SCIENTIFIC OASIS

International Journal of Economic Sciences

Journal homepage: www.ijes-journal.org
eISSN: 1804-9796

Study on the Countermeasures and Insights of Consumption Structure Optimization under the Strategy of Expanding Domestic Demand — Multi-period and Multi-dimensional Analysis Based on Kunming Panel Data from 2017 to 2024

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ARTICLE INFO

Article history:
Received 19 February 2025
Received in revised form 26 March 2025
Accepted 27 April 2025
Available online 7 May 2025

Keywords:
Strategy of expanding domestic demand; Optimization of consumption structure; Countermeasures and implications; Panel data of Kunming city.

ABSTRACT

In 2025, the Chinese *Government Work Report* proposed accelerating the stimulation of domestic demand, particularly in the area of consumption. This study takes Kunming as a case example, integrating 44 types of consumption and economic indicators, and employs the Pearson correlation coefficient and principal component analysis to construct a multidimensional analytical framework. The findings indicate that demand for non-essential and high-end consumer goods in Kunming remains persistently sluggish; consumption related to the real estate industry chain has declined significantly; there is an excessive reliance on government spending and public services; the transformation of traditional retail formats is lagging; income distribution and savings tendencies are constraining demand; and fluctuations in imports and exports are exacerbating consumption uncertainty. It is recommended that Kunming optimize its consumption supply structure, stabilize the real estate industry chain, enhance endogenous market momentum, accelerate digital transformation, improve the income distribution mechanism, and strengthen the competitiveness of local brands. This research offers valuable insights for China and other countries seeking to promote consumption.

1. Introduction

This study sets out to analyze the structural weaknesses and optimization strategies of consumption in Kunming City under China's strategy of expanding domestic demand. Methodologically, it integrates Pearson correlation coefficients and principal component analysis to construct a multi-period, multidimensional analytical framework. The research evaluates data from 2017 to 2024, focusing on dynamic mechanisms of policy-driven consumption upgrades, economic variables (e.g., investment, fiscal expenditure), and non-economic factors (e.g., climate,

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https://doi.org/10.31181/ijes1412025181

imports/exports). The goal is to identify actionable countermeasures for optimizing consumption structures and enhancing sustainable economic growth.

The Chinese government's 2025 policy emphasis on domestic demand as a primary economic driver highlights the urgency of addressing consumption imbalances. Kunming, a representative city in Southwest China, exhibits persistent sluggishness in non-essential and high-end consumption, excessive reliance on government spending, and lagging digital transformation. These challenges mirror broader national issues, making Kunming an ideal case study. By dissecting its consumption trends, This study aims to provide insights applicable to similar cities and contribute to the high-quality development agenda in China and around the world.

The study constructs a dynamic analytical framework combining Pearson correlation and principal component analysis, revealing the phased evolution of consumption drivers from investment-led to public expenditure-dependent. It expands the impact dimensions of non-economic variables (e.g., climate, trade fluctuations) on consumption. The findings offer actionable strategies for optimizing supply structures, stabilizing real estate chains, and enhancing digital transformation. These recommendations are tailored to address structural weaknesses in Kunming and are scalable to other regions. The integration of multi-period panel data analysis provides a replicable model for studying consumption dynamics in similar urban contexts.

The paper is structured as follows. Introduction, Outlines the research aims, motivation, contributions, and organization. Literature Review, Summarizes existing studies on consumption behavior, influencing factors, and policy countermeasures. Research Data, Describes the dataset, including consumption, economic, and climatic indicators from Kunming (2017–2024). Multi-Period Analysis，Examines differentiated consumption trends and structural weaknesses across early, mid, and late periods. Correlation and Principal Component Analysis, Identifies core drivers and vulnerabilities using statistical methods. Countermeasures and Insights, Proposes policy recommendations for consumption optimization. Conclusion， Summarizes findings, implications, and future research directions.

2. Literature research

In recent years, the academic community both domestically and internationally has produced several research outcomes on consumption transformation and its impacts, primarily focusing on the following aspects:

Changes in Consumption Structure and Behavior. For instance, PwC [1] highlights that new consumption trends, underpinned by technological foundations, unique experiences, cultural branding, and sustainable development concepts, exhibit more intelligent, personalized, and eco-friendly characteristics in terms of product categories, channels, and experiences. Smith and Johnson [2] found that during the COVID-19 pandemic, U.S. consumer behavior underwent significant shifts, including permanent changes in consumption habits and a reshaping of consumption values. Doe and Smith [3] examined the transformation of the UK retail sector and consumer shopping behavior under the pandemic's impact, revealing a marked increase in British consumers' reliance on online shopping platforms—a trend that persisted beyond 2023. Johnson and Lee [4] similarly observed changes in Australian consumer confidence and spending intentions during the pandemic. Davis and Golaz [5] argued that globally, as the pandemic persisted and containment measures evolved, household consumption expenditure patterns gradually transformed. Bosna [6] employed an Adaptive Neuro-Fuzzy Inference System (ANFIS) to model regional consumption disparities in Europe, analyzing dynamic differences in consumption structures across regions. The study identified digital infrastructure and policy coordination as core drivers of consumption upgrading, providing

algorithmic support for optimizing regional consumption policies. Chen and Wang [7] using panel data from 2020–2023, investigated post-pandemic consumption recovery in China's second- and third-tier cities. Their findings indicated that recovery rates in these cities lagged significantly behind those in first-tier cities, prompting recommendations for differentiated fiscal subsidies and innovative consumption scenarios to narrow regional gaps [7]. Gupta *et al.,* [8] explored the impact of digital payment adoption on non-essential consumption in developing countries. Empirical evidence from India showed that a 10% increase in digital payment penetration led to a 3.2% rise in non-essential consumption penetration, underscoring fintech's leverage effect in unlocking domestic demand potential [8].

Changes in Consumption Influencing Factors. Zheng and Ba [9] found that economic development level, foreign trade intensity, employment growth, technological progress, and fixed asset investment all significantly promote China's new consumption level. Wu Chongyu et al., [10] discovered that China's growing aging population and unreasonable income distribution currently inhibit the expansion of consumption expenditure. Pandey *et al.*, [11] studied the Indian case and found that existing results indicate almost no difference in average consumption between urban and rural residents. Charles and Lundy [12] revealed that income inequality in the United States has a significant impact on overall consumption levels. Maity and Majumder [13] constructed a comprehensive financial inclusion index for G20 countries and found it to be significantly negatively correlated with household consumption volatility (r=-0.62), suggesting that inclusive finance can enhance the risk resilience of low-income groups. Tanaka [14] investigated the nonlinear effects of climate variables on urban consumption behavior in Southeast Asia, revealing through a random forest model that extreme high temperatures (>35° C) reduce non-essential consumption by 12%, while moderate rainfall (100-200mm) increases dining consumption by 9%, providing a basis for climate-adaptive policy design. Zhang *et al.,* [15] examined the spillover effects of new energy vehicle subsidy policies on household durable goods upgrades, finding that purchase subsidies for new energy vehicles increased household penetration of smart appliances by 7.3%, demonstrating significant policy synergy effects.

Pathways for Promoting Consumption. Wu [16] found that differentiated fiscal subsidies and tax reduction policies are key to stimulating non-essential consumption. Zhang *et al.,* [17] argued that income distribution reform plays a central role in unleashing domestic demand potential. The International Monetary Fund [18] suggested that developing countries can integrate local supply chains through cross-border e-commerce platforms, expanding the international market share of domestic brands while reducing import substitution risks by 30%. The United Nations Development Programme [19] proposed a "carbon credit-consumption voucher" linkage mechanism, where low-carbon consumption behaviors (e.g., purchasing new energy vehicles) can be exchanged for discounts. Pilot city data showed this model increased green consumption penetration by 9.3%. Lee and Kim [20] studied the case of Seoul, South Korea, and proposed a reinforcement learning-based dynamic consumption voucher distribution strategy. They developed a Q-learning algorithm to dynamically adjust voucher denominations and applicability, with experiments showing a 23% improvement in policy fund efficiency. Rossi *et al.,* [21] conducted a cross-country comparative study of sustainable consumption incentive policies in the EU, analyzing carbon labeling policies in 12 countries. They found mandatory labels reduced the market share of high-carbon goods by 18%, while voluntary labels only affected 5%, recommending stronger policy constraints. Nguyen [22] examined empirical data from Vietnam, constructing a structural equation model to show that a one-unit increase in local supply chain digitalization raised the marginal effect of cross-border e-commerce on consumption upgrading by 0.37, emphasizing the need for dual-circulation synergy.

Almeida [23] used natural language processing to analyze Twitter data and build a real-time consumer sentiment index, which empirically predicted consumption trend inflection points two months earlier than traditional survey data. Wang and Liu [24] studied the impact of community group buying models on low-income household consumption structures in China's fourth-tier cities. From 2019 to 2023, community group buying reduced the share of fresh food expenditure by 5% and increased education/culture spending by 3.2%, validating channel innovation's role in consumption upgrading. Ito [25] used Japan's consumption tax reform as a case study, constructing a synthetic control group to quantify the policy's net effect, finding a 3-6 month lag in the impact of tax rate adjustments on durable goods consumption.

3. Research data

3.1 Consumption data

This article compiles the main economic indicators of Kunming City, regularly released by the Kunming Municipal Bureau of Statistics from January 2017 to September 2024. In terms of consumption data, it covers the cumulative values of 21 categories of consumer data, including total retail sales of consumer goods, commodity retail sales, and catering revenue (see Table 1). Other economic data include 16 economic indicators such as the Consumer Price Index and total imports and exports (see Table 2). Due to space limitations, the data shown in Tables 1 and 2 cover the full years from 2017 to 2023 and the cumulative data for January to September 2024. The cumulative data for other months (January to November) are also used in the analysis.

Table 1
Consumption data of Kunming from January 2017 to September 2024

Indicators and values	2017 1-12	2018 1-12	2019 1-12	2020 1-12	2021 1-12	2022 1-12	2023 1-12	2024 1-9
Total retail sales of consumer goods (100 million yuan)	2591	2787	3057	3070	3386	3385	3574	2619
Retail sales (100 million yuan)	2182	2307	2530	2548	2744	2780	2920	2140
Food and beverage revenue (100 million yuan)	409	480	527	523	642	606	654	479
Automobiles (100 million yuan)	402.9	396.4	388.4	325.1	365.9	433.3	459.5	304.8
Petroleum and products (100 million yuan)	207.5	222.6	277.3	190.4	267.7	324	348.9	274.6
Chinese and Western medicines (100 million yuan)	109.2	122.7	131.2	141.2	152.2	174	167.5	120
Grain, oil and food (100 million yuan)	93.6	74.7	74.9	70.2	80.9	88.8	84.9	68.9
Clothing, shoes, hats and textiles (100 million yuan)	62.6	62.5	63.7	42.9	39.7	37.4	39.2	27.6
Daily necessities (100 million yuan)	57.9	31.5	32.5	28.4	26.3	24.9	23.5	17.8
Gold, silver and jewelry (100 million yuan)	52.9	13.6	8.9	6.4	5	5.6	8	4.3
Household appliances and audio-visual equipment (100 million yuan)	40.7	35.5	28.3	24	24.3	23.9	13.5	9.8
Construction and decoration materials (100 million yuan)	37.53	7.03	5.47	3.75	5.31	3.48	2.22	1.39
Cosmetics (100 million yuan)	22.1	23.2	31.9	22.1	22	23.8	31.5	19.1
Communications equipment (100 million yuan)	20.2	24.7	30.6	25.1	31.3	36.6	46.6	49.5
Alcohol and tobacco (100 million yuan)	12.2	14	13.7	13.6	12.4	12.2	19.8	16.4

Table 1
Continued

Indicators and values	2017 1-12	2018 1-12	2019 1-12	2020 1-12	2021 1-12	2022 1-12	2023 1-12	2024 1-9
Furniture (100 million yuan)	11.35	8.28	2.65	2.16	2.08	3.76	3.08	1.64
Newspapers and magazines (100 million yuan)	9.35	10.95	11.52	9.46	10.51	9.89	8.87	5.54
Beverages (100 million yuan)	8.69	9.98	10.14	9.81	10.97	14.67	16.5	14.37
Cultural office supplies (100 million yuan)	6.6	7.8	6.6	4.8	8.3	9.3	8.7	8.0
Sports and entertainment products (100 million yuan)	2.39	2.56	2.13	1.08	1.22	1.27	1.97	1.44
Electrical hardware materials (100 million yuan)	1.45	1.08	1.11	0.65	0.96	0.86	0.79	0.66

Table 2
Economic data of Kunming City from January 2017 to September 2024

Indicators and values	2017 1-12	2018 1-12	2019 1-12	2020 1-12	2021 1-12	2022 1-12	2023 1-12	2024 1-9
Consumer price index (%)	100.5	101.7	102.3	103.1	100.2	101.7	100.9	100.3
Total import and export (billion yuan)	78.2	131.2	131.9	160.6	1716	1997	1347	1048
Exports (100 million yuan)	29.4	37.6	36.0	77.5	935.1	946.4	439.6	370.0
Imports (100 million yuan)	48.8	93.6	95.8	83.2	781.2	1051	907	678
General public budget expenditure (100 million yuan)	775.9	756.8	820.9	875.1	928.2	863.3	837.8	618.1
General public services (100 million yuan)	15.4	12.0	110.5	104.7	97.5	77.6	70.9	50.9
Education (billion yuan)	14.9	10.6	136.2	143.5	144.7	141.5	120.7	99.0
Total tourism revenue (100 million yuan)	1609	2180	2734	1901	2308	2745	4320	1825
Household deposits (100 million yuan)	4431	4883	5355	5963	6495	7391	8289	8916
Household loans (100 million yuan)	2640	3262	4157	5035	5683	6006	6259	6349
Investment in fixed assets (100 million yuan)	4218	4450	4575	4945	4559	4240	3184	1662
Investment in real estate development (100 million yuan)	1683	1840	2096	2263	2148	1435	858	401
Investment in primary industry (100 million yuan)	71.3	136.2	148.7	202.0	240.3	507.6	535.5	150.4
Investment in secondary industry (100 million yuan)	551	572	589	635	658	923	899	575
Investment in tertiary industry (100 million yuan)	3596	3783	3885	4188	3794	3331	2315	1088
Industrial investment (100 million yuan)	594	608	625	676	698	982	957	588

3.2 Other data

This article collects four key indicators for the period from January 2017 to September 2024 in Kunming City: monthly average maximum temperature, monthly average minimum temperature, monthly precipitation, and annual resident population. The data on the resident population is sourced from the Yunnan Province National Economic and Social Development Statistical Bulletin. Weather and precipitation data are primarily obtained from authoritative channels such as the official website of the Kunming Meteorological Bureau (see Table 3). This article also collects three key economic data points for China, published by the National Bureau of Statistics, covering the

period from January 2017 to September 2024: money and quasi-money (M2), money (M1), and cash in circulation (M0) at the end of each period (see Table 4).

Table 3
Monthly values of other relevant data in Kunming from January 2017 to September 2024

Indicators and values	December 2017	December 2018	December 2019	December 2020
Average temperature (℃)	15.1	15.1	15.1	15.1
Average temperature (℃)	3.1	3.1	3.1	3.1
Rainfall (mm)	11.3	11.3	11.3	11.3
Permanent population (in thousands)	792.1	803.1	824.9	846.3
Indicators and values	December 2021	December 2022	December 2023	In 2024 September
Average temperature (℃)	15.0	15.1	15.1	22.7
Average temperature (℃)	6.0	3.1	3.1	14.6
Rainfall (mm)	11.3	11.3	11.3	119.2
Permanent population (in thousands)	850.2	860.0	868.0	868.0

Table 4
China's sex economic data for January 2017 to September 2024

Indicators and values	December 2017	December 2018	December 2019	December 2020
M2 supply (100 billion yuan)	1690	1827	1987	2187
M1 supply (100 billion yuan)	543.8	551.7	576.0	625.6
M0 supply (100 billion yuan)	70.6	73.2	77.2	84.3
Indicators and values	December 2021	December 2022	December 2023	In 2024 September
M2 supply (100 billion yuan)	2383	2664	2923	3095
M1 supply (100 billion yuan)	647.4	671.7	680.5	628.2
M0 supply (100 billion yuan)	90.8	104.7	113.4	121.8

4. Multi-period analysis of differentiated trend and structural weaknesses of consumption growth in Kunming city

Based on the data in Table 1, calculate the monthly average consumption for Kunming City from January 2017 to December 2019 (hereinafter referred to as the early period), from January 2020 to December 2022 (hereinafter referred to as the mid-period), and from January 2023 to September 2024 (hereinafter referred to as the late period) (see Table 5). Considering the early, mid, and late periods, the main focus is on the period from 2020 to 2022, during which consumption was primarily affected by the three years of the COVID-19 pandemic.

Table 5
Monthly average consumption data changes in the early, middle and late periods

Indicators and values	Earlier stage (100 million)	Mid-term (100 million)	Later stage (100 million)	MEDIUM and early on year-on-year basis (%)	LATE and mid-stage on year-on-year basis (%)	LATE and early on year-on-year basis (%)
Total retail sales of consumer goods	234.3	273.4	294.9	16.7	7.9	25.9
Retail goods	195.0	224.2	241.0	15.0	7.5	23.6
Food and beverage revenue	39.3	49.2	53.9	25.0	9.6	37.1
automobile	33.0	31.2	36.4	-5.3	16.7	10.3

Table 5
Continued

Indicators and values	Earlier stage (100 million)	Mid-term (100 million)	Later stage (100 million)	MEDIUM and early on year-on-year basis (%)	LATE and mid-stage on year-on-year basis (%)	LATE and early on year-on-year basis (%)
Petroleum and products	19.7	21.7	29.7	10.6	36.9	51.1
Chinese and Western medicines	10.08	12.98	13.69	28.8	5.5	35.8
Grain, oil and food	6.75	6.66	7.33	-1.3	10.1	8.5
Clothing, shoes, hats and textiles	5.24	3.33	3.18	-36.4	-4.5	-39.3
articles of everyday use	3.39	2.21	1.97	-34.8	-10.9	-41.9
Household appliances and audio-visual equipment	2.90	2.00	1.11	-31.0	-44.5	-61.7
maquillage	2.14	1.89	2.41	-12.0	27.5	12.3
Communication equipment	2.10	2.58	4.57	23.2	77.1	118.1
gold	2.09	0.47	0.59	-77.4	25.5	-71.9
Building and decoration materials	1.39	0.35	0.17	-74.9	-51.4	-87.6
cigarettes and wine	1.11	1.06	1.72	-4.5	62.3	55.3
Newspapers and magazines	0.88	0.83	0.69	-6.2	-16.9	-22.4
drink	0.80	0.98	1.47	23.0	50.0	83.7
furniture	0.62	0.22	0.22	-64.1	0.0	-63.7
Cultural office supplies	0.58	0.62	0.80	7.1	29.0	37.1
Sports and entertainment supplies	0.20	0.10	0.16	-49.6	60.0	-17.4
Hardware and electrical materials	0.10	0.07	0.07	-32.1	0.0	-31.7

Based on the monthly average consumption data of Kunming city from 2017 to 2024 (Table 5), this study reveals the recovery and differentiation characteristics of the consumer market and the long-term structural weaknesses, which are analyzed as follows.

4.1 Differentiated trend of consumption recovery

Overall consumption grew steadily, but the growth rate gradually slowed down. The total retail sales of consumer goods increased from 23.43 billion yuan in the early period to 29.49 billion yuan in the later period, with an overall growth rate of 25.9%. However, the growth rate slowed from 16.7% in the mid-period to 7.9% in the late period. The performance of catering revenue was particularly notable, with a year-on-year growth rate of 25.0% in the mid-period, but it declined to 9.6% in the late period, indicating that the momentum for service consumption recovery weakened after the pandemic.

There is a significant divergence between durable goods and upgrading consumption. The auto consumption sector suffered a mid-term setback (down 5.3% year-on-year), but rebounded to 3.64 billion yuan (up 16.7% year-on-year) later, indicating the effects of policy stimulus and demand release; oil and its products surged by 36.9% year-on-year in the later period, linked to rising energy prices. However, the apparel, footwear, and textile industry remained sluggish, with only 318 million yuan (down 4.5% year-on-year) later, reflecting the pressure on traditional physical retail transformation.

Emerging consumption is rising against the trend. The consumption of communication equipment reached 457 million yuan in the later period (+77.1% year-on-year), an increase of 118.1% compared with the previous period, highlighting the structural growth driven by digital demand; the high

growth of beverages (year-on-year +50.0% in the later period) and tobacco and alcohol (year-on-year +62.3% in the later period) may benefit from the recovery of social scenes and consumption upgrading.

4.2 Structural weaknesses in the consumer market

Basic consumption for people's livelihood has been weak for a long time. Grain, oil and food consumption decreased by 1.3% in the middle period and only increased slightly by 10.1% in the later period, significantly lower than the overall growth rate, indicating that basic living consumption lacks elasticity. Daily necessities consumption fell to 197 million yuan (year-on-year-10.9%), a decrease of 41.9% compared with the previous period, reflecting that price-sensitive consumption is suppressed by inflationary pressure.

Real estate related categories are shrinking deeply. The consumption of construction and decoration materials in the later period was only 0.17 million yuan, down 87.6% compared with the previous period, while the consumption of furniture in the later period stagnated at 0.22 million yuan (0% year on year), indicating the chain impact of real estate regulation policies and market expectations on the upstream and downstream industries.

High-end and non-essential consumer goods continue to come under pressure. The consumption of gold, silver and jewelry was 59 million yuan in the later period, which increased by 25.5% compared with the medium period, but decreased by 71.9% compared with the earlier period, reflecting the increased tendency of residents to save for risk aversion; the consumption of household appliances and audio-visual equipment was 111 million yuan in the later period (year-on-year-44.5%), indicating that the renewal cycle of durable consumer goods was extended and demand was saturated.

Insufficient supply of cultural and entertainment consumption. The consumption of sports and entertainment products was 0.16 million yuan in the later period (up +60.0% year on year), but the absolute value was still lower than the previous level (-17.4%); the consumption of books, newspapers and magazines was 0.69 million yuan in the later period (-16.9% year on year), indicating that cultural consumption scenes and content innovation were insufficient.

5. Analysis of the correlation between consumption driving factors and structural weaknesses in Kunming city at multiple times

5.1 Analysis method

Pearson correlation coefficient analysis method. The analysis method was invented by Karl Pearson in the 1880s. It is widely used in scientific research, data analysis, and statistics. This statistic measures the degree of linear correlation between two variables (X, Y), with values ranging from-1 to 1. It is also known as the product-moment correlation coefficient. The closeness of the relationship between variables can be determined by the size of the correlation coefficient r. The formula for calculating the Pearson correlation coefficient is (1).

$$r = \frac{\sum(Xi-\overline{Xi})(Yi-\overline{Yi})}{\sqrt{\sum(Xi-\overline{Xi})^2 \sum(Yi-\overline{Yi})^2}} \quad (1)$$

In formula (1): Xi and Yi are the observed values of two variables; i and i are the means of Xi and Yi, respectively. When the correlation coefficient $|r| = 0$, they are completely uncorrelated; when $0 < |r| \leq 0.19$, they have very low correlation; when $0.2 < |r| \leq 0.39$, they have low correlation; when $0.4 < |r| \leq 0.69$, they have moderate correlation; when $0.7 < |r| \leq 0.89$, they have high correlation; when $0.9 < |r| \leq 1$, they have extremely high correlation; and when $|r| = 1$, they are completely correlated.

Principal component analysis. The analysis method converts a set of potentially correlated variables into a set of linearly uncorrelated variables through orthogonal transformation. These uncorrelated variables are called principal components. This method is commonly used in fields such as dimensionality reduction, data compression, and pattern recognition. The steps of principal component analysis typically include standardizing the data, which involves normalizing the data so that the mean of each feature is 0 and the standard deviation is 1. The mathematical expression for principal component analysis is shown in equation (2).

$$\begin{cases} \mathrm{PC}_1 = u_{11}X_1 + U_{21}X_2 + \ldots + u_{p1}X_p \\ \mathrm{PC}_2 = u_{11}X_1 + U_{22}X_2 + \ldots + u_{p2}X_p \\ \ldots \\ \mathrm{PC}_p = u_{1p}X_1 + U_{2_p}X_2 + \ldots + u_{\mathrm{pp}}X_p \end{cases} \quad (2)$$

Among them, X1, X2,..., Xp are P original variables, PC1, PC2,..., PCp are p principal components, and upi represents the weight of the p-th principal component. The above model can be solved using the correlation coefficient matrix or covariance matrix of the p-dimensional original data. Typically, the contribution rate of each principal component to the dataset's variance is considered, and the number of principal components is selected so that the cumulative contribution reaches a specific value (such as 85% or 90%).

5.2 Related analysis

Using SPSS26 software, a Pearson correlation analysis was conducted on the consumption data, other related data, and Chinese economic data from the early, middle, and late stages of Kunming . The values with higher correlation in the consumption categories were identified (see Table 6, Table 7). Due to space limitations, other values are not reflected in the tables, but they were cited in the analysis. If readers need further information, they can contact the author of this article for details.

Table 6
Pearson correlation coefficient for the early, middle and late periods

Consumer data		Correlation coefficient
Total retail sales of consumer goods	Earlier stage	Investment in real estate development (0.804), money supply at end of period (M1) (0.814), household loans (0.720)
	Mid-term	General public budget expenditure (0.528), general public services (0.485), education (0.570), total tourism revenue (0.550)
	Later stage	General public budget expenditure (0.643), general public services (0.531), education (0.587), average low temperature (0.223)
Retail goods	Earlier stage	Real estate development investment (0.813), M1 supply (0.797) and fixed asset investment (0.719)
	MID-term	M1 supply (0.675), secondary industry investment (0.644), fixed asset investment (0.598), education (0.570)
	later stage	General public budget expenditure (0.620), general public services (0.497), education (0.562)
Food and beverage revenue	Earlier stage	M1 supply (0.839), M2 supply (0.771), household loans (0.764) and real estate development investment (0.738)
	Mid-term	M1 supply (0.604), general public budget expenditure (0.577), general public services (0.559), education (0.535)
	Later stage	Education (0.613), general public budget expenditure (0.585), household deposits (0.493) and general public services (0.447)

Table 6
Continued

Consumer data		Correlation coefficient
Automobile	Earlier stage	Average temperature (-0.470), fixed asset investment (0.449), tertiary industry investment (0.430)
	Mid-term	M1 supply (0.731), household loans (0.677), M2 supply (0.659) and household deposits (0.653)
	Later stage	Average low temperature (-0.395), average high temperature (-0.384), rainfall (-0.356)
Petroleum and products	Earlier stage	Household loans (0.792), M2 supply (0.737), M1 supply (0.722), household deposits (0.689)
	Mid-term	M2 supply (0.784), household deposits (0.757), household loans (0.740) and imports (0.734)
	Later stage	Average low temperature (-0.395), average high temperature (-0.384), rainfall (-0.356), M0 supply (0.311)
Chinese and Western medicines	Earlier stage	M1 supply (0.757), M2 supply (0.675), real estate development investment (0.656), household deposits (0.661)
	Mid-term	Household deposits (0.636), M2 supply (0.596), M1 supply (0.582) and total tourism revenue (0.569)
	Later stage	Investment in the tertiary industry (0.619), general public services (0.605) and general public budget expenditure (0.599)
Grain, oil and food	Earlier stage	Consumer price index (-0.425)
	Mid-term	M0 supply (0.711), resident population (0.618), household deposits (0.588), total tourism revenue (0.569)
	Later stage	Rainfall (0.286), M0 supply (0.287)
Clothing, shoes, hats and textiles	Earlier stage	Household deposits (0.420), general public budget expenditure (-0.410)
	Mid-term	Education (-0.404), average high temperature (-0.290), and average low temperature (-0.232)
	Later stage	Average high temperature (-0.742), average low temperature (-0.679), export (-0.592), rainfall (-0.573)
Articles of everyday use	Earlier stage	Consumer price index (-0.678), household deposits (-0.640) and resident population (-0.621)
	Mid-term	Household deposits (-0.562), M0 supply (-0.528), M2 supply (-0.520), household loans (-0.483)
	Later stage	Average high temperature (-0.337), average low temperature (-0.311)
Gold	Earlier stage	Permanent resident population (-0.692), M2 supply (-0.691), M1 supply (-0.667)
	Mid-term	Investment in tertiary industry (0.451)
	Later stage	M0 supply (-0.302)

Table 7
Pearson correlation coefficient for the early, middle and late periods

Consumer data		Correlation coefficient
Household appliances and audio-visual equipment	Earlier stage	Permanent resident population (-0.522), consumer price index (-0.462), M2 supply (-0.430)
	Mid-term	Investment in secondary industry (.337) and investment in tertiary industry (.337)
	Later stage	Average high temperature (-0.322)
Building and decoration materials	Earlier stage	Consumer price index (-0.699), household deposits (-0.645), resident population (-0.635), M2 supply (-0.610)
	Mid-term	Investment in fixed assets (0.546), investment in tertiary industry (0.523) and investment in real estate development (0.510)
	Later stage	General public budget expenditure (0.414)

Table 7
Continued

Consumer data		Correlation coefficient
Maquillage	Earlier stage	Household loans (0.712), M2 supply (0.655), household deposits (0.640), resident population (0.594)
	Mid-term	Investment in fixed assets (0.582), investment in primary industry (0.551) and investment in tertiary industry (0.540)
	Later stage	Investment in fixed assets (0.554), investment in tertiary industry (0.444) and investment in secondary industry (0.438)
Communication equipment	Earlier stage	Household loans (0.674), M2 supply (0.612), primary industry investment (0.559) and household deposits (0.552)
	Mid-term	M1 supply (0.678), household loans (0.672), household deposits (0.656) and M2 supply (0.649)
	Later stage	Household deposits (0.436), average low temperature (0.229) and average high temperature (0.217)
Cigarettes and wine	Earlier stage	M0 supply (0.482), real estate development investment (-0.416), average low temperature (-0.266)
	Mid-term	Average high temperature (-0.305), average low temperature (-0.260)
	Later stage	Average high temperature (-0.612), export (-0.600), average low temperature (-0.574), total import and export (-0.567)
Furniture	Earlier stage	Consumer price index (-0.854), resident population (-0.840), household deposits (-0.834) and household loans (-0.791)
	Mid-term	Permanent resident population (0.575), household deposits (0.564), M2 supply (0.555) and M1 supply (0.497)
	Later stage	General public budget expenditure (-0.489), investment in primary industry (0.458)
Newspapers and magazines	Earlier stage	Investment in fixed assets (0.853), investment in tertiary industry (0.832) and investment in real estate development (0.793)
	Mid-term	Investment in fixed assets (0.606), investment in tertiary industry (0.606) and investment in primary industry (0.502)
	Later stage	General public services (0.724), general public budget expenditure (0.658) and tertiary industry investment (0.650)
Drink	Earlier stage	Household deposits (). 351), household loans () 367)
	Mid-term	M2 supply (0.662), resident population (0.634), household deposits (0.623), household loans (0.566)
	Later stage	M2 supply (0.705), household deposits (0.608), rainfall (0.584) and average low temperature (0.550)
Cultural office supplies	Earlier stage	Investment in real estate development (0.546), investment in tertiary industry (0.540) and investment in fixed assets (0.513)
	Mid-term	M1 supply (0.683), household loans (0.668), M2 supply (0.639) and total imports and exports (0.638)
	Later stage	Household deposits (0.521), household loans (0.406), average low temperature (0.389) and rainfall (0.319)
Sports and entertainment supplies	Earlier stage	Grain, oil and food (-0.223)
	Mid-term	Rainfall (-0.211)
	Later stage	Investment in primary industry (0.694), household loans (0.583), imports (0.509) and household deposits (0.489)
Hardware and electrical materials	Earlier stage	Education (-0.265)
	Mid-term	Rainfall (0.543), imports (0.442), average low temperature (0.430), household loans (0.404)
	Later stage	General public budget expenditure (0.330), total tourism revenue (-0.378)

Based on the Pearson correlation analysis of consumption data in Kunming city based on SPSS26 software (Table 6 and Table 7), this study reveals the core driving factors and potential weaknesses of consumption growth, which are analyzed as follows.

5.2.1 Core drivers of consumption growth

The first is the significant impact of investment and money supply on previous consumption. In the early stage, real estate development investment, M1/M2 supply, and fixed asset investment show strong positive correlations with most consumption categories (such as total retail sales of consumer goods, commodity retail sales, and catering revenue) (coefficients generally above 0.7). For example, the correlation coefficient between catering revenue and M1 supply is 0.839, while the coefficient between commodity retail sales and real estate development investment is 0.813, indicating that previous consumption was highly dependent on the expansion of real estate investment and loose monetary policy.

Secondly, the supporting role of public budget expenditures in education during the mid-to-late stages. In the mid-to-late phases, the correlation between general public budget expenditures and educational investment and consumption significantly increases. For example, in terms of total retail sales of consumer goods, the correlation coefficient for mid-term education expenditure is 0.570, rising to 0.587 in the later stage; the correlation coefficient between commodity retail sales and public budget expenditures reaches 0.620 in the later stage. This indicates that government public spending is gradually becoming a significant driver of sustained consumption growth.

The third point is the bidirectional effect of household credit and savings. The impact of household loans and deposits on consumption exhibits dynamic changes. In the early stage, household loans were strongly correlated with dining income (0.764) and petroleum products (0.792). Later, they became more dependent on savings (for example, the coefficient of household savings for dining income was 0.493 in the later period). This shift may reflect a decline in residents' willingness to consume through credit and an increase in their tendency to save.

5.2.2 Structural weaknesses in the consumer sector

The first is the consumption of durable goods is constrained by climate and external economic fluctuations. The consumption of durable goods such as automobiles and petroleum products is significantly negatively affected by climatic factors (such as high temperatures, low temperatures, and rainfall) in the later stages (coefficients generally below-0.35). For example, the correlation coefficient between automobile consumption and average high temperatures is-0.384, while that between petroleum products and rainfall is-0.356, indicating that extreme weather may suppress such consumption demands. Additionally, external economic indicators such as exports and imports (for instance, the export coefficient for tobacco and alcohol is-0.600) can drag down certain consumption, highlighting the risk of volatility in an outward-oriented economy.

Secondly, the growth momentum of livelihood consumption is insufficient. The correlation coefficients for basic livelihood consumption items such as grains, oils, and daily necessities in the mid-to-late stages are relatively low (for example, the coefficient of rainfall in later stages for grains, oils, and foods is only 0.286), and some indicators show negative correlations (such as the coefficient of consumer price index for daily necessities in earlier stages being-0.678). This indicates that livelihood consumption is easily suppressed by price fluctuations and lacks sustained growth potential.

The third issue is insufficient support for emerging consumption sectors. Emerging categories such as cultural offices and sports entertainment rely on a single factor (for example, the investment coefficient of sports and entertainment products in the primary industry is 0.694), lacking diversified drivers. Moreover, categories like gold and silver jewelry, and furniture are negatively correlated with the resident population and CPI (for instance, the CPI coefficient for furniture in the early stage is-

0.854), reflecting how demographic changes and inflationary pressures suppress high-end consumption.

5.3 Principal component analysis

Using EViews12 software, principal component analysis was conducted on the consumption data of Kunming City in its early, middle, and late stages, as well as other relevant data and China's economic data. Due to space limitations, this paper focuses on analyzing the value of PC1; other values are not presented but are referenced in the analysis. Readers who wish to learn more can contact the author for additional information.

5.3.1 Conduct principal component analysis in the early period

Data set time range: January 2017 to December 2019, a total of 36 months, with 44 variables. The calculation results are as follows: Principal Component 1 has an eigenvalue of 29.511 and an explained variance ratio of 67.07%; Principal Component 2 has an eigenvalue of 8.640 and an explained variance ratio of 19.64%. Taking the values from principal component 1 where the loadings (which reflect the contribution of each variable to this principal component) are higher, seven consumption variables and seven influencing variables were selected to create a loadings matrix and a main contribution chart (see Figure 1). From Figure 1, it can be seen that in the early stage, traditional Chinese and Western medicines, catering revenue, petroleum and its products, books and magazines, and tobacco and alcohol dominate various types of consumption in Kunming City. The main factors influencing the total retail sales of consumer goods, commodity retail sales, traditional Chinese and Western medicines, catering revenue, petroleum and its products, books and magazines, and tobacco and alcohol consumption in Kunming City are real estate development investment, general public budget expenditure, exports, tertiary industry investment, fixed asset investment, secondary industry investment, and industrial investment. This indicates that in the early stage, consumption in Kunming City is more driven by investment factors and also influenced by public budget expenditure.

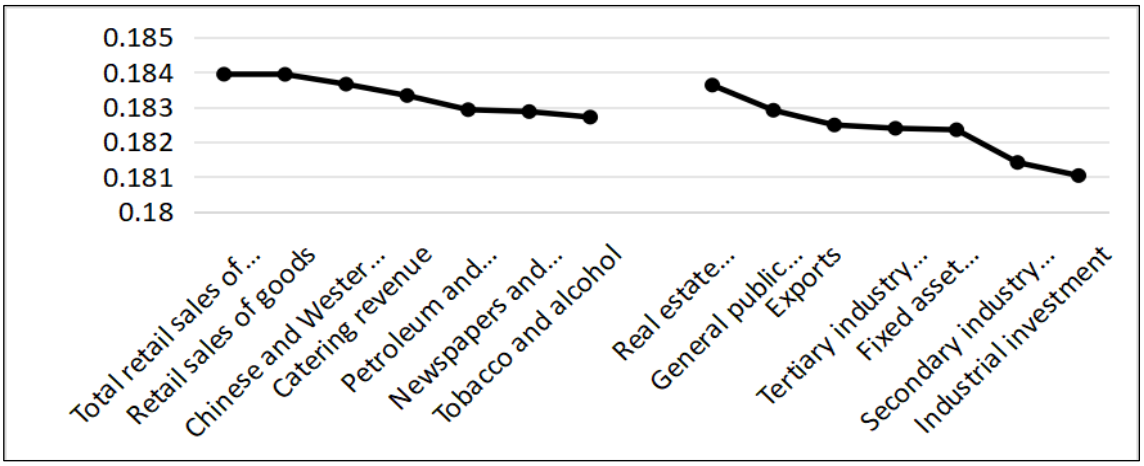

Fig. 1. Figure of the main contributing variables of PC1 load matrix in the early period

5.3.2 Conduct mid-term principal component analysis

Data set time range: January 2020 to December 2022, a total of 36 months, with 44 variables. The calculation results are as follows: Principal Component 1 has an eigenvalue of 31.889 and explains 72.48% of the variance; Principal Component 2 has an eigenvalue of 6.515 and explains 14.8% of the variance. Taking the values from principal component 1 where the loadings for consumption

data and other data are higher, seven consumption variables and seven influencing variables were selected, and the main contribution plot of the loading matrix was drawn (see Figure 2). From Figure 2, it can be seen that during the mid-term period, automobile, communication equipment, grain and oil food, Chinese and Western medicines, petroleum and its products, and catering consumption dominate in Kunming City. The primary factors affecting the retail sales of automobiles, communication equipment, grain and oil food, Chinese and Western medicines, petroleum and its products, social consumer goods, and catering revenue in Kunming City include total tourism income, investment in the secondary industry, general public budget expenditure, industrial investment, education, fixed asset investment, and investment in the tertiary industry. This indicates that during the mid-term period, tourism has become the leading factor driving consumption growth in Kunming City, while the influence of investment and public budget expenditure still exists but is beginning to diminish, with education starting to play a more significant role in boosting consumption.

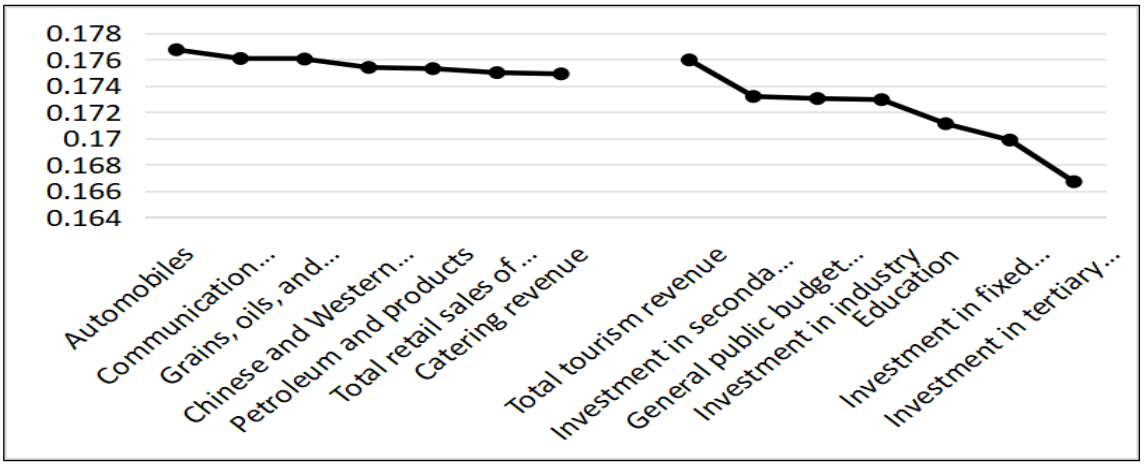

Fig. 2. Shows the main contributing variables of PC1 load matrix in the medium period

5.3.3 Perform principal component analysis in the later period

Data set time range: January 2023 to September 2024, a total of 21 months, with 44 variables. The calculation results are as follows: Principal Component 1 has an eigenvalue of 33.703 and explains 78.38% of the variance; Principal Component 2 has an eigenvalue of 4.684 and explains 10.89% of the variance. Taking the values from principal component 1 where the loadings are higher than those in other data, seven consumption variables and seven influencing variables are selected, and the loadings matrix is plotted to show the main contributions (see Figure 3). From Figure 3, it can be seen that in the later stages, the consumption of traditional Chinese and Western medicines, daily necessities, catering services, clothing and footwear, textiles, and food and grain products dominates in Kunming City. The primary factors influencing the total retail sales of consumer goods, commodity retail sales, traditional Chinese and Western medicines, daily necessities, catering services, clothing and footwear, textiles, and food and grain products are general public budget expenditures, imports, general public services, exports, education, and investment in the secondary industry. This indicates that in the later stages, general public budget expenditures have become the leading factor driving consumption growth in Kunming City, while the role of imports in boosting consumption has significantly increased. Additionally, the impact of general public services and education on consumption has grown, whereas the effect of investment on consumption has markedly declined.

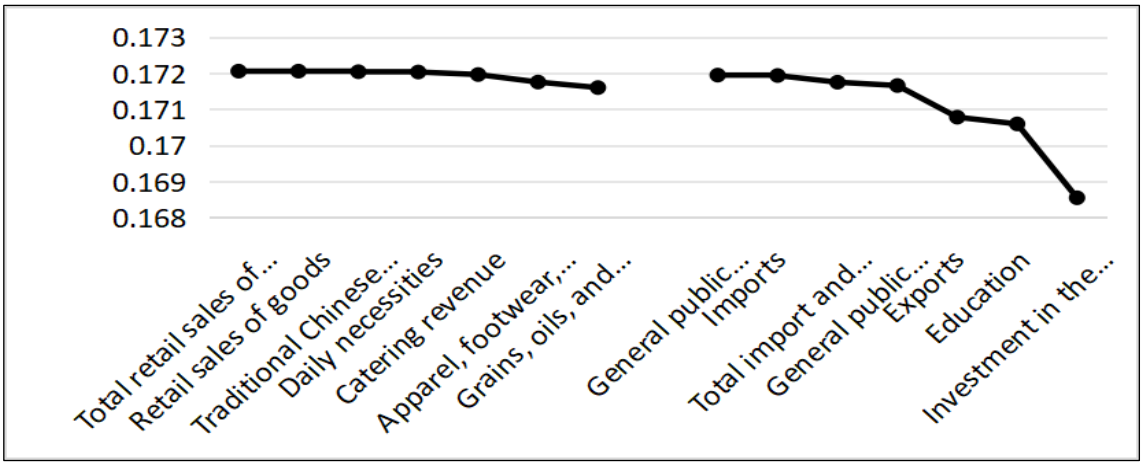

Fig. 3. Figure of the main contributing variables of PC1 load matrix in the late period

6. Analysis of structural weaknesses and countermeasures in consumption in Kunming city

6.1 Shortcomings in consumption in Kunming

Kunming's consumption shortcomings are primarily manifested in structural imbalance, single driving force, lagging transformation of traditional business models, and excessive external dependence. To address these issues, it is necessary to optimize the structure of consumer supply, promote industrial upgrading, improve income distribution mechanisms, and innovate consumption scenarios through comprehensive measures. This will stimulate internal market dynamics and achieve sustainable growth in consumption.

Non-essential consumer goods and high-end consumer demand continue to be depressed, and the imbalance of consumption structure is obvious. According to the data in Table 5, non-essential consumer goods such as clothing, footwear, textiles, daily necessities, household appliances, and audio-visual equipment in Kunming City showed a significant downward trend after 2023. For example, the average monthly consumption of clothing, footwear, textiles decreased by 36.4% during the mid-term (2020-2022) and further dropped by 4.5% in the late term (2023-2024). The consumption of daily necessities fell by 10.9% year-over-year in the late term, while the consumption of household appliances and audio-visual equipment plummeted by 44.5%. This decline reflects that consumers tend to save or prioritize basic living needs after the pandemic, significantly reducing their willingness to purchase non-essentials. Additionally, high-end consumption sectors like gold and jewelry, building materials, and decoration materials also showed weakness. In the late term, gold and jewelry consumption grew by only 25.5% year-over-year but remained low compared to the early period (2017-2019) (with an average monthly consumption of 0.59 billion yuan, which is just 28% of the early level). The shift in consumption structure towards essential items has left the potential for high-end and experiential consumption underutilized, leading to insufficient momentum for consumption upgrades.

Consumption in the real estate-related industrial chain declined sharply, dragging down overall consumption growth. Kunming's real estate-related consumption sectors, including building and decoration materials and furniture, experienced a cliff-like decline in the later stages. Data shows that the average monthly consumption of building and decoration materials was only 0.17 billion yuan, a decrease of 51.4% from the mid-term period and a significant drop of 87.6% compared to the earlier stage; furniture consumption saw zero growth year-over-year, down 63.7% from the previous period. This phenomenon is closely linked to the slowdown in real estate development investment. The downturn in the real estate market not only directly suppressed the consumption of building materials and home furnishings but also affected upstream and downstream industries such as home

appliances and hardware through supply chain effects. For example, the consumption of household appliances and audio-visual equipment decreased by 44.5% year-over-year, while the consumption of hardware and electrical materials remained at zero growth. The contraction in the real estate sector has become a major constraint on consumption growth in Kunming.

The driving force of consumption is single, and it relies too much on government spending and public services. Principal Component Analysis (PCA) results show that the core driving force behind consumption growth in Kunming City has undergone a significant shift in later stages. In the early stage (2017-2019), consumption was mainly driven by real estate development investment and fixed asset investment, while in the later stage (2023-2024), general public budget expenditure, educational investment, and imports have become the dominant factors. For example, the correlation coefficient between total retail sales of consumer goods and general public budget expenditure reached as high as 0.643, and the correlation coefficient between Sino-Western medicine consumption and public services was 0.605. Although government spending has had some boosting effect on consumption, this trend reflects insufficient internal market dynamics. Data shows that fixed asset investment in Kunming City decreased by 56.2% year-on-year in the later stage (Table 2), with the growth rate of secondary industry investment being only 0.4%, indicating a lack of vitality in manufacturing and the real economy, which is unable to support diversified consumption growth. A consumption model overly reliant on fiscal input has weak sustainability and is easily affected by policy adjustments.

There is insufficient innovation in online consumption scenarios, and the transformation of traditional retail formats lags behind. Despite a 77.1% year-on-year increase in communication equipment consumption later on (Table 5), this growth was mainly driven by the rigid demand for remote working and education, rather than innovations in local e-commerce or new retail models. Taking clothing, footwear, and textiles as an example, their consumption decreased by 4.5% later on, while China's M2 supply grew by 30.1% during the same period (Table 4), indicating ample liquidity that failed to effectively translate into local consumption momentum. Additionally, principal component analysis shows that the correlation between consumption in Kunming City and seasonal factors (such as temperature and rainfall) increased later on (for instance, the correlation coefficient between daily necessities consumption and temperature is-0.337), reflecting a high dependence of traditional retail formats on natural conditions and insufficient digital and intelligent transformation, which has not fully adapted to changes in consumer behavior.

Insufficient consumer confidence, income distribution and savings tendency restrain the release of demand. Kunming's household deposits reached 891.6 billion yuan in September 2024, a 101.2% increase from 2017 (Table 2). In contrast, household loans grew at a rate of only 140.5% during the same period, indicating that deposit growth far outpaced loan growth and suggesting an increased tendency towards savings among residents. Pearson correlation analysis further revealed a significant negative correlation between later-stage daily consumption and household deposits (-0.483), as well as a negative correlation between gold and jewelry consumption and M0 supply (-0.302). This reflects the crowding-out effect of high savings rates on consumption. Additionally, income distribution inequality is a prominent issue. Unreasonable income distribution is one of the main obstacles to expanding resident consumption. As a central city in southwestern China, Kunming had a permanent population of 8.68 million in 2023, but its per capita GDP was only 90,600 yuan, below the average level of major Chinese cities. Weak income growth and uneven distribution limit the consumption capacity of middle-and low-income groups, thereby suppressing overall consumption potential.

High dependence on external economy, import and export fluctuations increase consumption uncertainty. Kunming's consumption has shown a significant increase in its correlation with imports and exports in the later period. Principal component analysis reveals that the correlation coefficient between total retail sales of consumer goods and imports is 0.619, while the correlation coefficient between tobacco and alcohol consumption and exports reaches-0.600 (Table 7). This phenomenon indicates that Kunming's consumption is highly sensitive to external economic conditions. Fluctuations in international trade affect local commodity supply and price stability through supply chains, thereby dampening consumer confidence. Moreover, the substitution effect of imported goods on the local market (such as high-end cosmetics and electronics) may squeeze the survival space for domestic brands, further exacerbating imbalances in the consumer market.

6.2 Suggestions on promoting consumption in Kunming

Optimize the structure of consumption supply and activate non-essential and high-end consumer demand. To address the issues of sluggish demand for non-essential consumer goods and high-end consumption, it is necessary to enhance market vitality through supply-side reforms and innovations in consumption scenarios. Data shows that after 2023, the consumption of clothing, footwear, textiles, daily necessities, and household appliances in Kunming City declined by 4.5%,10.9%, and 44.5% year-on-year, respectively. The consumption of gold, silver, and jewelry has only recovered to 28% of its previous level (Table 5). It is recommended to implement differentiated consumption subsidy policies, providing fiscal subsidies or tax reductions for upgraded products such as smart home appliances and green home furnishings; promote the development of "first-store economy" and experiential consumption scenarios, introducing international brands and local premium customization services to create regional consumption centers. At the same time, combine tourism and cultural resources to develop high-end cultural and tourism products, such as customized jewelry design and intangible cultural heritage experiences, thereby releasing upgraded demand through diversified consumption scenarios.

Stabilize the real estate industry chain and foster diversified consumption growth points.The cliff-like decline in real estate-related consumption demands the restructuring of industrial chains and the cultivation of new consumer sectors. Data shows that in 2024, Kunming's real estate development investment fell by 81.3% compared to 2021, with building and decoration materials and furniture consumption declining by 87.6% and 63.7%, respectively (Table 2, Table 5). It is recommended to promote green buildings and smart home adoption through policy guidance, offering procurement subsidies for energy-saving building materials and smart home devices; encourage real estate companies to transform into long-term rental apartments and wellness communities, activating the existing property market. At the same time, support home furnishing companies in collaborating with e-commerce platforms to develop an "online selection + offline experience" model, lowering the consumption threshold. Additionally, promote policies for trading in old appliances for new ones, combining low-carbon consumption concepts to stimulate demand for upgrades.

Enhance the internal driving force of the market and build a diversified consumption-driven mechanism. The singularity of consumption drivers needs to be addressed through market mechanism reforms and industrial synergy. Principal component analysis shows that later-stage consumption growth mainly relies on general public budget expenditures (correlation coefficient 0.643) and educational investment (0.587), while fixed asset investment fell by 56.2% year-on-year (Table 2, Table 6). It is recommended to optimize the business environment, encouraging small and medium-sized enterprises' innovation through tax incentives and financing support; establish a consumer innovation fund to support local brand R&D and digital transformation. For example, for

services such as catering and tourism, promote policies for "nighttime economy" and "weekend economy," extending consumption periods. At the same time, enhance industry integration, such as the "agriculture + tourism" and "manufacturing + service" models, to foster new growth poles in consumption.

Accelerate digital transformation and promote the deep integration of online and offline consumption. Traditional retail formats need to transform through technological innovation and scenario reconstruction. Despite a 77.1% increase in communication equipment consumption later on, this growth mainly relies on remote working needs (Table 5), with insufficient penetration of local e-commerce. It is recommended to build regional digital consumption platforms, integrate local merchant resources, and introduce new models such as "cloud shopping" and "live-streaming sales"; support traditional supermarkets in connecting to smart retail systems, using big data analysis to understand consumer preferences and achieve precise marketing. For example, addressing the 4.5% decline in clothing and footwear consumption (Table 5), virtual fitting rooms and AR shopping tools can be developed to enhance online experiences. Additionally, improve logistics networks and cold chain facilities, expand the coverage of fresh food e-commerce, and strengthen community group buying services.

Improve the income distribution mechanism and enhance people's consumption capacity and confidence. The crowding-out effect of high savings rates on consumption needs to be mitigated through income distribution reform and improved social security. Data shows that household deposits in Kunming City reached 891.6 billion yuan in 2024, a 101.2% increase from 2017, while the consumption of daily necessities is negatively correlated with savings (-0.483) (Table 2, Table 6). It is recommended to raise the minimum wage and expand the size of the middle-income group; implement a tiered personal income tax reduction policy, favoring low-income families. At the same time, improve public services such as healthcare and education to reduce precautionary savings motives. For example, establish a mechanism linking consumption subsidies with income growth, issuing targeted consumption vouchers to low-income families. Additionally, develop inclusive finance, optimize consumer credit products, and lower the threshold for installment payments.

Strengthen the competitiveness of local brands and reduce the risk of external economic dependence. The impact of external economic fluctuations on consumption needs to be addressed through optimizing the domestic supply chain and building strong brands. Principal component analysis shows that the correlation coefficient between total retail sales of consumer goods in later periods and imports is 0.619, while tobacco and alcohol consumption is negatively correlated with exports (-0.600) (Table 7). It is recommended to establish a fund to support local brands, promoting technological upgrades and brand internationalization for "time-honored" enterprises; to promote collaboration between cross-border e-commerce and the domestic supply chain to reduce the risk of import substitution. For example, to address the issue of imported cosmetics squeezing out the domestic market, efforts can be increased in research and development to create products with natural ingredients and ethnic characteristics. At the same time, a regional emergency material reserve system should be established to enhance supply chain resilience; trade cooperation with Southeast Asian countries should be deepened to diversify export markets and spread external risks.

7. Conclusion

7.1 Research implications

Consumption, as a key driver of economic growth, has profound implications for the healthy development of an economy through changes in its patterns and structure. This paper, based on an in-depth analysis of consumption data from Kunming City from 2017 to 2024, explores insights into

China's consumption growth, aiming to provide a reference for promoting consumption and driving high-quality economic development across China.

Strengthen the data-driven scientific decision-making mechanism. Accurately grasping the current state and trends of consumption is a prerequisite for formulating effective consumer policies. This study employs Pearson correlation coefficients and principal component analysis to clearly outline the consumption landscape of Kunming City from 2017 to 2024. This indicates that regions should establish comprehensive data monitoring systems, track consumption dynamics in real time, leverage big data and artificial intelligence technologies to uncover consumption trends, achieve dynamic adjustments and precise optimization of consumer policies, thereby enhancing policy effectiveness.

Optimize the structure of consumption supply to stimulate market vitality. Research shows that non-essential consumption in Kunming is sluggish, highlighting the imbalance in supply structure. China should take this as a lesson and accelerate supply-side reform. Targeting upgrades such as smart home appliances and green living spaces, it should implement consumer subsidies and tax incentives to stimulate corporate innovation. At the same time, vigorously develop "first-store economy," experiential consumption, and cultural-tourism integration projects, like intangible cultural heritage experiences, to meet diverse consumer needs and unleash consumption potential.

Enhance the internal market power to resist external risks. Kunming's consumption is overly reliant on fiscal input, lacking intrinsic market momentum. Localities need to optimize the business environment, encouraging small and medium-sized enterprises to innovate through tax incentives and financing support, and establish consumer innovation funds to boost the growth of local brands. At the same time, promote industrial integration, such as "agriculture + tourism" and "manufacturing + services," to foster new growth points and enhance consumption resilience.

Accelerate digital transformation to lead consumer trends. Kunming's traditional retail sector lags behind in transformation, with insufficient innovation in online consumption. China should vigorously promote the construction of digital consumption platforms, integrate local resources, and popularize models such as "cloud shopping" and "live-streaming sales." Support supermarkets in connecting to smart retail systems to leverage big data for precise marketing; develop tools like virtual fitting and AR shopping to enhance online experiences; improve logistics and cold chain management, expand the coverage of fresh food e-commerce, and drive the deep integration of online and offline consumption.

Improve the income distribution mechanism to enhance consumption capacity. High savings rates and unequal income distribution suppress consumption in Kunming. Localities should raise the minimum wage, expand the middle-income group, implement tiered individual income tax reductions, and favor low-income families. At the same time, improve public services such as healthcare and education to reduce precautionary saving motives; develop inclusive finance, optimize consumer credit products, lower installment thresholds, and enhance residents' confidence and ability to consume.

Reduce external economic dependence to stabilize the consumer market. Kunming's consumption is significantly influenced by fluctuations in imports and exports. Localities should support domestic brands, promote technological upgrades and internationalization to reduce the risk of import substitution; strengthen regional emergency material reserves to enhance supply chain resilience; deepen trade cooperation with neighboring countries to diversify exports, such as expanding into Southeast Asian markets to stabilize consumer markets.

7.2 Research outlook

The study systematically analyzed the dynamic mechanisms of consumption structure transformation in Kunming City, combining Pearson correlation coefficients and principal component analysis to reveal the synergistic effects of policy-driven factors, economic variables, and non-economic factors on consumption upgrades. The research constructed a multidimensional analytical framework, clarifying the phased characteristics of consumption shifting from "investment-driven" to "public expenditure-dependent," providing theoretical support for optimizing consumption policies. Proposed strategies such as differentiated subsidies and digital transformation closely align with practical needs, offering significant reference value for balancing domestic demand expansion and risk prevention. The methodology also provides replicable analytical pathways for similar city studies. Future research can introduce more scientific methods to analyze consumers' micro-decision-making mechanisms in response to policy interventions, enhancing the precision of policy implementation.

Funding
This research received no external funding.

Data Availability Statement
https://tjj.km.gov.cn/ndsj/
https://data.stats.gov.cn/easyquery.htm?cn=C01

Conflicts of Interest
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement
This research was not funded by any grant.

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