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OPTIMIZATION RESEARCH ON THE PRICE FRAMING EFFECT OF INNOVATIVE CULTURAL PRODUCTS

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Abstract. *Under the background of media convergence, product bundling has become an important way of innovation for cultural products because of its added value. However, whether to adopt the integrating price frame or the separating price frame for the new bundled product has always been controversial in theory. According to three criteria (significantly promoting the consumer's purchase intention; promoting high-quality culture consumption; correctly setting P_A and P_B to maximize profits), this research takes poly media books as an example to find the optimal price frame. Empirical results show the following. Firstly, the separating price frame can improve the consumers' purchase intention more than the integrating price frame. Secondly, such kernel value elements of a cultural product as the cultural value and the perceived quality under the separating price frame have stronger and more significant influences on the purchase intention. Finally, the price of each composing product of the bundled product under the separating price frame can be optimized to maximize profits. The conclusion of this study has important and practical significance to the formulation of national policies on the pricing of innovative cultural products and to the pricing practice of cultural enterprises.*
Keywords: Framing effect, Integrating price frame, Separating price frame, Price optimization

1. **Research Background.** Cultural products are experimental, rational and fascinating. The fact that "cultural consumption" is undergoing radical changes due to digital technologies demands continuous innovation of cultural organizations in the fields of consumer communication, product development, value creation and organizational management, of which the innovation of cultural products is of greatest importance [1]. Under the background of media convergence, product bundling has become an important strategy for the innovation of cultural products.

"Product bundling" means integrating two or more products or services into a new one and selling it at a specific price. It embodies the reconstruction and redesign of the products and therefore provides added value to the consumers. In other words, the value of the new bundled product is more than the sum of the values of the independent products before they are "bundled" [2]. The added value growing out of "product bundling" can be found either in the improvement of product performance, the convenience of utility or in the fall of the price, etc.

The pricing strategy is of great importance to the bundled products. A satisfying price bundling strategy can enhance the consumer's satisfaction degree with the bundle brand and the bundle sales mode, and can further accelerate the consumer's purchase decision-making [3].

There are two price frame strategies for the price (P) of the new product after product A and product B are bundled: integrating frame ($P_{in} = P_{A+B}$), which means the bundled

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product will be sold at a new price as a whole; separating frame ($P_{se} = P_A + P_B$), which means A and B will be separately priced, and that they can be sold either separately or as a whole, and $P_{in} = P_{se}$. The framing effect based on the prospect theory deems that if $V(x)+V(y) > V(x+y)$ (x, y being the "gain"), then the integrating frame takes priority; if $V(-x) + V(-y) < V(-x - y)$ (x, y being the "loss"), then the separating frame takes priority [4]. Some research finds that compared with the separating frame, the integrating frame can remarkably increase the possibility of the consumer to purchase the bundled product [5]. However, some research also finds that the separating frame is more likely to succeed in the market in the case when the demand for product A is elastic which is of evidently higher value than product B, meanwhile product B complements product A and is able to enhance product A's value [6].

The cultural value of the innovative cultural product reflects the meaning its contents and spirits have for the consumer and the society, and it is its significant characteristics that distinguish it from the other ordinary products. Moreover, the innovative cultural product is also experiential, whose perceived quality is crucial to purchase decision-making. Therefore, according to the characteristics of the innovative cultural product, we mainly research on the changes of the consumer's purchase intention (ω) and its internal driving motivation under different price frames so as to establish the optimal price frame strategies for it.

For the innovative cultural product, which takes more priority, the integrating or the separating price frame? The essay proposes that there are three evaluating criteria for the innovative cultural products: 1) evaluate which price frame can significantly promote the consumer's purchase intention, or promote cultural consumption; 2) evaluate under which price frame will such kernel values as cultural value and perceived quality have a stronger and more direct influence on the consumer's purchase intention, or promote high-quality cultural consumption; 3) evaluate if the setting of P_A and P_B can maximize the manufacturer's profits when the separating frame takes priority under the premise of promoting high-quality cultural consumption. These criteria help to make an overall evaluation of the price framing effect from the perspective of promoting high-quality consumption of innovative cultural products and maximizing the manufacturer's profit.

Part 2 of the essay mainly constructs a multiple linear regression model for purchase intention (ω); Part 3 mainly introduces the collection and verification of the data that are used to test the difference of purchase intention and regression model. Part 4 uses the data and the constructed mathematics model to carry on an empirical analysis of the above three criteria; Part 5 gives the conclusion and suggestion.

2. **The Theoretical Basis and the Model.**

The consumer's preference for the cultural innovative product and purchase intention are decided by "LVs (Latent Value variables)" or "SDs (Social Demographic variables)", and the importance of the two is of an inverse relationship [7]. From the perspective of consumption, the innovative cultural product satisfies the consumer's spiritual needs on a higher level; therefore, the consumer's purchase intention is mainly decided by "LVs (Latent Value variables)".

H. T. Richard, winner of 2017 Nobel Prize in economics (2008) proposes that in an economic transaction, the perceived values by the consumer can be decomposed into acquired value (AV) and trade value (TV), the former being the perceived value of the product or the service itself, and the latter being the perceived value of the trade itself, such as the mode and the process. The consumer's purchase intention is decided by the two values, or $\omega = \text{AV} + \text{TV}$ [4] (hereafter called "Richard Model" for short). Trade value, other than the acquired value, reflects the consumer's mental satisfaction and happiness degree with the trade price from the financial perspective. Both AV and TV can well predict the consumer's purchase intention [8]. When J. G. Timothy et al. researched

on the price framing effect of luxury articles, they used "Richard Model" to decide the consumer's purchase intention [5].

However, the "Richard Model" assumes that the relating degree of the price and the quality is already known; therefore, it makes no explanation of the acquired quality effect. H. T. Richard deems that the price will help to increase the AV when it is used as a quality judgment signal. At the same time he also expects that the trade value and the quality signal mechanism could both be incorporated into the model for further research [4].

Considering the experiential characteristics of innovative cultural products, when it is hard to judge the quality of a product, the consumer will use the price as a tool to estimate the product quality: A price above his expectation is usually associated with a quality above his expectation as well, which can be further coded as the "quality acquired". Since the perceived quality is a significant variable that has a great influence on the consumer's purchase intention [9], it is necessary that "Richard Model" takes the perceived quality into consideration.

Existing researches have showcased that such cultural value elements of paintings as aesthetics, spirits and education have a significantly positive influence on the consumer's will to pay (WTP) [10]. Empirical studies on mobile phones have also found the consumer's cultural value has a significantly positive influence on his consumption decision [11]. Considering this, it is also necessary that "Richard Model" takes the cultural value into consideration.

Therefore, this essay assumes that the purchase intention (ω) for innovative cultural products is mainly decided by such four latent value variables as the cultural value (CV), the acquired value (AV), the perceived quality (PQ) and the trade value (TV), while such demographic variables as gender (GEN), age (AGE) and education (EDU) only have a very little influence. Therefore, this study uses hierarchical linear regression analysis to test this hypothesis. The regression equation is shown in Formulas (1)-(5):

$$\omega = i_{10} + i_{11}\mathrm{GEN} + i_{12}\mathrm{AGE} + i_{13}\mathrm{EDU} + \varepsilon_1 \tag{1}$$

$$\omega = i_{20} + i_{21}\mathrm{GEN} + i_{22}\mathrm{AGE} + i_{23}\mathrm{EDU} + i_{24}\mathrm{CV} + \varepsilon_2 \tag{2}$$

$$\omega = i_{30} + i_{31}\mathrm{GEN} + i_{32}\mathrm{AGE} + i_{33}\mathrm{EDU} + i_{34}\mathrm{CV} + i_{35}\mathrm{AV} + \varepsilon_3 \tag{3}$$

$$\omega = i_{40} + i_{41}\mathrm{GEN} + i_{42}\mathrm{AGE} + i_{43}\mathrm{EDU} + i_{44}\mathrm{CV} + i_{45}\mathrm{AV} + i_{46}\mathrm{PQ} + \varepsilon_4 \tag{4}$$

$$\omega = i_{50} + i_{51}\mathrm{GEN} + i_{52}\mathrm{AGE} + i_{53}\mathrm{EDU} + i_{54}\mathrm{CV} + i_{55}\mathrm{AV} + i_{56}\mathrm{PQ} + i_{57}\mathrm{TV} + \varepsilon_5 \tag{5}$$

where i_{m0} is a constant term, i_{mn} is a regression coefficient; $m = \{1, 2, 3, 4, 5\}$, $n = \{1, 2, 3, 4, 5, 6, 7\}$; $\varepsilon_1 \sim \varepsilon_5$ is a stochastic error term.

3. Data Collection and Verification.

3.1. Choice of the innovative cultural product and its price frame strategies.

The essay's choice of the "poly media book" from the innovative cultural products as the bundled product not only provides an ideal researching environment for the researched question, but also satisfies the four standards of a new product demanded in theoretical research [12]. ① There are significant differences between poly media books and existing paper books. We introduce the concept of "poly media book" in the beginning of the questionnaire with illustrations and specify it with subsidiary text. With paper books as the main subject of value, the poly media book is an innovative type of books that merges both the paper media and the digital media, bundling multiple digital hypermedia resources with the help of QR code to increase its own values. It is characterized by merged media, interactive communication and hyperlinks that help to stimulate a sense of new products. ② The poly media book is closely related to the interviewees in this research, who are mainly college students and also the major force of digital reading. ③ The pricing level of the poly media books is acceptable to most interviewees; meanwhile, it is not too cheap for casual buying. We investigated among the college students into the acceptable

price range of poly media books during the pre-investigation stage. ④ Poly media books bring no medical risks to the interviewees.

With an overall consideration of the R&D costs, expected profits and acceptable price range, this research determines that the integrating price frame for the poly media book is RMB52.8 (P_{A+B} = RMB52.8), and the separating price frame is RMB37.8 for the paper book, and RMB15 for the 30 digital resources in it, which add up to RMB52.8 as well.

3.2. **Data collection.** We conducted the online investigation among the college-student interviewees via SO JUMP, who filled in the questionnaire with WeChat using mobile phones. To guarantee the data quality, the questions were arranged in a random order, meanwhile the interviewees had to finish them anonymously in no less than 10 minutes, or else the questionnaire would be determined as invalid. Moreover, one mobile phone could only submit one questionnaire, and all the interviewees of successful submission could also participate in a lucky cash draw with a winning probability of 1/3 and the bonus from RMB5-20. The investigation lasted one month, with a final result of 352 valid questionnaires for the integrating price strategy and 353 for the separating price strategy.

3.3. **Concept measurements.** For CV: The measurement scale by V. A. Ginsburgh and D. Throsby [10] is used for major reference in measuring the CV perceived by the interviewees, which mainly contains such four items as the poly media book "promotes national reading", "delivers spiritual information", "is of significant cultural meanings" and "is valuable to the national education". The minimum value of the standardized load value of the terms is 0.85, and the value is significant at the 0.001 level, with Cronbach's $\alpha = 0.92$, composite reliability = 0.92, and AVE value = 0.79.

For AV, TV and ω: The measurement scales by G. Dhruv et al. [8] and J. B. Blaine and H. S. Eric [13] are used for major reference in measuring the AV, TV and ω perceived by the interviewees. The AV mainly contains such seven items as "Despite its price, the poly media book is still worthwhile", "The price is the guarantee of the poly media book's high quality", "Compared with the paper book, the poly media book is very cost-effective", "Given its characteristics, the poly media book is a good deal", "The poly media book can satisfy my need for high quality and low price", "The poly media book is cheap compared with the highest price I'm willing to pay" and "The poly media book is reasonably priced and its value far exceeds its price". The minimum value of the standardized load value of the terms is 0.75, and the value is significant at the 0.001 level, with Cronbach's $\alpha = 0.94$, composite reliability = 0.94, and AVE value = 0.69. The TV mainly contains such five items as "I am happy because the poly media book is money-saving", "Compared with my expectations, the poly media version is cheap", "I'm happy with the price of the poly media book because it's beneficial to me.", "The poly media pricing makes me feel comfortable compared with my psychological pricing" and "Compared with the paper book, I'm happy with the price of the poly media version". The minimum value of the standardized load value of the terms is 0.85, and the value is significant at the 0.001 level, with Cronbach's $\alpha = 0.94$, composite reliability = 0.94, and AVE value = 0.77. ω mainly contains such four items as "I like to buy the poly media book", "I would like to recommend my friends to buy the poly media book", "I'm willing to pay more for the poly media book" and "I'm more likely to buy a poly media book if I need to". The minimum value of the standardized load value of the terms is 0.78, and the value is significant at the 0.001 level, with Cronbach's $\alpha = 0.90$, composite reliability = 0.90, and AVE value = 0.70.

The measurement scale by G. Dhruv et al. [8] is used for major reference in measuring the PQ by the interviewees, which mainly contains such five items as "How is the quality of the poly media book", "How accurate is the knowledge", "How is the novelty of the book", "Is it trustworthy" and "Is it suitable for reading and learning". The minimum value of the standardized load value of the terms is 0.75, and the value is significant at

the 0.001 level, with Cronbach's $\alpha = 0.89$, composite reliability = 0.90, and AVE value = 0.66.

The above data indicate that the measurement scales have a higher reliability. All the measuring items in the scales adopt the 7-point Likert scale, where 7 means "very much agree", and 1 "very much disagree". Taking the integrating price (P_{A+B} = RMB52.8) strategy for example, the above data and conclusion show that the measuring scales have good reliability and convergent validity; the separating price (P_A = RMB37.8, P_B = RMB15) strategy is investigated at different times among different interviewees with all the indicators such as the reliability of the scales similar to those of the integrating price strategy, which also indicate that the scales have a higher test-retest reliability.

3.4. **Data verification.**

3.4.1. *Confirmatory factor analysis of the variables.* First, the research made a confirmatory factor analysis of the five main variables, with the conclusion shown in Table 1. The fact that the five-factor model is obviously superior to other competitive models and that all its fit indexes meet the requirements for the critical values indicates its excellent discriminant validity. (Here the integrating price frame is taken for example in data verification, and the conclusion in the case of integrating price frame remains the same. Similarly hereafter.)

Table 1. Result of the confirmatory factor analysis

Type of the Model	χ^2/df	CFI	TLI	RMSEA	SRMR
Five-factor A, B, C, D, E	1.71	0.97	0.96	0.05	0.04
Four-factor A, B+C, D, E	3.75	0.90	0.89	0.09	0.07
Three-factor A, B+C+D, E	5.57	0.84	0.82	0.11	0.09
Two-factor A+B+C+D, E	7.73	0.76	0.73	0.14	0.09
Single-factor A+B+C+D+E	8.31	0.74	0.71	0.14	0.10

Note: A represents the CV, B the TV, C the AV, D the PQ, E the purchase intention and + means merging.

3.4.2. *The descriptive statistics of the variables.* All the mean values, standard deviations and correlation coefficients of the variables are shown in Table 2, which indicates that the demographic variables have a smaller correlation with the purchase intention, yet on the other hand, CV, AV, PQ and TV have a bigger correlation with it. This also shows that the preference for innovative cultural products and the purchase intention are mainly decided by those LVs. The values in the brackets in the table are the square roots of

Table 2. Descriptive statistics of the variables

Variable	Mean value	Standard deviation	1	2	3	4	5	6	7	8
1 gender	1.65	0.48	1							
2 age	1.40	0.77	−0.08	1						
3 educational background	2.18	0.60	−0.08	0.66**	1					
4 PQ	5.21	0.85	−0.11*	−0.01	0.02	1(0.81)				
5 CV	5.52	0.94	−0.10	0.03	0.07	0.62**	1(0.89)			
6 AV	4.98	0.93	−0.10	−0.11*	−0.09	0.69**	0.48**	1(0.83)		
7 TV	4.54	1.11	−0.15**	−0.06	−0.09	0.56**	0.34**	0.75**	1(0.88)	
8 ω	4.95	0.98	−0.14**	−0.03	−0.03	0.63**	0.57**	0.79**	0.67**	1(0.84)

Note: * represents $p < 0.05$, **$p < 0.01$.

the corresponding variables (the values of AVE), which are all bigger than the correlation coefficients of the variables in the lower left. This further indicates that the scales adopted in this research have excellent discriminant validity.

4. **Empirical Analysis.**

4.1. **Analysis of the consumer's purchase intention differences.** The research made the T-verification of independent samples with ω, CV, TV, AV and PQ as the outcome variables and the bundling price strategies as the grouping variables. The mean values of the purchase intention ω are: $\omega_{\text{integrating frame}} = 4.95$, $\omega_{\text{separating frame}} = 5.23$. The difference is -0.28, whose significance $p < 0.001$. The mean values of TV are: $TV_{\text{integrating frame}} = 4.54$, $TV_{\text{separating frame}} = 5.03$. The difference is -0.49, whose significance $p < 0.001$. The mean values of AV are: $AV_{\text{integrating frame}} = 4.98$, $AV_{\text{separating frame}} = 5.29$. The difference is -0.31, whose significance $p < 0.001$. Compared with the integrating price frame, the ω, TV and AV under the separating price frame remarkably rise, while the CV (rising by 0.1) and PQ (rising by 0.11) rise merely a little ($p > 0.08$). Therefore, it is better that the innovative cultural product adopts the separating price frame so as to prompt the cultural consumption. This conclusion agrees with the one drawn from the research on the framing effect of fitness price [14]. The reason might be that the consumer will pay more attention to the acquired value when faced with cultural life consumption. Research has also found that the framing effect at this time has more significant influence on the consumer's purchase intention [15].

4.2. **Analysis of the internal influencing factors on the purchase intention.** The research made hierarchical regression of the acquired data, and the result is shown in Table 3. As can be seen in Models 2 and 7, the CV, under whichever price frames, has significantly positive influences on the ω, and the influence is even stronger under the separating price frame. With Models 3 and 8 we can see that the AV, under whichever price frames, also has significantly positive influences on the ω, yet the influences under the two price frames do not have much difference. With Models 4 and 9 we can see that the PQ under the integrating price frame does not have a significantly positive influence on the ω, but it does have a significantly positive influence on the ω under the separating price frame. With Models 5 and 10 we can see that the influences of each value element under the integrating price frame on ω can be sorted by size as follows: AV > TV > CV > PQ (PQ not significant) and that the influences of each value element under the separating price frame on ω can be sorted by size as follows: AV > PQ > CV > TV. Seen from the point of view of accelerating high-quality cultural consumption, the separating price frame takes priority since the PQ under it works better than under the integrating price frame where its influence is not significant at all. Compared with model 5(10), model 2(7) suggests that the decline of the role of cultural value may be caused by other variables, which does not affect the conclusion based on comparison in this study.

4.3. **The mathematical model to optimize P_A and P_B and its calculation.** From the point of view of the consumer, the separating price frame can prompt high-quality cultural consumption. Therefore, it is worthy of intensive study as to how to optimize P_A and P_B to maximize the manufacturer's profits under the premise of accelerating high-quality consumption.

The poly media book in this research is composed of paper book A, which is the kernel of the product and is priced at P_A, and digital resources B, which is supplementary and is priced at P_B. $P_A + P_B = K$ (K being a constant, and in this case K = RMB52.8). The consumer has different utility functions for A and B, and the utility the consumer can make from B is based on the utility he can make from A. In other words, without A the utility of B is null. Assume $P_A^{\max}$ and $P_B^{\max}$ represent respectively the biggest utilities

Table 3. Outcome of the hierarchical regression analysis

Variable	Purchase intention (ω)									
	Integrating price frame (models 1∼5)					Separating price frame (models 6∼10)				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
gender	−0.148**	−0.101*	−0.058	−0.056	−0.044	−0.157**	−0.129**	−0.045	−0.038	−0.034
age	−0.037	−0.017	0.028	0.028	0.018	0.061	0.039	0.039	0.036	0.032
Educational background	−0.013	−0.058	0.008	0.005	0.017	−0.006	0.031	0.021	0.022	0.022
CV		0.530***	0.150***	0.112**	0.121**		0.579***	0.175***	0.150***	0.155***
AV			0.709***	0.665***	0.555***			0.701***	0.590***	0.535***
PQ				0.092	0.075				0.193***	0.175***
TV					0.158**					0.119**
$\boldsymbol{R^2}$	0.023	0.300	0.648	0.652	0.662	0.033	0.366	0.683	0.698	0.704
adj$\boldsymbol{R^2}$	0.015	0.292	0.643	0.646	0.655	0.024	0.359	0.679	0.693	0.698
$\boldsymbol{\Delta R^2}$	0.023*	0.277***	0.348***	0.004	0.010**	0.033**	0.333***	0.317***	0.015***	0.006**
Value $\boldsymbol{F}$	2.734*	140.256	282.269	285.679	296.239	3.924**	182.901	330.501	349.238	356.533

Notes: Models 1-5 and models 6-10 correspond to Formulas (1)-(5) respectively. The significant level of value F of Model 1 $p < 0.05$, the significant level of value F of Model 6 $p < 0.01$, and the significant level of value F of the rest models $p < 0.001$; $^*p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$; all the regression coefficients are standardized; the ΔR^2s of Models 1 and 6 are obtained by comparing the models with 0, and the ΔR^2s of the rest models are obtained by comparison with the model on the left side.

the consumer can make from A and B, which can also be described as the upper price limits the consumer is willing to pay. (The upper price limit the consumer is willing to pay can also be called reserve price, which can be used to represent the economic value of the cultural product as well.)

Consumers' purchase intentions for poly media books are significantly different. In other words, their preferences are heterogeneous. Each consumer has his own preference parameter t ($0 \leq t \leq 1$). The lower the preference parameter, the lower the consumer assesses the product. And the higher the preference parameter, the higher the consumer assesses the product. The consumer's purchase decision depends on the consumer surplus S, which can be expressed by the following function, where $P_A + P_B = K$ and K is a constant

$$S = \begin{cases} P_A^{\max} \times t - P_A & \text{when only A is bought} \\ (P_A^{\max} \times t - P_A) + (P_B^{\max} \times t - P_B) & \text{when both A and B are bought at the same time} \\ 0 & \text{neither A nor B is bought} \end{cases} \tag{6}$$

Only when $S > 0$ will there be any purchase. The preference parameter t reflects the dispersion degree of the consumer's WTP, or the consumer's heterogeneity. When $t = 0$, the consumer's perceived utilities of A and B are 0, which also means his assessed prices for A and B are 0, and hence he will buy neither A nor B; When $t = 1$, the consumer has the highest perceived utilities of A and B, and his assessed prices for A and B are $P_A^{\max}$ and $P_B^{\max}$. He will buy both A and B, and at this time the consumer surplus $S = (P_A^{\max} - P_A) + (P_B^{\max} - P_B)$. The value of t indicates the differences of different consumers' assessed prices of the product. Suppose the consumer's preference parameter is t_1. When $0 < t < 1$, and $0 < t \leq t_1$, the consumer will not purchase A (and not B of course, since without A the utility of B is null), then $S = P_A^{\max} \times t_1 - P_A = 0$. Therefore:

$$t_1 = (P_A / P_A^{\max}) \tag{7}$$

Take t_1 as the critical point. Only when $t > t_1$ will $S = P_A^{\max} \times t - P_A > 0$, and will the consumer purchase A. Similarly, there is also a critical point t_2. When $t_1 < t \leq t_2$, the consumer think it is worthy of purchasing A yet not B, and then $S_A = P_A^{\max} \times t - P_A > 0$, and meanwhile $S_B = P_B^{\max} \times t_2 - P_B = 0$ (i.e., the consumer with a preference parameter t_2 considers the utility of B is null). Therefore:

$$t_2 = (P_B / P_B^{\max}) \tag{8}$$

When $t_2 < t \leq 1$, the consumer will purchase both A and B, then $S_A = P_A^{\max} \times t - P_A > 0$ and $S_B = P_B^{\max} \times t - P_B > 0$, or $S = (P_A^{\max} \times t - P_A) + (P_B^{\max} \times t - P_B)$.

For the rational consumer, only when the product price is lower than the highest price he is willing to pay will he possibly purchase the product. To ensure there is at least one consumer who will purchase A, $0 < t_1 < 1$; there can be no consumer for the supplementary product B, then $0 < t_2 \leq 1$ ($t_2 = 1$ means the consumer will only purchase A); for the rational manufacturer, the product can only be on sale when the product price is higher than the variable cost per unit (V_A being the variable cost per unit of the paper book A, and V_B the variable cost per unit of the digital resources B):

$$0 < V_A < P_A < P_A^{\max} \quad \text{and} \quad 0 < V_B < P_B \leq P_B^{\max} \tag{9}$$

Since $t_2 \geq t_1$, then $(1/t_2) \leq (1/t_1)$, therefore:

$$(P_A^{\max}/P_A) \geq (P_B^{\max}/P_B) \tag{10}$$

This means that seen from the consumer's point of view, the cost performance of A is bigger than or equal to that of B (when $t_2 = t_1 < 1$, the consumer will purchase both A and B at the same time).

Suppose there are Q consumers in the market, and the distribution probability density function of the preference parameter t is $f(x)$, then the quantity of A the market demands is $Q\int_{t_1}^{t_2} f(x)dx$ and the quantity of A and B the market demands is $Q\int_{t_2}^{1} f(x)dx$.

Suppose the variable cost and constant cost of A are V_A and C_A respectively, and the variable cost and constant cost of B are V_B and C_B respectively, then the manufacturer's profit is:

$$\pi(P_A, P_B) = Q(P_A - V_A)\int_{t_1}^{t_2} f(x)dx + Q(P_A - V_A + P_B - V_B)\int_{t_2}^{1} f(x)dx - C_A - C_B \tag{11}$$

The constraint condition is:

$$P_A + P_B = K \quad (K \text{ being a constant}) \tag{12}$$

When analyzing the cumulative percent of the consumers' purchase intentions under the separating price frame, we find that t has an S-shaped distribution, which is similar to the distribution of $B(x; 2, 2)$. $B(x; \alpha, \beta)$ (or Beta distribution) is a continuous probability distribution in the $(0, 1)$ zone, and its probability density function is:

$$\begin{aligned} f(x; \alpha, \beta) &= \frac{x^{\alpha-1}(1-x)^{\beta-1}}{\int_0^1 u^{\alpha-1}(1-u)^{\beta-1}du} = \frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)}x^{\alpha-1}(1-x)^{\beta-1} \\ &= \frac{1}{B(\alpha, \beta)}x^{\alpha-1}(1-x)^{\beta-1} \end{aligned} \tag{13}$$

Therefore, Formula (11) can be written as:

$$\begin{aligned} \pi(P_A, P_B) = {} & Q(P_A - V_A)\int_{t_1}^{t_2} f(x; 2, 2)dx \\ & + Q(P_A - V_A + P_B - V_B)\int_{t_2}^{1} f(x; 2, 2)dx - C_A - C_B \end{aligned} \tag{14}$$

In the constraint conditions (12), Formulas (14) can calculate the conditional extremum with the help of Lagrange multiplier method. Construct the function $\Psi(P_A, P_B)$ first, let

$$\begin{aligned} \psi(P_A, P_B) = {} & Q(P_A - V_A)\int_{t_1}^{t_2} f(x; 2, 2)dx + Q(P_A - V_A + P_B - V_B)\int_{t_2}^{1} f(x; 2, 2)dx \\ & - C_A - C_B + \lambda(P_A + P_B - K) \end{aligned} \tag{15}$$

where λ is a constant. Use $\Psi(P_A, P_B)$ to calculate the first partial derivatives of P_A and P_B and then let them equal 0. Then combined with Formula (12), the following equation set is obtained:

$$\begin{cases} Q\int_{t_1}^{1} f(x;2,2)dx + Q(P_A - V_A)\dfrac{\partial\left(\int_{t_1}^{1} f(x;2,2)dx\right)}{\partial(P_A)} + \lambda = 0 \\ Q\int_{t_2}^{1} f(x;2,2)dx + Q(P_B - V_B)\dfrac{\partial\left(\int_{t_2}^{1} f(x;2,2)dx\right)}{\partial(P_B)} + \lambda = 0 \\ P_A + P_B = K \end{cases} \tag{16}$$

$f(x;2,2) = 6x(1-x)$ can be obtained according to the density function (13), and according to Formulas (7) and (8), the equation set (16) can be solved. Finally a cubic equation of one yuan about P_A is obtained:

$$aP_A^3 + bP_A^2 + cP_A + d = 0 \tag{17}$$

where:

$a = 8\,(P_B^{\max})^3 - 4\,(P_A^{\max})^3$

$b = (12K - 3P_B^{\max} - 6V_B) \times (P_A^{\max})^3 - (9P_A^{\max} + 6V_B) \times (P_B^{\max})^3$

$c = 6V_A P_A^{\max} \times (P_B^{\max})^3 + (12KV_B + 6KP_B^{\max} - 12K^2 - 6V_B P_B^{\max}) \times (P_A^{\max})^3$

$d = (4K^3 - 3K^2 P_B^{\max} - 6K^2 V_B + 6KV_B P_B^{\max}) \times (P_A^{\max})^3$

Meanwhile, according to Formulas (9), (10) and (12) the data range of P_A can also be obtained, as is shown in Formula (18):

$$\max\{V_A; (K - P_B^{\max})\} \le P_A \le \min\{P_A^{\max}; (K - V_B); KP_A^{\max}/(P_A^{\max} + P_B^{\max})\} \tag{18}$$

The research takes $K = 52.8$, $P_A^{\max} = 50$, $P_B^{\max} = 20$, $V_A = 10$, $V_B = 5$ as the calculating example. According to Formula (18), we see $32.80 \le P_A \le 37.71$. With the help of the computer, three solutions to P_A can be found, which are $P_{A1} = 52.87$, $P_{A2} = 41.68$ and $P_{A3} = 33.25$.

$P_A = 52.87$ does not fit in the limits of P_A's data range. Even if we take into consideration the actual situation and set $P_A = 52.8$ and $P_B = 0$ which is actually under the integrating price frame in this research, it still cannot satisfy Criterion 1 and Criterion 2 (i.e., it cannot prompt high-quality cultural consumption), and hence should be given up.

$P_A = 41.68$ does not fit in the limits of P_A's data range. Although it satisfies the limits of Formula (9), it fails the limits of Formula (10) ($(P_A^{\max}/P_A) = 1.20$, $(P_B^{\max}/P_B) = 1.80$). This means the cost performance of the kernel product A is lower than that of the supplementary product B, and hence the price frame should also be given up.

$P_A = 33.25$ fits in the limits of P_A's data range, which means it satisfies the limits of both Formula (9) and Formula (10) ($(P_A^{\max}/P_A) = 1.50$, $(P_B^{\max}/P_B) = 1.02$). The cost performance of the kernel product A is higher than that of the supplementary product B. By using Formula (14), we can also obtain the profit $\pi = 6.10Q - C_A - C_B$. When $P_A = 37.71$ (which is close to the separating price frame $P_A = 37.80$ set in this research) or when the cost performance of A is equal to that of B ($t_1 = t_2$), or when the consumer will purchase both A and B at the same time, the profit $\pi = 5.74Q - C_A - C_B$, which is lower than that in the case when $P_A = 33.25$. This further explains the significance why the cost performance of the kernel product should be higher than that of the supplementary product. In the case when $P_A = 32.80$, $P_B = 20$ and $t_2 = 1$, the consumer will only purchase A, and the profit $\pi = 5.73Q - C_A - C_B$, which is also lower than that in the case when $P_A = 33.25$. This indicates that the price frame $P_A = 33.25$, $P_B = 19.55$ takes priority in maximizing the profits.

5. **Conclusion and Enlightenments.**

Compared with the integrating price frame, the separating price frame can more significantly promote the consumer's purchase intention. In fact, such kernel value elements of a cultural product as the CV and PQ under the

separating price frame have stronger and more significant influences on the purchase intention, and this frame can better promote product innovation since it facilitates the consumer's pursuit for consumption diversity [16]. Under the separating price frame, the prices for each composing product can be optimized to maximize the profits of the bundled product. However, considering the consumer's preference heterogeneity in the market, the cost efficiency of the kernel product must be higher than that of the supplementary product. Only in this way can the separating price frame become a more attractive choice that will maximize the profits at the same time comparatively speaking.

In nature, the bundled innovative cultural product is the mixed bundling of products and services. Compared with the bundling of pure products or pure services, its quality is more uncertain and its difference of cost structure is much bigger [17]. For this reason, further research still needs to be made on how the consumer can feel the quality and cost structure changes of this type of product and how to make consumer-satisfying price strategies and sales strategies.

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