Dean&Francis
ISSN 2959-6130

Optimizing Executive Compensation Contracts and Sharing Innovation Risks Through Human Capital Collateralization: A Case Study of Yili Group's AI talent evaluation

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Abstract:

With the rise of the digital economy and digital-intelligent transformation, companies face the challenges of growing competition for high-end talent and the limited effectiveness of long-term incentives. Meanwhile, since human capital is difficult to collateralize, traditional executive compensation contracts fail to alleviate the agency conflict. Managers tend to perform short-term behaviors, while shareholders emphasize long-term value. Therefore, from the perspective of the collateralizability of human capital and using Yili Group as a case study, this article examined the impact of AI talent evaluation on compensation contracts and innovation risk sharing. The article finds that AI technology significantly improves the accuracy and predictability of talent evaluations, enhancing the collateralizability of human capital, which encourages firms to be more willing to advance long-term equity incentives and to proactively bear the risk associated with expensing R&D costs, and fostering an innovation risk-sharing mechanism centered on the firms and coordinated with government subsidies. In conclusion, this article not only expands the theoretical framework of human capital theory in the digital intelligence era, but also provides a practical approach for enterprises to optimize long-term incentives and enhance their ability to undertake innovation risk.

Keywords: collateralizability of human capital; AI talent evaluation; executive compensation contracts; innovation risk sharing

1. Introduction

In the era of the digital economy and accelerating digital-intelligence transformation, companies are experiencing increasingly demand for advanced digital capabilities. At the same time, as firms focus more on attracting and retaining core talent, competition for high-end talent has intensified. However, the traditional agency problem namely, the conflict between managers and shareholders still exists. One fundamental issue is the inconsistency of time preferences between the two parties: managers tend to prefer short-term performance-oriented executive compensation contracts, which can damage the company's long-term interests [1]. Even companies that apply long-term executive compensation contracts still face the challenges in effective implementation, primarily because the future value of talent is hard to measure and collateralize. According to Gary Becker's human capital theory, human capital is an intangible asset that can not be collateralized like physical assets, although it can provide certain future returns. Some financial technology companies have attempted to implement human capital collateralization through mechanisms such as human capital securitization. However, in the current era of digital intelligence, the methods employed by enterprises to collateralize human capital are undergoing transformation. Therefore, this article aims to explore how AI-driven talent evaluation can improve the collateralizability of human capital, thus optimizing long-term compensation contracts and facilitating innovation risk sharing.

From a theoretical perspective, this research builds on collateralizability of human capital, extends the theoretical framework of human capital theory in a digital-intelligence context. By integrating AI-based talent evaluation into the framework of compensation contract design, Yili's case offers a mechanism for alleviating principal-agent conflicts. From a practical perspective, AI-based talent valuation offers a practical template for designing more effective long-term compensation contracts. This not only helps reduce agency costs and align the interests between managers and shareholders, but it also enables firms to identify and motivate innovative talent more accurately, thereby enabling high-risk, high-return innovation.

2. Literature Review

2.1 Traditional Compensation Contract Theory

Edmans et al. provide empirical evidence to show that short-term incentives can lead to short-term corporate actions, which damage the firms' long-term value [1]. Marinovic and Varas further argued in 2019 that short-term incentives can cause executive short-sightedness, directing their attention to short-term gains rather than long-term value [2]. Whether it is Flammer's opinion of "time preference" or Marinovic's analysis of "short-sightedness", both essentially reveal the difficulty of designing effective long-term incentives in traditional compensation contracts. Within the optimal-contracting framework of the optimal contracting perspective, recent studies have demonstrated that performance-related compensation arrangements that focus on long-term incentives are more effective at mitigating managerial short-termism and supporting long-term value creation [3].

2.2 AI-Driven Human Capital Theory Innovation

Brunello et al. argue that (2022) human capital, compared to physical capital, is more likely to be influenced by financing constraints, thus human capital investments are more prone to compression and have lower collateral value [4]. However, human capital is not entirely incapable of serving as collateral. Becker's human capital theory emphasizes that, although human capital is an intangible asset, it can generate predictable future returns. Building on this, Angrist et al. use global learning data to quantify human capital. Their analysis show that human capital is similar to physical capital and plays an important role in explaining economic output. This reinforces the view that human capital can be measured and valued [5]. This theory can be extended to the hypothesis of collateralizability of human capital—future returns of human capital can be used as collateral. This concept has been applied in finance and corporate governance. For example, shared-appreciation agreements (e.g., Unison's home-equity products) illustrate a related principle: exchanging a share of future returns for current financing [6]. In this article, this hypothesis is applied by using AI-based evaluation to make the future value, potential, and risk of talent more measurable, predictable, and reliable, so that it can serve as collateral similar to a tangible asset.

2.3 Innovation Risk Sharing Mechanism

Traditionally, innovation risk-sharing has largely centered on government action. Lin and Lu (2023) show that government risk-sharing support can effectively increase corporate innovation investment [7]. Within enterprises, the willingness to bear risk fundamentally depends on confidence in the capabilities and potential of the core talent. In China, for instance, the Shenzhen municipal government introduced a pilot policy titled "Tolerating Failure in Science and Technology Innovation (Trial)" [8]. This offers a new perspective on innovation risk-sharing and failure tolerance by integrating internal and external approaches. Elements of this model have also been tested in practice internationally. For example, agencies such as NASA use milestone-based payment schemes that shift early R&D

ISSN 2959-6130

uncertainties to private firms. Theoretical research also indicates that outcome-based, fixed-payment arrangements reduce the burden of government accounting and oversight by transferring some early-stage technical risk to companies, thereby promoting innovation in public–private partnerships [9].

3. Research Method

3.1 Data Sources

This article employs a single-case study, focusing on Yili Group's adoption of AI-based talent evaluation in 2022. To deepen the analysis, the study examines (i) Yili's human capital valuation in 2021–2023, (ii) the transformation of its executive compensation structure since 2019, and (iii) changes in its innovation risk-sharing mechanisms over 2019–2023. Data are drawn from the Yonyou Enterprise AI Application Landing White Paper (Yonyou Network Technology Co., Ltd.), Yili's 2021–2023 annual reports, and the CSMAR database.

3.2 Case Company Introduction

Yili Co., Ltd. is a leading dairy producer in China. It went public in 1996, becoming the first A-share–listed company in China's dairy industry. Yili Group consistently ranks among the world's top five dairy companies and has been the number-one dairy enterprise in Asia for eleven consecutive years. It is also China's largest dairy producer, with a comprehensive product portfolio. As of year-end 2024, the company's total assets exceeded RMB 140 billion, and its return on equity (ROE) has remained around 20% for many years—approximately twice the industry average. In line with globalization and digital-intelligence trends, Yili has achieved end-to-end digitalization across its value chain and implemented advanced applications of AI and big data. Additionally, in 2020, Yili announced a long-term strategic goal of becoming the "world's number one dairy enterprise" by 2030.

4. Research Findings

4.1 AI Talent Evaluation and the Collateralizability Of Human Capital

In 2022, Yili Group introduced Yonyou's YonGPT for AI-based interviews, integrating the system into résumé screening, interview-question generation, and candidate communication. According to the Yonyou Enterprise AI Application Landing White Paper, and in line with its strategic goal of becoming the "world's number one dairy enterprise by 2030," Yili adopted AI for talent evaluation and explored advanced digital technologies. Under AI-enabled résumé screening, the time required for preliminary reviews fell by 70%, thereby improving HR efficiency. The accuracy of soft-skills assessment improved by 40%, reducing the likelihood of misjudgment. Throughout the process, the consistency between AI interview evaluations and HR assessments reportedly exceeded 92%, helping to maintain accuracy while reducing screening costs.

In this context, by instituting more precise screening and interview-evaluation procedures, AI reduces information asymmetry, thereby increasing predictability and reliability and ultimately enhancing the collateralizability of human capital. To examine the effect of introducing AI-based talent evaluation on human capital valuation, the study drew on Yili's 2021–2023 annual reports to extract the number of R&D personnel, total R&D investment, and per-capita R&D investment. Among these metrics, per-capita R&D investment was used as a key proxy for human capital valuation and was calculated as total R&D expenditure divided by the number of R&D personnel. The formula is as follows: per-capita R&D investment = total R&D expenditure / number of R&D personnel.

$$per\ capita\ R\ \&\ D\ investment = \frac{total\ R\ \&\ D\ investment}{number\ of\ R\ \&\ D\ personnel} \quad (1)$$

Table 1 shows that, between 2021 and 2023—and following Yili's 2022 adoption of AI-based talent evaluation—R&D headcount rose by approximately 33% while total R&D expenditure increased by roughly 41%, indicating an overall rise in the valuation of human capital. Over the same period, per-capita R&D investment increased by about 6.4%, which is consistent with enhanced collateralizability of human capital and suggests a greater willingness by Yili to invest in R&D personnel.

Table 1. Number of R&D personnel, R&D investment, and per capita R&D investment at Yili Group (2021–2023)

Year	2021	2022	2023
Number of R&D Personnel	461	607	613
R&D Investment as % of Revenue (%)	75%	90%	95%
R&D Investment (RMB)	601017082.00	821551260.99	850146147.17
Capitalized R&D Investment (RMB)	1303724.69	1353461.715	1386861.578

To further illustrate changes in human capital quality, this study examines the educational background of Yili's R&D workforce from 2021 to 2023 (Table 2). The number of R&D staff with a bachelor's degree or higher increased from 425 in 2021 to 623 in 2023. Over the same period, the share of the highest-qualified personnel (master's or doctoral degrees) in total R&D staff rose from 61.4% to 65.9%. These shifts suggest that Yili has improved the overall quality of its human capital by attracting higher-end talent. This proactive optimization of the talent structure is further evidence of the company's increased confidence in the value and collateralizability of its core human capital.

Table 2. Educational background of R&D personnel at Yili Group (2021–2023)

Year	2021	2022	2023
Doctoral	40	51	50
Master's	243	347	354
Bachelor's	142	169	169
Associate	21	26	27
High School and Below	15	14	13
Total	461	607	613

4.2 Compensation Contract Optimization and Innovation Risk Sharing

In pursuit of its strategic goal of becoming the world's number one dairy enterprise by 2030, Yili Group implemented its third equity incentive plan in 2019. Unlike the previous two plans, this long-term incentive took the form of restricted stock, with 152.428 million shares granted (nearly 3% of total share capital), a five-year vesting period in five tranches, and a six-year lockup. In 2020, Yili also introduced a Long-term Service Plan, under which the company would repurchase shares using its own funds over twenty years and transfer them to employees upon retirement [10]. While the compensation structure had been adjusted, its long-term effectiveness still hinges on accurately identifying the value-creation potential of the recipients. Accordingly, in 2022 Yili introduced AI-based talent evaluation—not to redesign the contracts, but as a key enabling tool to improve the accuracy of talent identification. This integration strengthens the existing long-term compensation system and optimizes its operation by reducing the risk of misallocation and underperformance arising from talent misjudgment, thereby enabling the system to better serve the company's long-term strategic objectives.

To gauge changes in Yili Group's innovation risk-sharing mechanism, this article examines the company's R&D capitalization rates for 2021–2023 and finds that the capitalization rate was zero in each year, meaning Yili recognized all R&D expenditures as incurred rather than capitalizing them. Accounting conservatism is an important internal governance mechanism: Laux and Ray show that conservative accounting can reduce managers' incentives to manage reported earnings by capitalizing R&D, making firms more inclined to expense R&D and more willing to bear current-period innovation risk [11]. Such conservatism not only curbs earnings management but also enhances the transparency and efficiency of innovation investment, reflecting a greater willingness to shoulder near-term R&D risk. Yili's choice to expense all R&D in the short term thus represents a continued willingness to accept short-term profit pressure in exchange for a more transparent innovation process, ultimately promoting sustainable, long-term innovative capacity.

Table 3. Number of R&D personnel, R&D investment, R&D investment as a percentage of operating revenue, and capitalized R&D investment at Yili Group (2021–2023)

Year	2021	2022	2023
Number of R&D Personnel	461	607	613
R&D Investment (RMB)	601017082	821551261	850146147.2
R&D Investment as % of Revenue (%)	0.55%	0.67%	0.68%
Capitalized R&D Investment (RMB)	0	0	0

As shown in Table 4, government subsidies for Yili Group's R&D increased by about 35.6% over 2021–2023,

ISSN 2959-6130

suggesting societal-level risk sharing. Together with these subsidies, Yili has effectively developed a firm-centered innovation risk-sharing mechanism coordinated with government support. Moreover, because AI-based evaluation has improved the predictability and collateralizability of core talent's value and potential, Yili appears more confident that these R&D investments will ultimately yield financial returns. This, in turn, makes the company more willing to bear all current-period risk in its financial reporting and to continue increasing investment, with government subsidies functioning as external support.

Table 4. Government subsidies for Yili Group's innovation R&D (2021–2023)

Year	2021	2022	2023
Government Subsidies (RMB)	809326488.18	964339450.59	1097651685.94

5. Discussion

By analyzing the Yili Group case, this article proposes an AI-enabled causal chain: using AI-based talent evaluation can significantly improve the precision of human capital valuation and forecasts of future performance. Greater measurability and predictability, in turn, enhance the credibility and collateralizability of human capital as an intangible asset. Building on this mechanism, firms can design more effective long-term incentive contracts that align managers' and shareholders' long-term interests, thereby optimizing compensation structures and promoting innovation risk sharing.

6. Conclusion

6.1 Main Findings and Implications

Based on the Yili Group case, this article finds that precise AI-based talent evaluation can enhance the collateralizability of human capital, thereby strengthening and stabilizing the existing long-term executive compensation system. In turn, greater confidence in the value of the company's talent increases its willingness to bear current-period R&D risk. Accordingly, we suggest that governments adopt policies that specifically support AI-driven talent evaluation to help firms improve the transparency and collateral value of human capital, thereby strengthening their capacity for long-term innovation. Corporate management should incorporate AI evaluation results into executive compensation design and performance incentive systems to improve talent identification and strengthen alignment with long-term shareholder interests. In practice, Yili's precise AI-talent evaluation has improved the operation of its long-term executive incentives and fostered an enterprise-centered innovation risk-sharing mechanism in collaboration with government, offering a useful model for other firms seeking to enhance the value of human capital and implement long-term strategies.

6.2 Future Research

This study has limitations inherent to a single-case design and to the use of a relatively narrow set of indicators. Future research could further explore specific dimensions of AI evaluation—such as talent potential, skills, and cultural fit—to examine how they shape assessments of human capital's collateralizability. It could also investigate how different government risk-sharing policies (e.g., subsidies, tax incentives, and failure-tolerance regimes) relate to firms' internal innovation risk-taking. In addition, cross-industry comparisons and large-sample empirical analyses would help validate and generalize the conclusions.

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