

How the Level of Human Capital Enhances Enterprises' New Quality Productive Forces

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Abstract: *The fundamental driving role of human capital as a key factor of production has reached a consensus in both theory and practice, yet the micro-mechanisms through which it affects new quality productive forces remain to be systematically explained. In this context, using Chinese A-share listed companies on the Shanghai and Shenzhen stock exchanges from 2011 to 2023 as the research sample, this paper empirically examines the impact of human capital level on enterprise new quality productive forces. The study finds that an increase in human capital level promotes the development of enterprise new quality productive forces, with absorptive capacity playing a partial mediating role, and financial flexibility positively moderating the relationship between the two. The findings of this paper offer insights for enterprises to optimize human capital allocation and enhance new quality productive forces.*

Keywords: *Capital Level, Absorptive Capacity, Enterprises' New Quality Productive Forces*

1. Introduction

Against the backdrop of a new wave of technological revolution and global industrial chain restructuring, China is undergoing a profound transformation from "factor-driven" to "innovation-driven" growth. Enhancing enterprises' new quality productive forces has become a core strategic choice for reshaping national competitive advantages. The 2025 Government Work Report emphasized "developing new quality productive forces in accordance with local conditions" as a key lever to break away from traditional growth models and foster new drivers for industrial development. This advanced form of productive forces, characterized by high technology, high efficiency, and high quality, emphasizes qualitative leaps in enterprise productivity through innovation rather than scale expansion, thereby enhancing total factor productivity. Therefore, the essence of new quality productive forces lies in innovation-driven development, while the fundamental driving force behind enterprise innovation stems from human capital support. This paper thus focuses on exploring the relationship between human capital levels and enterprise new quality productive forces, aiming to uncover the underlying mechanisms through which human capital influences the development of new quality productive forces, providing theoretical references for optimizing enterprise human capital structures and improving total factor productivity.

Human capital refers to the systematic integration of workers with different educational backgrounds and skill types within an organization. As the direct carrier of human capital, an enterprise's internal allocation efficiency and structural rationality of human capital directly determine the efficiency with which it is transformed into actual productive forces. However, classical human capital theories have mostly focused on macro-level analysis, leaving the "black box" of how human capital value is fully realized at the micro-enterprise level largely unopened. This paper incorporates absorptive capacity and financial flexibility into the analytical framework from the two dimensions of resources and capabilities.

The potential contributions of this study are twofold. First, it enriches existing research on corporate new quality productive forces. While prior literature has examined influencing factors such as technology, innovation, and policy, most remain at the theoretical level. Drawing on a large sample of listed companies from China's Shanghai and Shenzhen A-share markets, this study investigates the impact of human capital on new quality productive forces, expanding the understanding of human capital's effects on Chinese enterprises and offering reference points for future research on human capital structure. Second, it advances the analysis of the mechanisms through which human capital influences new quality productive forces. By examining the roles of absorptive capacity and financial flexibility, this study clarifies the transmission pathway whereby human capital improves absorptive capacity and

subsequently affects new quality productive forces.

2. Theoretical Analysis and Research Hypotheses

2.1. Human Capital Level and Enterprises' New Quality Productive Forces

The direct impact of human capital levels on enterprise new quality productive forces manifests in three ways. First, enterprises with higher human capital levels typically employ staff with superior overall competencies. In response to rapid changes in the external macro-environment, these firms are better able to identify emerging opportunities and initiate timely adjustments, thereby facilitating improvements in new quality productive forces. Second, a higher level of human capital implies a greater concentration of high-caliber talent within enterprises, which often generates knowledge spillover effects. Through cross-departmental collaboration and technical exchange, innovations can be accelerated and more effectively commercialized. This efficient innovation ecosystem serves as the core driver for the formation and reinforcement of new quality productive forces. Third, by enhancing human capital, enterprises can more effectively integrate internal resources, ensuring alignment between resources and human capital levels. This accelerates the establishment of production relations compatible with new quality productive forces, thus promoting technological advancement and innovation capacity, laying a solid foundation for accelerating the development of new quality productive force^[1].

Moreover, the indirect influence of human capital levels on enterprise new quality productive forces should not be overlooked. On one hand, enterprises with higher human capital levels tend to possess more sophisticated and rational organizational structures and talent management systems. These organizations often exhibit flattened and boundaryless structures, significantly improving interdepartmental communication efficiency and indirectly fostering the development of new quality productive forces. On the other hand, organizations with well-developed human capital structures gradually evolve into learning organizations, cultivating a culture of continuous learning. In summary, we propose Hypothesis H1.

H1: Human capital levels have a positive effect on the development of enterprise new quality productive forces.

2.2. The Mediating Role of Absorptive Capacity

Absorptive capacity is defined as a dynamic capability system through which firms identify, internalize, and apply new knowledge—a dynamic transition process that transforms individual knowledge activities into organizational learning capabilities. We argue that, human capital, as the core vehicle for knowledge creation and transformation, provides continuous knowledge momentum for the leap in productivity through absorptive capacity.

First, the high-tech characteristic of new quality productive forces heavily depends on the development of corporate absorptive capacity. Characteristics of human capital, such as employees' individual learning goal orientation and willingness to proactively enhance professional skills, significantly promote the company's absorptive capacity^[3]. Second, the high-efficiency characteristic of new quality productive forces is reflected at the enterprise level through the gradual improvement of resource allocation efficiency and production efficiency, thereby fully unleashing the effectiveness of technology and institutional systems^[4]. Finally, Highly skilled talent can translate external standards related to green industrial and supply chains into systematic internal solutions, facilitating a leap from green technology to green productivity, promoting corporate green transformation, and supporting enterprises in achieving high-quality development. In summary, we propose Hypothesis H2.

H2: Absorptive capacity plays a partial mediating role between human capital and enterprise new quality productive forces.

2.3. The Moderating Role of Financial Flexibility

The process of human capital enabling enterprise new quality productive forces heavily depends on sustained resource investment and risk-taking capacity. Financial flexibility, through its provision of financial reserves and flexible financing capabilities, can effectively alleviate financing constraints faced by enterprises and support high-risk, long-term human capital investments. Existing research has shown that sufficient financial support and the alleviation of financial pressure are important foundations for

enhancing enterprise new quality productive forces^[5]. Therefore, this paper argues that corporate financial flexibility may be a key variable influencing the enhancement of new quality productive forces through human capital level. Specifically:

On the one hand, greater financial flexibility increases external confidence and equity premium, improving funding access. Sound finances support human capital via training and incentives, boosting skills and collaboration, thereby enabling resource integration and the development of new quality productive forces. On the other hand, the financial slack created by financial flexibility provides a more ample room for trial and error in innovation activities, tolerating uncertain losses such as R&D expenditure overruns and technological route adjustments. It ensures that cross-domain human capital collaboration and innovation are not interrupted by financial pressure, thereby laying a solid foundation for the knowledge integration and technological innovation required by new quality productive forces. In summary, we propose Hypothesis H3:

H3: The level of financial flexibility positively moderates the impact of human capital level on enterprise new quality productive forces.

3. Research Design

3.1. Sample Selection and Data Sources

This paper selects Shanghai and Shenzhen A-share listed companies from 2011 to 2023 as the research sample, and processes the sample as follows: (1) excluding the financial industry; (2) excluding observations with missing key variables; (3) excluding ST and ST* samples; (4) excluding sample data where relevant indicators deviate from the normal range. After these procedures, a final unbalanced panel of 32,937 observations is obtained.

3.2. Variable Selection

This paper defines the variables as follows. The dependent variable, enterprise new quality productive forces, is measured by constructing an indicator system from three perspectives (new quality laborers, new quality objects of labor, and new quality means of labor) following Li Xinru et al.^[2], with the entropy method assigning weights to each indicator. The explanatory variable, human capital level, is proxied by the proportion of high-skilled employees to total employees following Xiao Tusheng and Sun Ruiqi^[6]. The mediating variable, absorptive capacity, is quantified as the ratio of R&D expenditure to operating revenue following Zhao Xin^[7]. The moderating variable, financial flexibility, is measured as the sum of cash flexibility and debt flexibility following Zeng Aimin et al.^[8]. The control variables include firm age, firm size, leverage ratio, equity balance degree, book-to-market ratio, Tobin's Q, CEO duality, whether supervisors and executives have a financial background, whether the firm is audited, and whether the firm is a state-owned enterprise (SOE).

3.3. Model Specification

To improve the accuracy of panel data estimation, this paper employs a high-dimensional fixed-effects model for regression analysis and clusters standard errors at the firm level. To investigate the impact of human capital level on enterprise new quality productive forces, the specific model is specified as follows:

$$Nqp_{i,t} = \beta_0 + \beta_1 Unhisk_{i,t} + \gamma_j Controls_{j,i,t} + Year_{i,t} + Industry_{i,t} + Province_{i,t} + \varepsilon_{i,t} \quad (1)$$

To explore the mechanisms through which absorptive capacity and financial flexibility function in the process of human capital level affecting new quality productive forces, this paper adds the following models based on Model (1).

$$AC_{i,t} = \eta_0 + \eta_1 Unhisk_{i,t} + \gamma_j Controls_{j,i,t} + Year_{i,t} + Industry_{i,t} + Province_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$Nqp_{i,t} = \mu_0 + \mu_1 Unhisk_{i,t} + \mu_2 AC_{i,t} + \gamma_j Controls_{j,i,t} + Year_{i,t} + Industry_{i,t} + Province_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$Nqp_{i,t} = \theta_0 + \theta_1 Unhisk_{i,t} + \theta_2 Fifle_{i,t} + \theta_3 Unhisk_{i,t} \times Fifle_{i,t} + \gamma_j Controls_{j,i,t} + Year_{i,t} + Industry_{i,t} + Province_{i,t} + \varepsilon_{i,t} \quad (4)$$

4. Empirical Analysis

4.1. Baseline Regression

Table 1 presents the baseline regression results of this paper. The results show that Hypothesis H1 is supported regardless of whether control variables are included or fixed effects are controlled for.

Table 1: Baseline Regression Results

Variable	(1)	(2)	(3)	(4)
	<i>Nqp</i>	<i>Nqp</i>	<i>Nqp</i>	<i>Nqp</i>
<i>Unhisk</i>	0.3872***	0.3495***	0.3068***	0.3407***
	(28.6368)	(11.8446)	(9.4577)	(11.1959)
Controls	No	Yes	No	Yes
Year	No	No	Yes	Yes
Industry	No	No	Yes	Yes
Province	No	No	Yes	Yes
<i>N</i>	32937	32937	32936	32936
adj.R ²	0.0243	0.1122	0.2245	0.2924

Note: t-statistics adjusted for firm-level clustering are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Unless otherwise specified, the same applies to the following tables.

4.2. Robustness Test

To enhance the robustness of the empirical results, we employ the following three methods for robustness tests. First, lagged variables. Second, replacement of key variables. Third, reducing the sample time interval. The results are shown in Table 2, confirming the robustness of the research conclusions of this paper.

Table 2: Results of Robustness Tests

Variable	(1)	(2)	(3)	(4)	(5)
	<i>F.Nqp</i>	<i>Nqp</i>	<i>Nqp</i>	<i>Nqp2</i>	<i>Nqp</i>
<i>Unhisk</i>	0.3251***			0.3095***	0.3786***
	(9.9411)			(10.3272)	(11.8350)
<i>L.Unhisk</i>		0.3266***			
		(10.0055)			
<i>Hucap</i>			0.0045***		
			(3.0703)		
Controls	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes
Province	Yes	Yes	Yes	Yes	Yes
<i>N</i>	26948	26949	32936	30388	25143
adj.R ²	0.2906	0.2906	0.2821	0.3425	0.2552

4.3. Endogeneity Test

Although this paper controls for as many control variables as possible, omitted variable concerns may still theoretically exist. To address this, we employ the omitted variable bias test proposed by Oster^[9] to examine the potential omitted variable problem in this study. The detailed results are shown in Table 3, indicating that there is no severe omitted variable issue in our model specification.

Furthermore, this paper employs the instrumental variable method to mitigate endogeneity issues caused by omitted variables, reverse causality, and selection bias, thereby further enhancing the credibility of our findings. Following the approach of Liu Yunguo^[10] we select the one-period lag of the independent variable (IV1) and the industry mean of the independent variable in the same year (IV2) as instrumental variables. The test results are presented in Table 4. As shown, after controlling for the relevant endogeneity concerns, the impact of human capital level on enterprise new quality productive

forces remains significant.

Table 3: Omitted Variable Bias Test

Test Method	Judgment Criterion	Actual Calculated Result	Pass or Not
(1)	$\beta * (R_{\max}, \delta) \in [0.281, 0.400]$	$\beta * (R_{\max}, \delta) = 0.325$	YES
(2)	$\delta > 1$	$\delta = 17.533$	YES

Table 4: Instrumental Variable Regression Results

Variable	(1)	(2)	(3)	(4)
	First Stage	Second Stage	First Stage	Second Stage
	<i>Unhisk</i>	<i>Nqp</i>	<i>Unhisk</i>	<i>Nqp</i>
<i>IV1</i>	0.8603*** (141.4951)			
<i>IV2</i>			0.9974*** (16.8955)	
<i>Unhisk</i>		0.3797*** (10.0841)		0.5016*** (3.1695)
Controls	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Province	Yes	Yes	Yes	Yes
<i>N</i>	26949	26949	32936	32936
<i>R</i> ²		0.0967		0.0953
<i>KP-LM statistic</i>	1020.50***		215.72***	
<i>Wald F statistic</i>	20020.87		285.46	

4.4. Mechanism Test

Table 5 reports the test results of the mediation effect and moderating effect of absorptive capacity, effectively validating Hypotheses H2 and H3 of this paper.

Table 5: Instrumental Variable Regression Results

Variable	(1)	(2)	(3)	(4)
	<i>Nqp</i>	<i>AC</i>	<i>Nqp</i>	<i>Nqp</i>
<i>Unhisk</i>	0.3407*** (11.1959)	0.0480*** (15.6099)	0.2784*** (9.0103)	0.3430*** (11.2616)
<i>AC</i>			1.2975*** (11.7495)	
<i>Fifle</i>				-0.1169*** (-3.6416)
<i>Unhisk × Fifle</i>				0.2828*** (3.3925)
Controls	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Province	Yes	Yes	Yes	Yes
<i>N</i>	32936	32936	32936	32936
adj. <i>R</i> ²	0.2924	0.4518	0.3001	0.2938

5. Research Conclusions and Policy Recommendations

Taking Shanghai and Shenzhen A-share listed companies from 2011 to 2023 as the research sample, this paper deeply investigates the impact of human capital level on enterprise new quality productive forces and its underlying mechanisms. The findings are as follows: human capital level significantly promotes the development of enterprise new quality productive forces. Absorptive capacity plays a partial

mediating role in the process through which human capital level promotes the development of enterprise new quality productive forces; that is, human capital can enhance absorptive capacity, thereby facilitating the leap of new quality productive forces. Meanwhile, financial flexibility positively moderates the impact of human capital level on enterprise new quality productive forces.

Based on the above findings, we propose the following policy recommendations. At the government level: First, optimize the human capital supply system and enhance overall quality. Second, implement tax incentives to reduce corporate costs. Third, strengthen industry-university-research collaboration and consolidate the talent base. At the enterprise level: First, focus on cultivating absorptive capacity and open up pathways for knowledge transformation. Second, dynamically manage financial flexibility to precisely match human capital investment. Third, adapt to heterogeneous contexts and optimize the human capital system. In light of the heterogeneity in innovation input, enterprises with high innovation input should establish a cross-departmental collaboration system that spans technology research and development, production application, and market promotion.

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