Talent Development, Compensation Incentives and Firm Competitiveness: A Comparative Study of Short-term Growth and Long-term Innovation

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Abstract. As Chinese manufacturing shifts from scale-based growth towards technology and innovation-driven development, human capital has become increasingly important to firm competitiveness. Nevertheless, earlier research frequently treats human-capital investment as a single construct and evaluates competitiveness using a single performance indicator, giving inadequate attention to how diverse talent-investment strategies may operate across different time horizons. This study examines Chinese A-share listed manufacturing firms over 2019–2024 and compares the effects of talent development and per-capita compensation growth on short-term and long-term competitiveness. Talent development is measured by the proportions of highly educated employees and R&D personnel, while compensation-based talent activation is measured by the growth rate of per-capita employee compensation. The results suggest that talent development, and specifically the talent in the R&D team, is more strongly associated with long-term innovation, whereas growth in per-capita employee compensation is negatively associated with revenue growth and, in some specifications, with patent output. The study makes a contribution to resource-based view theory by demonstrating that the effectiveness of talent investment is contingent upon the time horizon of performance evaluation as well as the form of investment.

Keywords: Talent Development, Compensation Incentives, Firm Competitiveness, Corporate Innovation, Human Capital, Chinese Manufacturing Firms

1 Introduction

The manufacturing industry is an important industry for China, contributing to its economic growth, employment, exports and industrial upgrading. But the competitiveness in the manufacturing sector is changing from the traditional factors of scale, cost and capital accumulation to knowledge, technology and innovation. Firms' competitive advantage is consequently becoming more and more dependent on employee knowledge, technical skills and innovation capabilities, as technological transformation and digitalization, as well as rising labor costs, have heightened the importance of these assets.

The resource-based view (RBV) provides a theoretical basis for understanding this shift. Sustained competitive advantage may come from if firms have resources that are

© The Author(s) 2026
B. P. Siba et al. (eds.), *Proceedings of the 2026 5th International Conference on Public Service, Economic Management and Sustainable Development (PESD 2026)*, Advances in Economics, Business and Management Research 411,
https://doi.org/10.2991/978-94-6239-825-2_31

valuable, rare, hard to imitate and hard to substitute [1]. Human capital can have these attributes as employees' knowledge, skills and technical capabilities build over time and are difficult to replicate by competitors. Gerhart and Feng (2021) also stress the importance of effective development, organization and utilization of human resources for their competitiveness [2]. New data from China also emphasizes the value of skilled workforce. It was found that employee education and human-capital structure is associated with productivity and firm performance and innovation in Chinese firms [3,4]. But there are several ways of investing in employees. Talent development involves developing capabilities through education, technical expertise, R&D staffing, training and knowledge accumulation. Compensation-based talent activation, on the other hand, is an approach to motivate, retain and engage employees by offering higher compensation. These methods could lead to varying results as capability development can take a while to manifest itself in innovation, while compensation can have more immediate motivational and cost impacts.

This study compares two forms of talent investment across two dimensions of firm competitiveness. Talent development is represented by the proportion of highly educated employees and the proportion of R&D personnel, while compensation-based talent activation is measured by the growth rate of per-capita employee compensation. Operating-revenue growth represents short-term competitiveness, whereas corporate patent applications capture long-term innovation competitiveness. This study contributes to the literature in three ways. First, it distinguishes capability-building talent development from compensation-based talent activation rather than treating human-capital investment as a single construct. Second, it separates short-term operating competitiveness from long-term innovation competitiveness, providing a more differentiated understanding of the return horizons of talent strategies. Third, it extends the RBV perspective by examining whether the competitive value of human capital varies according to both the form of investment and the performance horizon. The findings also provide practical implications for manufacturing firms allocating resources between developing technical capabilities and increasing employee compensation.

2 Literature Review and Hypothesis Development

2.1 Resource-Based View and Talent Development

The resource-based view (RBV) theory is based on the differences in resources which are valuable, rare, difficult-to-imitate, and non-substitutable [1]. Human capital can meet these requirements, since the knowledge of the employees, technical skills and organisational routines develop over time and cannot be easily copied. How well companies can build, structure and integrate these resources with other complementary capabilities is also important in determining its strategic value [2]. This view favours the separation of talent development increasing knowledge and technical capacity and talent activation which increases the motivation and retention of existing staff using compensation.

The evidence generally confirms that talent development is important for firm performance and innovation. The improvement of employees' educational quality has been

linked to improved accounting and market performance, in part due to productivity and innovation [3]. The structure of R&D staff is especially significant in manufacturing companies as technological innovations rely on specialist knowledge, experimentation and knowledge accumulation. Shao et al. (2025) demonstrate that human-capital structures are positively associated with substantive and strategic innovation of Chinese listed companies [4]. Training and capability-building research also shows that human-capital development has the potential to enhance innovative capacity. The results indicate that highly educated employees and R&D staff could have an impact on both the performance of the business and innovation in the longer term.

2.2 Compensation Incentives and Competitiveness

Compensation can be used to boost firm competitiveness through greater employee effort, retention and motivation. Evidence indicates that co-ordinated executive and employee compensation can be used to incentivize corporate innovation through greater effort and lower employee turnover rates[5]. But, more pay doesn't always equate with better performance. As noted by Hong et al. (2022), competitiveness in employee compensation can lower corporate investment, as the higher labour costs and liquidity constraints increase the costs of investment [6]. Thus, compensation can have positive motivational and negative cost-crowding-out effects. Its overall impact is determined by whether remuneration growth is in line with productivity, innovation and strategic goals.

Return on various talent investments can take varying time periods to materialize. The two indicators, operating-revenue growth and patent applications, respectively, stand for relatively near-term commercial performance and knowledge creation and technological potential that may take longer to yield economic returns. Previous studies on organizational time horizons indicate that a long-term orientation would encourage innovation, and that a short-term market orientation would influence against innovation which is important or novel [7]. Thus, investments in capability, like staff education and R&D staffing, may be particularly relevant for long-term innovation efforts, while increases in compensation may have more direct motivational and cost impacts.

RBV reasoning and the empirical literature suggest that firms with stronger educational and R&D human-capital resources should be better able to improve operations, identify growth opportunities, and develop new technologies. Compensation incentives may also increase effort and retention, thereby supporting current performance and innovation. Therefore, this study proposes the following research hypotheses. H1(a-c): The proportion of highly educated employees, the proportion of R&D personnel and per-capita compensation growth is positively associated with firms' operating-revenue growth. H2(a-c): The proportion of highly educated employees, the proportion of R&D personnel and per-capita compensation growth is positively associated with corporate patent innovation. H3: The association between the proportion of highly educated employees and patent innovation is stronger than the association between per-capita compensation growth and patent innovation.

3 Methodology

3.1 Sample and Data

The dataset used in this study is an unbalanced panel of Chinese A-share listed manufacturing firms covering fiscal years 2019–2024. The baseline regression sample consists of 13,578 observations and 2,769 firm clusters after dropping observations with missing values in the dependent variables, lagged explanatory variables, and controls. The sample is limited to manufacturing firms as the production upgrading and innovation are particularly relevant to human-capital development and technological staffing. Firm-level financial, ownership, employment, compensation and patent data were obtained from the China Stock Market and Accounting Research (CSMAR) Database. The sample was limited to exclude ST designated firms, firms with no recorded employees, and observations with missing values for any of the core variables. The final dataset also contains first-order lagged values of the principal explanatory and control variables. All continuous variables are winsorised at the 1st and 99th percentiles on a two-tailed basis to eliminate extreme values.

3.2 Variable Definitions

Two dependent variables capture different dimensions of firm competitiveness. Short-term competitiveness is measured by the operating-revenue growth rate, denoted as ($RevenueGrowth_{i,t}$). Long-term innovation competitiveness is measured using corporate patent applications. The primary patent outcome is transformed as:

$PatentInnovation_{i,t} = \ln(1 + PatentApplications_{i,t})$. The logarithmic transformation reduces the influence of extreme patent counts while retaining observations with zero applications. The raw number of patent applications is retained for the supplementary Poisson and negative binomial models.

Talent development is represented by two variables. EduRatio is defined as the number of employees holding a master's degree or above divided by the total number of employees. RDRatio is defined as the number of employees engaged in R&D activities divided by total employees. Compensation-based talent activation is measured by AvgPayGrowth, defined as the year-on-year growth rate of per-capita employee compensation.

To capture the effects of the control variables, firm size, leverage, firm age, ownership concentration, and ownership nature are measured. Firm size is measured as the natural logarithm of total assets, leverage as total liabilities divided by total assets, and ownership concentration as the shareholding ratio of the largest shareholder. Age of the firm is in years while state ownership is represented by a binary variable equal to one for state-owned enterprises and zero otherwise.

All explanatory and control variables are lagged one period, with the exception of the time-invariant ownership indicator. Lagging the regressors also helps to avoid contemporaneous simultaneity and allows talent characteristics in year (t-1) to be used to explain competitiveness in year (t), although it does not fully remove omitted variables

and/or reverse causality. All continuous variables in the final dataset had already undergone two-tailed 1% winsorisation at the 1st and 99th percentiles prior to empirical estimation.

3.3 Model Specification

The baseline models estimate the following relationships:

$$RevenueGrowth_{i,t} = \alpha + \beta_1 EduRatio_{i,t-1} + \beta_2 RDRatio_{i,t-1} + \beta_3 AvgPayGrowth_{i,t-1} + \gamma Control_{i,t-1} + \delta_j + \lambda_t + \varepsilon_{i,t} \quad (1)$$

$$PatentInnovation_{i,t} = \alpha + \beta_1 EduRatio_{i,t-1} + \beta_2 RDRatio_{i,t-1} + \beta_3 AvgPayGrowth_{i,t-1} + \gamma Control_{i,t-1} + \delta_j + \lambda_t + \varepsilon_{i,t} \quad (2)$$

Here, i denotes the firm, t denotes the fiscal year, δ_j represents industry fixed effects, and λ_t represents year fixed effects. Industry fixed effects control for persistent differences across manufacturing industries, while year fixed effects absorb macroeconomic, regulatory, and economy-wide shocks common to all firms.

4 Empirical Results

Both the correlation-coefficient matrix and VIF test results indicate the absence of multicollinearity among variables, which justifies proceeding with the subsequent empirical analysis.

4.1 Baseline Regression Results

Table 1 presents the baseline regression estimates for short-term operating growth and long-term patent innovation. The coefficient of the share of highly educated workers is positive and significant at 1% ($\beta = 0.298$, $p < .001$). A one-percentage-point rise in the proportion of highly educated employees is linked to an around 0.30-percentage-point rise in the growth rate of operating revenues, other factors being equal. This finding supports H1a. The coefficient on R&D personnel is negative but statistically insignificant ($p = .664$), indicating no evidence of a systematic association between the proportion of R&D personnel and short-term operating-revenue growth. Accordingly, H1b is not supported.

Compensation growth has a negative and highly significant coefficient ($\beta = -0.155$, $p < .001$). A ten-percentage-point increase in per-capita compensation growth is associated with approximately a 1.55-percentage-point reduction in operating-revenue growth, holding other factors constant. Since this relationship is opposite to the hypothesised positive direction, H1c is not supported.

For long-term innovation, both talent-development variables show positive relationships with patent output. The coefficient on highly educated employees is positive and statistically significant ($\beta = 1.126$, $p = .019$), supporting H2a. R&D personnel also has

a positive and highly significant coefficient (β = 0.0148, p < .001), supporting H2b. A one-percentage-point increase in the share of R&D personnel is associated with an estimated 1.48% increase in patent applications using the log-point approximation. Compensation growth is negatively associated with patent innovation (β = −0.123, p < .05). This finding is again opposite to the hypothesised positive relationship, and H2c is therefore not supported.

Table 1. Baseline Regressions Results

	(1) Short-term Growth	(2)Long-term Innovation
Highly educated employees (t-1)	0.298***	1.126**
	(0.0798)	*(0.479)*
R&D personnel (t-1)	-0.000178	0.0148***
	(0.000411)	*(0.00240)*
Per-capita compensation growth (t-1)	-0.155***	-0.123**
	(0.0195)	*(0.0483)*
Firm size (t-1)	-0.00755**	0.809***
	(0.00307)	*(0.0183)*
Leverage (t-1)	0.0251	0.0522
	(0.0193)	*(0.105)*
Top-1 shareholder ownership (t-1)	0.000476**	0.000661
	(0.000188)	*(0.00132)*
Firm age (t-1)	-0.00311***	-0.00269
	(0.000537)	*(0.00316)*
State-owned enterprise	-0.0241***	0.0517
	(0.00701)	*(0.0427)*
Constant	0.321***	-14.53***
	(0.0654)	*(0.393)*
Observations	13,578	13,578
Adjusted R-squared	0.075	0.545
Industry FE	Yes	Yes
Year FE	Yes	Yes

*Standard errors are reported in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01. Industry and year fixed effects are included.*

4.2 Standardized Coefficients and Wald Tests

The standardised patent model provides a direct comparison among the three talent variables. The standardized coefficient for education is 0.0367 (p=.019) and the coefficient for R&D personnel is 0.0985 (p<.001). Compensation growth has a negative standardized coefficient of −0.0142 (p=.011). R&D staffing therefore exhibits the strongest standardized association with patent innovation.

Wald tests further confirm that these differences are statistically significant. Equality between the education and compensation coefficients is rejected (F = 9.56, p = .002). Comparisons of R&D personnel and compensation growth also indicate that equality is

rejected ($F = 41.89$, $p < .001$). These findings therefore support H3, indicating that talent-development variables have significantly stronger associations with patent innovation than compensation growth.

4.3 Alternative Patent-Count Models

Supplementary Poisson and negative binomial regressions were estimated using the raw number of patent applications. The mean of the patent counts is 123.5 and the variance is 236,190. Highly educated employees are positively associated with expected patent counts (IRR = 5.196, $p < .01$), while the IRR for R&D personnel is 1.014 ($p < .01$), implying that a one-percentage-point increase in the R&D personnel share is associated with approximately a 1.4% increase in expected patent applications. There is an incidence-rate ratio of 0.893 ($p<.05$) for compensation growth. Overall, the count-model evidence reinforces the positive relationship between talent development and patent innovation and the negative relationship between compensation growth and innovation, supporting the robustness of the baseline findings.

5 Discussion

Results show that talent development and compensation-based talent activation is related with different competitive outcomes. Talent development, especially R&D staffing, is much more related to long-term innovation, while the growth of per-capita compensation is negatively related to short-term revenue growth and in some specifications to patent innovation.

The negative compensation coefficients are of particular importance as they constitute an important turnaround of the assumed motivation effect. Theories of compensation-based incentives indicate that increased and/or performance-based pay can improve employee motivation, employee loyalty, employee retention and firms' attraction of skilled workers. One possible explanation is a cost-burden mechanism. Rapid compensation growth increases labour expenditure and may reduce resources available for investment, employee development and R&D [6]. If wage growth is not matched by productivity improvements, higher labour costs may weaken short-term operating performance and constrain innovation spending.

A second explanation is reverse causality. Firms experiencing weaker revenue growth or innovation may increase compensation to retain key employees, respond to employee dissatisfaction or manage organisational uncertainty. In this case, compensation growth may partly reflect a response to weaker performance rather than its cause. Although the use of lagged explanatory variables reduces contemporaneous simultaneity, it does not eliminate reverse causality or omitted-variable bias.

Similarly, rapid remuneration growth increases labour expenditure and may constrain resources available for marketing, capital investment, employee development and R&D [6]. Rising labour costs, therefore, can lead to a dampening of short-term revenue performance if productivity growth is not as strong. Talent development results in a different pattern. The proportion of highly educated employees is positively associated

with both revenue growth and patent innovation in the baseline models, while R&D staffing shows a particularly strong association with patent output. The absence of a statistically significant relationship between R&D staffing and short-term revenue growth is also theoretically plausible. Human-capital investment can therefore lead to the enhancement of long-term innovative capacity without delivering a quick sales boost.

The results clarify the RBV by demonstrating that the competitive value of human capital investment varies according to the type of investment and the outcome horizon. Increased human capital is more likely to contribute to sustained advantage when it is used to build up firm-specific knowledge and technological capability. The findings suggest that general per-capita compensation growth should not be treated as a substitute for talent development in manufacturing firms. Compensation should be aligned with productivity, skills and innovation objectives, while sustained investment in highly educated and R&D employees remains important for longer-term technological competitiveness.

6 Conclusion

This study aims to explore the impact of talent development and talent activation through compensation on short-term and long-term competitiveness of Chinese A-share listed manufacturing companies. The results show that the competitiveness of different talent investments varies. Highly educated employees are positively associated with revenue growth and patent innovation in the baseline models, while R&D staffing is consistently associated with stronger patent performance but not short-term revenue growth. In contrast, per-capita compensation growth is negatively associated with revenue growth and, in several specifications, with patent innovation.

The study contributes to the human-capital and RBV literature by distinguishing talent development from compensation-based talent activation and by separating short-term operating competitiveness from long-term innovation competitiveness. However, there are still a number of limitations. Reverse causality and omitted-variable bias are also not completely eliminated in the analysis. Future research could differentiate between fixed compensation, bonuses, equity compensation and compensation of critical technical workers, analyse the quality of patents in addition to their number, and use quasi-experimental or instrumental variables approaches.

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