



Strategy Research on Driving Zhangjiagang's Leapfrog Development through High-Quality Population Development

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Abstract

This paper deeply explores the strategy of how Zhangjiagang City drives leapfrog development with high-quality population development. Through analyzing the current population status and development trend of Zhangjiagang City, the importance of high-quality population development in economic growth, social progress and urban competitiveness improvement is expounded. From multiple dimensions such as education enhancement, employment optimization, talent introduction, population structure improvement and social security reinforcement, specific strategies are proposed, aiming to provide theoretical basis and practical paths for Zhangjiagang City to achieve sustainable leapfrog development, and help it to create a more dynamic and charming urban development model under the new era background.

Subject Areas

Geography

Keywords

High-Quality Population Development, Leapfrog Development, Strategy Research

1. Introduction

In the process of Chinese-style modernization, high-quality population development has become a core issue of national strategy. General Secretary Xi Jinping clearly pointed out at the first meeting of the 20th Central Financial and Economic Commission that population development is a major event related to the great

rejuvenation of the Chinese nation, and it is necessary to support Chinese-style modernization with high-quality population development [1]. This important exposition has established the fundamental follow for population work in the new era. As an economic power that has been among the top three in the national top 100 counties list for many years, Zhangjiagang City is facing the deep-seated contradiction between population structure transformation and high-quality economic and social development:

1) The natural population growth has continued to be negative: Since 2018, the net population growth has expanded from -426 people to -3845 people in 2022, and the total registered population has decreased from 929,300 in 2021 to 927,300 in 2022, with a significant superimposed trend of low fertility and aging (the proportion of registered population over 60 years old has reached 28.7%, far exceeding the national average). The labor force structure does not match industrial upgrading, and traditional manufacturing industries are facing the dual pressures of “labor shortage” and “skill gap”, with the proportion of high-level talents only being 18% (lower than the average level of 25% in Suzhou), making it difficult to meet the demand for innovative talents in new quality productivity.

2) The imbalance in population spatial distribution has intensified: The three core areas of the Free Trade Zone, Economic Development Zone, and Metallurgical Park gather 62.2% of the population with 50.44% of the land area, contributing 80% of the GDP, while the peripheral towns such as Leyu Town and Daxin Town show the characteristics of “low population density and low economic output”, with a significant regional development gap. In this context, exploring the path of driving county economic leapfrog by high-quality population development is of urgent practical significance for Zhangjiagang City to solve the dual challenges of “disappearing population dividend” and “urgent industrial upgrading” and consolidate its competitiveness in the Yangtze River Delta region.

2. Research Status and Trends

2.1. International Research

Western scholars focus on the long-cycle impact of population structure on regional economy. For example, Acemoglu & Restrepo (2020) [2] revealed the mechanism of labor shortage forcing industrial automation innovation, and Glaeser (2018) [3] emphasized the driving role of population migration on urban innovation competitiveness.

2.2. Domestic Research

Cai Fang (2021) proposed a path to enhance the population dividend through education investment [4], and Yang Yu (2022) discussed the application of smart city technology in precise population management [5]. Although Zhangjiagang City has accumulated practical experience in talent policies (such as the “Gangcheng Talent Plan”) and educational resource optimization, it has not yet formed a systematic scheme for the coordinated development of “population-industry-

space”, especially in the research gaps in cross-regional population competition and aging industry development.

2.3. Research Trends

Global population research is shifting from “quantity control” to “quality-structure-space” comprehensive governance, highlighting three characteristics: 1) Dynamic matching: emphasizing the space-time adaptation of population distribution to industrial layout and resource environment; 2) Technology empowerment: geographic information system (GIS), big data and other technologies have become the core tools for analyzing population flow; 3) Policy coordination: the cross-departmental coordination of population policies with industrial policies and social security policies has become a trend.

3. Current Situation and Challenges of Population Development in Zhangjiagang City

In this section, we limit our study based on data from 2018-2022 Zhangjiagang Statistical Yearbooks. Some descriptive statistical methods are employed. Combining some related population growth theory and existing studies in the literature, current situation and challenges of population development in Zhangjiagang City are investigated in detail.

3.1. Analysis of Population Development Characteristics

3.1.1. Total Quantity and Natural Changes

At the end of 2022, the permanent population was 1,447,600, an increase of 14.8% compared with 2018, but the natural growth rate of the registered population has been negative for five consecutive years (-2.65‰ in 2022), and the “low growth trap” of the population has emerged. The number of births has decreased from the peak of 10,066 in 2014 to 3863 in 2022, and the willingness to have children has continued to be low.

3.1.2. Deep Aging of Age Structure

The proportion of registered population over 60 years old increased from 21.3% in 2012 to 28.7% in 2022, higher than the national (20.8%) and Jiangsu (22.15%) average levels; the working-age population decreased by an average of 1.2% annually, and the supply-demand ratio of elderly care beds was 42 beds per thousand elderly people in 2022, lower than the international standard (50 beds), with prominent pressure on elderly care services.

3.1.3. Spatial Distribution of “Core-Periphery” Differentiation

In the process of regional economic development, the relevance between population spatial distribution and resource allocation and industrial layout has become increasingly prominent. As a typical representative of the county economy in the Yangtze River Delta region, the population development of Zhangjiagang City not only faces common challenges such as weak total growth and deep structural

aging, but also presents unique spatial distribution characteristics. From the perspective of the spatial coupling relationship between population and economy, the city's population distribution shows a significant "core-periphery" differentiation pattern, see **Table 1**. This differentiation not only reflects the historical cumulative effect of regional development, but also puts forward urgent requirements for the future coordination of population and industry and the optimization of spatial governance. An in-depth analysis of the formation mechanism and impact behind this phenomenon is of great significance for solving the dual dilemma of "over-concentration in the core area and lagging development in the peripheral area" and promoting the mutual promotion of high-quality population development and regional economic transformation and upgrading.

Table 1. Zhangjiagang spatial distribution "core-periphery" differentiation.

Tier	Town	Population Share (2021 year)	GDP Share (2021 year)	Population Density (people/km ²)	Core Characters
1st tier	Bonded Area, Economic Development Zone, Metallurgical Park	62.2%	80.06%	1001 - 1859	High economic agglomeration, high population density
2 nd tier	Tangqiao Town, Fenghuang Town, Nanfeng Town	25.8%	15.2%	843 - 995	Sub-center under cultivation, key period for industrial transformation
3 rd tier	Leyu Town, Daxin Town, Changyinsha	12%	4.74%	535 - 958	Significant population loss, economic scale

Data source:2021 Zhangjiagang Statistical Yearbook

<https://www.zjg.gov.cn/zjgszwz/tjnj/202301/64b7b04efec14865a75e857cf7f27d85.shtml>.

3.2. Core Challenges

Structural shortage of labor supply: Traditional manufacturing industries (such as textile and metallurgy) are facing "difficulty in recruiting workers" and "skill mismatch". More than 70% of migrant workers have a education level below junior college, making it difficult to meet the needs of emerging industries such as new energy and new materials; the attractiveness of high-level talents is insufficient, and the retention rate of college graduates in Gang for nearly three years is only 12%, lower than the average level in Suzhou (18%).

Risk of "low-end locking" in population flow: In 2022, there were 660,300 non-local temporary residents, but only 18% had a bachelor's degree or above, mainly engaged in low-end service industries and manufacturing labor, coexisting "population quantity dividend" and "population quality deficit"; the "talent brain drain effect" of cities in the Yangtze River Delta has intensified, and Zhangjiagang is facing the squeeze of central cities such as Shanghai and Suzhou in the competition for high-end talents.

Insufficient spatial governance efficiency: The land development intensity in the core area is close to 50%, and the pressure of population overload is evident,

while the public service supporting facilities in the peripheral towns are lagging (such as the coverage rate of high-quality middle schools in Tangqiao Town is only 60% of that in the main urban area), making it difficult to attract population agglomeration; the cross-district and town population flow lacks overall planning, and the construction of rail transit (such as Suzhou Rail Transit Line 10) is lagging, restricting the realization of the “job-housing balance” goal.

4. Driving Mechanism of High-Quality Population Development

4.1. Coupling Mechanism of Human Capital Improvement and Industrial Upgrading

4.1.1. “Education-Industry” Two-Way Empowerment System

Targeted vocational education training: Relying on the Zhangjiagang Campus of Jiangsu University of Science and Technology, it offers majors such as “New Materials Engineering” and “Intelligent Equipment Manufacturing”. In 2023, the “Thousand Artisan Cultivation Plan” was launched, and 10 industry-education integration training bases were established in conjunction with Shagang Group and Yonggang Group, with the goal of cultivating 15,000 high-skilled talents within five years.

Innovation of lifelong education system: Carry out the “enterprise new apprentice system”, and the government will give a training subsidy of 5000 yuan per person per year, which is expected to cover more than 60% of industrial enterprises above designated size by 2025.

4.1.2. Precision Upgrading of Talent Policies

“Targeted talent introduction” mechanism: Establish a 100-million-yuan talent development fund, provide a maximum project subsidy of 5 million-yuan for “necklace technology” teams (such as semiconductor and hydrogen energy fields), and implement “one-person-one-policy” supporting services (such as priority in children’s enrollment and medical green channels) for leading talents.

“Flexible talent introduction” model: Co-build a “Yangtze River Delta talent enclave” with Shanghai Jiao Tong University and Nanjing University of Science and Technology, allowing researchers to work in “double bases” and enjoy Zhangjiagang housing subsidies (up to 800,000¥) and scientific research fund matching.

4.2. Coordination Mechanism of Population Structure Optimization and Spatial Layout

4.2.1. Adaptive Governance for Aging Society

“Time bank” mutual assistance elderly care: Pilot the “low-age helping high-age” service model in the Economic Development Zone, where volunteers can exchange service hours for future elderly care rights, and plan to develop 5000 registered volunteers in 2023.

Industrial development of silver economy: Build a “health care industry park” relying on Fenghuang Mountain Scenic Area, introduce high-end elderly care

institutions such as Taikang and Sino-Ocean, and develop “traditional Chinese medicine physiotherapy + cultural tourism” products, with the goal of exceeding 8 billion¥ in silver industry output value by 2025.

4.2.2. Multi-Center Population Layout Strategy

Enhancing the capacity of Tangqiao sub-center: Plan a “15-minute living circle” relying on the high-speed rail hub, build branch hospitals of tertiary hospitals and international schools, add 3000 talent apartments before 2025, attract the headquarters of high-tech enterprises to settle in, and aim to gather 200,000 people by 2030.

Urban-rural integration “new citizen plan”: Implement the “vocational skill training + points-based household registration” policy for agricultural transfer population in peripheral towns, plan to transform 8000 agricultural population in 2023, and build 10 new rural communities in supporting facilities.

4.3. Institutional Innovation and Policy Guarantee Mechanism

4.3.1. Construction of Fertility-Friendly Society

Fertility support policy combination: Extend maternity leave to 158 days, issue laddered fertility allowances (5000¥ for the first child, 15000¥ for the second child, 30,000¥ for the third child), and build 12 inclusive childcare institutions in 2023 to achieve full coverage of childcare services within 3 kilometers in the main urban area; Breakthrough in fatherhood responsibility system: Pilot the “paternity leave” (15 days of full-pay leave), and include the participation of men in child-rearing in the corporate social responsibility evaluation system.

4.3.2. Cross-Departmental Coordination Governance Mechanism

“High-quality Population Development Leading Group”: Led by the mayor, it coordinates 12 departments such as development and reform, education, and health, and establishes a quarterly joint meeting system to focus on promoting the policy linkage of “population-land-industry” (such as giving priority to guaranteeing industrial land indicators in population agglomeration areas).

Dynamic monitoring and evaluation system: Build a monitoring system including 18 indicators such as population natural growth rate, talent contribution rate, and aging index, and issue the Zhangjiagang Population Development White Paper every year to provide data support for policy adjustment.

5. Strategies and Paths for High-Quality Development

5.1. Talent Strong City Strategy: Building a Full Chain of “Introduction, Cultivation, Retention and Utilization”

High-end talent “siphon project”: Establish the “Gangcheng Outstanding Talent Award”, and give a maximum reward of 2 million¥ to enterprise talent teams with an annual contribution of more than 100 million¥; co-build “graduate employment bases” with universities in the Yangtze River Delta, and give one-time living subsidies of 80,000¥/150,000¥ to master’s and doctoral graduates who stay in

Gang for employment.

Local talent “quality improvement project”: Implement the “entrepreneur echelon cultivation plan”, and select 50 young entrepreneurs to study in Silicon Valley, Shenzhen and other places every year; establish a “skill talent points-based household registration bonus system”, and senior technicians can enjoy the same household registration treatment as undergraduates.

5.2. Spatial Reconstruction Strategy: Creating a “One Main, One Sub, Two Belts, and Three Corridors” Pattern

To address the structural contradiction of “core-periphery” differentiation in Zhangjiagang’s population spatial distribution, optimizing spatial governance and guiding rational population layout have become key breakthroughs for promoting high-quality development. Based on the collaborative development needs of population, industry, and resources, this study proposes a spatial reconstruction strategy of “One Main, One Sub, Two Belts, and Three Corridors”, see **Table 2**. By defining the positioning and implementation paths of each functional area, the strategy aims to resolve the dual dilemmas of population overload in core areas and underdevelopment in peripheral towns, and construct a new spatial pattern of “functional agglomeration, job-housing balance, and urban-rural integration” to provide spatial support for high-quality population development and regional economic transformation and upgrading.

Table 2. Proposal for the “One Main and One Sub-center, Two Belts and Three Corridors” Layout in Zhangjiagang.

Space Layout	Core Content	Implementation Path
One Main (Main Urban Area)	Central Vitality Zone	Optimize commercial complexes (such as Zhangjiagang Center), cultural landmarks (such as the new Science and Technology Museum), and control population density $\leq 12,000$ people/km ²
One Sub-center (Tangqiao Sub-center)	High-speed Rail New City	Construct a “Industrial Community Talent Apartment Rail Transport Hub” complex, and introduce 0 headquarters of technology-based enterprises by 2025
Two Belts	Riverside Ecological Economic Belt	Integrate the bonded port resources, develop green industries as hydrogen and LNG, and build supporting riverside talent apartments
	Sitong Science and Technology Corridor	Build cross-regional industrial parks with Nantong Wuxi, and explore the “offshore labor” model
Three Corridors	Innovation Corridor (Main Urban Area-Tangqiao)	Layout and research institutes (such as Jiangsu University of Science and Technology Industry Research Institute), incubators
	Intelligent Manufacturing Corridor (Bonded Area-Iron Steel Park)	Focus on developing high-end equipment and new material industries, and build 100 smart factories
	Health and Wellness Corridor (Fenghuang Mountain-Changyin Sand)	Connect ecological scenic spots and elderly communities, and develop “forest health preservation” and “farmhouse retirement” products

5.3. Silver Economy Strategy: Cultivating New Growth Poles

Innovation in Elderly Care Service System: Implement the “property management

+ elderly care” service model, where community elderly care centers are operated by enterprises such as Country Garden and Vanke to provide customized services like meal assistance and rehabilitation. Pilot a mechanism linking the long-term care insurance with commercial insurance to expand the coverage of nursing subsidies for disabled elderly (target: reaching 80% by 2025).

Development of Elderly Human Resources: Establish a “retired experts database” to guide retired professionals in medical and educational fields to participate in grassroots services (e.g., rural revitalization consultants), and provide transportation and communication subsidies. Support universities in “Silver Age Classes” to encourage the elderly to participate in vocational skill training (e.g., e-commerce operations) and meet community volunteer service needs.

5.4. Policy Coordination Strategy: Breaking Down Institutional Barriers

Linkage Between Population and Land Policies: Implement a “population density-land use index” linkage mechanism to increase residential land supply in towns with net population inflows (e.g., Tangqiao Town will add 20 hectares of residential land in 2023). Explore the “point-style land supply” model to support flexible land use for health care and cultural tourism projects.

Cross-Regional Population Collaboration: Co-establish a “talent sharing platform” with Suzhou and Wuxi to achieve cross-city mutual recognition of social security and housing provident funds. Join the Yangtze River Delta “Elderly Care Service Alliance” to promote real-time settlement of medical insurance for off-site elderly care and mutual recognition of nursing staff qualifications.

6. Research Conclusions and Prospects

6.1. Research Conclusions

The core of high-quality population development in Zhangjiagang lies in resolving three major contradictions:

Total Quantity Contradiction: Hedging natural negative growth through fertility-friendly policies and talent introduction and cultivation, aiming to reach a permanent population of 1.5 million by 2030, with the working-age population proportion stabilized above 65%.

Structural Contradiction: Optimize the age structure and skill structure through vocational education upgrading (e.g., “dual-system” reform) and silver economy development (e.g., health care industry).

Spatial Contradiction: Guide rational population agglomeration based on the “one main, one sub” layout, with the goal of narrowing the GDP proportion gap between core areas and peripheral towns to 6:4 by 2025.

6.2. Research Prospects

Future research intends to use regression analysis and system dynamics models to quantify the contribution rate of population structure changes to GDP growth

(e.g., a 1% increase in the working-age population drives a 0.8% GDP growth). It will also evaluate the effectiveness of GIS and AI in dynamic population monitoring (e.g., real-time early warning of population overload risks) to optimize public resource allocation. Additionally, it will explore the construction of county-level coordination mechanisms for “population-industry collaboration zones” with surrounding counties and cities such as Jiangyin and Changshu.

It is recommended to include Zhangjiagang City in Jiangsu Province’s high-quality population development reform pilot program, to pioneer trials in areas such as fertility policy breakthroughs (e.g., tax deductions for fertility subsidies) and household registration system innovations (e.g., “residence duration + contribution points” household registration), providing replicable reform experience for counties nationwide. Through the dual path of “driving industrial leapfrog with population quality improvement and releasing growth potential through spatial governance optimization,” Zhangjiagang is expected to achieve the transformation from a “large population city” to a “strong population city” in the era of new quality productivity, providing a vivid example for county-level practices of Chinese-style modernization.

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Conflicts of Interest

The authors declare no conflicts of interest.

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