.carol carroll nki jfe. 20200816.201.
80. Lin, C., &Zhang, S.C. (2019). International diversification, CEO foreign experience, and stock price crash risk: empirical evidence based on GEM listed firms. Journal of Nanjing Audit University,16(06):61-71.
81. Denis, D. J. (2009) Siblkov V. Financial constraints, investment, and the value of cash holdings.The review of financial studies, 23 (1): 247－269.
82. Du, Y., Xie, J., &Chen J.Y.(2019). The Financial background of the CEO and the financialization of real firms. China's industrial economy, (5): 136-154. The DOI: 10.19581 / j.carol carroll nki ciejournal.
83. Heyden, M.L.M., Reimer, M., Van Doorn, S., (2017). Innovating beyond the horizon: CEO career horizon, top management composition, and R&D intensity. Hum. Resour. Manag. 56, 205–224.
84. Hanelt, A., Firk, S., Hildebrandt, B., Kolbe, L.M., (2021). Digital M&A, digital innovation, and firm performance: an empirical investigation. Eur. J. Inf. Syst. 30, 3–26.
85. Diller, M., Asen, M. and Spath, T. (2020), “The effects of personality traits on digital transformation: evidence from German tax consulting”, International Journal of Accounting Information Systems, 37,1-16, 100455.

86. Aghion, P., J. V. Reenen., & Zingales. L. (2013). Innovation and institutional ownership. American Economic Review 103 (1): 277–304. doi: 10.1257/aer.103.1.277
87. Granger, C. W. J. (1991). Modeling economic series: Readings in econometric methodology. Oxford: Clarendon Press.
88. Jiang, F., Cai, W.,Wang, X.,& Zhu,B. (2018). Multiple large shareholders and corporate investment: Evidence from China. Journal of Corporate Finance 50 (3):66–83. doi:10.1016/j.jcorpfin.2018.02.001.
89. Lai, S.M., & Liu. C.L. (2018). Management characteristics and corporate investment efficiency. Asia-Pacific Journal of Accounting & Economics 25 (3–4):295–312.doi:10.1080/16081625.2016.1266270
90. Liu, F. C., Mo, J. X., & Ma, R. K. (2017). The impact of TMT foreign background on firm innovation performance. Management Review, 29(7), 135–147. in Chinese
91. Zhong, X., Chen, W., & Lin, Y. (2018). CEO characteristics, internationalization speed, and corporate performance. China Science and Technology Forum, (09), 141-147. DOI:10.13580/j.cnki.fstc.2018.09.022.
92. Xia .H.(2019). An empirical test of the influence of executives' foreign background on firms' inefficient investment. Statistics and Decision Making,16:184-188.
93. Meng. X.Z., Zhang. J.R., &Bai. X.L.(2018). The relationship between the career experience, tenure of external CEO, and corporate business strategy change. Management Review,8:168-181.
94. Duchin, R. (2010). Cash holdings and corporate diversification. The Journal of Finance 65 (3), 955–992.
95. Lyytinen, K., Yoo, Y., Boland Jr.,& R.J., (2016). Digital Product Innovation Within Four Classes of Innovation Networks. Information. Syst. J. 26 (1), 47–75.
96. Arlott, A., Henike, T., & Hölzle, K. (2019). Digital Entrepreneurship and Value Beyond: Why to Not Purely Play Online. In R. Baierl, J. Behrens & A. Brem, Digital Entrepreneurship: Interfaces Between Digital Technologies and Entrepreneurship (1- 22). Cham: Springer. https://doi.org/10.1007/978-3-030-20138-8_1
97. Sebastian, I. M., Moloney, K. G., Ross, J. W., Fonstad, N. O., Beath, C.,&Mocker, M. (2017). How big old firms navigate digital transformation. MIS Q. Exec. 16, 197–213. doi: 10.4324/9780429286797-6