

Research on the Evaluation of the Ecological Niche of the Elderly Care Industry Based on the Theory of Situation

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Abstract: The expansion of the scale of the elderly care industry, the acquisition of market share, and the seizure of high profits depend on the consistency between the ecological niche of the elderly care industry and the actual resource and environmental conditions. Based on the situation theory of ecological niche, this paper expands the factor of “energy” and represents the three dimensions of “state,” “potential,” and “energy” from three aspects: market niche, technology niche, and resource niche. Taking 220 listed companies as samples, this paper improves the traditional catastrophe progression evaluation model and uses structural equation modeling to test the validity of the indicator system, thereby conducting evaluation research on the ecological niche of the elderly care industry. From the results of niche potential energy measurement, the three dimensions of market niche, resource niche, and technology niche are unevenly developed, reflecting the lack of competitiveness of the elderly care industry.

Keywords: Elderly care industry; Ecological niche evaluation; Situation theory; Structural equation modeling

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1. Introduction

The “National Medium and Long-Term Planning for Actively Responding to Population Aging” regards responding to the aging population as a major national strategy. How to achieve the integration of meeting the needs of the elderly and high-quality economic development is the key issue to be solved. Currently, the elderly care industry is emerging, but there is a lack of data. The niche method was first applied to the study of ecological environmental systems. The elderly care industry fits the scenarios of ambiguity and species behavioral diversity applicable to niches. This paper treats the elderly care industry entities as various organisms, introduces the concept of niche into the field of population research, and conducts an empirical analysis of the niche level of China’s elderly care industry.

The current application of niche theory mainly focuses on studying the niche breadth, density, and overlap, exploring issues such as the adaptability of enterprises in the environment, enterprise elimination rate, and

niche overlap. Ren analyzed enterprise niche overlap from the perspectives of causes and morphological models, and further studied its correlation with enterprise competition. He believed that niche overlap is the essence of enterprise competition and leads to a relative scarcity of resources in the process ^[1]. In addition, scholars have also introduced niche theory, mainly based on niche situation theory, to evaluate enterprise competitiveness, establishing a comprehensive evaluation index system for assessment. He and Wang specifically proposed an evaluation index system for the core competitiveness of real estate enterprises, encompassing the “state,” “potential,” and interface dimensions of the enterprise niche, which more comprehensively reflects the core competitiveness of enterprises, especially real estate enterprises, than previous studies ^[2]. Yan constructed an evaluation system based on both state and potential aspects, using a combination of the AHP method and catastrophe theory to evaluate enterprise niches in the Chinese context ^[3]. The evaluation framework of niche situation theory is similar to the Yin-Yang theory and the “Qi” and “Blood” theory in traditional Chinese medicine ^[4]. Although the niche composition variables of the pension industry include policies, capital, technology, services, and talent, according to ecological synergy theory, only a few factors play a key role near the critical point of system change. This paper summarizes the key niche factors of the pension industry into three categories: market niche, technology niche, and resource niche. Based on niche situation theory, the “energy” factor is expanded, and the pension industry niche is evaluated from three aspects: market niche, technology niche, and resource niche, representing the three dimensions of “state,” “potential,” and “energy,” as shown in **Figure 1**.

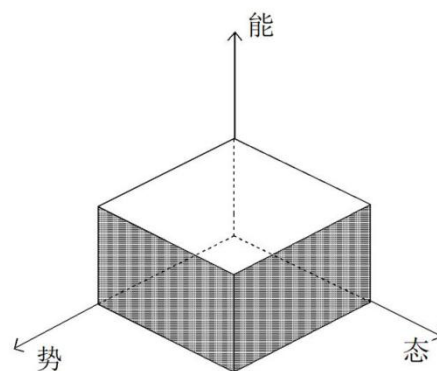


Figure 1. Three-dimensional diagram of “state-potential-energy” of niche in the pension industry

There are mainly two types of traditional situation and trend model evaluation methods. The first type treats the “state” and “trend” of the niche as two separate aspects, measuring them individually through different evaluation methods. However, using two sets of evaluation methods for the same evaluation object may lead to inconsistencies in evaluation scales and large computational workloads, resulting in significant errors ^[5]. The second type of indicator system construction is often based on subjective empiricism, ignoring the specificities of particular problems and lacking validation of whether the indicator system itself is reasonable. The dynamic research method adopted in this paper utilizes a centralized mutation function model and the mutation progression method to fit observations and statistical data of the niche system. This method can capture the primary and secondary relationships of contradictions, suitable for multi-objective comprehensive evaluation. It can conveniently identify mutation points and make decisions about system movements, addressing the limitations of previous static evaluation methods ^[6]. Traditionally, the indicator system for the mutation progression method is often derived subjectively, introducing a certain degree of subjectivity to the indicator system and affecting the

credibility of the comprehensive evaluation conclusions. This issue can be addressed by scientifically validating the effectiveness of the indicator system and improving the mutation progression method using structural equation modeling (SEM).

Therefore, this paper employs the situation and trend theory, collects and summarizes literature, and conducts research and analysis on 220 listed elderly care industry enterprises in 14 industries involving elderly care. It constructs a “state-trend-potential” evaluation index system, measures and analyzes the “state-trend-potential” of the elderly care industry by building an improved mutation progression evaluation model. This provides a theoretical basis and decision-making reference for promoting the development of various industries in China’s elderly care industry, and will facilitate the effective integration and rational allocation of resources in China’s elderly care industry from the institutional and mechanistic perspectives.

2. Construction of an evaluation index system for the elderly care industry niche

The evaluation index system for the elderly care industry niche serves as the structural framework for the development level system of the elderly care industry. The setting of the index system reflects the speed and trend of niche evolution in time, the overall layout and structure of niche evolution in space, the scale and efficiency of niche evolution in quantity, and the function and level of niche evolution in hierarchy. To quantify the elderly care industry niche, an evaluation index system is constructed from three dimensions: “state,” “trend,” and “potential,” corresponding to measurements of the market, technology, and resource niche levels of the elderly care industry.

The market niche factors of the elderly care industry mainly consist of eight indicators across three variables: profitability, operational capability, and social support. The technical niche factor adopts four indicators across two variables: technical research and development investment and technical research and development output. The resource niche factor is specifically divided into 11 indicators across four variables: enterprise scale, capital structure, growth ability, and solvency. The variable types, specific measurement indicators, and calculation formulas for each factor are shown in **Table 1**.

Table 1. Variable decomposition of the evaluation system for the elderly care industry niche

Variable analysis dimension	Variable type	Specific indicator	Meaning	Calculation formula/ notes
Market Niche Factor	Profitability	Sales Gross Margin	Reflects the competitiveness and profit potential of the company’s products	
		Return on Equity (ROE)	Measures the efficiency of a company in utilizing its own capital	
		Earnings Per Share (EPS)	Comprehensively reflects the company’s profit-making ability	
	Operational Capability	Total Asset Turnover	Measures the operational efficiency of enterprise assets	
		Inventory Turnover	Measures the operational efficiency of inventory in production and operation	
		Cash Turnover	Measures the efficiency of cash utilization	
	Social Support	Enterprise Value Growth Rate	Annual average market value, measuring the degree of annual increase/decrease	
		Intangible Assets	Important factors for sustaining enterprise development and establishing corporate image	Year-end Intangible Assets (billion yuan)

Table 1 (Continued)

Variable analysis dimension	Variable type	Specific indicator	Meaning	Calculation formula/ notes
Technology Niche Factor	Technology R&D Input	R&D Personnel Ratio	Represents the software component (personnel aspect) of the enterprise's R&D capability	
		R&D Expense Ratio	Measures the financial intensity of the enterprise's R&D investment	
	Technology R&D Output	Number of Technical Personnel	Represents the software component (personnel aspect) of the enterprise's technical capability	Year-end Number of Technical Personnel (persons)
		Number of Patents	Represents the output results of the enterprise's technology R&D investment	Year-end Number of Authorized Patents (items)
Resource Niche Factor	Enterprise Scale	Total Number of Employees	Measures the software component (personnel aspect) of enterprise scale	Year-end Total Number of On-Duty Employees (persons)
		Total Assets	Measures the stock aspect of enterprise scale	Year-end Total Assets (billion yuan)
		Operating Revenue	Measures the scale of annual revenue	Year-end Total Operating Revenue (billion yuan)
	Capital Structure	Shareholders' Equity Ratio	Reflects the proportion of owner investment in the enterprise's assets	
		Fixed Asset Ratio	Indicates whether there is idle capital in the enterprise's fixed assets	
	Growth Capability	Total Asset Growth Rate	Measures the capital accumulation ability and development capability in the current year	
		R&D Expense Growth Rate	Indicates the momentum of sustained growth in the enterprise's innovation capability	
		Net Profit Growth Rate	Measures the growth rate of the enterprise's current net profit compared to the previous period	
	Solvency	Asset-Liability Ratio (Net Assets)	Measures the security level for creditors granting loans	
		Current Ratio	Measures the ability of current assets to be converted into cash to repay debts before short-term debts mature	
		Quick Ratio	Measures the ability of highly liquid current assets to be immediately converted to repay current liabilities	
		Net Profit Growth Rate	Measures the growth rate of the enterprise's current net profit compared to the previous period	

The selection of the above indicators should objectively reflect reality, be scientific and reasonable, and take into account the availability of statistical data. This article mainly selects 23 indicators from three levels: market niche, technological niche, and resource niche of the pension industry. The pension industry niche is decomposed into an inverted tree-shaped index system, and the overall indicator is decomposed layer by layer into the more specific and quantifiable sub-indicators at the lowest level. When calculating, it is only necessary to know the raw data of the lowest-level sub-indicators.

3. Data sources and sample selection

Based on the “Classification and Codes of National Economic Industries” (GB/T4754-2017) used by statistical departments, this study focuses on 14 types of industries in the elderly care industry, including agriculture, forestry, animal husbandry, and fishery (A), manufacturing (C), construction (E), wholesale and retail (H), accommodation and catering (I), information dissemination, software, and information technology services (G), finance (J), real estate (K), leasing and business services (L), scientific research and technology services (M), resident services, repairs, and other services (O), education (P), health and social work (Q), and culture, sports, and entertainment (R).

Listed companies in China involved in the elderly care concept stocks are selected as research samples. On the one hand, from the perspective of supply, listed companies are characterized by large scale, strong financial resources, and strength. Most of them belong to oligopolistic or monopolistically competitive enterprises with economies of scale in the emerging elderly care industry. Therefore, the characteristic of high market share can be used as a typical representative of different industries in the elderly care industry. On the other hand, from the perspective of demand, listed elderly care companies represent the recognition and support of many consumers for the industry and enterprises. The longer the listing time and the higher the financial quality, the more they are favored by consumers and have greater market potential. Therefore, it is feasible to study and judge the development of China’s overall elderly care industry based on the development status of listed elderly care industry companies.

Based on the 2018 annual reports of elderly care industry enterprises in the Wind database, comprehensive data from 229 listed companies with continuous listing status in the Shanghai and Shenzhen stock markets as of the end of 2018 were selected. According to the classification of 14 industries in the elderly care industry, a total of 220 listed companies were selected as samples. All 23 indicators of the sample companies use publicly available data from 2018. The financial data involved comes from the Wind database, and other non-financial data is manually collated from the annual reports of the sample companies.

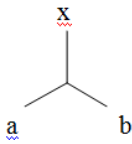
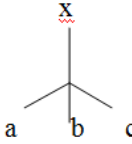
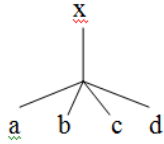
4. Construction of an improved catastrophe progression evaluation model

4.1. Principles of the catastrophe progression model

Catastrophe theory is an emerging mathematical branch that studies discontinuous phenomena. It has developed based on the theory of system structural stability, topology, and singularity theory. Its main idea is to classify critical points according to the potential function, study the characteristics of discontinuous states near various critical points, namely, several primary catastrophes with a limited number, and explore mutation phenomena in nature and society based on this.

By combining the bifurcation set equation in catastrophe theory with fuzzy mathematics, a mutation fuzzy membership function (normalization formula) is derived. The normalization formula converts the different qualitative states of various control variables within the system into a comparable qualitative state. The normalization formula performs comprehensive quantitative calculations, ultimately normalizing to one parameter, namely, calculating the overall membership function. This provides a comprehensive evaluation method for ranking and analyzing evaluation targets. See **Table 2** for specific models and calculation formulas.

Table 2. Catastrophe progression method evaluation model and formulas

Type	Fold catastrophe function	Cusp catastrophe function	Swallowtail catastrophe function	Butterfly catastrophe function
Schematic diagram				
Model	$f(x) = x^3 + ax$	$f(x) = x^4 + ax^2 + bx$	$f(x) = \frac{1}{5}x^5 + \frac{1}{3}ax^3 + \frac{1}{2}bx^2 + cx$	$f(x) = \frac{1}{6}x^6 + \frac{1}{4}ax^4 + \frac{1}{3}bx^3 + \frac{1}{2}cx^2 + dx$
Number of variables	a	a, b	a, b, c	a, b, c, d
Bifurcation set equation	$a = -2x^2$	$a = -6x^2$ $b = 8x^3$	$a = -6x^2, b = 8x^2$ $c = -3x^4$	$a = -10x^2, b = 20x^3$ $c = -15x^4, d = 5x^5$
Normalization formula	$x_a = \sqrt{a}$	$x_a = \sqrt{a}$ $x_b = \sqrt[3]{b}$	$x_a = \sqrt{a}, x_b = \sqrt[3]{b}$ $x_c = \sqrt[4]{c}$	$x_a = \sqrt{a}, x_b = \sqrt[3]{b}$ $x_c = \sqrt[4]{c}, x_d = \sqrt[5]{d}$

4.2. Optimization of the catastrophe progression method based on SEM

The catastrophe progression method decomposes evaluation targets into multi-level contradictions without examining whether the indicator system itself is reasonable. This may lead to significant errors due to the subjectivity of the indicator system construction, affecting the scientific validity and rationality of the conclusions. Therefore, it is necessary to improve and refine the traditional Catastrophe Progression Evaluation Model. SEM is used to test the effectiveness of the indicator system, eliminating evaluation errors caused by subjectivity. SEM can estimate and identify abstract concepts, with the application of covariance as its core. It can also handle average estimations, is suitable for large sample analysis, and has theoretical apriority. Structural equation analysis can be roughly divided into five steps.

5. Measurement of the “state-trend-energy” of the ecological niche in the elderly care industry

Step I: Non-dimensionalization Processing of Raw Data. Based on data from 220 listed companies, the original 23 indicator data points are first weighted and averaged, and then processed using a non-dimensional formula. The calculation formula is as follows:

$$C'_i = \frac{C_i - \min C_i}{\max C_i - \min C_i}$$

Where i represents the sample number, ranging from 1 to 220, and the standardized values range from 0 to 1.

Step II: SEM Indicator System Validation. 23 observed variables and 3 latent variables are identified. The latent variables represent the three analytical dimensions of the ecological niche in the elderly care industry:

market niche factor, technological niche factor, and resource niche factor. The observed variables are the 23 specific indicators selected from these three aspects of the elderly care industry.

The validity of the indicator system is tested using the structural equation method, implemented through the LISREL structural equation modeling software via programming. Additionally, to examine the stability of the improved model, a t-test and a goodness-of-fit test are conducted on the model. See **Table 3** for the LAMBDA-X output results.

Table 3. LAMBDA-X output results

Observable variable	Parameter estimation	Standard error	t value
A1	0.74	0.29	2.17
A2	0.87	0.31	2.31
A3	0.65	0.27	2.01
A4	0.61	0.26	2.00
A5	0.81	0.28	2.18
A6	0.92	0.29	2.14
A7	0.74	0.30	3.31
A8	0.69	0.27	3.01
B1	0.82	0.30	2.87
B2	0.83	0.28	2.92
B3	0.77	0.29	2.84
B4	0.63	0.24	2.51
C1	0.90	0.26	2.60
C2	0.81	0.31	2.05
C3	0.64	0.27	2.32
C4	0.71	0.27	2.77
C5	0.73	0.26	2.49
C6	0.70	0.30	2.35
C7	0.69	0.27	2.01
C8	0.84	0.26	2.08
C9	0.59	0.28	2.32
C10	0.66	0.29	2.11
C11	0.68	0.26	3.04

Based on the output results of the model in **Table 4**, the model's $RMSEA = 0.02 < 0.08$, $GFI = 0.91 > 0.9$, $NNFI = 2.26 > 0.9$, indicating a good fit of the model. Additionally, the model's $CFI = 1.04 > 0.9$, showing that no revision is needed. This suggests that the comprehensive evaluation index system for the ecological niche of the pension industry constructed in this paper is reasonable and highly stable.

Table 4. Test results of goodness-of-fit statistics

RMSEA	GFI	NNFI	CFI
0.02	0.91	2.26	1.04

Step III: Identify the type of catastrophic system. In catastrophe theory, the variables used to describe the system are divided into state variables and control variables. When the system is in a stable state, the value of the function remains constant. However, when parameters change within a certain range, the function may have multiple extrema, causing the system to transition from a stable to an unstable state, known as a catastrophe.

According to **Table 2**, commonly used catastrophe models include the fold catastrophe function, the cusp catastrophe function, the swallowtail catastrophe function, and the butterfly catastrophe function. The measurement of the ecological niche potential energy of the pension industry is a multi-factor system evaluation. In this case, the type of function is determined based on the number of control variables x . As shown in **Figure 2**, the profitability (B_{11}) of the market ecological niche factor has three control variables: gross sales margin (C_1), return on equity (C_2), and earnings per share (C_3), making it a swallowtail catastrophe function. Using statistical data from 220 listed companies in China's pension industry as of the end of 2018, a catastrophic progression evaluation model is constructed, as detailed in **Table 5**.

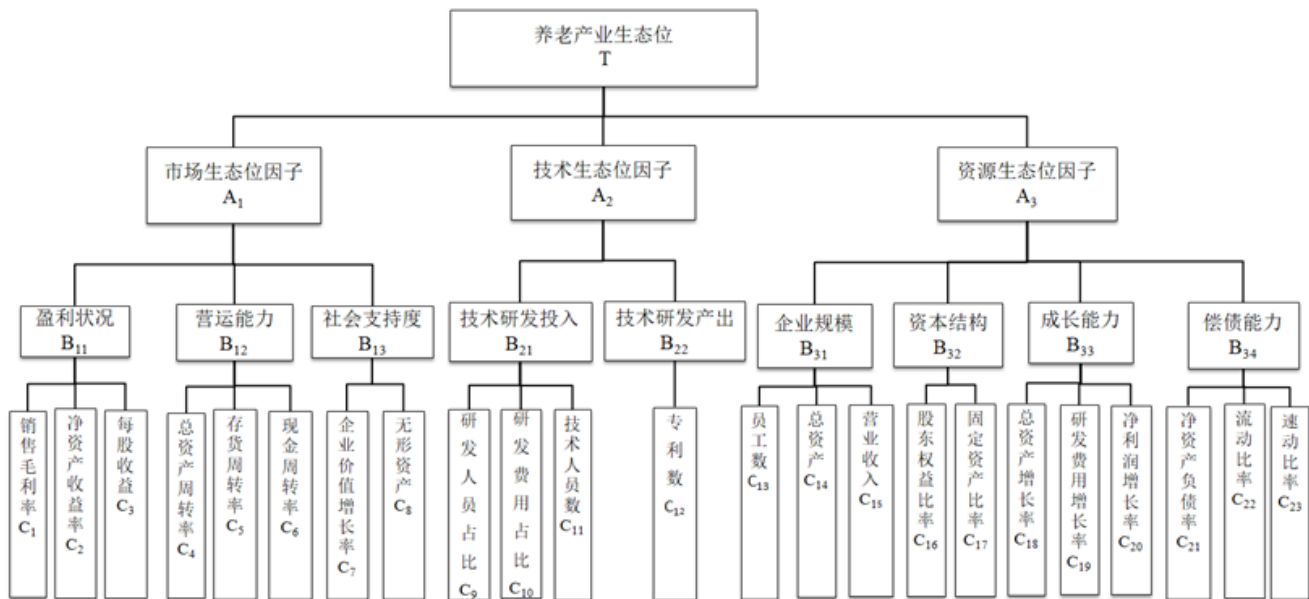


Figure 2. Comprehensive evaluation index system of the ecological niche of the elderly care industry

Table 5. Catastrophic model structure adapted to comprehensive evaluation indicators

T	A1	A2	A3	B11	B12	B13	B21	B22	B31	B32	B33	B34
The swallowtail model	The swallowtail model	The tip model	The butterfly model	The swallowtail model	The swallowtail model	The tip model	The swallowtail model	The folding model	The swallowtail model	The tip model	The swallowtail model	The swallowtail model

Step IV: Derive a normalization formula and use it for evaluation. For simplicity and typicality of the indicator system, complementary indicators are selected to jointly interpret each variable.

The catastrophic progression method is used to calculate the comprehensive strength of the enterprise's

ecological niche from three different dimensions: market, technology, and resource factors. The three ecological niche factors are decomposed layer by layer to the lowest level of quantitative indicators, determining the type of catastrophic function model $f(x)$ between different levels. Finally, the market ecological niche, technological ecological niche, resource ecological niche, and comprehensive ecological niche measurement values and rankings for 14 industry populations are obtained, as shown in **Table 6**.

Table 6. Measurement results of the ecological niche of industry populations in the pension industry

Industry population	Market niche	Ranking	Technology niche	Ranking	Resource niche	Ranking
A Agriculture, Forestry, Animal Husbandry and Fishery	0.77	7	0.46	6	0.71	14
C Manufacturing	0.82	1	0.43	12	0.76	1
E Construction	0.80	3	0.51	2	0.75	2
F Wholesale and Retail Trade	0.78	5	0.50	4	0.75	2
H Accommodation and Catering Services	0.77	7	0.32	14	0.75	2
I Information Transmission, Software and IT Services	0.76	10	0.52	1	0.74	10
J Finance	0.76	10	0.44	9	0.75	2
K Real Estate	0.79	4	0.44	9	0.75	2
L Leasing and Business Services	0.76	10	0.46	6	0.75	2
M Scientific Research and Technical Services	0.76	10	0.51	2	0.73	12
O Resident Services, Repair and Other Services	0.78	5	0.37	13	0.73	12
P Education	0.75	14	0.48	5	0.74	10
Q Health and Social Work	0.81	2	0.44	9	0.75	2
R Culture, Sports and Entertainment	0.77	7	0.46	6	0.75	2

6. Analysis of measurement results for the “state-trend-energy” of the elderly care industry’s ecological niche

Based on **Table 6**, a radar chart comparing the ecological niches of the elderly care industry is drawn, as shown in **Figure 3**. The measurement results are evaluated and analyzed from four aspects: comprehensive evaluation, market niche, technology niche, and resource niche.

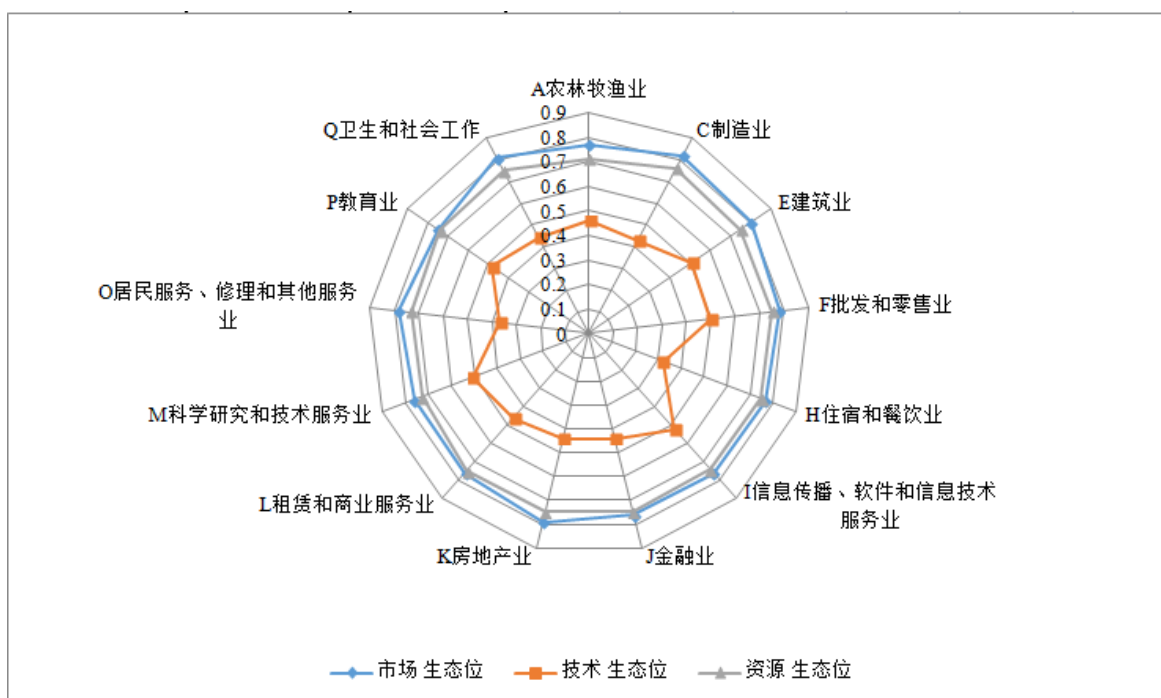


Figure 3. Radar chart comparing the measurement of ecological niches in the elderly care industry

6.1. Analysis of dimensional measurement results for the elderly care industry's ecological niche

From a comprehensive perspective, the elderly care industry's ecological niche is generally at a relatively early stage of development, and the three dimensions are unevenly developed. Among them, the market niche is located on the outermost layer of the circle, with the highest score above 0.75. This indicates that the elderly care industry contributes significantly to the economy, has a large market demand, and can drive China's economic development overall. The elderly care industry is expected to become a pillar, strategic industry, and a major engine of economic growth in China. The middle layer represents the resource niche, with measurement results ranging from 0.70 to 0.80. This suggests that the elderly care industry has a high capacity for sustained development and long-term benefits, indicating significant potential for growth. The innermost layer represents the technology niche, with scores ranging from 0.32 to 0.51. This reflects a lack of competitiveness in the elderly care industry, which currently serves as a bottleneck restricting its development in China. It also represents a direction that the country, as well as industries and enterprises, needs to overcome in the future. Cultivating and improving the technology niche is an urgent priority for the elderly care industry in China.

Based on the results of the market niche measurement (**Figure 4**), it can be observed that the discrimination of measurement outcomes for different industry market niche factors is relatively low, ranging overall from 0.75 to 0.82. Currently, the pension manufacturing industry contributes the most to China's economic development, serving as a pillar industry within the pension sector and positioned at the upstream end of the entire pension industry chain. Listed companies involved in pension manufacturing have the highest number in the entire industry, and in recent years, the market size growth rate of China's pension manufacturing industry has shown an upward trend. Ranked second is health and social work, which is related to the increasing total population of aging individuals in China and the high demand for care among elderly people who are advanced in age or have

difficulties in self-care. The third-ranked industry is construction. With the development of the pension industry, specialized pension healthcare, pension real estate, and integrated medical and nursing care models require accommodation and dining facilities that meet national standards, thus giving rise to a significant demand for pension construction services. In contrast, the pension education industry ranks at the bottom, with a measurement result of only 0.75. Although the government has introduced various policies to promote the development of the pension service industry, such as the Opinions on Promoting the Development of Pension Services issued by the General Office of the State Council in 2019, which emphasizes the need to vigorously develop elderly education as part of efforts to enhance the quality of pension services, overall, the pension education industry has developed slowly compared to other pension-related industries, and its market vitality has not been fully stimulated. In summary, although the scores for the three variables of profitability, operational capability, and social support, which consist of eight indicators calculated from bottom to top using the catastrophe progression method, vary, the final calculated scores for the market niche factors do not differ significantly. Different industry groups contribute roughly equally to the current national economy, with high overall income quantity and quality. The pension industry is a lucrative sector with a promising future, which explains why more and more enterprises are transitioning into this field.

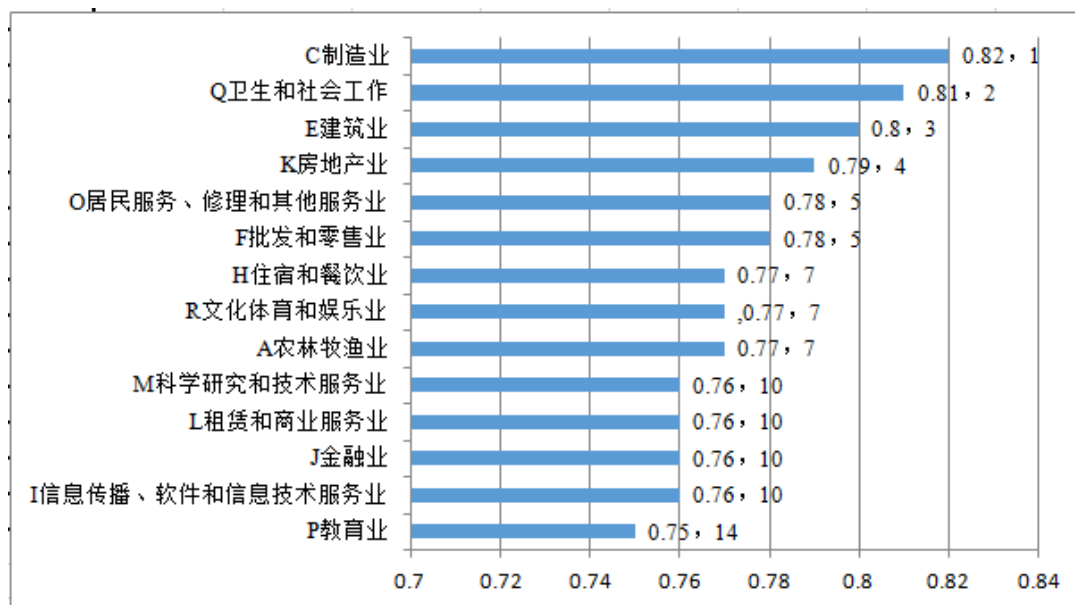


Figure 4. Results of the market niche measurement

Based on the results of the technological niche measurement (**Figure 5**), significant differences can be observed among various industry groups, with overall scores ranging from 0.32 to 0.52. Among these, the information dissemination, software, and information technology service industry ranks first, scoring 0.52. This is followed by the construction industry and the scientific research and technology service industry, both with a measurement result of 0.51. Evidently, to capture the elderly demographic, these industries require cutting-edge technologies to survive in the rapidly developing technological landscape of modern society. Consequently, they occupy the high ground in terms of technology among businesses catering to the elderly, thereby enhancing the overall competitiveness of the industry. The wholesale and retail industry ranks fourth with a score of 0.5. The primary reason for this is that businesses engaged in wholesale and retail for the elderly often operate as composite

enterprises with multiple industries and projects. As national policies increasingly favor businesses catering to the elderly, more companies are emphasizing scientific research input and output. These wholesale and retail enterprises often balance production, processing, and manufacturing, while registering as primarily engaged in wholesale and retail, subsequently expanding their business scope. Therefore, a high level of scientific research input and output leads to strong transformation capabilities of enterprise achievements, further enhancing their competitiveness in the market and forming a virtuous cycle. From the perspective of a technological niche, the manufacturing industry for the elderly has no advantages. Enterprises in this sector, along with their supporting manufacturers, are small in scale, resulting in limited resources for further investment. Globally, there are sixty thousand types of products for the elderly, with Japan offering forty thousand. However, China's manufacturing industry for the elderly provides fewer than three thousand products, indicating a shortage of product categories and a significant lag in technology compared to developed countries. The accommodation and catering industry ranks last with a score of only 0.32, a difference of 0.2 from the top-ranked industry. Enterprises in this sector reflect the varying levels of competitiveness among different industries. Service industries that do not require high technology tend to have weaker competitiveness.

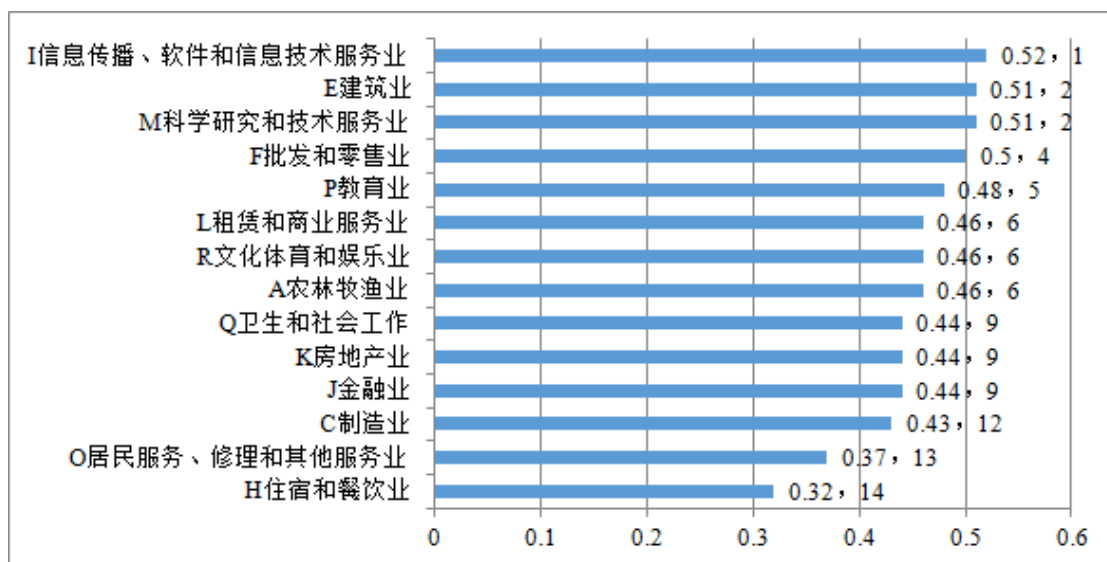


Figure 5. Ranking of measurement results of the technical ecological niche of the elderly care industry

Based on the measurement results of the resource niche (**Figure 6**), it can be seen that the niche evaluation values of various industries are very close, with a small standard deviation, falling into five gradients. The manufacturing industry ranks first with an absolute advantage of 0.76 in total score. This industry has the highest capacity for sustained development and long-term benefits. The second gradient includes eight industries: culture, sports, and entertainment; health and social work; leasing and business services; real estate; finance; accommodation and catering; wholesale and retail; and construction. The measurement results for all eight industries are 0.75. The third gradient comprises education, information dissemination, software, and technical services, with measurement results of 0.74 for both industries. The fourth gradient includes resident services, repairs, and other services. Agriculture, forestry, animal husbandry, and fisheries rank last, as their sustained development capability and long-term benefits are not currently favored. Overall, listed companies in the elderly care industry exhibit good enterprise scale, capital structure, growth capacity, and solvency. The elderly care

industry is showing a positive development trend, with strong, sustained development capability and promising long-term benefits. Although there is currently little overall difference among various industries, in the future, there will be a high degree of overlap among elderly care industries in terms of resource allocation, leading to increased competition.

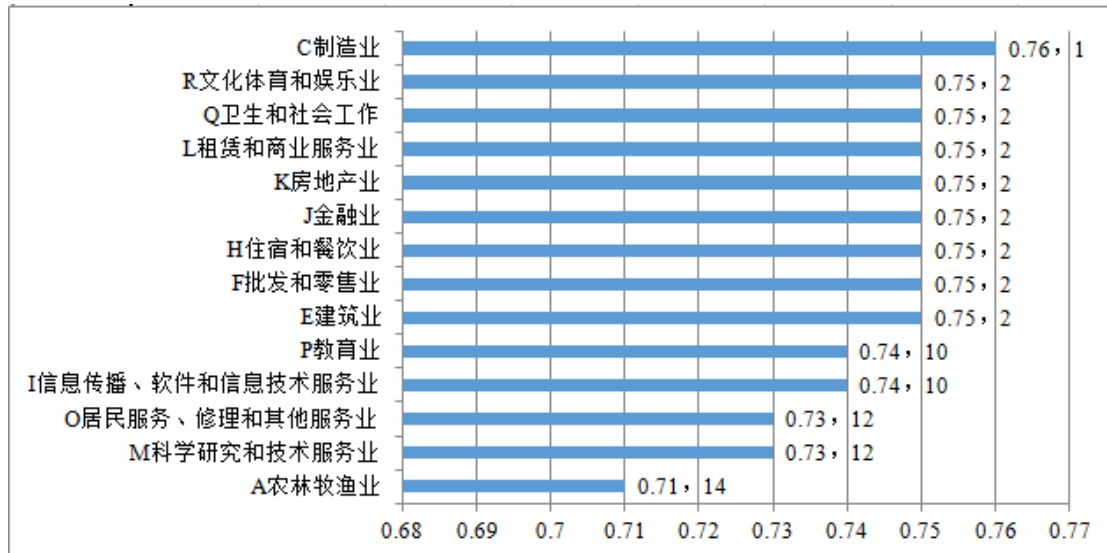


Figure 6. Ranking of measurement results of the resource niche in the elderly care industry

6.2. Analysis of niche measurement results by industry in the elderly care industry

Based on Table 6, which provides niche measurement values for the market niche, technology niche, and resource niche in the elderly care industry, we have plotted the “state-trend-energy” values for the elderly care industry niche in China, as shown in Figure 7.

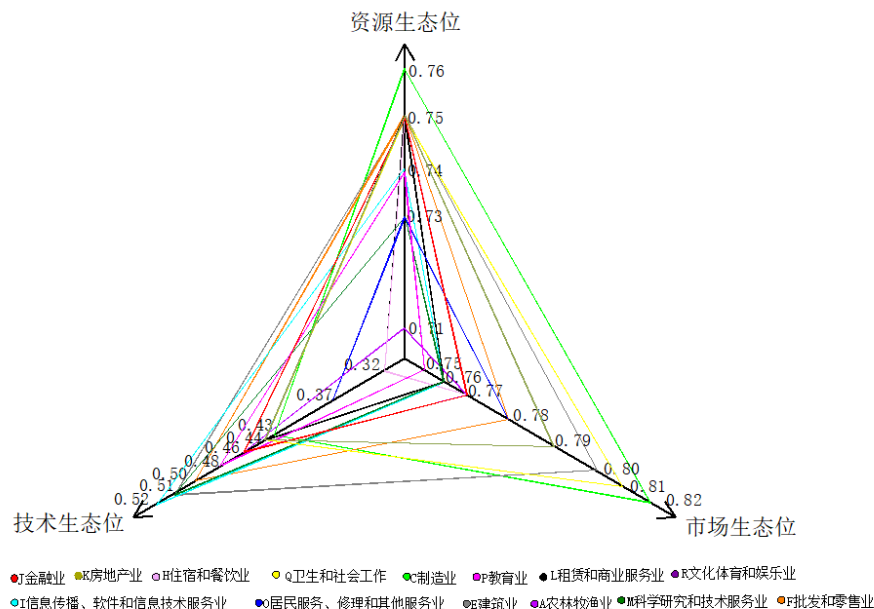


Figure 7. Measurement value of “state-potential-energy” of the ecological niche of the elderly care industry

As seen in **Figure 7**, which shows the “state-trend-energy” measurement values of the ecological niche of the pension industry, China’s pension industry has not yet formed a distinct circle, and the measurement results of various industries are intertwined, without forming a scale effect or a leading industry. The three dimensions of industry development—“state,” “trend,” and “energy”—are shifting. This indicates that there are obvious issues in the development of the pension industry, such as inaccurate industry positioning, low concentration of industrial elements in certain regions, and excessive “hot money” or “fast money” in investments. As a result, on the one hand, pension demand has not been fully released and converted into market demand, and on the other hand, the overall supply of elderly care services shows a low-level involution and lacks sustainable development momentum. This suggests that there are inaccuracies in the policy direction and focus of the development strategy.

Based on the ranking of population measurement values in **Table 6**, various industries are projected into the ecological niche space based on their ranking, as shown in **Figure 8** below, using AutoCAD software.

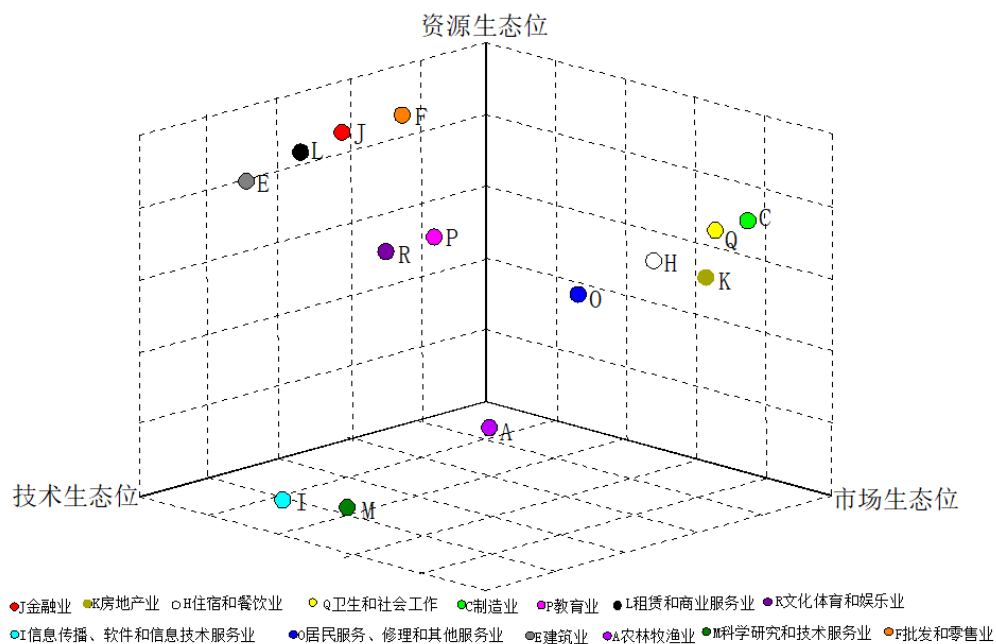


Figure 8. Spatial projection of the “state-trend-energy” ecological niche of the elderly care industry

As can be seen clearly from the figure above, the development of different industries has its own characteristics. Here, the spatial projection points are divided into three categories: market-constrained, technology-constrained, and resource-constrained.

6.2.1. Market-constrained

Market-constrained refers to industries where both the technical ecological niche and resource ecological niche rankings are high, while the market ecological niche ranking is relatively low. Industries with projections on the “resource-technology” ecological niche plane are classified as market-constrained. Among them, the financial industry (J), leasing and business services (L), and education (P) have market ecological niches ranked outside the top 10, which has become a shortcoming for the development of these industries.

The pension construction industry (E) ranks in the top three positions in all three dimensions of ecological niche level. As the country gradually pays more attention to the elderly population, the design specifications for elderly care facility architecture have gradually increased their standards. The leapfrog development of the pension industry in the future will require the driving and radiating effects of the construction industry.

The pension wholesale and retail industry (F) ranks highly in all three dimensions of ecological niche level. There is a wide range of health products, physiotherapy equipment, and daily living aids available on the market, and the sale of daily necessities tailored to the physiological characteristics of the elderly is gradually increasing in the pension wholesale and retail industry. In the future, as the number of elderly people increases, this type of lifestyle service industry will have a huge market and potential.

The pension finance industry (J) only has a resource ecological niche ranked 2nd, while its market and technical ecological niches are both lagging. Only a small number of elderly people are aware of the importance of financial planning for retirement and actively participate in commercial pension insurance and bank financial products, but this group is relatively small. However, China has not yet launched dedicated pension financial products, and some are only individual financial projects.

The leasing and business service industry (L) has the strongest resource ecological niche, ranking 2nd, followed by the technical ecological niche, and the weakest market ecological niche, ranking 10th. Although the overall market contribution of the elderly care service industry is high and its development potential is great, the leasing and business service industry does not occupy a major position, mainly relying on elderly consulting and intermediary services, and the leverage effect of economic growth has not been fully utilized. This industry is also a knowledge-intensive industry that can only provide services to elderly consumers through the professional knowledge of its employees, leveraging the industry's economies of scale.

The pension education industry (P) has the strongest technical ecological niche, ranking 5th; the resource ecological niche ranks 10th; especially the market ecological niche ranks last, which has become a current shortcoming of the industry's development. The development of China's geriatric education industry only stays at the level of public geriatric universities in various regions or activities organized by geriatric associations, and has not formed industrialized operations. There is a serious gap between this and the vast needs of many elderly groups, especially the highly educated elderly groups represented by the post-60s generation.

The cultural, sports, and entertainment industry (R) has a strong resource ecological niche, ranking 2nd; both the market and resource ecological niches are in the middle. Among them, the pension tourism industry has a strong momentum and obvious sustainable development trends. The results of the fourth sample survey of the living conditions of urban and rural elderly people in China show that the elderly have a strong willingness to travel. The better-developed cultural products for the elderly are newspapers, magazines, and books. There is a large demand for cultural supplies in the market, but there is insufficient investment in development and research. Developing high-end cultural products for the elderly is an important growth point for developing the elderly product market in the future and an important choice for vigorously developing the pension cultural industry.

6.2.2. Technology-constrained

The technology-constrained type refers to industries where both market niche and resource niche rankings are high, but the technology niche ranking is relatively low. Points projected onto the "resource-market" plane are classified as technology-constrained.

The manufacturing industry (C) is in good shape overall, with both market niche and resource niche

occupying the top position, but the technology niche lags significantly, ranking 12th. Daily use products, health products, and funeral supplies for the elderly are developing rapidly, but they are mainly limited to low-tech products, or core technologies are held by overseas companies, and there is an urgent need to increase technology research and development and output.

The resource niche of the elderly accommodation and catering industry (H) ranks second, leading the pack, and the overall prospects for future development are promising. The civil affairs security industry, which is most closely related to China's aging population, urgently needs to strengthen its technological level and improve the industry's competitiveness and market recognition.

The core of the elderly real estate business (K) is the sale and leasing of elderly-friendly housing, extending to park development, supporting construction, real estate management, property management, intermediaries, community services, and other businesses, closely related to the construction and finance, and insurance industries. The development of the elderly real estate industry is mainly manifested in three aspects: first, the entire industry entering the market; second, rapid cross-industry development; and third, strong investment appeal.

From the measurement results, the market niche of the resident services, repairs, and other services industries (O) is strong, ranking fifth. The main reason is the strong demand for home care, clinical care, and other home services for elderly people with disabilities. However, the technology niche and resource niche rankings of this industry are low. It is difficult to meet the daily care service needs of the elderly. With the trend of high-end and younger aging services in the future, the industry should improve the overall quality of employees and service standards, enhance the industry's resource allocation and utilization capabilities, and competitiveness.

The market niche and resource niche of health and social work (Q) both rank second, but the technology niche is weak. The medical needs of the elderly population are concentrated in healthcare, rehabilitation nursing, and daily care. The pension institutions included in this industry also face many problems. Firstly, the contradiction between supply and demand is very prominent. Secondly, there is an imbalance between public and private development. Thirdly, suburban nursing homes are operating with difficulties, while nursing homes in urban core areas are very scarce. Fourthly, home-based services cannot keep up with market demand. In summary, in addition to policy guarantees in the future, clear technical standards should be established, and the stability of technical services should be improved to enhance the overall development of the industry.

6.2.3. Resource-constrained

The resource-constrained type refers to industries that rank high in both market niche and technology niche but relatively low in resource niche. Points projected onto the "technology-market" niche plane are classified as resource-constrained. This type consists of three industries: agriculture, forestry, animal husbandry, and fishery; information dissemination; software and information technology services; and scientific research and technology services. All three industries rank below 10th in terms of resource niche.

The agriculture, forestry, animal husbandry, and fishery industry (A) has a mid-to-low level of niche measurement for various factors, particularly with the resource niche ranking at the bottom. Enterprises targeting the elderly market are inherently small-scale and have not achieved economies of scale. Such enterprises often require significant investment and have long cost recovery periods, resulting in weak solvency. Consequently, factors related to the resource niche, such as enterprise scale and solvency, have become bottlenecks affecting the industry's development. The overall score for the technology niche in the elderly care industry is relatively low, and technological input and output related to agriculture, forestry, animal husbandry, and fishery involving the

elderly are also areas that need strengthening.

The information dissemination, software, and information technology services industry (I) ranks high in terms of technology niche, occupying the top spot. However, it ranks relatively low in both market niche and resource niche. To ensure sustained competitiveness, it is crucial to build an information platform for elderly care services, improve the elderly information database, and drive development through emerging formats, thereby becoming a new growth point for the industry's economy.

The scientific research and technology services industry (M) has the strongest technology niche, ranking second. However, the measurement results for both market niche and resource niche in this industry are relatively low. As a modern service industry, it has not leveraged its unique technological advantages to achieve market effects. In the future, advanced scientific research advantages should be utilized to intensify research and development efforts for elderly healthcare products, rehabilitation and nursing supplies, assistive listening and vision products, elderly household items, and other in-demand products. This will help promote the overall technological development of the elderly care industry.

7. Conclusion

By introducing niche theory into the field of pension industry research and using multidisciplinary methods and tools, the interaction between populations and their possible trends is measured and evaluated. From the measurement results of niche potential energy, the three dimensions of development are unbalanced, with scores for market niche, resource niche, and technology niche decreasing in order, reflecting the lack of competitiveness in the pension industry. The pension industry has not yet formed a distinct circle as a whole, and the measurement results of various industries are intertwined, without forming a scale effect or a leading industry. The three dimensions of “state-trend-energy” in industry development counteract each other, and the niche ranking of various industries in the three dimensions illustrates their development shortcomings.

The data for measuring the “state-trend-energy” of the pension industry niche comes from listed companies in the pension industry. However, as the pension industry is still in its infancy, the absence of large or representative supply entities may result in data that is not typical enough and accounts for a small overall proportion, leading to errors in the measurement results. In the future, with the development of the pension industry and the improvement of national statistical indicators and measurement methods, the author will conduct key surveys on typical enterprise representatives in the pension industry, continuously improve the pension industry database, scientifically monitor regional industrial structure adjustment and pension industry development, and predict future development trends and key points of industrial structure adjustment in the pension industry.

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Disclosure statement

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