

# Research on the Impact of Executive Characteristics on Enterprise Digital Transformation: Moderating Effects Based on the Level of Enterprise Risk-taking

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**Abstract:** Using a sample of A-share listed companies in Shanghai and Shenzhen from 2013 to 2019 and based on upper echelons theory, this paper explores the impact of executives' overseas background, academic background and financial background on enterprise digital transformation, and also examines the moderating effects of enterprise risk-taking. It finds that executives' overseas background, academic background and financial background are all positively associated with enterprise digital transformation. Furthermore, enterprise risk-taking can enhance the positive relationship between executives' overseas background, academic background and enterprise digital transformation, but weaken the positive impact of executives' financial background on enterprise digital transformation. These findings possess theoretical significance in enriching studies in related domains, so as to offer important practical insights into optimizing top management team composition and facilitating the digital transformation of companies.

**Keywords:** Enterprise digital transformation; executives' overseas background; executives' academic background; executives' financial background; enterprise risk-taking.

## 1. Introduction

From the initial proposition of "facilitating the accelerated development of the digital economy" in 2017, to the dedicated section on "facilitating the development of the digital economy" in 2022, to further emphasizing the imperative of "developing digital economy vigorously" in 2023, the portrayal of promoting the growth of the "digital economy" in China's Government Work Reports has continuously deepened, effectively conveying the affirmative policy signals of our nation's resolute commitment to advancing the digital economy. In recent years, propelled by the dual support of policies and technological advancements, China's digital economy has been swiftly flourishing as cloud computing, blockchain, big data, and other digital information technologies further mature. According to "Research Report on China's Digital Economy Development (2023)" by China Academy of Information and Communications Technology, the scale of our country's digital economy reached 50.2 trillion yuan in 2022, accounting for a proportion of 41.5% in GDP, underscoring the inherent significance of digital economic development in improving our national economy.

Enterprises, as the microcosm of the macroeconomy, assume the responsibility of promoting the development and transformation of the macro-level digital economy [1]. The digital transformation of enterprises not only stimulates the flourishing growth of the digital economy but also facilitates their own alignment with contemporary trends and innovating their development strategies, and finally enables their long-term progress. Existing research demonstrates that the digital transformation of enterprises fosters the fulfillment of social responsibilities [2], enhances capital allocation efficiency [3], propels corporate innovation [4], thereby elevating innovation performance [5], financial performance [6], and economic benefits [7], consequently amplifying enterprise value. The extent of an enterprise's digital transformation is influenced not only by the macro-level political, economic, and technological environments but also by the direct impact from corporate executives. As strategic decision-makers, executives' understanding and acceptance of digital transformation are fully reflected in the development strategies of the company, influencing the choices made regarding the path of enterprise development.

Therefore, this paper focuses on the relationship between executives' overseas background, academic background, financial background, and enterprise digital transformation. Furthermore, considering that corporate strategic decision-making is also influenced by organizational-level influences, and recognizing that enterprise digital transformation represents a transformative process characterized by both risks and opportunities, this paper introduces corporate risk-taking as a moderating variable, exploring the moderating effects it makes in the relationship between executives' overseas, academic, and financial background, and enterprise digital transformation. By doing so, this paper aims to provide a theoretical foundation into how to drive the digital transformation of enterprises, and enrich the research outcomes in relevant fields.

## 2. Literature Review

In recent years, an increasing number of scholars have undertaken research on the relationship between observable characteristics of executives and corporate strategy, behavior, and performance. In terms of demographic variables, Gang W et al. [8] propose that executive age significantly influences the process of organizational change, with older executives tending to be more conservative in decisions regarding acquisitions, R&D investments, and internationalization. Xie Fei and Hou Qingsong [9] propose that female executives, compared to their male counterparts, exhibit a strong risk aversion attitude in innovation decision-making, thereby reducing R&D investments and innovation levels in companies. Regarding executive backgrounds, the richer the CEO's professional experience is, the higher their tolerance for change and acceptance of new phenomena are, resulting in higher levels of innovation within the company [10]. Lin C et al. [11] suggest that CEO'S military experience positively influences a company's acquisition performance, thereby expanding its enterprise value. From the perspective of the executive team, Tihanyi [12] suggests that the higher the average educational level and the richer the overseas experience of the executive team, the lower the uncertainty the company faces in international expansion, thereby facilitating the formulation and implementation of international diversification strategies. Considering TMT stability, Zhang Zhaoguo et al. [13] propose that the stability of the top executive team positively influences technological innovation performance. Approaching TMT heterogeneity, diversity allows teams to complement each other in terms of mindset, skills, professional knowledge, and social networks [14]. Prior to making strategic decisions, team members can fully communicate to help the company gather comprehensive information resources, conduct a holistic analysis of internal and external environments, avoid arbitrary decision-making, and promote company development [15]. However, TMT heterogeneity may also contribute to internal conflicts and reduce strategic consensus within the organization [15].

In the realm of digital transformation, existing research has indicated that at the individual level, executives with backgrounds in information technology and R&D possess the ability to leverage their past education and professional experiences to assist companies in swiftly acquiring high-quality digital talent and technological channels [16-17], thus propelling digital transformation. CEOs with multifaceted professional backgrounds not only help companies seize opportunities presented by digital transformation but also provide abundant resources to facilitate the implementation of digital transformation strategies [37]. At the team level, it has been observed that the younger the top executive team and the fewer female executives within the team, the more likely the company is to engage in technology-related acquisitions in the context of digital transformation [18]. Both TMT heterogeneity and TMT stability play a positive role in facilitating a company's digital transformation [19-20].

Overall, the current researches on the relationship between executive characteristics and enterprise digital transformation primarily focus on the characteristics of the top executive team or the professional backgrounds of individual executives, with limited exploration of other aspects of executive backgrounds in relation to digital transformation. Moreover, the existing domestic research on enterprise digital transformation predominantly consists of qualitative studies such as case studies,

with a dearth of quantitative research on the influencing factors of digital transformation. Therefore, this paper selects three observable characteristics at the individual level, namely executives' overseas background, academic background, and financial background, aiming to explore the impact they have on enterprise digital transformation in quantitative research method. While further enriching the research content in this field, this paper also seeks to provide a more rigorous and uniquely Chinese theoretical foundation for enterprise digital transformation on the socialism road with Chinese characteristic.

### **3. Theory and Hypothesis**

#### **3.1 The direct effect of executive characteristics on enterprise digital transformation**

Upper echelons theory argues that organizational decision-making is influenced not only by the rational choices made by top managers but also by the individual traits and past experiences of executives [21]. Even when operating within the same internal and external environment, executives with distinct personal characteristics and backgrounds may make divergent strategic decisions, subsequently impacting organizational behavior. Hence, this paper, based on the upper echelons theory, aims to explore the relationship between executives' overseas background, executives' academic background, and executives' financial background—and enterprise digital transformation.

##### **3.1.1 Executives' Overseas Background and Enterprise Digital Transformation**

Executives' overseas background refers to their experience of working or studying abroad, which is a significant characteristic of executives. From a human capital perspective, an overseas background enhances executives' receptiveness and adaptability to new environments and innovations. It enables them to learn about internationalized corporate management models and strategic approaches, fostering a forward-thinking global perspective and an open-minded mindset [19]. Executives with an overseas background are more inclined to drive innovation within the organization and internalize external technologies, effectively recognizing and leveraging external knowledge to facilitate company growth [22]. Therefore, when confronted with the emerging trend of digital transformation, executives with an overseas background possess higher levels of competency and a global vision. They excel at resource allocation to promote enterprise digital transformation, while also keenly capturing the economic benefits and growth potential that digital transformation brings to the organization. They embrace this new trend with a positive attitude and draw upon their knowledge reservoir and work experience to propel the company's digital transformation efforts.

From a social capital perspective, an overseas background empowers executives to cultivate extensive networks of international social relationships. This enables them to gain a better grasp of cutting-edge industry insights, while also entitling the, with more support when navigating the intricacies and uncertainties of corporate development [23]. Therefore, executives with an overseas background possess a deeper understanding of digital transformation as a prevailing trend in corporate management. They are adept at leveraging their social resources to help the company mitigate risks and overcome challenges, and provide a safeguard for the smooth progression of digital transformation within the organization.

From a psychological capital standpoint, serving as a rare form of human capital, executives with an overseas background often exhibit greater optimism and confidence. When confronted with the novel challenges of digital transformation, they are more inclined to take rather than avoid them, thereby facilitating the organization's digital transformation. Thus, we propose that:

H1a: Executives' overseas background is positively related to enterprise digital transformation.

##### **3.1.2 Executives' Academic Background and Enterprise Digital Transformation**

Executives' academic background refers to their experience in teaching at universities, working in research institutions, or conducting studies in associations, all of which profoundly influence their

thought processes and professional quality, consequently shaping their decision-making in the enterprise [24]. The unequivocal guidance that scientific theories offer to managerial practices is undeniable. Universities, research institutions, and professional associations often serve as the breeding ground for cutting-edge scientific theories. Therefore, executives with an academic background often possess a broader and more forward position scholarly perspective, a profound reservoir of theoretical knowledge, and a more thorough understanding of specialized expertise. In comparison to their counterparts without an academic background, they are more adept at externalizing their internalized knowledge into action.

Digital transformation is a popular research domain in recent years. An academic background facilitates executives a profound comprehension of the essence and significance of digital transformation, along with a recognition of its inevitable connection to corporate development [25]. Academic experiences also cultivate the innovative thinking and logical abilities of executives. This not only enhances their acceptance of emerging trends in digital transformation but also enables them to thoroughly analyze the internal and external organizational environments, grasping the uncertainties inherent in the transformation process. Consequently, they are empowered to formulate rational and effective digital transformation strategies.

Furthermore, academic research is a trial and error process that necessitates unwavering perseverance and resilient determination from researchers. Thus, executives with an academic background exhibit a heightened level of resilience and a greater capacity to tolerate challenges. When confronted with obstacles such as financial constraints and technological complexities brought about by digital transformation, or even the potential of failure, they demonstrate unwavering willpower [26] and ardently seek solutions to achieve the ultimate objectives. Thus, we propose that:

H1b: Executives' academic background is positively related to enterprise digital transformation.

### 3.1.3 Executives' Financial Background and Enterprise Digital Transformation

Executives' financial background refers to their professional experience in regulatory bodies, non-commercial banks, commercial banks, insurance companies, securities companies, fund management companies, securities registration and settlement companies, futures companies, investment banks, trust companies, investment management company, stock exchanges, and other financial institutions. Given the inherent characteristics of the financial industry, such as high pressure, elevated risks, and abundant temptations, executives with a financial background often demonstrate proficiency in risk identification, risk mitigation, and risk management. They exhibit a more adventurous style in management [27], which enhances their tolerance towards the risks that digital transformation may entail, thereby fostering the digital transformation of businesses.

Moreover, in comparison to executives without a financial background, those with a financial background tend to possess robust capabilities in acquiring financial resources and a solid foundation of financial expertise [28]. Throughout their involvement in corporate decision-making processes, they can effectively assimilate financial resources into the strategy of the enterprise, thereby facilitating its progress [29]. Consequently, during the course of enterprise digital transformation, executives with a financial background can undertake the role of financial advisors, employing their financial experience and knowledge to provide scientifically sound financial recommendations and decisions for digital transformation. Moreover, when confronted with the challenges and difficulties brought about by digital transformation, executives with a financial background can fully leverage their financial acumen to aid the enterprise in problem-solving and managing financial risks, thus ensuring a steady progress of digital transformation. Thus, we propose that:

H1c: Executives' financial background is positively related to enterprise digital transformation.

### 3.2 The moderating Effects of Corporate Risk-taking

The level of enterprise risk-taking reflects the willingness and inclination of companies to pay the cost in their pursuit of high profits [30]. It has a certain influence on the growth opportunities, R&D investments, and overall performance of the company [31]. Moreover, the level of enterprise risk-taking can also indicate the willingness of companies to bear the cost of high-risk investments, such

as innovation, and companies with a higher risk-taking level often have a higher level of innovation investment [32]. Therefore, companies with higher levels of risk-taking are often more inclined to embrace the risks associated with digital transformation for the expected benefits, thereby promoting the digital transformation of the enterprise. When executives have an overseas or academic background, based on their own horizons, thinking patterns, and deep understanding of digital transformation, a higher level of enterprise risk-taking can further enhance the company's capacity to embrace risks, thus facilitating a greater expansion of the digital transformation. Thus, we propose that:

H2a: Enterprise risk-taking plays a positive moderating role in the influence of executives' overseas background on enterprise digital transformation.

H2b: Enterprise risk-taking plays a positive moderating role in the influence of executives' academic background on enterprise digital transformation.

However, compared to overseas and academic backgrounds, executives with a financial background contribute more significantly to the safeguarding aspect of risk in the context of enterprise digital transformation. In other words, executives with a financial background promote digital transformation by enhancing the company's ability to manage risks. Therefore, when the level of enterprise risk-taking is higher, the necessity for the risk safeguarding role of executives with a financial background in digital transformation decreases, leading to a weakening of the positive impact. Conversely, when the level of enterprise risk-taking is lower, the importance of the risk safeguarding role of executives with a financial background increases, thereby enhancing their promoting effect on digital transformation. Thus, we propose that:

H2c: Enterprise risk-taking plays a negative moderating role in the influence of executives' financial background on enterprise digital transformation.

## 4 Methodology

### 4.1 Samples and Procedure

This paper uses a primary sample of A-share listed companies in Shanghai and Shenzhen from 2013 to 2019. After excluding financial firms, ST companies, and companies with missing crucial data after matching, a total of 11,351 sample observations were obtained. All the data used were sourced from CSMAR. Additionally, to mitigate the influence of extreme values, a Winsorization technique was employed to truncate the continuous variables at the 1st and 99th percentiles.

### 4.2 Variable and Research Model

#### 4.2.1 Variable Description

**Dependent Variable:** Enterprise Digital Transformation (Digit). Drawing upon the study by Tang Xuan et al.[19], this paper measures the level of Digit for a specific company in a given year by summing the frequencies of terms related to digital transformation in annual reports within the sample. A higher frequency indicates a greater degree of enterprise digital transformation.

**Independent Variables:** Executives' Overseas Background (E\_over), Executives' Academic Background (E\_aca), and Executives' Financial Background (E\_fin). The definition of executives in this paper is based on the categorization of "Concurrent Position Category" in the "Individual Characteristics" section under the "Character characteristics of listed companies" in the CSMAR database. Specifically, executives with position codes 1 and 3 are included in the analysis. Code 1 represents CEOs( including Chief Executive Officers and General Managers), while code 3 includes CEOs( including Chief Executive Officers and General Managers) and Chairpersons of the Board. Drawing upon the research by Wang Huacheng et al.[33] and Lian Yanling et al.[34], this paper uses a binary measurement approach for E\_over, E\_aca, E\_fin, where 1 indicates the presence of the relevant background and 0 indicates the absence of the relevant background.

Moderating Variable: Enterprise Risk-taking (Risk). Following the measurement approach proposed by Yu Minggui et al.[35],  $\sigma(\text{ROA}_i)$  (earning volatility) is used to gauge the level of Risk.  $\text{ROA}_i$  represents the ratio of EBIT to total assets at the end of the corresponding year for company  $i$ . To mitigate the influence of industry factors, the ROA for each year is adjusted by the industry average, and then the standard deviation of the industry-adjusted ROA is computed for each observation period. The volatility of ROA is calculated using a rolling method based on a three-year observation period ( $N=3$ ), considering that the typical tenure for executives in listed companies in our country is three years. Therefore, this study employs a rolling calculation approach with a three-year observation period:

$$Risk_{it} = \sqrt{\frac{1}{N-1} \sum_{n=1}^N (\text{Adj\_ROA}_{in} - \frac{1}{N} \sum_{n=1}^N \text{Adj\_ROA}_{in})^2} \quad N=3 \quad (1)$$

$$\text{Adj\_ROA}_{in} = \frac{EBIT_{in}}{ASSETS_{in}} - \frac{1}{X_n} \sum_{k=1}^X \frac{EBIT_{kn}}{ASSETS_{kn}} \quad (2)$$

Equations (1) and (2) involve symbols where  $i$  represents the company,  $n$  denotes the annual values within the observation period, ranging from 1 to 3,  $X$  signifies the total number of companies in a specific industry, and  $k$  represents the  $k$ th company within that industry.

Controlled Variables: Drawing upon relevant studies on executive characteristics and enterprise digital transformation [36-37], this paper incorporates nine variables as control variables. These variables include Board Size (Board), Proportion of Independent Directors (Ind), Corporate Size (Size), Profitability (Roa), Asset-liability ratios (Lev), Enterprise's listed years (Age), Enterprise's growth capability (Growth), Year (Year), and Industry (Industry). The specific measurement methods for these variables are elaborated in Table 1.

Table 1. Table of variable definitions in this paper

Variable Type	Variable Name	Variable Symbol	Measurement Method
<b>Dependent Variable</b>	Enterprise digital transformation	Digit	Total frequency of terms related to digital transformation in annual reports
<b>Independent Variable</b>	Executives' overseas background	E_over	Executive with overseas work experience or education background: 1 (Yes), 0 (No)
	Executives' academic background	E_aca	Executive with academic experience in teaching at universities, working in research institutions, or conducting studies in associations: 1 (Yes), 0 (No)
	Executives' financial background	E_fin	Executive with work experience in regulatory agencies, non-commercial banks, commercial banks, investment banks, and other financial institutions: 1 (Yes), 0 (No)
<b>Moderating Variable</b>	Enterprise risk-taking	Risk	Earnings volatility, calculated according to the methods listed in equations (1) and (2)
<b>Controlled Variable</b>	Board Size	Board	Natural logarithm of the number of directors in the board plus 1
	Proportion of Independent Directors	Ind	Number of Independent Directors / Total number of directors
	Corporate Size	Size	Natural logarithm of the Total Assets at the end of the period
	Profitability	Roa	Net profit / Total assets at the end of the period
	Asset-liability ratios	Lev	Total liabilities / Total assets at the end of the period
	Enterprise's listed years	Age	Natural logarithm of the Enterprise's listed years plus 1
	Enterprise's growth capability	Growth	Increase rate of main business revenue
	Year	Year	Year dummy variables, representing the sample years from 2013 to 2019
	Industry	Industry	Industry Dummy Variables, following the industry classification guidelines of the China Securities Regulatory Commission

### 4.2.2 Research Model

Based on the research content of this article, the following model has been constructed to validate the hypotheses mentioned above:

Main effects:

$$\text{Digit} = \beta_{1,0} + \beta_{1,1}E\_over + \beta_{1,2}\text{Controls} + \text{Industry} + \text{Year} + \varepsilon_1 \tag{3}$$

$$\text{Digit} = \beta_{2,0} + \beta_{2,1}E\_aca + \beta_{2,2}\text{Controls} + \text{Industry} + \text{Year} + \varepsilon_2 \tag{4}$$

$$\text{Digit} = \beta_{3,0} + \beta_{3,1}E\_fin + \beta_{3,2}\text{Controls} + \text{Industry} + \text{Year} + \varepsilon_3 \tag{5}$$

Moderating effects:

$$\text{Digit} = \beta_{4,0} + \beta_{4,1}E\_over + \beta_{4,2}\text{Risk} + \beta_{4,3}E\_over * \text{Risk} + \beta_{4,4}\text{Controls} + \text{Industry} + \text{Year} + \varepsilon_4 \tag{6}$$

$$\text{Digit} = \beta_{5,0} + \beta_{5,1}E\_aca + \beta_{5,2}\text{Risk} + \beta_{5,3}E\_aca * \text{Risk} + \beta_{5,4}\text{Controls} + \text{Industry} + \text{Year} + \varepsilon_5 \tag{7}$$

$$\text{Digit} = \beta_{6,0} + \beta_{6,1}E\_fin + \beta_{6,2}\text{Risk} + \beta_{6,3}E\_fin * \text{Risk} + \beta_{6,4}\text{Controls} + \text{Industry} + \text{Year} + \varepsilon_6 \tag{8}$$

Models (3)-(5) are used to examine the relationship between executives' overseas background, academic background, financial background, and enterprise digital transformation. Models (6)-(8) are used to test the moderating effects of enterprise risk-taking in this process.

## 5 Empirical Analysis

### 5.1 Descriptive Statistics Analysis

Table 2 presents the means, standard deviations, and correlations between the main study variables. The statistical results indicate that the mean values of E\_over, E\_aca, and E\_fin are 0.086, 0.194, and 0.052, respectively. This suggests that approximately 8.6% of the selected sample of listed companies had executives with overseas backgrounds, 19.4% had executives with academic backgrounds, and 5.2% had executives with financial backgrounds between 2013 and 2019. To address potential issues of multicollinearity among the variables, Pearson correlation tests were conducted, and the analysis results indicate that the absolute values of the correlation coefficients among the variables are all less than 0.6, indicating the absence of multicollinearity. Executives' overseas background, academic background, and financial background are all significantly positively correlated with enterprise digital transformation ( $r_1=0.058$ ,  $p<0.001$ ;  $r_2=0.131$ ,  $p<0.001$ ;  $r_3=0.027$ ,  $p<0.01$ ), which lays the foundation for further validation of the research hypotheses.

Table 2. Means, Standard Deviations, and Correlations Between the Main Study Variables

	E_over	E_aca	E_fin	Digit	Risk	Board	Ind	Size	Roa	Lev	Age	Growt h
E_over	1											
E_aca	0.094***	1										
E_fin	0.022*	0.004	1									
Digit	0.058***	0.131***	0.027**	1								
Risk	0.005	0.013	0.029**	0.089***	1							
Board	-	-	-0.017	-	-	1						
Ind	0.069***	0.076***	0.013	0.072***	0.119***	-	1					
Size	-0.028**	-	0.010	0.011	-	0.525***	0.273***	0.010	1			
Roa	0.014	0.016	-0.007	-0.017	-	0.040***	-0.026**	0.019*	-	1		
Lev	-	-	0.009	-	-	0.138***	0.000	0.523***	-	-	1	
Age	0.069***	0.092***	0.022*	0.063***	0.041***	-	0.179***	-	0.321***	-	-	1
Growth	0.135***	0.211***	0.022*	0.130***	0.071***	-	0.060***	0.026***	-	0.332***	-	-
M	-0.013	0.001	-0.011	-0.003	-0.008	0.000	0.004	0.006	-0.005	0.054***	0.048***	1
SD	0.086	0.194	0.052	1.324	0.025	2.253	37.512	22.436	0.037	0.427	2.912	0.463
SD	0.280	0.396	0.221	1.359	0.031	0.177	5.556	1.318	0.067	0.202	0.339	2.877

Notes: n=11351, \*P<0.05,\*\*P<0.01,\*\*\*P<0.001

## 5.2 Examination of Main Effects

To investigate the influence of executives' overseas background, academic background, and financial background on enterprise digital transformation, this study conducted regression analysis with the inclusion of controlled variables. Table 3 presents the regression results for the main effects. M1, M2, and M3 reveal that, after controlling for variables such as corporate size, enterprise's listed years, asset-liability ratios, industry, and year, executives' overseas background, academic background, and financial background are all significantly positively correlated with digital transformation of companies ( $r_1=0.152$ ,  $p<0.001$ ;  $r_2=0.291$ ,  $p<0.001$ ;  $r_3=0.120$ ,  $p<0.01$ ). Hypotheses 1a, 1b, and 1c have been validated, indicating that the presence of executives' overseas background, academic background, or financial background, either individually or collectively, can enhance the level of enterprise digital transformation.

Table 3. Regression Results of Executive Characteristics and Enterprise Digital Transformation

Variables	Dependent variable: Digit			
	M1	M2	M3	M4
Board	-0.202**	-0.212**	-0.206**	-0.201**
Ind	0.008***	0.007**	0.008***	0.007**
Size	0.111***	0.113***	0.113***	0.112***
Roa	0.021	0.003	0.023	0.002
Lev	-0.018	-0.021	-0.025	-0.014
Age	-0.265***	-0.220***	-0.280***	-0.211***
Growth	0.002	0.002	0.003	0.002
E_over	0.152***			0.125***
E_aca		0.291***		0.284***
E_fin			0.120**	0.109*
Constant	-0.067	-0.216	-0.045	-0.266
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
F	195.962***	201.132***	195.447***	188.946***
Adj_R <sup>2</sup>	0.329	0.335	0.328	0.336

Notes: n=11351, \*P<0.05,\*\*P<0.01,\*\*\*P<0.001.

## 5.3 Examination of Moderating Effects

In order to delve into the moderating effects of enterprise risk-taking, this paper examined enterprise digital transformation as the dependent variable, executive background as the independent variable, and enterprise risk-taking as the moderating variable. By introducing the product terms of the independent and moderating variables, along with control variables, a distributed regression methodology was employed to validate the theoretical model. The regression results are presented in Table 4. M5 reveals a significant influence of the interaction between enterprise risk-taking and executives' overseas background on enterprise digital transformation ( $\beta = 3.607$ ,  $p < 0.01$ ). Moreover, the direction of this influence aligns with the impact of enterprise risk-taking as a moderating variable on digital transformation ( $\beta = 0.811$ ,  $p < 0.05$ ). This indicates that as the level of risk-taking increases, the impact of executives' overseas background on digital transformation becomes stronger. Hypothesis 2a is validated. M6 demonstrates a significant positive correlation between the interaction term and the level of digital transformation ( $\beta = 2.114$ ,  $p < 0.05$ ). The direction of this correlation aligns with the influence of enterprise risk-taking on the dependent variable ( $\beta = 0.847$ ,  $p < 0.05$ ), suggesting that enterprise risk-taking plays a positive moderating role in the relationship between executives' academic background and digital transformation. Hypothesis 2b is confirmed. M7 reveals a significant negative correlation between the interaction term of enterprise risk-taking and executives' financial background, and the enterprise digital transformation ( $\beta = -3.261$ ,  $p < 0.05$ ). However, the direction of this correlation is opposite to the impact of enterprise risk-taking on the level of digital transformation ( $\beta = 0.844$ ,  $p < 0.05$ ). This implies that as the risk-taking level increases,

the promoting effect of executives' financial background on digital transformation weakens. Hypothesis 2c is validated.

Table 4. Test Results of the Moderating Effects

Variables	Dependent variable: Digit			
	M5	M6	M7	M8
Board	-0.195**	-0.203**	-0.196**	-0.194**
Ind	0.008***	0.007**	0.008***	0.007**
Size	0.112***	0.114***	0.114***	0.114***
Roa	0.160	0.152	0.160	0.135
Lev	-0.004	-0.010	-0.017	-0.007
Age	-0.266***	-0.221***	-0.282***	-0.212***
Growth	0.002	0.002	0.003	0.002
Moderator: Risk	0.811*	0.847*	0.844*	0.844*
E_over	0.152***			0.126**
E_over*Risk	3.607**			
E_aca		0.290***		0.286***
E_aca*Risk		2.114*		
E_fin			0.129**	0.106*
E_fin*Risk			-3.261*	
Constant	-0.098	-0.218	-0.099	-0.355
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
F	183.894***	188.665***	183.299***	183.258***
Adj R <sup>2</sup>	0.331	0.337	0.331	0.336

Notes: n=11351, \*P<0.05,\*\*P<0.01,\*\*\*P<0.001.

#### 5.4 Property heterogeneity testing

Following the categorization of property rights nature, this paper divided the entire sample into two groups: state-owned enterprises and non-state-owned enterprises, and conducted separate regression analysis. The regression results are presented in Table 5 and Table 6.

Table 5 reports the regression results of the main effects after grouping the samples based on property rights nature. With the exception of the insignificant impact of executives' financial background on digital transformation in the group of non-state-owned enterprises, all other results are statistically significant at least at the 5% level, consistent with the aforementioned research conclusions. This paper suggests that for non-state-owned enterprises, lacking the policy and economic assurance provided by the government and facing intensified competition in the market, executives with financial backgrounds alone are insufficient to effectively navigate the various risks that may arise during the process of digital transformation. Therefore, the influence of executives' financial background on digital transformation in the non-state-owned enterprises group did not reach the 5% significance level.

Table 6 presents the regression results of the moderating effects after grouping the samples based on property rights nature. In the group of non-state-owned enterprises, the moderating effects of enterprise risk-taking on the relationship between executives' overseas background, academic background, financial background, and digital transformation all pass the significance test at the 5% level, aligning with the aforementioned conclusions. However, in the group of state-owned enterprises, only the moderating effect of enterprise risk-taking when executives' overseas background is the independent variable passes the significance test. The paper posits that for state-owned enterprises, on the one hand, they bear not only economic responsibilities but also greater social and political responsibilities. Therefore, regardless of the level of enterprise risk-taking, executives in state-owned enterprises need to actively respond to the government's call and drive digital transformation. On the other hand, state-owned enterprises enjoy multifaceted support from the government in terms of policies, funding, and other aspects, often possessing better credibility and greater stability. Hence, regardless of the level of enterprise risk-taking, state-owned enterprises

have more abundant resources to address the risks and challenges brought about by transformation. As a result, the moderating effect of enterprise risk-taking in the group of state-owned enterprises does not pass the significance test at the 5% level.

Table 5. Property Heterogeneity Testing: The Main Effects

Variables	Dependent variable: Digit					
	The Group of State-owned Enterprises			The Group of Non-state-owned Enterprises		
E <sub>over</sub>	0.176*			0.121**		
E <sub>aca</sub>	0.288***			0.260***		
E <sub>fin</sub>	0.182**			0.015		
CVs	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
N	4694	4694	4694	6726	6726	6726
F	81.423***	82.862***	81.470**	122.376***	125.379***	121.988***
Adj R <sup>2</sup>	0.324	0.328	0.324	0.336	0.341	0.335

Notes: \*P<0.05,\*\*P<0.01,\*\*\*P<0.001.

Table 6. Property Heterogeneity Testing: The Moderating Effects

Variables	Dependent variable: Digit					
	The Group of State-owned Enterprises			The Group of Non-state-owned Enterprises		
E <sub>over</sub>	0.206**			0.124**		
E <sub>aca</sub>	0.291***			0.263***		
E <sub>fin</sub>	0.184**			0.034		
Moderator: Risk	-0.953	-1.164	-1.340	0.787	0.922*	0.860
E <sub>over</sub> *Risk	13.855**			2.908*		
E <sub>aca</sub> *Risk	3.339			2.417*		
E <sub>fin</sub> *Risk	2.970			-3.611*		
CVs	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
N	4694	4694	4694	6726	6726	6726
F	76.516***	77.541***	76.226***	114.535***	117.463***	114.231***
Adj R <sup>2</sup>	0.330	0.333	0.329	0.339	0.345	0.339

Notes: \*P<0.05,\*\*P<0.01,\*\*\*P<0.001.

## 5.5 Robust Test

Based on the preceding regression results, the regression findings of this paper are deemed valid. To further examine the reliability of the research conclusions, a robustness test is conducted by extending the observation window.

In order to assess the robustness of the main effects regression results, this study performs regression analysis by forwarding 1-2 periods for the dependent variable, enterprise digital transformation (Digit), to validate the conclusions. The regression results are presented in Table 7. The analysis outcomes indicate that, when considering a longer time series, both when the dependent variable (Digit) is forwarded by one period and by two periods, the positive impact of executives' overseas background, academic background, and financial background on enterprise digital transformation passes the significance test at the 5% level. Therefore, the original research conclusions still hold true.

Table 7 Extended observation window: dependent variable antecedent 1-2 periods

Variables	M(1)	M(2)	M(3)	M(4)	M(5)	M(6)
	F1. Digit	F1. Digit	F1. Digit	F2. Digit	F2. Digit	F2. Digit
E_over	0.133***	-	-	0.113*	-	-
E_aca	-	0.299***	-	-	0.265***	-
E_fin	-	-	0.149**	-	-	0.157*
CVs	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
N	9779	9779	9779	8038	8038	8038
F	159.189***	163.877***	159.076***	127.523***	130.461***	127.570***
Adj R <sup>2</sup>	0.312	0.318	0.312	0.298	0.303	0.298

Notes: \*P<0.05, \*\*P<0.01, \*\*\*P<0.001.

## 6 Conclusion and Implications

### 6.1 Conclusion

This paper utilizes data of A-share listed companies in Shanghai and Shenzhen from 2013 to 2019 to explore the effects of executives' overseas background, academic background, and financial background on the enterprise digital transformation, based on upper echelons theory. Additionally, considering the influence at the corporate level, the study introduces the concept of enterprise risk-taking to examine its moderating effects. The research findings are as follows: First, executives' overseas background, academic background, and financial background are all positively correlated with enterprise digital transformation. These conclusions remain valid even after robust test. Second, enterprise risk-taking plays a positive moderating role in the relationship between executives' overseas background, academic background, and enterprise digital transformation, while it plays a negative moderating role in the relationship between executives' financial background and digital transformation. Third, after categorizing by property rights, the direct impact of executives' overseas, academic, and financial backgrounds on digital transformation remains significant in the state-owned enterprise group. However, in the non-state-owned enterprise group, the impact of executives' financial background on digital transformation is no longer significant. This paper suggests that non-state-owned enterprises face greater market competition pressure and lack policy support and economic security at the national level. Executives with financial backgrounds are insufficient in leveraging their personal abilities and experiences to help companies effectively manage various risks in the digital transformation process, leading to a diminished significant impact on digital transformation. On the other hand, the moderating effects of enterprise risk-taking is significant in the non-state-owned enterprise group, whereas it is no longer significant in the state-owned enterprise group regarding the relationship between executives' academic and financial backgrounds and digital transformation. The paper posits that state-owned enterprises enjoy multifaceted support from the government and bear higher levels of corporate social and political responsibilities. Therefore, regardless of the level of risk-taking, executives in state-owned enterprises are more inclined to respond to the national policy's call and fully utilize the resources provided by the government to promote the digital transformation of companies.

### 6.2 Research Significance

At the theoretical level, this study expands the application scope of upper echelons theory in the field of research related to enterprise digital transformation, providing a novel theoretical foundation for further exploration of the influence of various executive characteristics on digital transformation. On the other hand, this study, to some extent, enriches the quantitative research on the factors influencing digital transformation in the domestic context.

At the practical level, this paper offers the following insights which facilitate digital transformation in companies: Firstly, it is imperative to establish robust mechanisms for the recruitment of overseas

talents and overseas returned talents, fostering an executive team with an international outlook and diverse thinking patterns. Simultaneously, it is vital to nurture an inclusive and diverse corporate culture, enabling executives' overseas experiences to have the maximum impact on corporate management. Secondly, enhancing collaboration and cooperation with higher education institutions and research organizations is crucial. Thirdly, it is essential to refine incentive mechanisms to attract executives with strong financial backgrounds and extensive expertise to join the company. Appropriate incentive measures should be implemented to enhance executives' subjective willingness to utilize their financial knowledge and resources, thereby maximizing the risk mitigation and financial advisory roles of executives with financial backgrounds and promoting corporate digital transformation. Fourthly, companies should adopt a long-term perspective and prioritize the long-term interests and sustained development of the company, and recognize the positive impact that digital transformation can have on its progress.

### 6.3 Research Limitations and Future Prospects

This study still has numerous areas that warrant improvement. Firstly, the research in this paper solely focuses on three observable features of executives: their overseas background, academic background, and financial background. However, executives possess a multitude of other observable characteristics, as well as measurable traits such as personality, mindset, and management style. Hence, future research could delve into other executive characteristics and continue to explore the relationship between executive characteristics and enterprise digital transformation in greater depth. Secondly, while executives exert significant influence on strategic decision-making in organizations, digital transformation is a complex process of organizational change that is greatly influenced by both internal and external environmental factors. But this study only investigates the moderating effects of enterprise risk-taking. Future research can further focus on enterprise or industry characteristics, enrich the understanding of the impact mechanisms of executive characteristics on enterprise digital transformation, and continue exploring other potential mediating and moderating variables in the relationship between executive characteristics and digital transformation, continuously expanding the research landscape in this field.

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