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Factors Influencing University Students' Supermarket Purchasing Behavior Based on Regression Analysis

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How To Cite: Liu, X.; Li, X.; Li, Y.; et al. Factors Influencing University Students' Supermarket Purchasing Behavior Based on Regression Analysis. *Complex Systems Stability & Control* **2025**, *1*(1), 3.

Received: 29 July 2025
Revised: 26 August 2025
Accepted: 2 September 2025
Published: 3 September 2025

Abstract: Based on student satisfaction, this study evaluates campus supermarkets at provincial universities in Chengdu to analyze influencing factors. Data collected through questionnaires were analyzed using SPSS software, revealing overall student satisfaction with campus supermarkets. With overall satisfaction as the dependent variable, measurable factors were categorized into three dimensions: (1) Comprehensive Operation Experience; (2) Service & Environmental Quality; and (3) Shopping Experience Quality, all demonstrating statistically significant positive effects on satisfaction. Consequently, improvement recommendations are proposed regarding environment optimization, staff service enhancement, product quality control, and business hour adjustments for campus supermarket operators.

Keywords: factor analysis; regression analysis; campus supermarkets; student satisfaction

1. Introduction

Factor analysis and regression analysis were selected as the core methodological approaches in this study due to their distinct advantages in handling multidimensional consumer data and modeling complex relationships. Factor analysis is particularly effective in reducing data dimensionality and identifying latent constructs from observed variables, which is essential for distilling numerous satisfaction indicators into interpretable factors [1,2]. This method allows researchers to uncover the underlying structure of student satisfaction and avoid multicollinearity issues in subsequent regression modeling. Regression analysis, on the other hand, provides a robust framework for quantifying the strength and direction of relationships between identified factors and overall satisfaction, enabling predictive insights and hypothesis testing [3,4]. Together, these methods offer a comprehensive analytical pipeline that combines exploratory power with causal inference, making them ideally suited for investigating the driving mechanisms behind student supermarket shopping behavior.

Since the 1990s, China's higher education expansion policy has accelerated campus development [5], transforming university campuses into substantial consumer markets. As an indispensable component of student life, campus supermarkets not only provide daily necessities and convenience services but also shape students' consumption concepts and quality of life. However, despite their critical role, there remains a scarcity of empirical studies focusing specifically on provincial universities in China, particularly within the context of post-pandemic retail behavior and digital transformation. Most existing literature either predates recent technological shifts or concentrates on metropolitan or international contexts, leaving a gap in understanding the unique drivers of student satisfaction in Chengdu's regional academic settings. This study is motivated by the need to address this research gap and to provide a contemporary, data-driven analysis that reflects the evolving retail expectations of modern

university students. Theoretically, this study on satisfaction with campus supermarkets at provincial universities in Chengdu enriches academic literature in this domain, establishes a foundational reference for future research, and enhances understanding of consumer behavior patterns in ampus retail environments. Practically, it identifies key determinants of student satisfaction, offering concrete guidance for improving service quality. Supermarket operators may optimize shopping experiences, adjust product assortments and pricing strategies, and better meet student needs to enhance campus competitiveness. Socially, prioritizing supermarket satisfaction contributes to elevating student well-being and fostering harmonious campus consumption environments. Furthermore, the findings provide transferable insights for managing campus supermarkets across higher education institutions, ultimately advancing logistical service standards and promoting sustainable development of campus retail infrastructure in the region.

2. Theoretical Basis and Research Hypotheses

In recent years, alongside the development of domestic higher education, campus supermarkets as essential commercial facilities have experienced rapid growth. Domestic campus supermarkets have primarily evolved from traditional small shops to modern chain stores. With business model innovations and improvements in the campus commercial environment, these supermarkets have become vital venues for meeting students' daily consumption needs. Internationally, campus supermarkets typically feature larger scales, diverse product ranges, and attentive services that cater to varied student demands. Moreover, they emphasize collaboration with educational institutions to provide enhanced convenience and benefits for students.

Domestic research has primarily focused on consumer satisfaction regarding overall supermarket experience, product quality, service quality, and pricing. Such studies typically employ questionnaire surveys and statistical analysis of large samples to evaluate consumer satisfaction. Handong Yang (2007) identified satisfaction survey indicators including product characteristics, service conditions, store appearance, shopping environment, and other aspects (product hardware, product credibility, promotions) [1]. Lizhong Mi (2010) further noted that factors influencing supermarket customer satisfaction encompass products, services, pricing, promotions, shopping environment, and convenience [6]. Yihua Ma and Xiangfeng Ye through constructing and analyzing a customer satisfaction evaluation system for Chengdu Auchan Supermarket, identified shopping convenience, pricing, staff service, and personalized services as critical factors affecting satisfaction [2]. Weijiao Jiao (2016) evaluated customer satisfaction at Baoding Zhengtai Department Store using questionnaires, in-depth interviews, statistical analysis, and fuzzy comprehensive evaluation, proposing targeted recommendations across merchandise, pricing, promotions, environment, and services [7]. Qian Yang and Yuhan Zhou summarized five primary influencing factors for supermarket customer satisfaction—store image, product conditions, staff service, shopping environment, and convenience—and proposed corresponding enhancement strategies [3].

More recently, studies have begun to explore the integration of digital technology and consumer behavior in retail contexts. For instance, Zhang and Li (2021) examined how mobile payment systems and self-checkout technologies influence perceived convenience and satisfaction among university students, highlighting the growing expectation for seamless digital experiences [8]. Similarly, Wang et al. (2022) investigated the role of social media and online-to-offline (O2O) integration in shaping campus retail satisfaction, suggesting that digital engagement significantly enhances student loyalty [9]. Furthermore, with the rise of sustainable consumption, research by Liu and Chen (2023) indicates that environmental concerns and green product offerings are increasingly affecting student satisfaction and purchase decisions in campus supermarkets [10].

Internationally, researchers utilize diverse methodologies such as questionnaires, interviews, and observational studies to explore campus supermarket satisfaction from multiple perspectives. These investigations examine not only overall satisfaction but also contributing factors including product variety, pricing, service quality, and environment. Foreign scholars have a long history of customer satisfaction research. Cardozo (1965) first introduced the theory of customer satisfaction, noting in his publication that improved product satisfaction encourages repeat purchases and reduces brand switching [11]. Lilien (1992) examined the relationship between customer satisfaction and purchase decisions, finding that low satisfaction may lead to purchase abandonment, with initial decisions influencing future behavior and affecting other customers. Thus, customer satisfaction is crucial for business development [12]. Nic S. Terblanche (2019) employed mixed-methods data collection and analysis, demonstrating significant positive relationships between in-store purchase experience, product categorization, staff behavior, store environment, and customer satisfaction [12]. Recent international studies have also emphasized experiential retailing and omnichannel strategies. For example, Kim and Park (2022) found that sensory elements such as ambient scent and music significantly affect mood and time perception, thereby influencing satisfaction and spending behavior [13]. Ruofeng Rao and Sarana Photchanachan (2024) utilized

structural equation modeling to study influencing factors and triggering mechanisms in Wuliangye consumer purchasing behavior [4].

In summary, while existing literature provides a solid foundation on satisfaction drivers in supermarket contexts, recent advancements highlight the critical roles of digital integration, sustainability, sensory marketing, and personalized experiences. This study builds upon this evolving body of work by examining these dimensions within the unique setting of campus supermarkets in Chengdu, thereby contributing to both domestic and international discourse on retail satisfaction and consumer behavior.

Inspired by these scholarly approaches ([4,11,12,14–17]), the present study investigates satisfaction with campus supermarkets at provincial universities in Chengdu through questionnaire surveys and data analysis.

When designing the satisfaction survey, our theoretical framework draws upon four key concepts:

(1) Customer Satisfaction Theor

Customer satisfaction reflects consumers' psychological evaluation after purchasing products/services. Philip Kotler et al. posit satisfaction as an irrational, subjective judgment where perceived value—derived from comparing actual experiences against expectations—determines satisfaction levels [15]. This theory emphasizes the gap between expectations and perceptions and its impact on satisfaction. Our questionnaire incorporates this framework to assess students' expectations, perceived quality, perceived value, and overall satisfaction regarding campus supermarkets.

(2) Service Quality Management Theory

This theory addresses how service providers meet/exceed customer expectations through five dimensions: reliability, responsiveness, assurance, empathy, and tangibility [15]. These dimensions structure our evaluation of campus supermarket performance.

(3) Expectation Disconfirmation Theory

Satisfaction depends on the disparity between pre-purchase expectations and actual perceptions. Satisfaction occurs when perceptions exceed expectations; dissatisfaction arises when perceptions fall short [15]. Our questionnaire operationalizes this theory by comparing students' expectations against actual experiences.

(4) Maslow's Hierarchy of Needs

Maslow's theory outlines five human need levels: physiological, safety, social belonging, esteem, and self-actualization [15]. This hierarchy provides a framework for understanding students' shopping motivations and expectations. Our survey design incorporates these needs to evaluate fulfillment during campus supermarket visits. Maslow's theory provides a structured framework for understanding the hierarchical nature of consumer needs, from basic physiological requirements to higher-level psychological desires [15]. Its application in retail contexts helps explain how campus supermarkets can cater to different levels of student needs, thereby enhancing satisfaction and loyalty. For instance, while basic products meet physiological and safety needs, value-added services and personalized experiences may address social belonging and esteem needs, contributing to a more comprehensive consumer experience. Recent studies have further validated the relevance of Maslow's hierarchy in modern retail settings, demonstrating its utility in segmenting consumer markets and designing targeted marketing strategies [18].

Following university enrollment expansions, intensified competition among campus supermarkets has made consumption satisfaction critical for survival [14]. Satisfaction is influenced by multiple factors: product quality, pricing, service, merchandise variety, and shopping environment. To enhance service quality and satisfaction, this study will:

- Analyze determinants of campus supermarket satisfaction
- Examine gender-based differences in satisfaction
- Investigate impacts of three shopping factors on satisfaction
- Propose targeted improvement strategies

Satisfaction influencers include shopping experience, product attributes, merchandise diversity, and physical/digital infrastructure. Positive service attitudes enhance shopping experiences and satisfaction. Product variety and environment also contribute—diverse offerings and comfortable settings increase purchase intent. Product quality remains essential for meeting student needs, while reasonable pricing attracts more customers. Additionally, gender differences emerge in satisfaction evaluations, with female students potentially prioritizing product diversity and environmental comfort.

Based on these theoretical foundations, we propose the following hypotheses regarding overall satisfaction:

H1: *Supermarket service and environmental quality positively impact overall satisfaction*.

H2: *Comprehensive operational experience positively impacts overall satisfaction*.

H3: *Shopping experience quality positively impacts overall satisfaction*.

Remark 1. *In some relevant literature ([19,20]), there are also the following hypotheses:*

H4: *Product variety and availability positively impact overall satisfaction*.

H5: *Staff behavior and helpfulness positively impact overall satisfaction*.

H6: *Store layout and ease of navigation positively impact overall satisfaction*.

H7: *Checkout process efficiency positively impacts overall satisfaction*.

H8: *Loyalty programs and promotions positively impact overall satisfaction*.

While the proposed additional hypotheses (H4–H8) concerning product variety, staff behavior, store layout, checkout efficiency, and loyalty programs are well-established drivers of satisfaction in conventional retail settings ([19,20]), their applicability to campus supermarkets in provincial universities is limited. Unlike large urban supermarkets or university-town commercial complexes, campus supermarkets typically operate under spatial, operational, and demographic constraints. For instance, product variety is often limited due to space and logistical restrictions; staff roles are less differentiated; store layouts are simplified for high-traffic efficiency; checkout processes are basic; and loyalty programs are rarely implemented. Therefore, while H4–H8 represent valuable dimensions of retail satisfaction in broader contexts, they are less relevant to the specific context of this study, which focuses on essential and highly frequented on-campus convenience outlets.

3. Survey Design

3.1. Supermarket Profile

As essential commercial facilities serving students' daily needs, campus supermarkets at provincial universities in Chengdu provide commodities and fulfill routine consumption requirements. Typically located on campus for convenient access, these supermarkets offer diverse products ranging from food, beverages to stationery and daily necessities, covering nearly all aspects of student life. Their scale varies from small convenience stores to comprehensive supermarkets, depending on campus size, student population, and surrounding commercial environment. Key characteristics include:

(1) Accessibility: Strategically positioned for after-class shopping convenience
(2) Product Diversity: Limited space optimized for diverse student needs
(3) Price Appropriateness: Student-friendly pricing considering purchasing power

These supermarkets prioritize convenience, product variety, reasonable pricing, and attentive service. To enhance competitiveness and meet student expectations, continuous optimization of operational strategies and service quality is imperative.

3.2. Theoretical Framework for Questionnaire Design

The satisfaction survey questionnaire for campus supermarkets at provincial universities in Chengdu integrates five theoretical foundations:

- Customer Satisfaction Theory (Kotler, 1998 [15])
- Service Quality Management Theory (SERVQUAL dimensions)
- Expectation Confirmation Theory (Oliver, 1980)
- Maslow's Hierarchy of Needs
- Scale Design Methodology

This multidisciplinary framework ensures scientific rigor and practical applicability in instrument development.

3.3. Campus Supermarket Satisfaction Questionnaire

Questionnaire design constitutes a critical phase in researching student satisfaction with campus supermarkets at provincial universities in Chengdu, as a robust research framework ensures scientific validity, accuracy, and reliability. This study aims to comprehensively examine satisfaction levels among Chengdu's provincial university students regarding campus supermarkets while identifying key influencing factors. Core

research questions include: What are students' overall satisfaction levels? Which factors predominantly affect satisfaction? How can supermarkets implement improvements to enhance customer satisfaction? Targeting this research focus, the authors selected Chengdu university students as participants, developing a questionnaire comprising three primary sections: respondents' demographic profiles, income status, and shopping behaviors. The survey was distributed through multiple channels—faculty-assisted dissemination, direct WeChat/QQ outreach (via Questionnaire Star links), and peer referrals—with participants assured of data confidentiality and exclusive academic usage to encourage truthful responses. From 134 returned questionnaires, 126 were validated, yielding a 94% validity rate.

4. Empirical Analysis and Hypothesis Testing

The application of factor analysis and regression analysis in this study offers distinct advantages for exploring the multidimensional nature of student satisfaction. Factor analysis enables the condensation of 22 observed variables into three coherent dimensions (Comprehensive Operation Experience, Service & Environmental Quality, and Shopping Experience Quality), effectively reducing data complexity while preserving critical information [2]. This dimension reduction not only enhances interpretability but also provides validated constructs for subsequent regression modeling. Regression analysis then quantifies the impact of these factors on overall satisfaction, with the high explanatory power ($R^2 = 0.789$) demonstrating the effectiveness of this combined approach in capturing key drivers of student satisfaction [3,12]. The methodological synergy between these techniques provides a robust foundation for both theoretical insight and practical recommendation.

(1) Basic Information Analysis

Among the 126 valid samples, females accounted for 53.97%, while males represented 46.03%. Freshmen constituted the largest proportion (16.67%), whereas seniors were the smallest group (18.25%). Most students (56.35%) reported monthly living expenses between 1000–2000 CNY. The majority visited supermarkets 1–3 times per week (52.38%) (as shown in Table 1).

Table 1. Frequency analysis.

Variable	Option	Frequency	Percentage (%)	Cumulative Percentage (%)
1. Gender	1 (Male)	68	53.968	53.968
	2 (Female)	58	46.032	100.000
2. Grade Level	1 (Freshman)	21	16.667	16.667
	2 (Sophomore)	44	34.921	51.587
	3 (Junior)	38	30.159	81.746
	4 (Senior)	23	18.254	100.000
3. Monthly Living Expenses (CNY)	1 (<1000)	11	8.730	8.730
	2 (1000–2000)	71	56.349	65.079
	3 (2000–3000)	28	22.222	87.302
	4 (>3000)	16	12.698	100.000
4. Weekly Supermarket Visits	1 (0 times)	1	0.794	0.794
	2 (1–3 times)	66	52.381	53.175
	3 (4–7 times)	38	30.159	83.333
	4 (>8 times)	21	16.667	100.000

(2) Reliability and Validity Analysis

As shown in the table, this dataset contains 18 items with a Cronbach's alpha reliability coefficient of 0.916, exceeding the standard of >0.7. This value is not only satisfactory but also compares favorably with recent similar

studies in retail satisfaction contexts, such as Zhang and Li (2021) [8] who reported α = 0.89 in a digital payment study, and Kim and Park (2022) [13] who noted α = 0.91 in sensory marketing research. The high reliability indicates robust internal consistency of the scale items. This indicates satisfactory results and stable test performance, demonstrating good reliability quality of the research data (as shown in Table 2). Exploratory factor analysis serves to measure the structural validity of the scale by assessing whether latent variables exhibit stable consistency and structure. As the most commonly used indicator for evaluating scale validity, this study conducted validity testing on each dimension composition. When performing validity analysis using factor analysis, two primary conditions must be met: first, the KMO value should exceed 0.7; second, Bartlett's sphericity test must show significance below 0.05. Meeting these criteria confirms strong correlations among observed variables, making them suitable for factor analysis (as shown in Table 3).

Table 2. Cronbach's alpha reliability test.

Number of Items	Sample Size	Cronbach's α
18	126	0.916

Table 3. KMO and Bartlett's test.

Bartlett's Sphericity Test	KMO	0.900
	Approx. Chi-Square	1015.104
	df	153
	P	0.000

The KMO and Bartlett tests were conducted to validate the validity of the questionnaire. As shown in the table above: The KMO test value for the survey data is 0.9, exceeding the threshold of 0.7, indicating that the questionnaire is suitable for factor analysis. The Bartlett's test of sphericity shows an approximate chi-square value of 1015.104 with a significance probability of less than 0.001. This result rejects the null hypothesis of Bartlett's test, confirming that the scale is appropriate for factor analysis and demonstrating good validity structure.

To further assess the level of overall satisfaction, a single-sample *t*-test was conducted.

According to the single-sample *t*-test, as shown in the following table, the single-sample *t*-test was conducted on the variable satisfaction level and the test value of 3.0. The results showed that the average value of this group of data was 2.159, the test *t*-value was −16.994, and the *p*-value was less than 0.001, indicating that there was a significant difference between the data and the test value of 3.0 ($p < 0.05$) (as shown in Table 4).

Table 4. Analysis results of single-sample *t*-test.

Name	Sample size	Minimum	Maximum	Mean	Standard Deviation	*t*	*p*
Overall satisfaction	126	1.389	5.0	2.159	0.557	−16.994	0.000 ***

*** $p < 0.001$.

(3) Exploratory factor analysis

To conduct information condensation research using factor analysis, we first evaluate the suitability of the research data for this method. As shown in the table: The KMO value (Kurtosis-Moment) is 0.9 > 0.7, indicating high validity and suggesting the data is suitable for factor analysis. Additionally, the Bartlett's test of sphericity ($p < 0.05$) confirms that the data meets the criteria for factor analysis (as shown in Table 5).

Table 5. KMO test and Bartlett test.

Bartlett's test of sphericity	KMO	0.900
	Approximate chi-square	1015.104
	df	153
	p	0.000

The table analyzes the factor extraction situation and the information content of the factor extraction. From the table, it can be seen that three factors are extracted from the factor analysis, and the characteristic root values are all greater than 1. The variance interpretation rate of the three factors after rotation is [42.179%,7.078%,6.57%], and the cumulative variance interpretation rate is 55.828% (as shown in Table 6). This level of cumulative explanation is consistent with—and in some cases exceeds—benchmarks set in prior supermarket satisfaction studies. For instance, Ma and Ye (2008) [2] reported a cumulative variance of 52.1% in their factor analysis of supermarket satisfaction, while Jiao (2016) [7] reached 58.3%. Our model achieves a balanced explanatory power without significant cross-loading, indicating clear factor structuring.

Table 6. Variance interpretation rate table.

Factor Number	Characteristic Root			Rotated Variance Explained Ratio		
	Latent Root	Interpretation Rate of Variance%	Cumulation%	Characteristic	Interpretation Rate of Variance%	Cumulation%
1	7.592	42.179	42.179	7.592	42.179	42.179
2	1.274	7.078	49.258	1.274	7.078	49.258
3	1.183	6.570	55.828	1.183	6.570	55.828
4	0.972	5.397	61.225	-	-	-
5	0.911	5.062	66.287	-	-	-
6	0.853	4.741	71.028	-	-	-
7	0.753	4.183	75.212	-	-	-
8	0.618	3.434	78.645	-	-	-
9	0.578	3.211	81.856	-	-	-
10	0.493	2.741	84.597	-	-	-
11	0.469	2.607	87.205	-	-	-
12	0.454	2.520	89.725	-	-	-
13	0.418	2.321	92.046	-	-	-
14	0.347	1.925	93.971	-	-	-
15	0.314	1.744	95.714	-	-	-
16	0.287	1.594	97.308	-	-	-
17	0.259	1.440	98.748	-	-	-
18	0.225	1.252	100.000	-	-	-

The bold mark indicates that the absolute value of the load coefficient is greater than 0.5 (as shown in Table 7).

Table 7. Factor loadings after rotation.

Name	Factor Loading Coefficient		
	F1	F2	F3
5. Employee Service Attitude:	0.792	0.044	0.164
6. Checkout Efficiency:	0.753	0.362	0.022
7. Lighting:	0.663	0.358	0.288
8. Return/Exchange Process:	0.239	0.707	0.23
9. Environmental hygiene:	0.536	0.413	0.341
10. Shelf placement:	0.393	0.33	0.487
11. Indoor temperature:	0.403	0.273	0.555
12. Background music:	0.164	0.66	0.217
13. The quality of the goods:	0.404	0.296	0.543
14. Packaging of goods:	0.569	0.16	0.453
15. Product safety:	0.283	0.234	0.468
16. The price of goods:	0.332	0.125	0.536
17. The type of goods:	0.073	0.191	0.624
18. Product Variety Updates:	0.005	0.174	0.819
19. Timeliness of commodity replenishment:	0.071	0.672	0.407
20. Cash register setup:	0.315	0.572	0.295
21. The size of the supermarket space:	0.336	0.628	0.135
22. Supermarket opening hours:	0.111	0.786	0.118

As can be seen from the table, all variables have a good extraction degree, indicating that the extracted common factors have a strong correlation with the original variables, and can have a good explanatory power for the original variables (as shown in Table 8).

Table 8. Common factor variance.

	Initial	Extraction
5. The service attitude of supermarket staff:	1.000	0.656
6. The service efficiency of the cashier:	1.000	0.699
7. Supermarket lighting:	1.000	0.651
8. Return and exchange process:	1.000	0.609
9. Environmental hygiene:	1.000	0.574
10. Shelf placement:	1.000	0.501
11. Indoor temperature:	1.000	0.545
12. Background music:	1.000	0.51
13. The quality of the goods:	1.000	0.545
14. Packaging of goods:	1.000	0.555
15. Product safety:	1.000	0.354
16. The price of goods:	1.000	0.413
17. The variety of goods in the supermarket:	1.000	0.431
18. Update of commodity categories:	1.000	0.702
19. Timeliness of commodity replenishment：	1.000	0.622
20. Cash register setup:	1.000	0.514
21. The size of the supermarket space:	1.000	0.525
22. Supermarket opening hours:	1.000	0.645

The principal component analysis method was employed for factor extraction, followed by Kaiser-normalized varimax rotation. The rotation converged after 6 iterations (as shown in Table 9).

Table 9. Component matrix after rotation.

	Component		
	1	2	3
5. The service attitude of supermarket staff:		0.792	0.164
6. The service efficiency of the cashier:	0.361	0.753	
7. Supermarket lighting:	0.359	0.663	0.287
8. Return and exchange process:	0.707	0.239	0.229
9. Environmental hygiene:	0.413	0.536	0.341
10. Shelf placement:	0.330	0.393	0.487
11. Indoor temperature:	0.273	0.403	0.555
12. Background music:	0.660	0.164	0.217
13. The quality of the goods:	0.296	0.404	0.542
14. Packaging of goods:	0.160	0.569	0.453
15. Product safety:	0.234	0.283	0.468
16. The price of goods:	0.125	0.332	0.536
17. The variety of goods in the supermarket:	0.191		0.624
18. Update of commodity categories:	0.174		0.819
19. Timeliness of commodity replenishment:	0.671		0.407
20. Cash register setup:	0.572	0.315	0.294
21. The size of the supermarket space:	0.628	0.336	0.134
22. Supermarket opening hours:	0.786	0.110	0.118

Based on the table content, we can analyze the meaning represented by each principal component: Principal Component 1 relates to factors collectively influencing customers' overall supermarket experience, such as product exchange processes, background music in stores, timely restocking of goods, checkout counter layouts, store space dimensions, and operating hours. Hence, it is termed the Comprehensive Experience Factor for Supermarket Operations. Principal Component 2 focuses on enhancing service quality and environmental standards, including staff attitudes, cashier efficiency, lighting conditions, sanitation levels, and product packaging. These variables exhibit high loadings on Principal Component 2, thus named the Service and Environmental Quality Factor for Supermarkets. Principal Component 3 primarily addresses comprehensive factors that improve shopping experience quality, such as indoor temperature, product quality, pricing, variety, and product refreshment cycles. Therefore, it is called the Shopping Experience Quality Factor for Supermarkets.

As shown in Table 10, all three dimensions demonstrated high internal consistency, with Cronbach's α values exceeding 0.7, further confirming the reliability of the factor structure.

Table 10. Cronbach's reliability analysis.

Conception	Name	Item Deleted Coefficient	Cronbach α
Supermarket operation comprehensive experience factor	8. Return/exchange process:	0.808	0.839
	12. background music:	0.821	
	19. Timeliness of commodity replenishment:	0.807	
	20. Cash register setup:	0.813	
	21. The size of the supermarket space:	0.817	
	22. Supermarket opening hours:	0.81	
Supermarket service and environmental quality factors	5. Service attitude:	0.813	0.833
	6. The service efficiency of the cashier:	0.794	
	7. Supermarket lighting:	0.775	
	9. Environmental hygiene:	0.803	
	14. Packaging of goods:	0.809	
Quality factors of supermarket shopping experience	11. Indoor temperature:	0.71	0.766
	13. The quality of the goods:	0.709	
	16. The price of goods:	0.74	
	17. Variety of goods:	0.738	
	18. Update of commodity categories:	0.725	

Based on the factor score coefficient matrix, we define the following measurement variables:

X1–X22: Staff service attitude (X1), checkout efficiency (X2), lighting (X3), return/exchange process (X4), environmental hygiene (X5), shelf arrangement (X6), indoor temperature (X7), background music (X8), product quality (X9), product packaging (X10), product safety (X11), pricing (X12), product variety (X13), product variety updates (X14), restocking timeliness (X15), checkout counter setup (X16), space size (X17), and operating hours (X18).

The latent variables are denoted as:

F1 = 0.707 * X8 + 0.66 * X12 + 0.671 * X19 + 0.572 * X20 + 0.628 * X21 + 0.786 * X22

F2 = 0.792 * X5 + 0.753 * X6 + 0.663 * X7 + 0.536 * X9 + 0.569 * X14

F3 = 0.555 * X11 + 0.542 * X13 + 0.536 * X16 + 0.624 * X17 + 0.819 * X18

(4) Hypothesis test

1. There are differences in the satisfaction of students of different genders in the campus supermarket

The independent samples *t*-test was employed to examine whether there were significant differences in overall satisfaction levels between genders. As shown in the Table 11, the *t*-value of −0.574 and *p*-value of 0.567 for Group 1 versus Group 2 indicate no statistically significant difference ($p > 0.05$). Specifically, Group 1 had a sample size of 68 with a mean of 2.132 and standard deviation of 0.516, while Group 2 contained 58 participants with a mean of 2.189 and standard deviation of 0.606. The average difference between the two groups was −0.057.

Table 11. Independent Sample *t*-test.

	1. Your Gender (Mean ± Standard Deviation)		*t*	*p*
	1 (*n* = 68)	2 (*n* = 58)		
Overall satisfaction	2.132 ± 0.516	2.189 ± 0.606	−0.574	0.567

2. Supermarket service and environmental quality, comprehensive experience of supermarket operation and shopping experience quality positively affect the overall satisfaction of campus supermarkets

In general, this model summary shows that the model is quite effective in explaining the change of the dependent variable, with high R square and adjusted R square, and relatively small prediction error (as shown in Table 12). The R^2 value of 0.789 is notably higher than many previous studies in similar settings; for example, Yang and Zhou (2016) [3] reported an R^2 of 0.712 in their model of supermarket customer satisfaction, and Terblanche (2019) [12] documented an R^2 of 0.74 in a service quality study. This suggests that the three-factor model used herein has strong predictive power and aligns well with contemporary retail satisfaction dynamics.

Table 12. Model summary.

Mode	R	R Square	Adjusted R Squared	Errors in Standard Estimates
1	0.888 [a]	0.789	0.783	0.25940

[a] Predictor variables: (constant), supermarket shopping experience quality factor, supermarket operation comprehensive experience factor, supermarket service and environment quality factor.

The analysis revealed a F-value of 151.662, which is exceptionally high and typically indicates significant influence of the model's predictors on the dependent variable. The *p*-value of 0.000 further confirms that these key predictors—supermarket shopping experience quality factor, comprehensive operational experience factor, and service-environment quality factor—exert substantial effects on overall customer satisfaction (as shown in Table 13).

Table 13. ANOVA[a].

Mode		Quadratic Sum	df	Mean Square	F	Sig.
1	Regression	30.616	3	10.205	151.662	0.000 [b]
	Residual	8.209	122	0.067		
	Total	38.825	125			

[a] Dependent variable: Overall satisfaction. [b] Predictor variables: (constant), Supermarket shopping experience quality factor, supermarket operation comprehensive experience factor, supermarket service and environment quality factor.

Linear regression analysis reveals that when overall satisfaction is the dependent variable and the supermarket operational experience factor, service and environment quality factor, and shopping experience quality factor are independent variables, a multiple regression model is established. The R^2 (Root Square) indicates the explanatory power of independent variables for dependent variable variation, serving as the starting point for regression analysis. As shown in the table, the model's R^2 value reaches 0.789, meaning these three factors collectively account for 78.9% of overall satisfaction variance. The F-test evaluates regression effectiveness by examining linear relationships between dependent and independent variables, confirming statistical significance. Results show an F-value of 151.662 with a *p*-value < 0.05, indicating strong independent variable influence on dependent variable—validating the model's validity. The operational experience factor demonstrates a significant positive correlation with overall satisfaction (beta = 0.087, $p < 0.05$), followed by service and environment quality (beta = 0.108, $p < 0.05$) and shopping experience quality (beta = 0.064, $p < 0.05$) (as shown in Table 14).

Table 14. Coefficients [a].

Mode		Non-Standardized Coefficients		Standardized Coefficients	*t*	Sig.
		B	Standard Error	Beta		
1	(Constant)	0.176	0.098		1.792	0.076
	Supermarket operation comprehensive experience factor	0.087	0.012	0.407	7.122	0.000
	Supermarket service and environmental quality factors	0.108	0.015	0.410	7.122	0.000
	Quality factors of supermarket shopping experience	0.064	0.018	0.207	3.668	0.000

[a] Dependent variable: Overall satisfaction.

In conclusion, the hypotheses H1, H2, and H3 are confirmed. The study demonstrates that supermarket services and environmental quality positively influence campus supermarket overall satisfaction, while supermarket operations and shopping experience quality also positively affect overall satisfaction. The model equation is expressed as: Overall Satisfaction = 0.087 * Comprehensive Shopping Experience Factor + 0.108 * Environmental Quality Factor + 0.064 * Shopping Experience Quality Factor.

5. Research Conclusions

In the discussion section, we delve into the relationship between satisfaction and campus supermarket operational strategies, as well as the link between satisfaction and consumer behavior, providing evidence-based insights and recommendations.

5.1. Relationship between Satisfaction and Operational Strategies

Campus supermarkets' operational strategies directly influence consumer satisfaction. The study reveals that higher satisfaction levels correlate with superior service experiences, reasonable pricing, and diversified product offerings. Therefore, campus supermarkets should proactively monitor shifting consumer demands, regularly optimize product assortments, elevate service standards, and implement effective pricing strategies to attract and retain customers. Additionally, creating comfortable shopping environments, offering convenient purchasing

channels, and strengthening collaborations with universities further enhance satisfaction. These strategies not only fulfill fundamental consumer needs but also bolster brand image and competitive advantage.

5.2. Relationship between Satisfaction and Consumer Behavior

Consumer satisfaction significantly drives purchasing frequency, spending volume, and brand advocacy. Highly satisfied consumers demonstrate greater loyalty and willingness to recommend the supermarket, whereas dissatisfaction leads to reduced visits and defection to competitors. Thus, continuously improving satisfaction is crucial for cultivating consumer loyalty and positive word-of-mouth. This approach increases revenue and market share while strengthening the supermarket's reputation among students.

5.3. Key Findings

Gender Differences: Independent samples t-tests confirmed no significant gender-based variations in overall satisfaction ($t = -0.574$, $p = 0.567$), indicating gender does not moderate satisfaction (as shown in Table 11).

Factor-Satisfaction Correlations: All three factors positively influenced satisfaction, with the Service & Environmental Quality Factor ($\beta = 0.108$) exhibiting the strongest impact, followed by the Supermarket Operation Experience Factor ($\beta = 0.087$) and Shopping Experience Quality Factor ($\beta = 0.064$).

Regression Model: The multivariate regression model explained 78.9% of satisfaction variance ($R^2 = 0.789$, $F = 151.662$, $p < 0.001$), confirming H1–H3:

Service/environment quality ($\beta = 0.108$, $p < 0.001$)
Operation experience ($\beta = 0.087$, $p < 0.001$)
Shopping experience quality ($\beta = 0.064$, $p < 0.001$)

The novelty of this study lies in its targeted focus on provincial universities in Chengdu—a less-explored demographic in retail satisfaction literature—and its integration of both traditional and digital experience factors within a single analytical framework. Unlike prior studies that often treated satisfaction drivers in isolation, our factor analysis synthesized 22 variables into three coherent dimensions, offering a more holistic understanding of campus retail mechanics. Moreover, the confirmation that digital and sensory elements (e.g., background music, checkout efficiency) load significantly on consumer satisfaction factors aligns with recent global trends [8,13] but contextualizes them within the Chinese higher education setting. These findings not only validate the growing importance of digital readiness and environmental ambiance in retail but also provide actionable insights for campus supermarket operators to enhance service delivery and student well-being. This research thus contributes both theoretically and practically to the fields of educational retail management and consumer behavior studies.

6. Recommendations and Conclusions

Based on the empirical findings, we propose the following strategies for enhancing campus supermarket operations in provincial universities across Chengdu:

(1) Adjust Student Shopping Peak Times: To avoid congestion during peak shopping hours, managers should stagger inventory replenishment across five key periods: 10:00 AM, 12:00 PM, 3:00 PM, 6:00 PM, and 9:00 PM. This ensures smooth supermarket operations and better meets student needs.
(2) Diversify Product Selection: Catering to modern college students' preference for variety, supermarkets should expand product offerings to boost satisfaction and repeat visits. Despite limited space, priority should be given to high-margin, best-selling items.
(3) Clear Division of Labor and Fixed Zones: Establish dedicated service areas where staff focus on specific tasks. This ensures comprehensive service, prevents customer dissatisfaction, and facilitates issue tracking with reward/punishment systems.
(4) Unified Training & Professional Development: Implement standardized training programs to enhance staff competence and professional image, thereby improving student satisfaction.
(5) Intensify Promotions: Launch targeted promotions at each store to elevate brand reputation, drive sales, and increase profits.
(6) Digital Transformation: Leverage smart payment systems and online reservations to improve convenience and cater to personalized needs.
(7) Feedback Mechanism: Develop effective feedback channels to collect student suggestions promptly. Continuous improvements in service quality and management will ultimately enhance student satisfaction.

In summary, campus supermarkets must dynamically adapt to evolving student needs and market trends. By centering strategies on satisfaction enhancement—through service optimization, environmental upgrades, and experiential refinement—these facilities can deliver higher-quality, more convenient services that enrich campus life.

7. Future Research Directions

This study focused on campus supermarkets within provincial universities in Chengdu, which are characterized by their small scale, limited product range, and service-oriented operational model. However, future research could extend to large-scale commercial supermarkets located in university towns, where factors such as product variety, staff professionalism, store layout, checkout efficiency, and loyalty programs may play more significant roles in shaping student satisfaction.

For example, in a university-town supermarket setting, H4 (product variety and availability) could be tested given the larger inventory and broader consumer base. Similarly, H5 (staff behavior) and H6 (store layout) may be more relevant in complex retail environments where customer flow and service differentiation are critical [19,20]. H7 (checkout efficiency) could be examined in contexts with multiple payment options and high peak-hour traffic, and H8 (loyalty programs) may be applicable where supermarkets employ membership or point systems to enhance retention.

Moreover, future studies could incorporate emerging technologies such as smart shelves, mobile app integrations, and omnichannel retail strategies that are increasingly adopted in large-format stores [21]. Such research would not only enrich the understanding of student consumption behavior in varied retail formats but also provide actionable insights for retailers operating in academic ecosystems.

Author Contributions

X.L. (Xin Liu): writing—original draft; R.R.: writing—review and editing, supervision, project administration, correspondence; X.L. (Xin Liu), X.L. (Xiaolan Li), Y.L., L.Y., Y.H., B.L., B.Z.: investigation, data curation. All authors have read and agreed to the published version of the manuscript.

Funding

The authors were supported by the Project—Chengdu Normal University 2023 College Students Innovation and Entrepreneurship Training Program (Project No.202314389046).

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

The authors confirm that the data supporting the findings of this study are available within the article.

Acknowledgments

The authors would like to thank the anonymous reviewers for their valuable comments and constructive suggestions, which improved the quality of this paper.

Conflict of Interest

The authors declare there are no conflicts of interest.

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