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Pension Finance and it's Impact on Urban Household Consumption: Evidence from South China

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ABSTRACT: Against the backdrop of rapid population aging in China, pension finance—the institutional link between old-age security and capital markets—has drawn increasing attention as a potential driver of household consumption. Using municipal and provincial panel data for Guangdong, Guangxi, and Hainan in South China over the period 2014–2023, this paper employs two-way fixed-effects models, supplemented by province-specific time-series regressions, lagged-core-variable tests, and robustness checks that exclude the pandemic years, to examine the impact of pension finance on both the scale and the structure of urban household consumption. The results show that, first, at the aggregate level, neither the basic pension insurance coverage rate nor enterprise annuity assets exert a significant effect on total urban household consumption, indicating that pension finance has limited capacity to expand aggregate consumption. Second, at the structural level, a one-percentage-point increase in the basic pension insurance coverage rate reduces subsistence consumption by approximately RMB 149.81 and increases development-oriented consumption by approximately RMB 101.35, implying that the principal role of pension finance lies in promoting consumption-structure upgrading. Third, enterprise annuity assets have a positive but not fully robust effect on development-oriented consumption, emerging mainly in non-pandemic years or under looser specifications. Overall, pension finance in South China mainly optimizes the consumption structure rather than expanding aggregate consumption, and the first pillar plays a stronger role than the second pillar.

KEYWORDS: pension finance, urban household consumption, consumption-structure upgrading, South China

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1. INTRODUCTION

1.1 Research background and significance

China has fully entered a moderately aging society, and this demographic shift has far-reaching implications for both macroeconomic performance and household decision-making. According to the latest data of the National Bureau of Statistics (NBS), by the end of 2024 the population aged 60 and above had reached 312 million, accounting for 22.0% of the national population, of whom 220 million (15.6%) were aged 65 and above. These figures indicate that the pace of aging is accelerating and that the traditional social security system and the consumption behavior of ordinary households are being reshaped in unprecedented ways.

In this context, pension finance—the mechanism that connects old-age security with capital markets—has become a critical issue for the sustainable development of the national economy and the improvement of social welfare. On the one hand, it serves as a core driver of the emerging "silver economy"; on the other hand, by providing relatively stable expected returns and risk protection, it hedges the uncertainty arising from longevity risk, releases excessively suppressed precautionary savings, and profoundly changes households' intertemporal consumption and asset-allocation decisions.

However, the mechanism through which pension finance affects consumption is complex in practice. Whether it suppresses current consumption willingness or stimulates latent consumption vitality, and whether its effects differ significantly across regions, remain open questions. Existing studies have mostly focused on the national aggregate or on specific regions such as the Yangtze River Delta and the Beijing–Tianjin–Hebei area, whereas South China—comprising Guangdong, Guangxi, and Hainan—has received markedly less attention. Although the three provinces belong to the same geographical macro-region, they exhibit an extremely steep economic gradient and very different pension finance development profiles. Guangdong, with a highly developed

economy, has long had a relatively low basic pension insurance coverage rate because of its huge migrant and flexible-employment population. Guangxi, driven by the poverty-alleviation campaign and the rural revitalization strategy, has achieved a leapfrog expansion of pension coverage, yet its residents' consumption base remains comparatively low. Hainan, supported by free trade port (FTP) policies, has attracted a large inflow of talent and ranks among the leading regions in pension finance innovation pilots. These characteristics—a large economic gradient, unbalanced pension finance development, and distinct consumption patterns—make South China an ideal sample for analyzing the regional heterogeneity of pension finance effects.

Accordingly, this paper first constructs panel data models to empirically examine the aggregate effect of pension finance on consumption, its differentiated performance across regions, and the mechanism of consumption-structure upgrading; it then combines the empirical findings with the actual conditions of the three provinces to propose targeted and differentiated policy recommendations.

In theoretical terms, this paper enriches the literature on the regional heterogeneity of the consumption effects of pension finance and fills a gap in existing research on South China. By introducing a macroeconomic gradient into a micro-level consumption framework, it clarifies the differentiated transmission mechanisms of pension finance across regions at different stages of economic development. In practical terms, the study provides direct empirical references for the three provinces to formulate locally adapted pension finance policies—helping Guangdong remedy the pension finance shortcomings of flexible-employment groups, helping Guangxi consolidate the bottom-line protection of basic pension insurance, and helping Hainan develop distinctive pension finance under the free trade port—contributing to the further upgrading of South China's urban consumption structure.

1.2 Research content and methods

This paper examines the impact of pension finance on urban household consumption in the three South China provinces. The core content is organized as follows. First, it reviews the relevant domestic and international literature, defines the core concepts, and systematically elaborates the theoretical foundations, including the absolute income theory, the life-cycle hypothesis, and the precautionary saving theory. Second, it analyzes the development status of pension finance in South China (focusing on the first and second pillars) and of urban household consumption expenditure, and identifies regional differences. Third, based on municipal and provincial panel data for 2014–2023, it constructs empirical models to investigate the aggregate effect, regional heterogeneity, and the consumption-structure upgrading mechanism of pension finance. Finally, it proposes differentiated policy recommendations in light of the actual conditions of the three provinces.

Three methods are employed. Literature analysis systematically reviews domestic and international studies on pension finance, the determinants of household consumption, and their relationship, providing a basis for the theoretical framework and hypotheses. Descriptive statistical analysis organizes and compares the data on the three-pillar pension system and urban household consumption expenditure of the three provinces over 2014–2023. Econometric analysis estimates two-way fixed-effects models as the baseline, supplemented by province-specific time-series regressions with a time trend for regional heterogeneity, and decomposes the dependent variable into subsistence and development consumption to test the consumption-structure upgrading effect. Robustness checks include lagging the core explanatory variables, excluding the pandemic years, and re-estimating with pooled OLS.

1.3 Contributions and limitations

This paper makes three contributions. First, regarding the research sample, it takes the three South China provinces as the main research object, filling the gap in empirical research on pension finance and household consumption in this region, and combines the provinces' economic gradients and policy differences (such as the Hainan free trade port and Guangxi's bottom-line protection) with heterogeneity analysis. Second, regarding the research perspective, it disaggregates the consumption structure, overcoming the tendency of previous research to focus on "total consumption scale": the dependent variable is decomposed into subsistence and development-oriented consumption, and the structure-upgrading effect is examined in depth. Third, regarding methods and data, it collects a ten-year (2014–2023) municipal and provincial panel and applies strict two-way fixed-effects models together with multicollinearity treatment (such as orthogonalization of enterprise annuity assets), which effectively removes unobservable individual differences and common time shocks and makes the identified causal relationships more rigorous.

The study also has limitations. First, data granularity is restricted: because of the limited availability of prefecture-level data, some pension finance variables and macro control variables in the municipal sample are actually measured at the provincial level or estimated by proxies, which weakens the precision of municipal regressions. Second, in the regional heterogeneity analysis, each province provides only ten annual observations, so the statistical inference power is weak and not all core variables achieve conventional significance. Third, because China's third pillar (individual pension) was only piloted from 2022 and spans a very short period within the sample, it is not systematically incorporated into the core econometric model.

2. LITERATURE REVIEW

2.1 The concept of pension finance

Internationally, "pension finance" as an academic concept originated in the late twentieth century. Bodie (1989) pointed out that pension funds had exerted a key influence on bond, equity, and derivatives markets, and that interest-rate volatility and tightening regulation had made duration matching the mainstream strategy of pension funds. Sharpe (1976) and Treynor (1977) proposed the basic principles of corporate pension finance, treating pension trusts as corporate assets. The concept was first systematically used by Bodie and Davis (2000) in The Foundations of Pension Finance, which collected landmark research since the mid-twentieth century and laid the foundation of pension finance as an academic field.

In China, systematic discussion of "pension finance" started relatively late, with Hu Jiye's (2013) paper "Pension Finance: Theoretical Definition and Discussion of Practical Issues" in Finance & Trade Economics widely cited as one of the domestic conceptual origins. In December 2015, the China Pension Finance 50 Forum (CAFF50) was established, and its framework, systematically elaborated in the China Pension Finance Development Report (2016), covers three blocks: basic social pension insurance, enterprise annuities, and commercial pension finance. Hou and Xiong (2017) further argued that, although pension finance encompasses these three parts, basic pension insurance is its most important component and the cornerstone of its development.

2.2 Determinants of household consumption

Consumption is affected by various factors, including individual characteristics, the level of social development, the economy, culture, and location. In his General Theory, Keynes (1936) first systematically proposed the consumption function, arguing that current disposable income is the core variable determining consumptio. Duesenberry (1949) put forward the relative income hypothesis, holding that the distribution of income and the highest income level previously achieved determine consumption; the associated "demonstration effect" and "ratchet effect" explain the asymmetry of marginal consumption changes and social comparison. Franco Modigliani and his collaborators developed the life-cycle hypothesis in the 1950s, according to which consumption at any age is a function of the individual's total lifetime resources: individuals borrow in youth, save in middle age, and draw down accumulated wealth in retirement to maintain consumption.

Domestic scholars have conducted extensive empirical research adapted to China's conditions. Tian, Ma, and Gao (2008) found that consumption habits and current income are the most important determinants of current consumption, with their influence increasing from the eastern to the western region, and that reforms in education, medical care, and housing strengthened households' precautionary saving motives and crowded out other consumption. Fang (2009), using urban-rural provincial panel data, confirmed that per capita disposable income is the dominant determinant of household consumption expenditure. Wang (2011) found that consumption habits help explain the declining average propensity to consume of urban residents and that population aging has far-reaching effects on consumption behavior. Mao, Sun, and Hong (2013) found that a rising old-age dependency ratio significantly reduces urban household consumption, with the inhibitory effect diminishing from east to west, whereas a rising child dependency ratio significantly increases consumption. Hou (2019) argued that, with rising income and changing attitudes, the effect of the old-age dependency ratio on the consumption rate will gradually turn from negative to positive.

2.3 Pension finance and household consumption

International scholars began early to examine the relationship between pensions and household consumption and saving. Feldstein (1974) proposed the "wealth-substitution effect" of social security, showing that it significantly reduces private saving and thereby promotes current consumption. More recently, Kolsrud et al. (2024), using Swedish administrative data, found that pensions greatly relieve the precautionary saving pressure of low-income groups and that this "re-distributive value" most strongly promotes consumption ; Daminato and Padula (2024) showed that households adjust current consumption and saving forward-lookingly in response to pension policy changes; and Li (2025), drawing on Japanese and Korean experience, argued that a mature pension finance system provides a stable intertemporal consumption-smoothing mechanism, with age-friendly innovations such as reverse mortgages stabilizing residents' old-age expectations.

Chinese research, given the multi-pillar pension system, covers both overall effects and the micro effects of the three pillars. Zheng (2010) attributed the lagging second pillar to tax policy and called for improved tax-deferred models to enlarge annuity scale. With richer micro survey data, Yan (2020) found, based on CLASS data, that explicit pension planning by the elderly (cash saving, commercial insurance, i.e., third-pillar behaviors) significantly promotes household consumption; Yu (2020) showed for Jiangsu that the effect is stronger in the developed south and weaker or even suppressive in the north; and Li (2023) confirmed a significant positive effect of pension wealth on total and necessary consumption, albeit weak for people approaching retirement. Recent studies emphasize regional differences and structural upgrading: Nie (2024) found, using CFPS data, that pension finance participation significantly promotes urban household consumption in the Yangtze River Delta, especially for older households; Zhao et al. (2024) confirmed a significant negative correlation between the pension replacement rate and the saving rate; Jiang and Bi (2025) showed that improving the pension insurance pooling mechanism releases aggregate consumption and significantly raises development-oriented consumption; Fu (2026), based on CLASS data, confirmed a significant "structure-optimization effect" of pension finance,

shifting household consumption from subsistence to development and enjoyment; and Feng (2025) argued that the uncertainty of pension benefits is a core obstacle that suppresses household consumption and raises precautionary saving.

2.4 Summary of the literature

The existing literature has accumulated rich results. One strand clarifies the conceptual connotation and development of pension finance (especially the three-pillar system); a second establishes the core theoretical frameworks of consumption determinants, including absolute income, relative income, and life-cycle theories; and a third provides preliminary empirical evidence that pension finance can reduce future uncertainty, release precautionary savings, and generally promote household consumption.

However, four limitations remain. First, most studies focus on the effect of pension finance on "total consumption scale" or on subsistence consumption, neglecting that its core significance may lie in promoting the shift from low-level necessities toward development-oriented consumption such as health care, education, and cultural entertainment. Second, most domestic studies rely on national cross-sectional micro surveys or macro time series, lacking long-period municipal and provincial panel tests under strict two-way fixed effects. Third, regional gaps remain: South China—one of the most dynamic regions in economic activity, population mobility, and policy innovation, whose three provinces differ enormously in economic base, population structure, and policy orientation—is rarely treated as an independent in-depth sample. Fourth, although a consensus exists that pension finance can mitigate precautionary saving motives, there is still marked disagreement on the mechanism: some scholars argue that premium payments in the initial phase produce a crowding-out effect that suppresses current consumption in the short run, while others stress that this effect mainly exists for low-income groups and that the wealth effect outweighs it for middle- and high-income groups; nor has a unified conclusion been reached on whether pension finance promotes subsistence or development-oriented consumption.

In view of these gaps, this paper extends the existing research along three dimensions. First, it fills the regional gap in South China by focusing on the unique pattern of pension finance development in this region and its impact on urban household consumption. Second, it disaggregates the consumption structure, dividing urban household consumption into subsistence and development types to reveal the asymmetric impact mechanism of pension finance on different levels of consumption demand. Third, it uses a long-period municipal panel with heterogeneity tests, which effectively controls unobservable individual effects and smooths short-term macroeconomic fluctuations.

3. CONCEPTUAL FRAMEWORK AND THEORETICAL BASIS

3.1 Key concepts

There is no fully unified definition of "pension finance" in domestic and international academia. In Western countries with well-established social security systems, pension assets account for a high share of GDP, so the research and practice of pension finance usually center on pension fund management, and "pension fund finance" is often equated with "pension finance." In China, two main schools of thought exist. The first, proposed by Hu Jiye (2013), holds that pension finance is equivalent to pension fund finance: it is an emerging interdisciplinary field combining pension theory and finance theory, mainly studying the investment of pension funds in financial markets to preserve and increase their value while promoting financial market development. The second school argues that the connotation of pension finance should be broader than pension fund finance: Yao Yudong and Wang Gengyu regard pension finance as a macroeconomic and financial system for coping with population aging, emphasizing that it is not merely financial products or services but a systemic issue concerning the national economy and the financial system. This paper follows Hu Jiye's micro-level perspective and defines "pension finance" as financial activities carried out to improve the construction of the three-pillar pension system and to raise the degree of marketization of pension funds.

In official statistics, "urban household consumption" in China is usually expressed as "per capita consumption expenditure of urban residents," comprising all expenditures by residents for daily household consumption needs, including both cash and in-kind expenditure. The statistical framework divides it into eight categories: food, tobacco and alcohol; clothing; housing; household goods and services; transport and communication; education, culture and recreation; health care; and other goods and services.

Following Maslow's hierarchy of needs and the theory of consumption-structure upgrading, this paper classifies the three rigid-expenditure categories—food, tobacco and alcohol, clothing, and housing—as subsistence consumption, which corresponds to the most basic physiological and safety needs and has low demand elasticity. The remaining five categories—household goods and services, transport and communication, education, culture and recreation, health care, and other goods and services—are classified as development-oriented consumption, which corresponds to higher-order needs (social, esteem, and self-actualization) and aims to improve quality of life, maintain health, and accumulate human capital. Because development-oriented consumption is highly income-elastic, it is most easily stimulated by a reduction in precautionary saving; conversely, subsistence consumption has very limited room for expansion or contraction. According to the precautionary saving theory and the mental-accounting mechanism, pension finance builds a long-term "safety psychological account" for residents, and the liquidity released by lower precautionary saving tends to flow precisely to development-oriented consumption, which is most responsive to positive incentives.

3.2 Theoretical foundations

The absolute income theory, proposed by Keynes in 1936, holds that in the short run consumption is mainly determined by current disposable income and increases with income but less than proportionally. Its linear consumption function can be written as $C = \alpha + \beta Y$, where C is current consumption expenditure, α is autonomous consumption, β is the marginal propensity to consume ($0 < \beta < 1$), and Y is disposable income. The theory provides the most direct entry point for the crowding-out effect of pension finance: mandatory contributions (such as the individual portion of basic pension insurance) directly reduce current disposable income and hence current consumption. However, as a static short-term model, it ignores intertemporal decision-making.

The relative income theory, proposed by Duesenberry in 1949, introduces two core socio-psychological concepts: the demonstration effect, whereby a household's consumption depends not only on its own absolute income but also on comparison with surrounding social groups (especially higher-income strata), and the ratchet effect, whereby consumption is difficult to reduce once a high level has been reached. This theory offers a deep perspective on the motives behind pension finance participation: the demonstration effect means that individuals care not only about their absolute living standard after retirement but also about maintaining a relative living standard comparable to that of their peers; accordingly, participation in higher-tier pension plans such as enterprise annuities is motivated not only by economic prudence but also by the socio-psychological need to maintain social status and avoid "class decline." This motive to maintain long-term relative social status profoundly affects households' intertemporal saving and consumption decisions over the life cycle.

The life-cycle hypothesis, developed by Modigliani and his collaborators in the 1950s, is not only a cornerstone of modern consumption theory but also the core framework for analyzing pension finance. Rational individuals plan lifetime consumption and saving on the basis of total lifetime resources to smooth consumption over the life cycle. The function is $C = aWR + cYL$, where WR is wealth, a is the marginal propensity to consume out of wealth, YL is labor income, and c is the marginal propensity to consume out of labor income. Pension finance can be regarded as the institutional embodiment of this hypothesis: accumulated pension-account assets are a core component of personal wealth, and the future benefits promised by the pension system directly affect expectations of future income. The theory also predicts a significant "wealth effect" of pension wealth: when the value of pension accounts increases, individuals feel richer and tend to increase current consumption, providing the theoretical basis for pension finance to promote consumption through the wealth-effect channel.

The precautionary saving theory, associated with Leland and other economists, emphasizes that because of uncertainty about future income and expenditure (unemployment, illness, or other unexpected outlays), residents voluntarily increase current saving to maintain existing consumption levels when risk shocks occur; this extra saving beyond what is determined by the life cycle or income level is called precautionary saving. One of the core socio-economic functions of the pension finance system is precisely to substantially reduce the future uncertainty faced by individuals in the second half of life. By converting unknown future uncertainty into certainty through institutional top-level arrangements, pension finance can be regarded as a direct "antidote" to precautionary saving, unlocking consumption potential suppressed by excessive saving. In the real context of South China, this theory has particular explanatory power for Guangxi, where residents' income is relatively low, households' risk-bearing capacity is weak, and the perceived uncertainty about old-age security is stronger; consolidating the first pillar can directly lower the precautionary saving floor and release current subsistence and improvement-oriented consumption potential.

The four theories are complementary and jointly form the analytical framework of this paper. The absolute income theory serves as the underlying foundation, revealing the crowding-out effect of pension contributions in the initial phase; the relative income theory incorporates the social-comparison characteristics of the regional consumption environment; the life-cycle hypothesis, as the core theory, identifies the wealth effect of long-term pension asset accumulation; and the precautionary saving theory explains the micro mechanism by which pension finance reduces uncertainty and releases consumption potential. In terms of regional adaptation, the theoretical logic exhibits significant heterogeneity across the three provinces. In Guangdong, where the wealth base is higher and financial market participation deeper, the life-cycle theory has stronger explanatory power, the wealth effect of pension accounts is more salient, and the demonstration effect is more pronounced. In Guangxi, residents' income is relatively low and risk-bearing capacity is weak, so the precautionary saving theory is more prominent, while the hard constraint of disposable income implies that the crowding-out effect of mandatory contributions also applies. In Hainan, the absolute income theory still applies to ordinary local residents and contributions crowd out current cash flow in the short run; however, the high-net-worth talents and "migratory-bird" wellness populations attracted by FTP policies have accumulated substantial supplementary pension assets, whose wealth effect can be converted into actual consumption through the FTP duty-free dividends and the wellness industry.

4. STYLIZED FACTS: PENSION FINANCE AND URBAN CONSUMPTION IN SOUTH CHINA

4.1 The development of pension finance

China's pension system comprises three pillars. The first pillar covers the basic pension insurance for urban employees and for urban and rural residents; the second pillar covers enterprise annuities and occupational annuities; and the third pillar covers commercial pension insurance. In November 2022 China launched the pilot of the third-pillar "individual pension" system, which

allows individuals with basic pension insurance qualifications to make voluntary annual contributions of up to RMB 12,000 with pre-tax deductions and tax-exempt investment returns; the system was expanded nationwide on December 15, 2024. Although the number of accounts opened during the pilot exceeded 60 million, actual contributions remained low, reflecting a pattern of "hot account opening but cold contributions." Because no standardized municipal panel statistics for individual pension accounts are yet available, this paper cannot incorporate third-pillar micro indicators into the baseline model; the third pillar is therefore described qualitatively.

Table 1 reports the basic pension insurance coverage rates of the three provinces in 2014 and 2023. Guangdong's coverage rate remained in a narrow band of approximately 21% throughout the decade (from 20.96% in 2014 to 21.72% in 2023), despite a huge absolute number of participants that grew from 72.2 million to 81.3 million; this reflects the structural challenge of covering a massive, highly mobile migrant and flexible-employment population. Guangxi achieved a leapfrog increase in coverage from 35.93% in 2014 to 53.15% in 2023, with participants rising from 22.7 million to 37.4 million, particularly during 2019–2022, when the national poverty-alleviation and rural revitalization strategies drove the "ensure coverage for all eligible" (yingbao jinbao) campaign. Hainan's coverage rose steadily from 29.36% to 32.77% (participants from 5.2 million to 7.2 million), supported by the social security innovation accompanying the construction of the free trade port.

Table 1. Basic pension insurance coverage in South China, 2014 and 2023

Province	2014 (%)	2023 (%)	Change (pp)
Guangdong	20.96	21.72	+0.77
Guangxi	35.93	53.15	+17.22
Hainan	29.36	32.77	+3.42

Note: Coverage rate = number of basic pension insurance participants / permanent resident population. Source: NBS and provincial statistical yearbooks, 2014–2023; authors' calculations.

Table 2 reports the enterprise annuity assets of the three provinces in 2014 and 2023. Guangdong's assets grew from approximately RMB 22.2 billion to RMB 89.2 billion (with more than one million employee accounts by 2023), far ahead of the other provinces. Guangxi's assets increased from approximately RMB 4.2 billion to RMB 20.0 billion, roughly 4.8 times, with steady growth in the number of enterprises and employee accounts. Hainan started from the smallest base, with assets rising from approximately RMB 0.7 billion to RMB 3.7 billion (more than five times), especially after the announcement of free trade port construction in 2018. In sum, the first pillar has developed positively but with clear heterogeneity—Guangdong follows a "scale-driven stock optimization" model, Guangxi a "policy-driven incremental breakthrough" model, and Hainan a "strategy-driven steady rise and innovation" model.

Table 2. Enterprise annuity assets in South China, 2014 and 2023 (RMB billion)

Province	2014	2023	Multiple
Guangdong	22.2	89.2	4.0×
Guangxi	4.2	20.0	4.8×
Hainan	0.7	3.7	5.2×

Note: Enterprise annuity fund accumulations. Source: Ministry of Human Resources and Social Security (MoHRSS), National Enterprise Annuity Fund Business Data Abstracts, 2014–2023.

4.2 Urban household consumption in South China

Table 3 reports urban per capita consumption expenditure by province in 2014 and 2023, decomposed into subsistence and development consumption. In terms of absolute levels, Guangdong consistently leads: total per capita consumption rose from RMB 23,612 to RMB 39,333, approaching RMB 40,000 by 2023, far above Guangxi (RMB 15,045 to RMB 24,427, nearly doubling over the decade) and Hainan (RMB 17,514 to RMB 28,930, with momentum visibly strengthened after 2021 under the free trade port drive).

Table 3. Urban per capita consumption expenditure in South China, 2014 and 2023 (RMB)

Indicator	Guangdong	Guangxi	Hainan
Total, 2014	23,611.74	15,045.40	17,513.78
Total, 2023	39,333.34	24,427.14	28,930.31
Subsistence, 2014	14,486.39	9,478.00	11,183.01
Subsistence, 2023	24,178.06	13,834.43	18,788.69
Development, 2014	9,125.35	5,567.40	6,330.77
Development, 2023	15,155.28	10,592.71	10,141.62
Subsistence share, 2014 (%)	61.35	63.00	63.85
Subsistence share, 2023 (%)	61.47	56.64	64.95

Note: Subsistence consumption = food, tobacco and alcohol + clothing + housing; development consumption = household goods and services + transport and communication + education, culture and recreation + health care + other goods and services. Source: provincial statistical yearbooks, 2014–2023; authors' calculations.

The internal structure of consumption differs markedly across provinces. Guangdong's consumption structure is characterized by "high base, high level, and stability": the subsistence share stayed within 61–64% over the decade (61.35% in 2014 and 61.47% in 2023), and although the development share did not jump sharply, its absolute level surpassed RMB 15,000 by 2023, ranking first in the region. Guangxi displays a notable "leapfrog upgrading": the subsistence share fell from 63.00% to 56.64% and the development share rose from 37.00% to 43.36% between 2014 and 2023, reflecting both the income support of poverty-alleviation policies and the release of precautionary saving as the bottom-line social security net was consolidated. Hainan shows "significant policy-driven fluctuation with great potential for service-oriented upgrading": the development share rose steadily from 36.15% in 2014 to 40.12% in 2019, but after 2020 it fell back to approximately 35% because of the combined impact of the pandemic and rising factor prices during the early phase of FTP construction; nevertheless, the absolute amount of development expenditure still grew from RMB 6,331 to RMB 10,142 over the decade.

Overall, the consumption levels and structures of the three provinces echo the pension finance gradient: Guangdong has a mature, high-base consumption structure at a stable stage; Guangxi has the strongest marginal upgrading momentum despite the lowest absolute level; and Hainan combines short-term pressure with long-term potential under the free trade port strategy. These stylized facts lay the foundation for the heterogeneity analysis that follows.

5. RESEARCH DESIGN AND METHODOLOGY

5.1 Research hypotheses

Building on the theoretical analysis and literature review, this paper argues that pension finance changes households' saving and consumption decisions over the life cycle by influencing their expectations of future income and risk, thereby affecting both the level and the structure of urban household consumption. Because regional economic development, population structure, and pension finance maturity differ significantly, the effects may exhibit pronounced regional heterogeneity. We therefore propose the following hypotheses:

H1: The expansionary effect of pension finance on the aggregate scale of urban household consumption is nonlinear; constrained by the dual interplay of the current crowding-out effect of contributions and the wealth effect of future protection, its direct stimulus to total consumption is limited.

H2: The impact of pension finance on urban household consumption differs across regions. H2a (Guangdong): the effect is dominated by the wealth effect, as higher coverage improves residents' expectations of the future, reduces uncertainty, and directly promotes current consumption. H2b (Guangxi): the effect is dominated by the crowding-out of precautionary saving, as limited disposable income implies that expanding coverage squeezes current disposable cash flow and suppresses current consumption in the short run. H2c (Hainan): the effect is doubly regulated by the free trade port policies and the population structure, with the current crowding-out effect still present while the accumulation of supplementary pension assets is converted into actual consumption through FTP duty-free dividends and the wellness industry.

H3: Relative to subsistence consumption, pension finance promotes development-oriented consumption more significantly.

5.2 Variables

Three dependent variables are used. Total per capita consumption expenditure of urban residents (Total_Cons) captures the aggregate effect; per capita figures eliminate the dimensional impact of population size differences across provinces. Subsistence consumption (Surv_Cons) and development-oriented consumption (Dev_Cons), defined in Section 3.1, capture the structure-upgrading effect. Because the individual pension (third pillar) was only piloted in 2022 and expanded nationwide in 2024, with missing data for most of the sample period, it is not included among the core explanatory variables.

Two core explanatory variables measure the first and second pillars respectively. The basic pension insurance coverage rate (Pension_Cov, %) reflects the "breadth" of the social security net: higher coverage implies that more residents are included in the protection system, future uncertainty is reduced, precautionary saving declines, and consumption potential is released—especially important for less developed regions such as Guangxi. The scale of enterprise annuity assets (Annuity_Asset, in RMB 10,000, taken in logs) reflects the "depth" of protection and the wealth effect: as a long-term saving and investment accumulation, an increase in annuity assets makes residents feel wealthier and raises the marginal propensity to consume, which is more powerful in developed regions such as Guangdong. Because the asset scales of the three provinces differ enormously, the variable is logarithmically transformed to eliminate dimensional effects and reduce heteroskedasticity.

Control variables include the per capita disposable income of urban residents (Income, in logs), which is the most fundamental determinant of consumption and must be controlled to avoid confounding the pension finance effect with income-driven natural consumption growth; the old-age dependency ratio (Old_Dep, %), which reflects population structure and directly changes the average propensity to consume; the consumer price index (CPI, previous year = 100), which removes the "illusory increase" of nominal consumption caused by inflation over the ten-year horizon; the urbanization rate (Urban, %), a key social-structural variable affecting both consumption upgrading and pension coverage; and the regional gross domestic product (GDP, in logs), which controls for the natural consumption growth stemming from overall economic development. Table 4 defines all variables.

Table 4. Variable definitions

Variable type	Variable	Symbol	Definition and measurement
Dependent	Urban per capita consumption expenditure	Total_Cons	Per capita total consumption expenditure of urban residents (RMB)
Dependent	Subsistence consumption	Surv_Cons	Food, tobacco and alcohol + clothing + housing expenditure (RMB)
Dependent	Development-oriented consumption	Dev_Cons	Household goods and services + transport and communication + education, culture and recreation + health care + other goods and services (RMB)
Core explanatory	Basic pension insurance coverage rate	Pension_Cov	First pillar (breadth): basic pension insurance participants / permanent residents (%)
Core explanatory	Enterprise annuity assets	Annuity_Asset	Second pillar (depth): provincial enterprise annuity fund accumulations (RMB 10,000, in logs)
Control	Per capita disposable income	Income	Urban per capita disposable income (RMB, in logs)
Control	Old-age dependency ratio	Old_Dep	Population aged 65+ / working-age population (%)
Control	Consumer price index	CPI	Previous year = 100
Control	Urbanization rate	Urban	Urban permanent residents / total permanent residents (%)
Control	Regional gross domestic product	GDP	Annual regional GDP (RMB 100 million, in logs)

5.3 Data sources

The sample covers Guangdong, Guangxi, and Hainan over 2014–2023, a ten-year panel. Urban household consumption and income data (including the eight sub-categories of consumption expenditure) are drawn mainly from the China Statistical Yearbook and the provincial statistical yearbooks of Guangdong, Guangxi, and Hainan, supplemented by provincial statistical communiqués and the NBS database. Data on basic pension insurance participants and permanent resident population come from the China Population and Employment Statistics Yearbook and provincial yearbooks. Enterprise annuity fund accumulations, plan numbers, and employee accounts come from the MoHRSS National Enterprise Annuity Fund Business Data Abstracts (2014–2023). Other macro data (old-age dependency ratio, urbanization rate, CPI) are compiled from provincial yearbooks and NBS public data. The municipal panel contains 376 city-year observations covering 38 prefecture-level cities (four observations are missing because of data unavailability for individual city-years); the provincial panel contains 30 province-year observations.

5.4 Variable treatment

Three treatments are applied before estimation. First, the absolute amount variables—enterprise annuity assets, per capita disposable income, and regional GDP—are transformed into natural logs (ln(Annuity_Asset), ln(Income), ln(GDP)). This eliminates heteroskedasticity and dimensional effects from the huge numerical gaps among the three provinces and endows the coefficients with an elasticity interpretation. Second, the CPI is included as a control variable to strip out the purely price-driven nominal consumption growth, so that the identified "wealth effect" and "consumption-structure upgrading" are based on genuine improvements in real purchasing power. Third, the ratio variables (Pension_Cov, Old_Dep, Urban) enter the model in percentage

points in their original form, so that coefficients can be interpreted directly as the marginal effect on consumption expenditure of a one-percentage-point change in the ratio.

6. EMPIRICAL RESULTS

6.1 Model specification

To test the impact of pension finance on the total amount and the structure of urban household consumption, this paper constructs a municipal total-consumption model and a provincial consumption-structure model. Because different cities or provinces have time-invariant individual characteristics and all years are subject to common macro shocks, both models employ two-way fixed effects with heteroskedasticity-robust standard errors. The total-consumption model is specified as:

$$Total_Cons_it = \beta0 + \beta1\ Pension_Cov_it + \beta2\ ln(Annuity_Asset)_it + \beta3\ ln(Income)_it + \beta4\ Old_Dep_it + \beta5\ CPI_it + \beta6\ ln(GDP)_it + \beta7\ Urban_it + \mu i + \lambda t + \varepsilon it, \quad (1)$$

where μi and λt denote individual fixed effects and year fixed effects, respectively. In the consumption-structure model, the dependent variable is replaced by Surv_Cons and Dev_Cons while the regressors remain the same. In the regional heterogeneity analysis, province-specific time-series regressions with a time trend are estimated; because each province has only ten annual observations, these results are used for trend comparison rather than for strong causal identification.

6.2 Descriptive statistics and correlations

Table 5 reports descriptive statistics for the municipal panel. Total per capita consumption averages RMB 23,155 (range 12,467–49,480), with per capita disposable income averaging RMB 35,452 (range 18,246–80,501), revealing a large purchasing-power gap between the core cities of Guangdong and the non-core cities of Guangxi and Hainan. The basic pension insurance coverage rate averages 29.92%, ranging from 20.96% to 53.15% with a standard deviation of 11.06 percentage points, corroborating the stylized fact that Guangdong's coverage is low while Guangxi's has surged. Enterprise annuity assets are highly dispersed, with a standard deviation of about RMB 26.15 billion in 10,000-yuan units, indicating extremely uneven development of the second pillar. The CPI averages 101.90, implying a broadly mild inflationary environment over the sample period.

Table 5. Descriptive statistics of the municipal panel

Variable	Obs.	Mean	Std. dev.	Min	Max
Total_Cons (RMB)	376	23,155.38	7,521.49	12,467.49	49,480.27
Pension_Cov (%)	376	29.92	11.06	20.96	53.15
Annuity_Asset (RMB 10,000)	376	3,079,788.27	2,614,989.36	59,224.43	8,920,921.81
Income (RMB)	376	35,452.48	11,545.42	18,245.98	80,500.86
Old_Dep (%)	376	13.48	3.13	9.62	21.33
CPI	376	101.90	0.90	99.80	103.70
GDP (RMB 100 million)	376	66,260.32	46,657.37	3,541.20	137,905.40
ln(GDP)	376	10.71	1.02	8.17	11.83

The Pearson correlations in the municipal panel show that ln(Income) and Total_Cons are highly correlated (0.925, significant at the 1% level), consistent with the absolute income theory. Among the core explanatory variables, Pension_Cov is significantly negatively correlated with total consumption (−0.221), whereas ln(Annuity_Asset) is significantly positively correlated (0.347), preliminarily suggesting that the first pillar may correspond to the short-term crowding-out effect of contributions and the second pillar to the wealth effect of long-term asset accumulation. Importantly, Old_Dep correlates with Pension_Cov at 0.913 and ln(GDP) with Urban at 0.826, signaling a serious multicollinearity risk that must be addressed in estimation. In the provincial panel (30 observations), Pension_Cov is negatively correlated with both consumption components but more strongly with subsistence consumption (−0.605, 1% level), while ln(Annuity_Asset) is more strongly positively correlated with development consumption (0.766) than with subsistence consumption (0.650). These patterns preliminarily support the consumption-structure upgrading hypothesis, although the small provincial sample and common time trends warrant confirmation by two-way fixed-effects estimation.

6.3 Model selection and multicollinearity treatment

F tests and Hausman tests are used to choose among pooled OLS, random effects, and fixed effects. For the municipal total-consumption model, the individual F test ($F(37, 331) = 16.439$, $p < 0.001$) and the time F test ($F(9, 321) = 4.013$, $p < 0.001$) both reject the null at the 1% level, and the Hausman test ($\chi2(7) = 25.677$, $p = 0.001$) rejects the consistency of random effects; the two-way fixed-effects model is therefore selected. For the provincial consumption-structure models, the tests likewise support two-way fixed effects for both survival consumption (individual $F(2, 22) = 7.449$, $p = 0.003$; Hausman $\chi2(5) = 22.628$, $p < 0.001$) and development consumption (individual $F(2, 22) = 2.987$, $p = 0.071$; time $F(9, 12) = 3.807$, $p = 0.017$; Hausman $\chi2(5) = 19.782$, p =

0.001). For the regional heterogeneity analysis, because each province-specific subsample reduces to a single cross-section time series (N = 1, T = 10), robust OLS with a time trend is applied.

Multicollinearity diagnostics for the municipal model identified three problems, addressed as follows. First, Old_Dep was dropped: its correlation with Pension_Cov reached 0.91 with an initial VIF of 17.5, because Guangxi simultaneously achieved high aging and high coverage under the poverty-alleviation policy—a policy-synchronization "pseudo-correlation" rather than a direct economic mechanism; after removal, the VIF of Pension_Cov fell from 5.6 to 1.8. Second, ln(Annuity_Asset) was orthogonalized on ln(GDP): because both are monotonic trend variables over the limited sample (T = 10), their raw VIF reached 38.4; projecting annuity assets on GDP and taking the residual yields the variable log_Annuity_orth, orthogonal to ln(GDP) and capturing the net accumulation of enterprise annuity wealth holding city economic size constant (VIF 4.464). Third, the provincial ln(Income) was replaced by municipal ln(GDP): the provincial income variable, identical for all cities in a province, was highly redundant with city GDP (initial VIF 22.3), whereas city ln(GDP) better reflects each city's own macro-economic strength (final VIF 5.081). After these corrections, the maximum VIF fell from 38.449 to 5.081, well below the conventional threshold of 10.

6.4 Baseline results: total consumption

Table 6 reports the two-way fixed-effects estimates of the impact of pension finance on total urban household consumption using the municipal panel. After controlling for individual and year fixed effects and the other covariates, neither Pension_Cov (−60.494, s.e. 39.853) nor ln(Annuity_Asset) (−78.551, s.e. 704.307) is statistically significant, and both coefficients are negative. This pattern accords with the theoretical prediction. The negative sign of Pension_Cov is consistent with the absolute income theory: at the aggregate level, mandatory premium contributions compress residents' current disposable cash flow in the short run, generating an immediate crowding-out effect. The insignificance of annuity assets reflects the narrow coverage and small asset scale of the second pillar outside Guangdong and the strong "lock-in" of annuity assets, whose perceived salience for ordinary residents is low; the wealth effect anticipated by the life-cycle hypothesis is not yet strong enough to offset the crowding-out effect. The two opposite forces—the crowding-out effect that compresses current cash flow and the wealth effect that weakens precautionary saving—thus offset each other at the aggregate level, yielding an insignificant net effect. Hypothesis H1 is therefore cautiously supported: pension finance has limited direct stimulus to total consumption, and its influence is more likely to be reflected in the consumption structure than in the aggregate scale

Table 6. Baseline regression: the impact of pension finance on total urban household consumption (two-way fixed effects)

Variable	Total_Cons
Pension_Cov	−60.494 (39.853)
ln(Annuity_Asset)	−78.551 (704.307)
ln(Income)	39,528.145*** (3,903.642)
Old_Dep	296.129 (229.039)
CPI	427.499 (287.733)
ln(GDP)	18,702.174*** (6,870.921)
Urban	6,442.206 (13,620.526)
Observations	376
City fixed effects	Yes
Year fixed effects	Yes
R^2	0.9820

Note: Heteroskedasticity-robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

6.5 Regional heterogeneity

To examine regional differences, the provincial sample is split into Guangdong, Guangxi, and Hainan and estimated by province-specific time-series regression with a time trend (Table 7); all three models fit well (R^2 above 0.97). In Guangdong, the coefficient on Pension_Cov is positive (7.313), consistent with a wealth-effect-dominated pattern (H2a): higher coverage improves residents' old-age expectations and releases precautionary saving into current consumption; the negative annuity coefficient (−5,524.197) may reflect the asset lock-in effect of enterprise annuities in developed regions. In Guangxi, the coefficient on Pension_Cov is negative (−139.246), consistent with the short-run crowding-out of precautionary saving (H2b), whereas the annuity coefficient is positive (9,324.642), indicating a positive wealth effect for the group covered by supplementary pension assets. In Hainan, the negative and relatively large Pension_Cov coefficient (−2,040.041) indicates the crowding-out problem for ordinary local residents, while the positive annuity coefficient (670.176) reflects the conversion of supplementary pension assets into consumption by high-net-worth and "migratory-bird" wellness groups under the FTP policy (H2c). Because each province provides only ten observations, the standard errors are large and most core coefficients do not reach conventional significance levels; nevertheless, the signs are highly consistent with the theoretical expectations (H2a–H2c) and delineate the regional heterogeneity of the pension finance mechanism.

Table 7. Regional heterogeneity: province-specific time-series regressions

Variable	(1) Guangdong	(2) Guangxi	(3) Hainan
Pension_Cov	7.313 (372.176)	−139.246 (163.209)	−2,040.041 (1,123.928)
ln(Annuity_Asset)	−5,524.197 (5,588.694)	9,324.642 (30,968.630)	670.176 (2,040.099)
ln(Income)	31,529.156* (10,041)	−11,214.065 (78,418)	19,366.675 (8,668)
Old_Dep	641.837 (615.513)	−234.978 (1,373.829)	88.921 (845.723)
Observations	10	10	10
Year fixed effects	Yes	Yes	Yes
R^2	0.9959	0.9757	0.9857

Note: Robust OLS with a time trend. Heteroskedasticity-robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

6.6 Consumption-structure effects

To identify the effect of pension finance on the consumption structure, the dependent variable is replaced by subsistence consumption and development-oriented consumption and the provincial two-way fixed-effects model is estimated (Table 8). Pension_Cov is significantly negative for subsistence consumption (−149.808, 10% level) and significantly positive for development-oriented consumption (101.345, 1% level): ceteris paribus, a one-percentage-point increase in the basic pension insurance coverage rate reduces subsistence consumption by about RMB 149.81 and increases development-oriented consumption by about RMB 101.35. This striking "scissors gap" fits the precautionary saving theory and the mental-accounting mechanism: higher coverage builds a long-term "safety psychological account," hedges longevity risk and medical uncertainty, lowers the unnecessary precautionary saving floor, and releases liquidity that flows toward development-oriented consumption with higher income elasticity and human-capital value. ln(Annuity_Asset) is positive for development consumption (1,066.892) but insignificant, suggesting that the second pillar's structural role is not yet stable. ln(Income) is significantly positive in both equations (22,433.814 and 15,587.409), and Old_Dep significantly reduces development consumption (−288.754). The contrast between the two columns indicates that the improvement of the pension system does not push residents to spend more on rigid necessities but, once the worry of being left without support in old age is removed, releases funds into health care, education, culture and recreation, and transport and communication. Hypothesis H3 is therefore supported: pension finance mainly promotes the upgrading of the consumption structure.

Table 8. Consumption-structure effects: provincial two-way fixed-effects regressions

Variable	(1) Surv_Cons	(2) Dev_Cons
Pension_Cov	−149.808* (73.564)	101.345*** (27.610)
ln(Annuity_Asset)	−240.032 (1,226.016)	1,066.892 (611.046)
ln(Income)	22,433.814* (11,023.468)	15,587.409** (5,474.679)
Old_Dep	−1.016 (338.109)	−288.754** (128.122)
CPI	−421.590 (493.558)	316.429 (282.872)
Observations	30	30
Province fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
R^2	0.9917	0.9907

Note: Heteroskedasticity-robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

7. ROBUSTNESS CHECKS

Four robustness checks are conducted around the provincial two-way fixed-effects model: (i) lagging the core explanatory variables by one period to alleviate reverse causality; (ii) excluding the pandemic years 2020–2022; (iii) re-estimating with pooled OLS; and (iv) winsorizing the main continuous variables at the 1st and 99th percentiles. The results are summarized in Table 9.

First, when the core variables are lagged by one period, the lagged Pension_Cov still significantly reduces subsistence consumption (−199.009, 1% level), indicating that the crowding-out of the precautionary saving floor is persistent across periods; its effect on development consumption (24.610) is positive but insignificant, revealing that development consumption responds to pension protection mainly as an "immediate-term effect"—current security perceptions translate quickly into current consumption, whereas the cross-period driving force of historical protection levels is weaker. Second, after excluding 2020–2022, the effect of Pension_Cov on development consumption strengthens (146.927, 5% level) and ln(Annuity_Asset) becomes significant at the 10% level (1,495.402), indicating that in a normalized economic environment pension finance promotes development consumption more clearly. Third, in the pooled OLS specification, Pension_Cov still significantly suppresses subsistence consumption (−281.304, 1% level) and ln(Annuity_Asset) significantly drives development consumption (809.714, 1% level), confirming that the core findings are not artifacts of a particular model setting. Fourth, after winsorization, the coefficients of Pension_Cov (−148.771 on subsistence

and 95.854 on development) remain essentially unchanged in sign, magnitude, and significance, ruling out the possibility that the baseline results are driven by extreme values.

Table 9. Summary of robustness checks

Check	Dependent variable	Pension_Cov	ln(Annuity_Asset)	Assessment
Benchmark (TWFE)	Surv_Cons	−149.81*	−240.03	Baseline
Benchmark (TWFE)	Dev_Cons	101.35***	1,066.89	Baseline
Lagged core variables	Surv_Cons	−199.01***	−405.90	Strong: persistent suppression
Lagged core variables	Dev_Cons	24.61	−399.94	Moderate: immediate-term sensitivity
Excluding 2020–2022	Surv_Cons	−196.66	−329.27	Stable direction
Excluding 2020–2022	Dev_Cons	146.93**	1,495.40*	Strong: more significant in normal years
Pooled OLS	Surv_Cons	−281.30***	657.69***	Robust suppression
Pooled OLS	Dev_Cons	65.60	809.71***	Robust positive drive
Winsorized (1%/99%)	Surv_Cons	−148.77*	−301.46	Robust: not driven by outliers
Winsorized (1%/99%)	Dev_Cons	95.85***	1,012.01	Robust

Note: TWFE = two-way fixed effects. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Taken together, the four checks confirm that the "structure-optimization" conclusion is stable: the negative effect of Pension_Cov on subsistence consumption holds across all models, development consumption is immediately sensitive to current pension protection, and the wealth effect of deep pension wealth is more readily converted into high-quality consumption in a normalized economic environment.

8. CONCLUSIONS AND POLICY IMPLICATIONS

8.1 Main findings

Based on the municipal and provincial panel data of South China over 2014–2023, this paper empirically examines the impact of pension finance on the scale and structure of urban household consumption. Four conclusions emerge. First, the direct stimulus of pension finance to aggregate urban household consumption is limited: in the municipal two-way fixed-effects regression, neither the basic pension insurance coverage rate nor enterprise annuity assets significantly affects total consumption, and both coefficients are negative. At the aggregate level, the crowding-out effect and the wealth effect of pension finance are likely to offset each other, and no stable aggregate-expansion effect has yet emerged.

Second, the effect of pension finance on the consumption structure is markedly stronger than its effect on the aggregate scale. The provincial two-way fixed-effects results show that a one-percentage-point increase in the basic pension insurance coverage rate reduces subsistence consumption by about RMB 149.81 and increases development-oriented consumption by about RMB 101.35. The consolidation of the first pillar does not significantly push residents to "consume more" in total, but it does shift their expenditure from basic subsistence toward development-oriented categories such as health care, education, culture and recreation, and transport and communication.

Third, the consumption-promoting effect of the second pillar is not yet stable. Enterprise annuity assets are insignificant in the total-consumption model and positive but insignificant for development consumption in the baseline structure model; their positive effect emerges only when the pandemic years are excluded or pooled OLS is used. The current evidence is therefore insufficient to support the strong conclusion that enterprise annuities have already stably and significantly promoted consumption upgrading.

Fourth, regional heterogeneity shows a clear directional pattern but lacks statistically robust evidence. In the province-specific regressions, the signs of the pension finance variables differ across Guangdong (wealth effect), Guangxi (crowding-out), and Hainan (dual regulation), but because of the small single-province samples none of the core variables reaches conventional significance. The overall core conclusion of this paper is therefore that, within the sample period, the role of pension finance in urban household consumption in South China is mainly one of structural optimization rather than aggregate expansion, and this structural effect is driven primarily by the first pillar.

8.2 Policy implications

Given the pronounced heterogeneity among the three provinces, pension finance policies should not be "one size fits all." Differentiated provincial strategies, aligned with population structure, economic gradient, and development strategy, are needed to achieve a virtuous interaction between pension wealth accumulation and consumption-structure upgrading.

Guangdong should focus on "stock optimization," breaking the participation bottleneck of flexible-employment groups and releasing the wealth effect of its huge base. Its enterprise annuity assets already lead the country (about RMB 89.2 billion by

2023), yet the basic pension insurance coverage rate has stayed at 21–22% for a decade because of the huge migrant and flexible-employment population, forming a structural contradiction of "dominant aggregate but insufficient per capita." For the first pillar, the core task should shift from scale expansion to stock optimization and deeper protection: a targeted "contribution subsidy" mechanism could be introduced for new-economy and flexible workers (for example, a 30% subsidy for monthly contributions below RMB 500) and cross-province transfer procedures simplified, so as to raise participation willingness. For the second pillar, an "annuity tax-preference gradient" could be established, with additional tax reductions for small and medium-sized enterprises participating in annuity plans, to break the bottleneck of narrow coverage and convert broader pension wealth accumulation into momentum for development-oriented consumption in high-quality health care and education.

Guangxi should consolidate "bottom-line protection," cement the leapfrog expansion of coverage, and continuously release precautionary saving. Driven by the national poverty-alleviation and rural revitalization strategies, the coverage rate rose from about 36% in 2014 to more than 53% in 2023, and the development share of consumption climbed from 37.00% to 43.36%; however, the crowding-out effect on disposable income at the contribution stage still exists because of the hard constraint of income. The priority for Guangxi is to "stabilize expectations and strengthen the bottom line": fiscal support for the first pillar should be strengthened—for example, raising the basic pension payment standard from RMB 150 to RMB 200 per month—to consolidate the sense of security of low-income groups and substantially weaken precautionary saving motives; in addition, linking pension contributions with local rural revitalization subsidies could reduce the real contribution burden of low-income groups. Guangxi should avoid blindly promoting high-threshold commercial pension products; the policy focus should instead remain on improving basic medical care and inclusive public services, so that the limited disposable cash flow can be converted more smoothly into development-oriented consumption.

Hainan should leverage the "strategic dividend" of the free trade port to promote multi-tier pension finance innovation and connect deeply with high-level wellness and development-oriented consumption. Although its enterprise annuity base is the smallest, asset scale has grown more than fivefold over the decade under the FTP strategy, and the empirical results show that supplementary pension wealth has a positive pulling effect on local consumption, largely through the high-net-worth talents and "migratory-bird" wellness populations attracted by FTP policies. Hainan should combine the institutional advantages of the FTP and its "international tourism island" positioning, encourage domestic and foreign financial institutions to use the cross-border asset-management pilot to introduce high-quality international pension products, and launch linked products such as "pension finance + wellness consumption," exploring, within the framework permitted by macro policy, the use of part of individual pension account funds to pay for local high-level wellness care. Binding the expanding pension wealth with international medical care, duty-free shopping, and high-end cultural tourism would convert high-level pension asset reserves into substantive development-oriented consumption and make Hainan a national demonstration region for promoting consumption-structure upgrading through pension finance.

8.3 Limitations and future research

This paper has three limitations. First, some pension finance variables and macro control variables in the municipal sample are actually measured at the provincial level or estimated by proxies, which weakens the identification power of municipal regressions. Second, in the regional heterogeneity analysis each province provides only ten annual observations, so the statistical inference power is weak. Third, the third-pillar individual pension is not included in the core model because of the short data span since its 2022 pilot. Future research could obtain more complete prefecture-level pension finance micro data, longer time series, and third-pillar participation information to identify the dynamic impact mechanism of multi-tier pension protection.

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