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Structural Contradictions and Solutions for Talent Shortages in High-Tech Industries: Empirical Evidence from Four Key Industries in Beijing Economic-Technological Development Area

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Keywords: High-quality development; Beijing Economic-Technological Development Area (BDA); talent shortage; supply-demand matching; policy optimization

Abstract: Based on the 2023 survey data on urgently needed talents in the Beijing Economic-Technological Development Area (BDA), this paper analyzes the demand for 517 job positions across four key industries: next-generation information technology, biomedicine and healthcare, high-end automobiles and new energy vehicles, and robotics and intelligent manufacturing. The study reveals the structural contradictions of talent shortages during the process of industrial upgrading. Findings show that 73.64% of enterprises in BDA face shortages of professional technical personnel, while high-level research talents and skilled workers simultaneously encounter challenges in both recruitment and retention. Key restrictive factors include household registration policies, high housing costs, and insufficient educational resources for employees' children. Based on these insights, the paper proposes an optimized, stratified talent policy framework to provide practical references for improving the human capital adaptation mechanisms in BDA.

1. Introduction

In recent years, with the deepening of the national innovation driven development strategy, the importance of high-level and high-quality urgently needed and scarce talents has become increasingly prominent. On March 26, 2024, the Ministry of Education issued a notice on further improving the establishment of undergraduate majors in ordinary higher education institutions, proposing to "train urgently needed and scarce talents in a targeted manner", emphasizing that undergraduate education should closely follow national strategic needs, optimize professional structure, and serve the development of key areas and strategic emerging industries. This orientation not only reflects the high importance that the country attaches to the talent training system, but also indicates that adjusting the structure of talent supply and demand has become an important task to support high-quality economic development.[1]

As a key force in the transformation of old and new driving forces, high-precision and cutting-edge industries play a core role in technological innovation, industrial upgrading, and international competitiveness enhancement. In recent years, national and local governments have

successively introduced multiple policies to actively support the development of new generation information technology, biomedicine, new energy vehicles, intelligent manufacturing and other fields, driving the continuous expansion of high-precision and cutting-edge industries, and the demand for specialized, compound and innovative talents continues to grow. The talent supply capacity of high-precision and cutting-edge industries has become an important indicator for measuring regional development potential and innovation capability. However, currently there is a lack of systematic and detailed identification and classification of the types, ability requirements, and scale of urgently needed talents in high-precision and cutting-edge industries. Relevant policy guidance mostly stays at the macro level, lacking precise alignment with job dimensions. Existing research mainly focuses on macro level industrial layout and higher education reform. Empirical analysis of the imbalance and mismatch of talent supply and demand, as well as optimization paths for micro level positions in high-precision industries, is still relatively insufficient, especially in key areas such as national development zones, where systematic research is still weak.[2]

In this context, it is of great practical value and theoretical significance to deeply identify the characteristics of the shortage of talents in high-precision and cutting-edge industries. On the one hand, it helps local governments to accurately formulate policies for talent introduction, training, and retention, enhancing the core competitiveness of regional industrial development; On the other hand, it can also provide reference for optimizing the professional structure and training mode of higher education institutions, promoting the effective connection between the education chain, talent chain, industry chain, and innovation chain, and promoting the dynamic balance of talent supply and demand.

Based on the awareness of the above issues, this article selects Beijing Economic and Technological Development Zone (hereinafter referred to as "Economic Development Zone") as the research object. As a national high-tech industrial development zone, the Economic Development Zone has gathered key industries such as new generation information technology, biomedicine, high-end automobiles and new energy vehicles, robots and intelligent manufacturing, and has strong representativeness and typicality. This article is based on the talent demand survey data of 110 key enterprises in the Economic Development Zone in 2023 and 517 job recruitment information. Using a combination of quantitative analysis and qualitative interviews, the article systematically sorts out the characteristics of scarce positions, constructs a job shortage index, and deeply analyzes the differences in dimensions such as industrial fields, job levels, and ability requirements. It explores the key factors that affect the imbalance of talent supply and demand in high-precision and cutting-edge industries, and strives to provide empirical support and policy reference for regional talent optimization and sustainable industrial development.[3]

2. Data sources and research methods

2.1 Data sources

The data in this article is sourced from a special survey conducted in the Economic Development Zone from June to December 2023. The survey was mainly conducted through enterprise questionnaires and the Zhilian Recruitment Big Data Platform, covering a total of 110 enterprises, including 70 private enterprises (64%), 23 foreign-funded enterprises (21%), and 11 state-owned enterprises (10%). Enterprises are distributed in industries such as new generation information technology (20.91%), new energy vehicles (3.64%), etc., and have obtained a total of 517 effective job recruitment information, involving various types of enterprises from the start-up stage to the mature development stage. [4]

2.2 Research Methods

This study employs a combination of qualitative and quantitative analysis methods. This study firstly performs data cleaning and filtering to remove part-time positions, duplicate posting positions, and positions with severe information loss, while retaining representative key positions. Secondly, it establishes a job shortage index system to evaluate the degree of shortage through two aspects: job posting frequency and recruitment difficulty expert scoring. Among them, the frequency of job posting accounts for 40% of the weight of the shortage level, and the difficulty of recruitment rated by experts accounts for 60% of the weight. Once again, perform range normalization on the obtained data and classify the degree of scarcity into three levels: extremely scarce (0.5-1), scarce (0.2-0.5), and moderately scarce (0-0.2). Finally, based on the calculated shortage index, a ranking analysis is conducted to determine the shortage positions and related characteristics of key industries. In addition, this study also conducted interviews and in-depth investigations with enterprises to understand the actual problems and difficulties in implementing talent policies, and obtained specific manifestations of key constraints such as household registration, housing, and children's education, in order to enhance the depth of analysis and the pertinence of policy recommendations.

3. Main research findings

3.1 Structural Characteristics of Talent Shortage

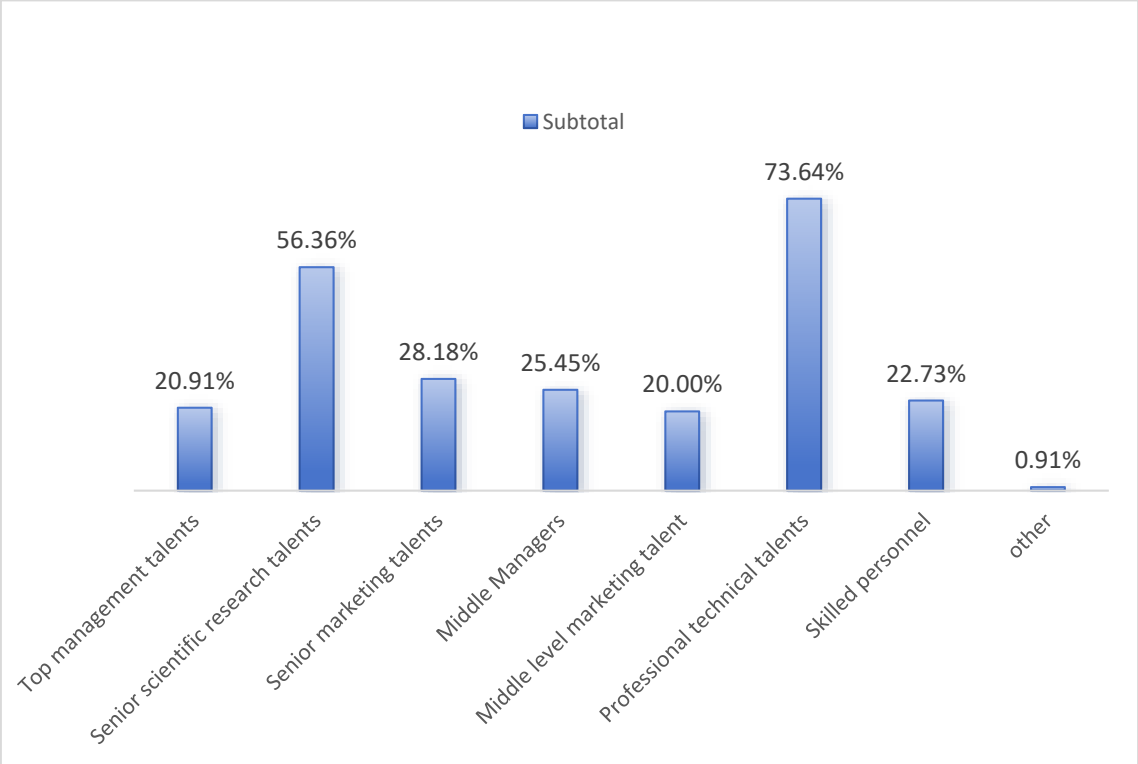

Figure 1: Types of Talent Shortage in Economic Development

According to the survey, the shortage of professional and technical talents is the most severe, accounting for 73.64% of the total number of enterprises, followed by senior scientific research personnel, accounting for 56.36%. There are significant industrial differences, with the highest proportion of "extremely scarce" positions in the robotics and intelligent manufacturing industries

reaching 46%. The demand for positions in the new generation information technology industry and the biopharmaceutical industry ranks second and third respectively. The demand for talents in the biopharmaceutical industry is the highest, with a total of 223 positions, reflecting the important position of the pharmaceutical industry in the economic structure of the Economic Development Zone. The demand for technical positions is particularly prominent, occupying a significant majority of all scarce positions, reflecting that technical talents have become an important bottleneck in the industrial development process of the Economic Development Zone, like the figure. (Figure 1)

3.2 Key factors for talent retention and turnover

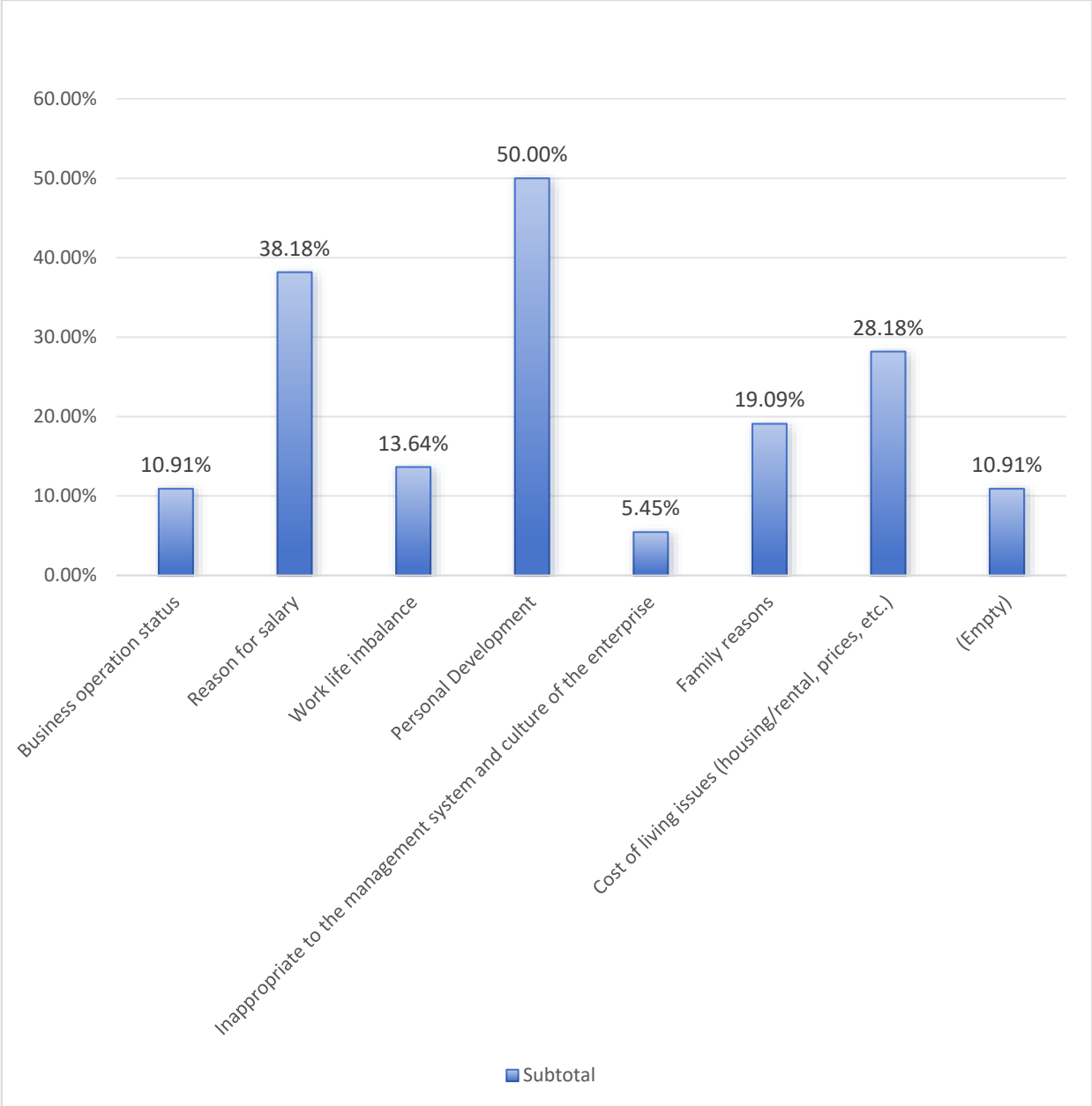

Figure 2: Key factors for talent introduction and retention

From the perspective of the key factors for talent introduction and retention identified by the

surveyed enterprises, the top three are salary and benefits, corporate culture, and household registration policies, accounting for 88.18%, 77.27%, and 69.09% of the total surveyed enterprises, respectively. The following are work environment, career planning, talent introduction rewards, and housing security, accounting for 60.91%, 60.91%, 60%, and 52.73%, respectively. Only 25.45% of the surveyed enterprises believe that regional environment is a key factor for talent introduction and retention, like the figure.(figure 2)

Research companies believe that the primary reason for employee turnover is based on personal development (50%), followed by salary reasons (38.18%), and cost of living issues (housing/rental, prices, etc.) as the third main reason (28.18%). Family reasons, work life imbalance, and business conditions account for 19.09%, 13.64%, and 10.91%, respectively, like the figure.(figure 3)

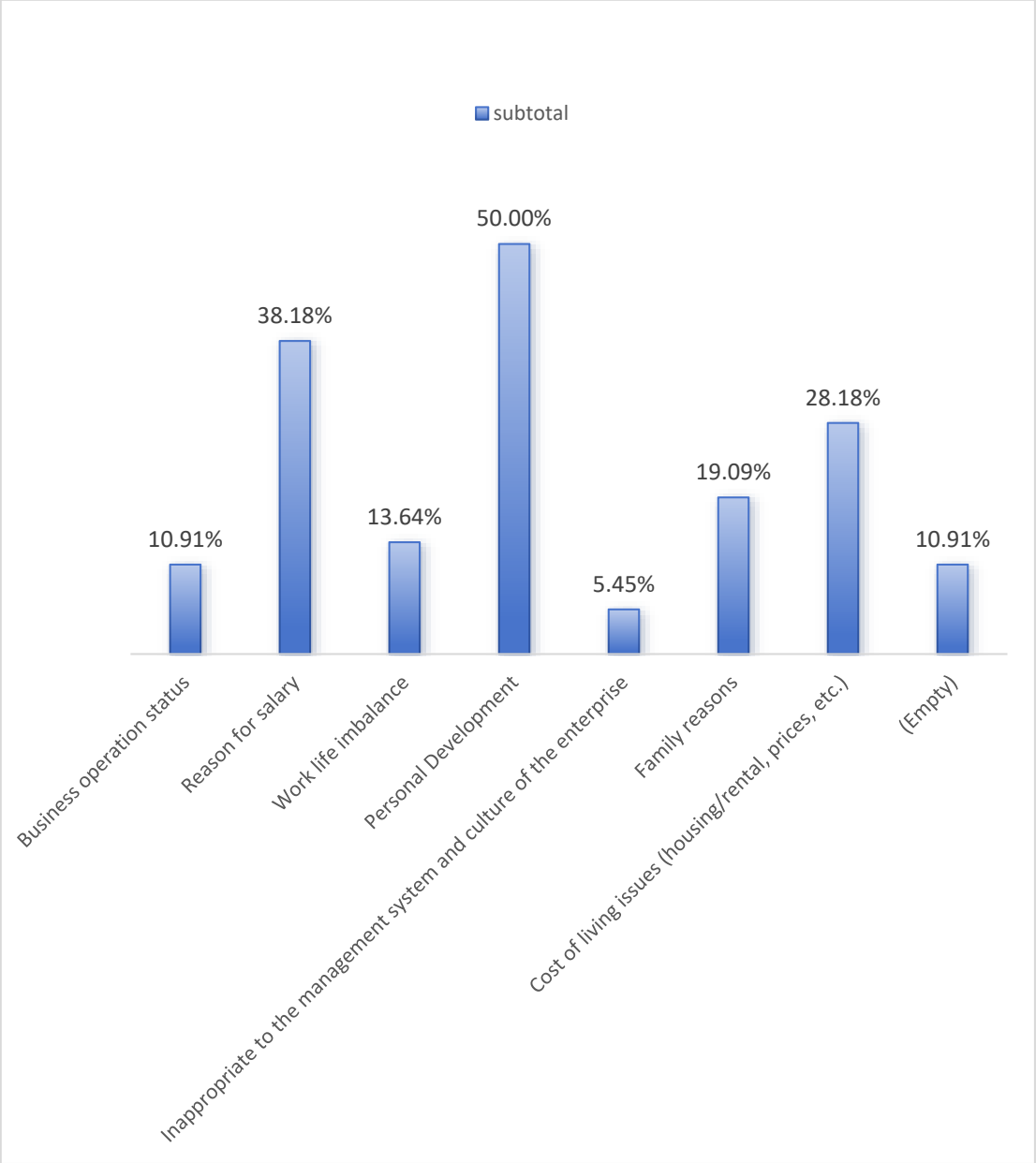

Figure 3: Reasons for Employee Resignation

4. Policy optimization suggestions

To effectively alleviate the practical difficulties faced by high-end and skilled talents in housing security, a tiered and classified housing support strategy should be adopted. For high-level scientific research talents, it is recommended to establish a property based doctoral community, with supporting facilities such as laboratories and libraries, to create a comprehensive living circle that integrates residence, scientific research, and academic exchange, in order to enhance the attractiveness of the region to top talents. For young technical backbone, a "3+2" gradient rental subsidy policy will be implemented, which provides a high proportion of rental subsidies in the first three years, gradually decreasing in the second two years, to help talents smoothly pass through the early stage of career adaptation. For skilled talents, especially frontline workers, a centralized accommodation or "shared apartment" model can be implemented in industrial parks, with supporting infrastructure such as transportation and medical care, to enhance the stability and sense of belonging of grassroots technical talents from the perspective of living security.[5]

5. Conclusion and Prospect

This study is based on the survey data of the demand for scarce professional talents in Beijing Economic and Technological Development Zone in 2023, and systematically analyzes the talent supply and demand situation and existing problems in the four key industries of new generation information technology, biomedicine, high-end automobiles and new energy vehicles, and robotics and intelligent manufacturing in the Economic and Technological Development Zone. Research has shown that in the context of accelerated industrial development in the Economic Development Zone, the structural shortage of high-end scientific research talents and professional technical talents is particularly prominent, and "inability to attract and retain" has become a common problem. At the same time, restrictions on household registration policies, high housing costs, and insufficient education support for children have been identified as the main factors leading to increased talent mobility and turnover rates. The current talent policy still has significant room for optimization in terms of precision, coverage, and implementation effectiveness.

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