

# A Structural Equation Modeling Study on Consumers' Willingness to Pay a Premium under the Coupling of Multi-Dimensional Channel Characteristics and Perceived Value

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**Abstract:** Based on the context of consumers purchasing regionally branded fruits, this study constructs a comprehensive analytical framework that incorporates sales channel characteristics, perceived value, and willingness to pay a premium. Structural Equation Modeling (SEM) is employed to systematically depict multidimensional latent variables and their path relationships. By integrating factors such as cost rationality, channel convenience, service quality, and perceived risk, and introducing mediating mechanisms of quality value, economic value, and emotional value, the model achieves a unified estimation of both direct and indirect effects. Empirical results indicate that the model effectively reveals the mechanisms of multi-factor interactions. Specifically, cost rationality and service quality exert positive influences on willingness to pay a premium through multiple pathways, while risk factors exert a negative influence by suppressing perceived value, demonstrating significant structural transmission characteristics. Compared to traditional regression methods, the constructed SEM model offers greater explanatory power and generalizability in handling relationships among multiple latent variables and mediating effects, providing a generalizable analytical framework for research on multi-channel consumer behavior and value perception.

**Keywords:** Structural Equation Modeling; Multidimensional Latent Variable Analysis; Mediating Effects.

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## 1. Introduction

Against the backdrop of an increasingly integrated digital consumer environment and multi-channel landscape, consumer decision-making behavior exhibits increasingly complex structural characteristics. This is particularly true in the sectors of agricultural products and regional public brands, where price acceptance and value judgments are no longer determined by a single factor but are instead influenced by a combination of multidimensional elements, including channel experience, service processes, and risk perception. How to characterize consumers' willingness to pay a premium in such complex contexts has become one of the key research questions today. However, existing studies largely rely on traditional regression or single-path analysis methods, which struggle to simultaneously address the interactive relationships among multiple latent variables and mediating mechanisms, resulting in significant limitations when explaining the synergistic effects of multiple factors [1, 2].

To address these shortcomings, this paper constructs an analytical framework based on structural equation modeling, starting from the coupling relationship between multidimensional perceptions and behavioral decision-making. This framework integrates sales channel characteristics, perceived value, and willingness to pay into a unified model system. This framework not only estimates the relationships between observed and latent variables simultaneously but also systematically identifies direct and indirect effects across different pathways, thereby enhancing the model's ability to capture complex behavioral mechanisms. Methodologically, by introducing multidimensional value structures and risk variables, the study extends traditional single-effect analysis, deepening the

model's explanatory power and broadening its applicability [3, 4].

Using the consumption of regionally branded fruits as a specific case study, this paper further validates the applicability of the constructed model in a multi-channel environment. It provides a new analytical perspective for understanding the mechanisms of value formation and price acceptance among consumers across different channels, while also offering a methodological pathway for model construction and empirical research in related fields.

## 2. Theoretical Framework and Hypotheses

### 2.1. Sales Channel Characteristics and Willingness to Pay a Premium

Consumers' willingness to pay a premium is closely related to their overall evaluation of product value as well as the transaction process. In the case of regional public brand fruits, sales channels function not only as distribution pathways but also as important contexts in which consumers acquire product information, assess quality, experience services, and perceive potential risks. As a result, differences in channel characteristics can influence consumers' willingness to pay a premium by shaping their perceptions of value and risk during the transaction.

More specifically, cost rationality reflects consumers' judgment of whether the price is reasonable and plays a fundamental role in determining their acceptance of a premium. Channel convenience mainly refers to the ease of purchase, including time savings, accessibility, and process smoothness. Service quality captures the overall performance of the channel across pre-sale, in-sale, and after-sale stages.

In contrast, delivery risk and product risk represent uncertainties related to fulfillment and product quality, respectively. In general, higher levels of cost rationality, channel convenience, and service quality are expected to increase willingness to pay a premium, whereas higher perceived risks are likely to reduce it.

Based on the above analysis, the following hypotheses are proposed:

H1: Cost rationality has a significant positive effect on willingness to pay a premium.

H2: Channel convenience has a positive effect on willingness to pay a premium.

H3: Service quality has a significant positive effect on willingness to pay a premium.

H4: Delivery risk has a significant negative effect on willingness to pay a premium.

H5: Product risk has a significant negative effect on willingness to pay a premium.

## 2.2. The Mediating Role of Perceived Value

Perceived value reflects consumers' overall evaluation formed through a trade-off between perceived benefits and costs, and it plays an important role in shaping purchase and payment decisions. In the context of regional public brand fruits, sales channel characteristics influence willingness to pay a premium not only directly, but also indirectly through consumers' value perceptions.

In this study, perceived value is divided into three dimensions: quality value, economic value, and emotional value. Quality value refers to consumers' evaluation of product attributes such as freshness and stability. Economic value captures judgments related to price fairness and value for money. Emotional value reflects the psychological satisfaction and positive feelings experienced during the purchase and consumption process. Differences in channel characteristics may affect these dimensions of perceived value, which in turn influence willingness to pay a premium.

Accordingly, the following hypotheses are proposed:

H6: Sales channel characteristics have significant effects on perceived value.

H7: Perceived value has a positive effect on willingness to pay a premium, with stronger effects from quality value and economic value.

## 3. Data Sources, Variable Measurement, and Research Methods

### 3.1. Data Sources and Sample Description

The empirical analysis is based on questionnaire survey data collected from consumers who have experience purchasing regional public brand fruits. The questionnaire is designed to capture consumers' perceptions of sales channel characteristics, perceived value, and willingness to pay a premium under different channel settings.

In contrast to studies that derive premium levels from market price data, this study focuses on consumers' subjective responses. The data is obtained directly from individual consumers and cover a variety of sales channels, including membership-based supermarkets, non-membership supermarkets, comprehensive e-commerce platforms, fruit specialty stores, and social e-commerce platforms. This allows for a more comprehensive understanding of how consumers perceive service quality, risk, and value across

different channels.

Overall, the sample shows a relatively balanced distribution across major demographic characteristics, indicating that it is suitable for subsequent empirical analysis.

### 3.2. Variable Measurement

Sales channel characteristics are defined based on consumers' perceptions of key channel attributes during the purchase process, including cost rationality, channel convenience, service quality, delivery risk, and product risk. Perceived value is divided into three dimensions—quality value, economic value, and emotional value—while willingness to pay a premium is treated as the dependent variable.

All variables are measured using a five-point Likert scale, with higher values indicating stronger perceptions. To reduce the influence of individual heterogeneity, several control variables are included, such as gender, age, education level, income, and household structure. These factors may affect willingness to pay a premium by influencing price sensitivity, channel preference, and risk perception.

### 3.3. Research Method and Model Specification

Given the presence of multiple latent variables and the need to examine both direct and mediating relationships, structural equation modeling (SEM) is adopted. Compared with traditional regression methods, SEM enables the simultaneous estimation of measurement and structural relationships within a unified framework, making it appropriate for analyzing the relationships among channel characteristics, perceived value, and willingness to pay a premium [5].

## 4. Scale Testing and Measurement Model Analysis

### 4.1. Reliability Test

A reliability test was conducted for the perceived value scale. As shown in Table 1, the Cronbach's  $\alpha$  coefficients for quality value, economic value, and emotional value are 0.910, 0.909, and 0.909, respectively, and the overall scale reaches 0.917. All values exceed the threshold of 0.70, indicating good internal consistency and supporting further analysis.

Table 1. Reliability test results

Item	Cronbach's $\alpha$	Number of items
Quality value	0.910	3
Economic value	0.909	3
Emotional value	0.909	3
Overall mediating variable	0.917	9

### 4.2. Exploratory Factor Analysis

Based on the reliability results, exploratory factor analysis was carried out. As reported in Table 2, the KMO value is 0.839, and Bartlett's test is significant, suggesting that the data are suitable for factor analysis. Three factors with eigenvalues greater than 1 are extracted, explaining 72.583% of the total variance. Factor loadings are generally high and clearly distributed, supporting the three-dimensional structure of perceived value.

**Table 2.** KMO and Bartlett's test

Test item	Statistic
KMO measure of sampling adequacy	0.839
Bartlett's test of sphericity: Approx. Chi-square	1086.025
Bartlett's test of sphericity: df	36
Bartlett's test of sphericity: Sig.	0.000

### 4.3. Confirmatory Factor Analysis and Measurement Model Testing

Confirmatory factor analysis (CFA) was conducted to further evaluate the measurement model. As shown in Table 3, the model fit indices meet commonly accepted standards (CMIN/DF = 1.089, RMSEA = 0.017, GFI = 0.932, NFI = 0.919, CFI = 0.993), indicating a good overall fit.

Further results in Table 4 show that all standardized factor loadings exceed 0.5, composite reliability (CR) values are above 0.7, and average variance extracted (AVE) values are

above 0.5. In addition, the square root of AVE for each construct is greater than its correlations with other constructs, indicating satisfactory convergent and discriminant validity. Overall, the measurement model is considered reliable and valid for subsequent structural analysis.

**Table 3.** Model fit indices

Index	Criterion	Value	Fit
CMIN/DF	< 3	1.089	Good
RMSEA	< 0.08	0.017	Good
GFI	> 0.90	0.932	Good
NFI	> 0.90	0.919	Good
RFI	> 0.90	0.901	Good
IFI	> 0.90	0.993	Good
TLI	> 0.90	0.991	Good
CFI	> 0.90	0.993	Good

**Table 4.** Confirmatory factor analysis results

Observed variable	Latent variable	Estimate	S.E.	C.R.	Std.	CR	AVE
Perceived value for money	Cost rationality	1			0.751	0.813	0.593
Price fit		1.060	0.088	12.039	0.781		
Cost-performance advantage		1.041	0.087	12.008	0.777		
Process convenience	Channel convenience	1			0.739	0.822	0.607
Transportation loss		1.034	0.084	12.338	0.785		
Store accessibility		1.137	0.090	12.560	0.812		
Professional service	Service quality	1			0.856	0.825	0.613
Integrity guarantee		0.759	0.061	12.487	0.705		
Information transparency		0.851	0.062	13.706	0.780		
Fulfillment risk	Delivery risk	1			0.804	0.790	0.557
Cold-chain risk		0.848	0.073	11.664	0.716		
Timeliness fluctuation		0.778	0.067	11.656	0.715		
Freshness fluctuation	Product risk	1			0.735	0.812	0.592
Promotional deviation		1.183	0.095	12.515	0.857		
Frequent returns/exchanges		0.926	0.082	11.343	0.708		
Safety assurance	Quality value	1			0.770	0.817	0.598
Quality of life		0.902	0.073	12.387	0.762		
Technological progress		1.043	0.082	12.671	0.787		
Positive emotions	Emotional value	1			0.773	0.805	0.580
Environmental resonance		0.926	0.078	11.932	0.735		
Peace-of-mind assurance		1.001	0.080	12.432	0.776		
Controllable cost	Economic value	1			0.747	0.806	0.580
Discount return		1.049	0.088	11.949	0.762		
Value for money		1.081	0.089	12.101	0.776		

## 5. Results of the Structural Equation Model

### 5.1. Structural Model Fit

**Table 5.** Fit indices of the structural model

Index	Criterion	Value	Fit
CMIN/DF	< 3	1.20	Good
RMSEA	< 0.08	0.025	Good
GFI	> 0.90	0.924	Good
NFI	> 0.90	0.909	Good
RFI	> 0.90	0.890	Acceptable
IFI	> 0.90	0.984	Good
TLI	> 0.90	0.980	Good
CFI	> 0.90	0.983	Good

The structural model shows a good fit to the data. As reported in Table 5, the values of CMIN/DF (1.20) and

RMSEA (0.025) fall within acceptable ranges, while GFI, NFI, IFI, TLI, and CFI all exceed 0.90. These results suggest that the model adequately captures the relationships among channel characteristics, perceived value, and willingness to pay a premium.

### 5.2. Path Coefficient Results

The estimated path coefficients are reported in Table 6. The results show that cost rationality and service quality have positive and significant effects on willingness to pay a premium, whereas delivery risk and product risk have significant negative effects. This indicates that reasonable pricing and reliable service are important factors in promoting consumers' acceptance of premium prices, while perceived risks related to delivery and product quality reduce such willingness.

Channel convenience does not show a significant direct effect. This suggests that its role is more related to facilitating transactions and reducing search costs, rather than directly

influencing consumers' price acceptance. Its effect may therefore operate through indirect mechanisms.

In addition, quality value and economic value have significant positive effects on willingness to pay a premium,

while emotional value is not significant. This implies that consumers rely more on evaluations of product quality and price fairness when making premium payment decisions.

**Table 6.** Regression results of structural model paths

Dependent variable	Independent variable	Estimate	S.E.
Quality value	Cost rationality	0.128	0.069
Economic value	Cost rationality	0.147	0.070
Emotional value	Cost rationality	0.142	0.071
Quality value	Channel convenience	0.095	0.066
Economic value	Channel convenience	0.213	0.068
Emotional value	Channel convenience	0.125	0.068
Quality value	Service quality	0.224	0.075
Economic value	Service quality	0.143	0.076
Emotional value	Service quality	0.169	0.077
Quality value	Delivery risk	-0.244	0.104
Economic value	Product risk	-0.172	0.085
Emotional value	Product risk	-0.172	0.085
Willingness to pay a premium	Quality value	0.221	0.074
Willingness to pay a premium	Emotional value	-0.030	0.073
Willingness to pay a premium	Economic value	0.146	0.072
Willingness to pay a premium	Cost rationality	0.115	0.063
Willingness to pay a premium	Channel convenience	0.007	0.061
Willingness to pay a premium	Service quality	0.171	0.070
Willingness to pay a premium	Delivery risk	-0.299	0.104
Willingness to pay a premium	Product risk	-0.366	0.083
Economic value	Product risk	-0.172	0.085
Emotional value	Product risk	-0.172	0.085

### 5.3. Mediating Effects of Perceived Value

The mediating effect results are presented in Table 7. Perceived value plays an important role in linking channel characteristics to willingness to pay a premium, but the effects differ across dimensions.

Quality value and economic value act as the main mediating paths, both showing significant positive effects. In contrast, emotional value does not have a significant

mediating effect [6].

From the perspective of total effects, cost rationality and service quality not only directly increase willingness to pay a premium, but also enhance it indirectly through perceived value. On the other hand, delivery risk and product risk reduce willingness to pay both directly and indirectly by weakening perceived value. These results indicate that both channel performance and value perception jointly shape consumers' premium decisions.

**Table 7.** Test results of the mediating effects

Characteristic	Path	Effect type	Effect value
Cost rationality	Cost rationality → Willingness to pay a premium	Direct effect	0.145
	Cost rationality → Perceived value → Willingness to pay a premium	Indirect effect	0.058
		Total effect	0.203
Channel convenience	Channel convenience → Willingness to pay a premium	Direct effect	0.009
	Channel convenience → Perceived value → Willingness to pay a premium	Indirect effect	0.068
		Total effect	0.077
Service quality	Service quality → Willingness to pay a premium	Direct effect	0.208
	Service quality → Perceived value → Willingness to pay a premium	Indirect effect	0.080
		Total effect	0.288
Delivery risk	Delivery risk → Willingness to pay a premium	Direct effect	-0.300
	Delivery risk → Perceived value → Willingness to pay a premium	Indirect effect	-0.086
		Total effect	-0.386
Product risk	Product risk → Willingness to pay a premium	Direct effect	-0.397
	Product risk → Perceived value → Willingness to pay a premium	Indirect effect	-0.075
		Total effect	-0.472

## 5.4. Discussion

Overall, cost rationality and service quality emerge as the main positive drivers of willingness to pay a premium, while delivery risk and product risk serve as key constraints. Channel convenience does not directly influence premium payment, suggesting that improving convenience alone may not be sufficient to increase price acceptance.

The mediating analysis further shows that perceived value mainly operates through quality value and economic value. This indicates that consumers' premium decisions are largely based on evaluations of product quality and price fairness, rather than emotional factors.

## 6. Conclusions

Based on an empirical analysis of questionnaire data and structural equation modeling, this study systematically examines the mechanisms underlying the relationships among sales channel characteristics, perceived value, and willingness to pay a premium. The results indicate that cost rationality and service quality have a significant positive impact on willingness to pay a premium, while delivery risk and product risk exert a significant negative influence. Among these, product risk exhibits the most pronounced inhibitory effect, with a total effect of -0.472; In contrast, channel convenience did not exhibit a significant direct effect but primarily exerted its influence through indirect pathways. Meanwhile, perceived value played a key mediating role in the model, with path coefficients of 0.221 and 0.146 for quality value and economic value, respectively—significantly higher than those for emotional value—indicating that consumers rely more on rational evaluations when making premium pricing decisions. Overall, this study

validates the theoretical framework of the synergistic interaction among multidimensional factors, expands the analytical paradigm of consumer behavior and channel research, and provides empirical evidence for optimizing channel management and value delivery. Future research could further integrate dynamic data and multi-scenario samples to enhance the model's external validity and explanatory power.

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