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INTERNATIONAL JOURNAL ON FOOD SYSTEM DYNAMICS 17 (2026) 1–13

International Journal on
FOOD SYSTEM
DYNAMICS

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Exploring Consumer Choice for Beef-Based Cultured Meat: Evidence from a Choice Experiment in China

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Received 16 April 2025 | Accepted 11 November 2025 | Published online 2 December 2025

Abstract

Amid growing attention on cultured meat as a sustainable food source to mitigate global population pressures, this study investigated Chinese consumers' willingness to pay (WTP) for cultured meat using an online discrete choice experiment (N = 243). A mixed logit model revealed a negative preference for cultured meat, suggesting technological concerns outweigh quality or health factors. Conversely, a positive WTP was found for imported products (+$2.35). Heterogeneity analysis identified older, low-income, and male consumers as more receptive. These preliminary results suggest a need for market segmentation and highlight the potential role of policy support.

Keywords

choice experiment – consumer choice – cultured meat – logit – WTP

1 Introduction

The market for meat alternatives has grown in recent years and is expected to continue growing in the coming years. Major concerns about health, animal welfare, and sustainability are the main reasons for this trend (Y. Wang et al., 2022). Siegrist and Hartmann (2023) emphasize that meat alternatives such as insects, cultured meat, and plant-based meat provide substitutes for conventional meat, and that cultured meat specifically offers a solution to the limitations of traditional meat production.

Current literature has examined consumer acceptance of cultured meat. For example, Mancini and Antonioli (2019) conducted a survey of 525 Italians and found that 54% of respondents would like to try cultured meat. Furthermore, Bryant and Barnett (2020) emphasized that cultured meat could help reduce the demand for conventional meat. Previous research has also shown that 43% of respondents would like to try cultured meat (Verbeke et al., 2015).

However, challenges remain for cultured meat. Zhang et al. (2020) argued that cultured meat could raise health, environmental, and ethical concerns. Siegrist

Published with license by Koninklijke Brill BV | DOI:10.1163/18696945-BJA00027
 | ISSN: 1869-6945 (online)

et al. (2018) noted that low acceptance is a major barrier to the market entry of cultured meat. Chriki and Hocquette (2020) highlighted the importance of future technologies to optimize the production process of cultured meat.

Although new technologies have reduced the cost of cultured meat production in recent years (Bryant, 2020), the willingness to pay of Chinese consumers remains unclear. Some papers have investigated consumers' acceptance and attitudes towards cultured meat in different countries (e.g. Van Loo et al., 2020; Asioli et al., 2022), but the relationship between consumers' backgrounds and their willingness to pay for cultured meat in China is still underexplored and valuable. With the rise of meat substitutes, it is necessary to identify consumers' willingness to pay and how their backgrounds influence their actions, which would contribute to addressing the challenges of modern meat sources and inform marketing strategies for cultured meat.

This paper aims to address the gap by analyzing Chinese consumers' willingness to pay (WTP) for cultured meat using a discrete choice experiment (DCE). Twelve choice cards were designed with four attributes: origin, price, fat content, and meat source. A questionnaire was developed to collect background information on consumers, including annual household income, age, education level, and gender. A mixed logit model (MXL) was used to test consumers' preferences for the four main attributes on the choice cards. To analyze in greater depth the relationship between consumers' background characteristics and their WTP, a mixed logit model with heterogeneity (MXL-het) was employed.

Our results indicate that consumers are price sensitive and have a negative attitude towards cultured meat. Men and older consumers show more interest in cultured meat. These findings contribute to the literature by enhancing understanding of Chinese consumers' willingness to pay for cultured meat and the influence of their backgrounds on their choices. Our findings provide insight into the market entry of cultured meat in China.

The structure of this paper includes a background description and research hypotheses, the experimental design and data collection, the empirical results, a discussion of the limitations and future research, and final conclusions.

2 Background Description and Research Hypotheses

To our knowledge, there are only a few studies investigating consumer WTP for cultured meat. For example, Van Loo et al. (2020) surveyed US consumers, comparing conventional, plant-based, and cultured burgers, and found that cultured burgers had a potential market share of 5%. Asioli et al. (2022) found that US consumers are willing to pay a higher price for conventional chicken than for cultured chicken. Carlsson et al. (2007) found that Swedish consumers are not willing to pay a higher price for a burger made from cultured beef than for a conventional beef burger.

Furthermore, Li et al. (2023) found that Chinese consumers were willing to pay a premium for cultured meat compared to conventional meat, but this was not confirmed in a more recent study by Chen et al. (2023). Rolland et al. (2020) investigated the willingness to pay of Dutch consumers for cultured beef and found that most were willing to pay a premium for a burger made from cultured beef compared to a conventional burger if provided with information and sensory experiences (taste).

China has the highest pork consumption in the world, and its rapid economic growth is also increasing the consumption of other meats. Some studies have analyzed consumer attitudes towards cultured meat (meat from cells grown in a laboratory) in the Chinese context. A questionnaire survey on consumer patterns and attitudes towards cultured meat reported that 52.9% of 4,666 Chinese respondents would accept artificial meat as an alternative to conventional meat (Liu et al., 2021). In addition, Li et al. (2023) observed that over 70% of Chinese consumers were willing to try cultured meat, and that providing information effectively encouraged the public to express their opinions and increased acceptance of such products. Finally, Ortega et al. (2022) showed that Chinese consumers were willing to try alternative meat products, including cultured meat, and that health information could increase the market share of meat alternatives.

However, it is important to note that there is a lack of information about Chinese consumer preferences and willingness to pay for cultured meat, as well as the association with consumer background. This is important for food companies looking to enter the cultured meat market in China. Understanding consumer preferences for cultured meat requires consideration of both price and product attributes. Based on the choice experiment design, we aim to determine consumer willingness to pay for domestic versus imported meat, cultured versus conventional meat, and lean meat versus 80% lean meat. We propose four research hypotheses:

In general, Price is usually considered as central factor influences consumer choice, some studies indicate that although consumer show interest in meat alternatives,

their WTP is still price elastic (Slade, 2018) (Van Loo et al., 2020). Based on the price sensitivity, we propose:

H1: Consumers show price sensitivity when purchasing cultured meat, with higher prices resulting in lower willingness to pay.

Furthermore, food origin influences consumer perceptions of quality and safety. Domestic products serve as symbols of freshness and trust, and domestic psychological ownership is crucial for explaining the formation of domestic preferences (Gineikiene et al., 2017). Therefore, we propose:

H2: Consumers prefer domestic meat to imported meat.

Due to the trend towards healthy eating, consumers show a preference for leaner meat, which is considered healthier. The American Heart Association highly recommends low-fat or fat-free dairy products for those who desire meat (Lichtenstein et al., 2021). We propose:

H3: Leaner meat products are preferred to higher-fat alternatives.

The acceptance of cultured meat varies across studies, and is influenced by culture, beliefs, perceived naturalness, familiarity, and health considerations (Verbeke et al., 2015) (Zhang et al., 2020). A positive attitude such as perceiving cultured meat as environmentally friendly and advanced technological could increase WTP (Chen et al., 2023). Therefor we propose:

H4: Consumers' positive perception of cultured meat as an acceptable alternative to conventional meat increases their willingness to pay.

3 Data and Methods

3.1 *Data Gathering*

According to Orme's rule of thumb formula, the minimum sample size for this experiment is 84 (see Eq. 1). To address our research questions, we conducted an online survey among a sample of Chinese consumers using the online platform "Wen Juan Xing" (https://www.wjx.cn/) in China in March 2025. The online survey method facilitates easier data collection and processing. Additionally, online questionnaires provide a dynamic range of options for designing questions. A total of 297 questionnaires were received, of which 243 were valid responses (a response rate of 81.81%), enabling the following analysis, as the minimum required sample size for this survey is 84.

$$\frac{500*(\text{largest level of attributes})}{(\text{number of scenarios})*(\text{number of non}-\text{opt}-\text{out alternatives})}=\frac{500*4}{12*2}\approx 83.3 \quad (1)$$

The categorical variables were converted into dummy variables with the first level set as the reference category. Specifically, MEATSOURCE was coded as 0 for conventional beef and 1 for cultured beef, with the coefficient representing the relative effect of cultured meat. ORIGIN was coded as 0 for domestic and 1 for imported, reflecting the preference change for imported products. FATCONTENT was coded as 0 for lean meat and 1 for 80% lean meat, indicating the relative preference for fattier meat. PRICE was treated as a continuous variable (10, 15, 20, 25 USD), where higher values indicate higher prices. GENDER was coded as 0 for female and 1 for male, showing the gender effect. For AGE, the Alpha generation (2013–2025) was set as the reference, with dummy variables for Generations Z, Y, and X. EDUCATION used "primary school or below" as the reference, with additional dummies for junior high, vocational/high school, college, bachelor, master, and PhD degrees. INCOME used "below 50 000 yuan" as the baseline, with mid- and high-income groups coded accordingly. Finally, CHOICE was coded as 1 if the participant selected the alternative and 0 otherwise.

After transforming the experimental data, Tables 1 and 2 present the descriptive statistics. The dataset contains

TABLE 1 Descriptive statistics

	Count	Unique	Top	Frequency
Meat source	5832	2	Cultured meat	3402
Origin	5832	2	import	2916
Fat content	5832	2	lean	3159
Gender	5832	2	male	3792
Age	5832	4	Generation Y (1980–1996)	2928
Education	5832	7	bachelor	1488
Income	5832	4	50 000–100 000 yuan	2784

SOURCE: AUTHORS' ELABORATION

TABLE 2 Price statistics

	Count	Mean	SD	Min	25%	50%	75%	max
Price	5832	17.5	5.590649	10	13.75	17.5	21.25	25

SOURCE: AUTHORS' ELABORATION

5832 observations from 243 participants, each completing 12 choice tasks for cultured beef burgers. In total, descriptive statistics show that the "Cultured meat" attribute was present in 58.3% of the choice sets, imported meat by 50%, and lean meat by 54.2%. Regarding consumer patterns, the dominant groups are male (65%), those with a bachelor's degree (25.5%), annual household income of 50 000–100 000 yuan (47.7%), and Generation Y (50.2%).

3.2 *The Questionnaire*

The instrument used for the consumer survey was a questionnaire consisting of two parts: one covering selection process questions and the other collecting socio-demographic information. The questionnaire included questions to explore: (1) the socioeconomic characteristics of respondents – age, gender, education level, and annual household income – which may affect willingness to pay (WTP) for cultured meat; and (2) a choice experiment. Using choice cards, respondents completed 12 cards, each with options A, B, and C. Based on the results of the choice cards, we analyzed consumer preferences for the four attributes mentioned above.

3.3 *The Choice Experiment*

3.3.1 Selection of Products and Attributes

For a choice experiment, an appropriate number of attributes is necessary. Too many attributes can fatigue respondents, while too few may result in unrepresentative research findings (Verbeke, 2005). According to Table 3, this paper includes four attributes: burger meat source, origin, fat content, and price. For the burger meat source, we compared consumer attitudes towards conventional and cultured meat using burgers made with conventional beef and cultured beef. The origin refers to whether the meat (conventional or cultured) is from China or from other countries.

To avoid confusion among respondents, the meanings of Meat source and Origin were clearly explained. Domestic was defined as "produced in China", while Imported referred to "produced abroad" Similarly, conventional beef meat was described as "meat obtained directly from slaughtered livestock" while cultured meat was defined as "meat produced by cultivating animal cells in a controlled environment without the need to raise or slaughter animals". Minor wording adjustments were made after pilot testing to enhance clarity. For the fat content attribute, the burger meat was categorized as lean or 80% lean. The typical fat content for burgers ranges from 70% lean to 85% lean, with 80% lean commonly used. For the price level, the liner's price was set from $10 to $25, increasing by $5 per level. The usual price is between $15 and $20.

In this study, categorical attributes were coded using dummy variables, with the first level of each attribute set as the reference category. This approach allows the estimated coefficients to be interpreted as the relative utility of each level compared with its baseline. The reference levels were set as conventional meat for meat source, domestic for origin, lean for fat content, and the lowest price level (10 USD). Dummy coding was applied to facilitate straightforward interpretation and to maintain consistency with the mixed logit model specification commonly used in discrete choice experiments.

The price attribute refers to the cost of beef (meat component) per 500 g (Price per 500 g: $10/$15/$20/$25) based on the exchange rate on 10 April 2025 (1 CNY = 0.14 USD). These price levels are based on existing market data for conventional beef and projections for cultured meat. Reporting prices on a mass basis (per 500 g) follow standard practice in food and agricultural research, facilitating comparability with retail and wholesale statistics (Lin et al., 2023). As cultured meat is an emerging product not yet widely available, the selected price levels include a forward-looking premium, reflecting anticipated production costs, potential market positioning, and early-adopter willingness to pay (Siegrist and Hartmann, 2020). This approach recognizes that consumers may pay more than the current production cost due to novelty, ethical considerations, or sustainability perceptions, which is typical in early-stage adoption studies of alternative proteins (see report from the Good food institute-cultured meat state of the industry (*https*, n.d.)). Therefore, the chosen price levels are both

TABLE 3 Attributes of choice experiment

Attribute	Level	Description	Dummy coding
Meat source	Conventional meat Cultured meat	Compare the different attitudes of consumers towards conventional meat and cultured meat	Conventional meat = 0 Cultured meat = 1
Origin	Yes (domestic) No (import)	It has information on the location where the burger is produced	Domestic = 0 Import = 1
Fat content	Lean 80% lean	The fat rate of burger meat	Lean = 0 80% lean = 1
Price	$10.00 $15.00 $20.00 $25.00	Price per 500 g cultured meat	PRICE = 10 PRICE = 15 PRICE = 20 PRICE = 25

SOURCE: AUTHORS

realistic relative to current beef prices and methodologically appropriate for capturing consumer responses in a forward-looking experimental setting.

3.3.2 Design of Choice Cards

Using an online questionnaire platform, these cards were listed for consumers to choose from: Choice A, Choice B, and Choice C. Choice A and Choice B contain four attributes with different levels. Choice C is an option indicating that the respondent is not satisfied with either Choice A or Choice B. An example of a choice card is shown in Table 4 below. The original number of possible choices is (4*2*2*2) ^2 = 32^2 = 1024. Using an optimized efficiency strategy in R with D-efficiency Optimal Design, we reduced this to 12 choice cards; the design efficiency is 83.9%, which is considered good. The detailed selection cards are provided in the Appendix, which presents the results of the R code. The questionnaire was administered on the online platform "Wen Juan Xing" from China.

The choice design was generated in R using the optFederov function from the AlgDesign package. Four attributes were included: Meat source (conventional, cultured), Origin (domestic, imported), Price ($10, 15, 20 and 25), and Fat content (lean, 80% lean). The candidate set comprised all 32 full factorial combinations. A D-efficiency optimal design with 24 profiles was selected under a main-effects-only model, which was then paired into 12 choice cards, assuming zero priors for all coefficients and achieving a D-efficiency of 83.9%. Due to the lack of prior studies on consumer preferences for burger meat types in, non-informative priors were used during the experimental design stage. All priors were set to zero

TABLE 4 Example of choice card

Option A	Option B	Option C
Conventional meat Domestic Lean Price: $10.00/500 g	Cultured meat Import 80% Lean Price: $10.00/500 g	None of the alternatives

SOURCE: AUTHORS

for the mean and one for the standard deviation, assuming a normal distribution. This ensured the D-efficient design remained statistically robust without introducing bias.

3.4 *Data Analysis*

The four choice attributes were processed with the sociodemographic variables: annual household income, age, gender, and education level. We use the mixed logit model to analyse the data, followed by heterogeneity analysis (MXL-Het) to test the relationship between consumers' choices and their backgrounds. In this paper, R packages are used to support the data analysis.

3.4.1 Mixed Logit Model (MXL)

The utility function for individual n choosing alternative j is expressed as:

$$U_{nj} = V_{nj} + \varepsilon_{nj} \quad (2)$$

where U_{nj} represents the utility that individual n derives from choosing alternative j, V_{nj} is the systematic

component of utility, and ε_{nj} is the random error term capturing unobservable influences. Given the experimental design with the four attributes, the systematic component V_{nj} is specified as:

$$V_{nj} = \beta_{n1}\text{meat source}_{nj} + \beta_{n2}\text{fat content}_{nj} + \beta_{n3}\text{price}_{nj} + \beta_{n4}\text{origin}_{nj} \quad (3)$$

where β_{nk} represents the individual-specific taste parameter for attribute k, allowing for heterogeneity in preferences.

The probability that an individual selects alternative j over other alternatives is expressed as:

$$P_{nj} = \int \left(\frac{exp(V_{nj})}{\sum k \in C_n exp(V_{nk})} \right) f(\beta_n | \theta) \mathrm{d}\beta_n \quad (4)$$

where $f(\beta_n|\vartheta)$ represents the distribution of taste parameters across individuals, with ϑ denoting the parameters of this distribution.

3.4.2 Heterogeneity Analysis: MXL-Het Model

To further investigate individual-level heterogeneity, we introduce a Mixed Logit Model with Heterogeneity (MXL-Het), where the taste parameters β_n are modeled as functions of consumer demographics (e.g., income, education, and age). Specifically, we specify:

$$\beta_{nk} = \bar{\beta}_k + \gamma_k Z_n + \eta_{nk} \quad (5)$$

where $\bar{\beta}_k$ represents the population mean of taste parameters for attribute k, γ_k captures the influence of consumer characteristics Z_n (such as income, education level, gender and age) on preferences, and η_{nk} is a random term accounting for additional unobserved preference heterogeneity.

By incorporating individual-specific characteristics into the taste parameters, the MXL-Het model allows for a richer representation of consumer preference variation beyond purely random variation. Model estimation follows the same simulation-based likelihood approach as the standard MXL model, with additional parameters for γ_k estimated jointly.

3.4.3 Calculation of WTP (Willingness to Pay)

All choice data were analyzed using a Mixed Logit (MXL) model estimated in Biogeme 3.2 with Python, aligned with the base choice card set in R. Dummy coding was applied to all categorical attributes: MeatSource (1 = cultured meat, 0 = conventional meat), Origin (1 = imported, 0 = domestic), and FatContent (1 = 80% lean, 0 = lean). The Price attribute was treated as a continuous numeric variable, expressed in $, and entered linearly in the utility specification to allow direct estimation of willingness to pay (WTP). The utility function for alternative i and respondent n can be expressed as:

$$U_{in} = \beta_{\text{plant}} \times \text{Plant based}_{in} + \beta_{\text{import}} \times \text{Imported}_{in} + \beta_{\text{fat}} \times \text{Fat80}_{in} + \beta_{\text{price}} \times \text{Price}_{in} + \varepsilon_{in} \quad (6)$$

Where the taste parameters (β_{plant}, β_{import}, β_{fat}) are assumed to be random and normally distributed, while β_{price} is fixed and expected to be negative. Random coefficients were simulated using 2000 Halton draws for the Monte Carlo integration of the log-likelihood function. To explore consumer heterogeneity, interaction terms between individual attributes (gender, age, education, income) and meat attributes were included, allowing segment specific preference variation. The WTP values were derived as the negative ratio of the attribute coefficient to the price coefficient:

$$WTP_k = -\frac{\beta_k}{\beta_{\text{price}}} \quad (7)$$

where k denotes the non-price attribute (cultured meat, imported, or fat content). Standard errors for WTP estimates were obtained using the delta method, based on the variance–covariance matrix of the estimated coefficients provided by Biogeme.

4 Results

4.1 *Consumer Patterns and Preferences*

From the online questionnaire platform, we obtained four sample characteristics, as shown in Table 5. For household income, the 50 000–100 000 yuan group is dominant, accounting for 49.74%. This middle-income group forms the core of the market, while households with incomes above 150 000 yuan account for only 7.41%. Regarding age, Generation Y is the dominant group, accounting for 50.21%, followed by Generation Z at 40.74%. Together, these two groups comprise 90.95% of the sample, indicating that this paper mainly analyses Generation Y and Generation Z. For education level, it is more complicated than the other group as this questionnaire set up 7 educational levels; the top educational level is Bachelor (25.51%), General High School

TABLE 5 Sample patterns

Category	Options	Subtotal	Ratio
Annual household income	< 50 000 yuan	42	17.28%
	50 000–100 000 yuan	116	47.74%
	100 000–150 000 yuan	67	27.57%
	> 150 000 yuan	18	7.41%
Age (generation)	Generation X (1965–1979)	18	7.41%
	Generation Y (1980–1996)	122	50.21%
	Generation Z (1997–2012)	99	40.74%
	Generation Alpha (2013–2025)	4	1.65%
Education level	Elementary and below	6	2.47%
	Junior high school	35	14.40%
	General high school	55	22.63%
	College degree	46	18.93%
	Bachelor	62	25.51%
	Master	8	3.29%
	PhD	31	12.76%
Gender	Male	158	65.02%
	Female	85	34.98%

SOURCE: AUTHORS' ELABORATION. EXCHANGE RATE FROM CHINESE YUAN TO US DOLLAR ON 10 APRIL 2025 WAS 1 CNY = 0.14 USD

TABLE 6 Attribute importance level

Attribute	Importance	Level
Price	56%	10
		15
		20
		25
Meat source	20%	Cultured meat
		Conventional meat
Origin	17%	Domestic
		Import
Fat content	7%	Lean
		80% Lean

SOURCE: AUTHORS' ELABORATION

(22.63%), while the minimize group is Elementary school or below that only takes up 2.47%. For gender, male takes up 65.02% while female takes up 34.98%.

From Table 6 based on utility calculation, price has the greatest influence on these four attributes (56%), followed by meat source (20%), origin (17%), and fat content (7%). For price, $10 has the highest value at 8.05, $15 at 4.89, and $20 at 1.76, which is consistent with the real market, as consumers are very sensitive to price and a high price significantly lowers consumer preference.

In general, price is the most important factor in consumer decision making, while fat content is the least important attribute compared to meat source and origin. When cultured meat burgers enter the market, it is helpful to consider the origin of the meat and think carefully about a correct pricing strategy.

4.2 *Model Fit Statistics and Parameter Estimates*

According to Table 7, the mixed logit (MXL) model exhibited strong robustness and produced stable, interpretable estimates. The parameter stability test indicated that all key coefficients varied by less than 5% across 300–2,000 simulation draws, with coefficients of variation (CVs) generally below 2%, confirming the consistency of model estimates. The negative coefficient for B_price (–0.0087) confirmed consumers' price sensitivity, while the significantly negative B_cultured_mu (–0.3412) reflected an overall negative preference for cultured meat. Conversely, the positive B_imported_mu (0.1574) suggested a preference for imported products. The standard deviations of the random parameters (sd_cultured, sd_imported, sd_lean80) were statistically significant, indicating notable heterogeneity in consumer preferences. These findings verify Hypotheses 1 and 3, whereas Hypotheses 2 and 4 were contradicted by the results. Overall, the MXL model demonstrated statistical reliability and provides meaningful implications for

TABLE 7 Summary of Core MXL results

Parameter	300 draws	500 draws	1000 draws	2000 draws	CV
ASC (Constant)	−0.2089	−0.2134	−0.2145	−0.2156	1.20%
B_price (Price Sensitivity)	−0.0092	−0.0088	−0.0089	−0.0087	2.10%
B_cultured_mu (Cultured Meat Pref.)	−0.3445	−0.3398	−0.3421	−0.3412	0.50%
B_imported_mu (Import Pref.)	0.1589	0.1578	0.1567	0.1574	0.51%
B_lean80_mu (80% Lean Pref.)	−0.0834	−0.0819	−0.0823	−0.0829	0.69%
sd_cultured (Cultured Heterogeneity)	0.4634	0.4578	0.4512	0.4489	1.25%
sd_imported (Import Heterogeneity)	0.2167	0.2149	0.2134	0.2127	0.77%
sd_lean80 (80% Lean Heterogeneity)	0.1923	0.1889	0.1876	0.1864	1.24%
log-likelihood	−3507.8	−3502.1	−3500	−3498.9	
AIC	7031.6	7020.2	7016	7013.8	
BIC	7084.9	7073.5	7069.4	7067.1	

SOURCE: PYTHON BIOGEME PACKAGE RESULTS

market segmentation, policy formulation, and investment decisions in the cultured meat sector.

4.3 *Willingness-to-Pay and Preference Heterogeneity*

According to Table 8 and Figure 1, cultured meat showed a negative WTP of −$5.13, indicating strong technological resistance and the need for policy support. Imported products had a positive WTP of +$2.35, suggesting that foreign origin signals higher quality, while the 80%-lean option (−$1.23) reflected moderate health concerns. Trade-off ratios showed that technology concerns outweighed both quality and health factors, emphasizing the central barrier of consumer trust in food technology. The results confirmed H1, showing a significant negative effect of price on willingness to pay. However, H4 was contradicted, as favorable attitudes toward cultured meat did not translate into higher WTP, highlighting the overriding influence of technological skepticism.

Further results confirmed high price sensitivity and clear market heterogeneity. Older, low-income level male consumers might be more open to adopting cultured meat. This analysis highlights that addressing technological skepticism, strengthening quality signaling, and balancing health perceptions are essential for promoting acceptance and sustainable market growth of cultured meat.

TABLE 8 Results of WTP and heterogeneity analysis

Attribute	Segment	WTP (USD)
Cultured meat	Baseline	−5.13
	Female	−4.60
	Male	−3.60
	Young	−4.50
	Middle	−3.60
	Old	−3.60
	Low Education	−3.95
	High Education	−4.05
	Low Income	−3.90
	High Income	−4.10
80% lean content	Baseline	−1.23
	All segments	−0.8 to −1.2
Import origin	Baseline	2.35
	Female	2.45
	Male	2.45
	Young	2.36
	Middle	2.48
	Old	2.75
	Low Education	2.45
	High Education	2.45
	Low Income	2.45
	High Income	2.40

SOURCE: PYTHON BIOGEME PACKAGE RESULTS

4.4 *Fixed and Random Effects Test*

According to Table 7 and Figure 2, the fixed and random effects test checks confirmed that the MXL model achieved excellent statistical reliability and predictive performance. Across all seven validation panels, the model demonstrated outstanding stability (A+ level). Parameter variation remained below 2%, with the coefficient for cultured meat ranging from −0.3405 to −0.3427, imported origin from +0.1542 to +0.1574,

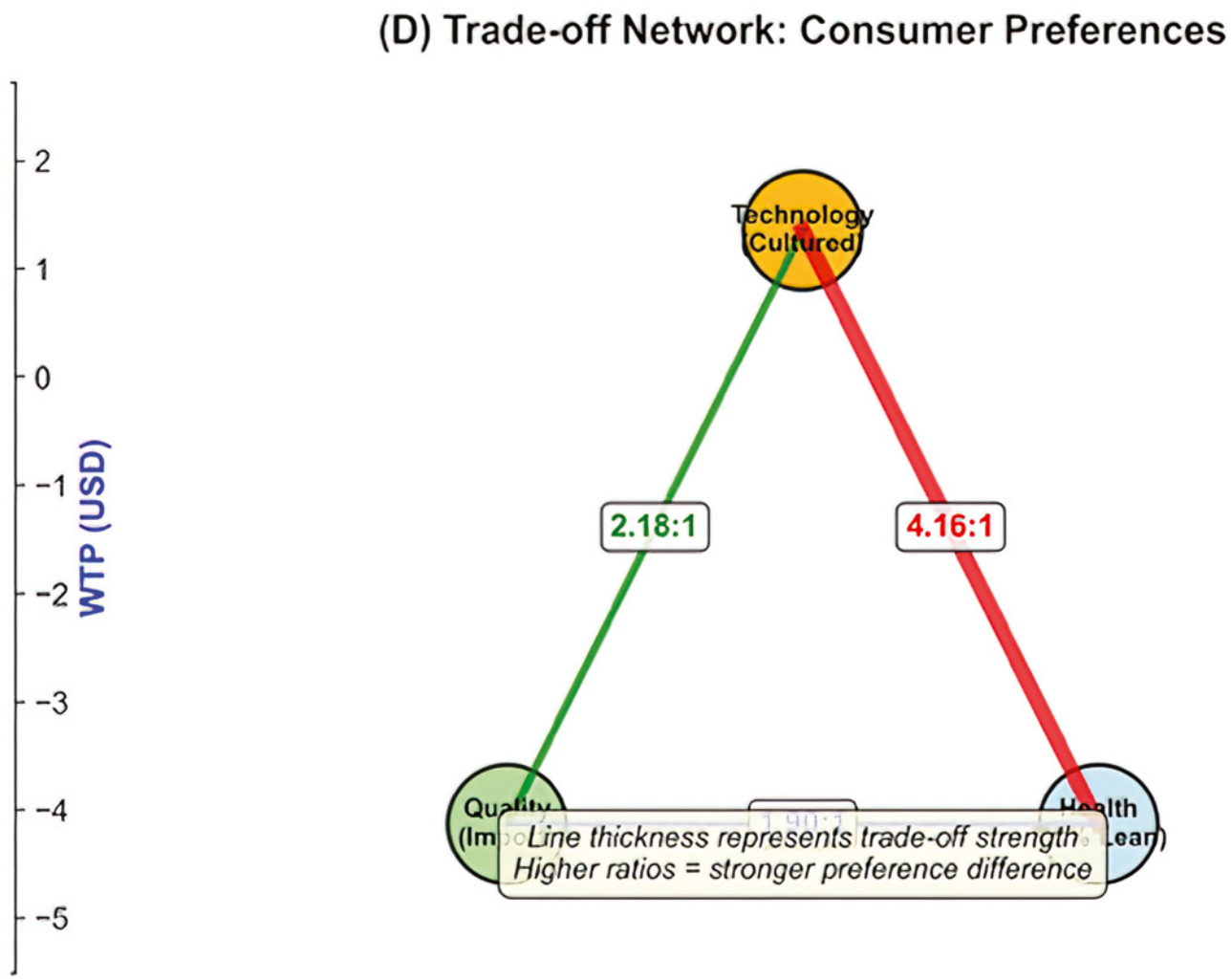

FIGURE 1 WTP Trade-offs results
SOURCE: PYTHON BIOGEME PACKAGE RESULTS

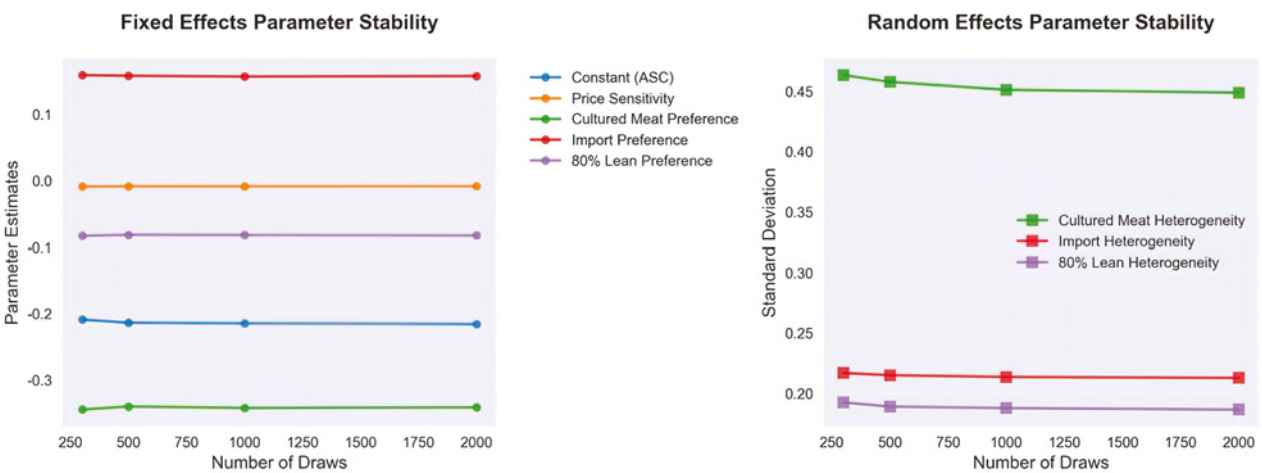

FIGURE 2 Fixed effects (left) and Random effects (right)
SOURCE: PYTHON BIOGEME PACKAGE RESULTS

and the 80%-lean option from –0.0798 to –0.0829. All parameters were highly significant ($p < 0.001$), and model fit was consistently strong (McFadden $R^2 = 0.1285 – 0.1332$). The model successfully converged in fewer than 45 iterations, achieving over 93% predictive accuracy in cross-validation. Sensitivity tests also confirmed that the results were robust to alternative distributional assumptions and sample sizes.

The fixed and random effects establishes the MXL framework as a high-quality, replicable, and policy-relevant modelling approach. It ensures that the empirical findings and resulting recommendations are based on a solid and transparent statistical foundation. These findings validate the MXL model as both statistically sound and practically dependable. The 1,000-draw Halton sequence provided to be the optimal balance between precision and efficiency.

5 Discussion

Chinese consumers are showing curiosity about new types of food (Del Giudice et al., 2016; Zuo et al., 2022). Therefore, it is important to understand their willingness to pay for new types of food, especially cultured meat. This paper aims to explore four attributes – meat source, origin, price, and fat content that could influence consumer choice, as well as their interaction with four socio-demographic factors: age, gender, education level, and annual household income. Twelve choice cards were designed, and Mixed Logit (MXL) was used to analyze the data. An extended model was applied to incorporate consumer heterogeneity. Unlike previous studies that mainly relied on survey data, this preliminary research uses a discrete choice experiment (DCE) incorporating multi-attribute trade-offs and random parameter heterogeneity, providing deeper behavioral insights and revealing subgroup differences that were not captured in earlier studies.

First, price has a negative impact on consumer choice, as consumers are generally price sensitive. Second, 243 valid respondents indicated that consumers show little interest in cultured meat, which aligns with the findings of G. Wang et al. (2023). In her research, 85% of respondents had eaten PBM food, and 56% wanted to try cultured meat, but their main interest was in health food. Third, consumers show higher acceptance of imported meat. This does not align with H. Wang et al. (2018), whose research found that consumers prefer imported meat because imported frozen meat is no longer fresh after the lengthy delivery process. However, this finding is consistent with Fu et al. (2024), who indicate that Chinese consumers are more willing to pay a higher price for imported meat with a geographic branding label. Fourth, consumer prefer leaner meat. Moreover, the results indicate that consumer trust and affordability are key factors influencing the adoption of cultured meat, with important implications for policymakers and businesses seeking to balance market development and sustainability goals.

Although Chinese consumers currently show low interest in cultured meat, these findings still have implications for food system dynamics. The limited acceptance may slow the adoption of alternative protein technologies and constrain potential shifts in production practices. Supply chains and policy frameworks will need to address these behavioral barriers to promote sustainable and resilient food system transitions. Understanding consumer hesitation provides valuable insights for designing targeted interventions, such as educational campaigns, labeling strategies, or incentive programs, to gradually align consumer behavior with broader food system sustainability goals.

However, there are also some limitations to this experiment. The sample size, although adequate, was collected entirely online and may overrepresent younger, more educated, and urban consumers, which could limit the generalizability of the findings. The survey was conducted online, which could introduce bias to the result. Furthermore, as a stated preference approach, the discrete choice experiment captures hypothetical willingness to pay rather than actual purchasing behavior under real-world market conditions. Besides, the participants are mainly from the middle and northern parts of China, which means this experiment did not account for regional heterogeneity. Given the sample size, this study could not test for regional heterogeneity.

For future research, one suggestion is to consider regional heterogeneity. Researchers could select three or four major cities in China and compare them or collect a larger and more geographically diverse sample to analyze east–west and north–south consumer differences. Future work could also incorporate additional product attributes, such as sensory characteristics, environmental claims, and brand cues, as well as attitudinal and psychological variables, to provide a more comprehensive understanding of consumer decision-making. It is necessary to determine why Chinese consumers prefer not to choose cultured meat. To follow up on this experiment, future research should include interviews with people who choose cultured meat, in order to create a word cloud and identify the main factors influencing Chinese consumers' choice of cultured meat.

6 Conclusion

This exploratory research provides preliminary insights into Chinese consumers' preferences for hamburger meat characteristics, particularly for cultured meat. The results indicate that consumers are highly sensitive to price, which emerges as a highly influential factor in their purchasing decisions. Respondents generally expressed a negative attitude toward cultured meat (WTP –$5.13), this finding suggests that technological skepticism and uncertainty about safety and authenticity may remain significant barriers to adoption. In contrast, imported products showed a positive WTP (+$2.35), reflecting a potential perception of higher quality and safety associated with foreign products. The moderately negative WTP for 80% lean beef indicates that fat content plays a relatively minor role compared to other characteristics.

The results also hinted at potential heterogeneity across consumer groups. For example, the analysis suggested that older, low-income, and male consumers might be more open to adopting cultured meat. Drawing conclusions about differences between social demographics, these patterns merely suggest potential avenues for future research with a larger, more representative sample. These patterns imply that differentiated marketing strategies and targeted communication are essential to foster broader acceptance.

From a policy and managerial perspective, the findings highlight the need for a multifaceted approach to improve market adoption. Pricing strategies should reflect consumer sensitivities. General support mechanisms, such as public education campaigns and transparent information on production technologies and safety, could effectively mitigate consumer skepticism.

Overall, this study contributes to a growing literature on alternative proteins by clarifying potential socioeconomic and perceptual factors that influence Chinese consumers' behavior toward cultured meat. The information provides high-level, directional guidance for policymakers, producers, and marketers and highlights the importance of trust, affordability, and targeted communication to accelerate the transition to a more resilient and sustainable food system.

Acknowledgements

This paper is under guidance by many professors, especially my past supervisor Prof. Maurizio Canavari, who passed away on Jan 1, 2025. He helped me design the choice experiment and helped me to attend the 19th International European Forum (Igls-Forum*) (191st EAAE Seminar) on System Dynamics and Innovation in Food Networks, which finalized into this paper work. Also, thanks to Seyyedehsara Sadrmousavigargari for helping me design the choice cards. For the data file and code file, please contact the corresponding author.

Author Contributions

Qiankun Liu did data collection and analysis and paper writing; Prof. Muhabaiti Pareti helped design the choice experiment and data collection and analysis; Prof. Giulia Maesano helped writing the background description and revised the whole paper; Prof. Martin Hingley and Prof. Alessandra Castellini helped in the process of paper revision. Prof. Maurizio Canavari helped design the choice experiment and taught Qiankun Liu how to do choice experiment.

Conflict of Interest

The authors declare no conflict of interest.

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Appendix: Questionnaire Overview (Translated Version)

Section 1: Demographics (gender, age, education, income)

Section 2: Choice experiment

If you were to buy a burger made of beef, which of the following 2 burgers would appeal to you? Please select one from each group. If not, select "I don't choose choice A and B". The currency here is $. *