Moderating Effects of Agricultural Product Category Characteristics on Consumers' Online Shopping Intention

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Abstract. Based on the Technology Acceptance Model, this paper explores the relationship between consumers' online shopping perceived usefulness and online shopping intention, as well as the Tripartite for the five agricultural product characteristics, including price perception, purchase frequency, familiarity, thinking time and involvement. Experiment with two scenarios of high and low online shopping perceived usefulness is designed to test the hypothesis. Nine hundred sixty sample subjects' data are collected. The structural equation model is used to empirically test the variable regulation effect involving three groups of comparisons. The study finds that consumers' online shopping perceived usefulness has a positive effect on online shopping intention. Five agricultural product characteristics play a moderating effect in regulating this relationship. The tripartite of agricultural product characteristics have statistically significant differences as a moderator variable.

Keywords: Agricultural product · Moderating effect · Structural equation model · Experiment

1 Introduction

With the popularity of the Internet and terminal equipment in China, the Internet retail industry has made significant progress as a supplement to the physical retail industry. According to the data of China Internet Network Information Center, as of June 2019, the number of online shopping users in China was 639 million, with a half-year growth rate of 4.7%, accounting for 74.8% of the total Internet users [1]. From 2011 to 2018, the scale of online retail transactions in China continued to expand. However, the year-on-year growth rate of the scale of online retail transactions has shown a trend of floating decline and stabilization [2]. Simultaneously, the distribution of categories of online retail products differs from the distribution of categories of social consumer products. According to the classified sales and share data of China's retail sales of social consumer goods in 2018 [2], the top three categories of goods in China's total retail sales

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of social consumer goods are automotive, petroleum and products, and grain, oil, food, and beverages, with the ratios at 11.51%, 5.78%, and 4.07%. In the same year, the top three product categories with the most significant online sales in China were clothing, shoes, and hats and textile products, daily necessities, and home appliances and audio-visual equipment, accounting for 25.2%, 14.4%, and 10.6% respectively, with only a small proportion of agricultural products [1]. It can be seen that some of the Chinese consumer goods retail categories, such as automobiles, petroleum and products, Chinese and Western medicine, tobacco and alcohol, construction and decoration materials, have not been sold online. At the same time, there is a difference between the categories with a higher proportion of retail value in China's total retail sales and those with a higher proportion of online shopping categories.

In this context, relevant literature in the theoretical world has pointed out to varying degrees the impact of commodity categories on consumer online shopping tendencies. Lee et al. [3] research on the online market of medical devices in China and Taiwan shows that product attributes and characteristics have a significant impact on consumers' willingness to buy online. Rudi and Çakır [4] studied the online and offline channels of healthy food and junk food when consumers buy food products, and found that consumers are more likely to buy junk food offline, while they are relatively restrained online. Yoo et al. [5] pointed out in the research on how the self-reinforcing mechanism of accessible information affects consumer purchases. Even within the same product category, there are many different categories within them. These different characteristics of products are essential and have a significant impact on consumers' online shopping decisions. These research results indicate that when exploring consumer online shopping trends, the regulatory role of commodity categories must be considered. Even in the same category of products, consumers' online shopping intentions will differ for products with different product characteristics.

Agricultural product retailing is also gradually realizing the influence of commodity categories on consumers' online shopping intentions. In the early days of the rise of online retail, e-commerce platforms pursued all categories, and a large number of brick-and-mortar retailers quickly set up online retail platforms to adapt to the new situation and list all the products in physical channels to online platforms with the reputation of "infinite shelves". E-commerce platforms and brick-and-mortar retail stores have gradually become more rational in channel category management. Brick-and-mortar retailers are more cautious about opening online businesses, and more successful emerging offline stores are paying more attention to their ability to select goods rather than hoping to increase e-commerce channels. Successful pure e-commerce companies are also more aggressive in opening physical stores. Alibaba Group has opened unmanned supermarkets since 2017; the e-commerce company Amazon has already established five offline store businesses, including bookstores, whole food supermarkets, full-time convenience stores, and Amazon Go in 2018. The sixth offline store model is equivalent to the "four-star Amazon" of a boutique [6]. These situations indicate that, whether in the theoretical world or the practice of the retail industry, there is a specific understanding that consumers' online shopping intentions will be affected by commodity categories. Research on how agricultural product categories affect consumers' online shopping intention is of

great significance for expanding online sales of agricultural products, retailing theory, and practice.

When analyzing how consumers' online shopping intentions are affected by product categories, the academic tends to compare the respective strengths and weaknesses of physical and online retail channels to explain consumers' differences in online shopping intentions for different products. The original literature focused on merely analyzing the relative strengths and weaknesses of the two channels. In contrast, the recent literature analyzes channel selection decisions related to consumers, product categories, and channel adaptation from the perspective of the characteristics of the channels themselves and the advantages and disadvantages of other channels and fit analysis. For example, John et al. [7] discussed the channel design that retailers could carry out in a multi-channel environment using transaction cost methods corresponding to physical and online channels. Banerjee et al. [8] used the analysis of ideas based on online channels' advantages and disadvantages to evaluate the consumer happiness attributes of online grocery shopping sites in India. Harris et al. [9] investigated the corresponding perceived strengths and weaknesses of online shopping and traditional supermarket shopping of 871 British consumers who purchased daily necessities online and in physical stores based on behavior theory, thereby explaining different daily necessities characteristics of the channel.

In terms of the classification of product categories in the internet environment, most of the literature still uses information economics, regarding the methods, properties, and ease of searching for consumers to collect product information before purchasing different products to classify products into Taxonomy of search, experience and trust products. Chocarro et al. [10] discussed the different information sources of service goods with different characteristics such as search, experience, and trust in the process of consumer information search. They found that consumers have different information acquisition channels for different categories of service products. Other literature, from the perspective of consumers' emotions, is classified according to utilitarian goods and hedonistic goods with emotion and subjective experience. Zheng et al. [11] studied the impact of consumer browsing of hedonic and utilitarian products on mobile channels on their impulse shopping, and found that mobile channels increase consumers' impulse shopping.

It can be seen that previous research has the following three limitations. First of all, most of the literature that analyzes consumers' purchase intention for different products in online shopping channels is analyzed from the perspective of the advantages and disadvantages of online shopping channels compared to traditional physical channels, or transaction costs, which is hard to be exhaustive, and will change with the evolution of the times and technological progress; Second, in the research of online shopping channels and product categories, most of the research is temporarily limited to correlation analysis, rather than causal analysis and verification. The primary reason is mainly that in the analysis of categories and channels, the decision-making process of consumers cannot be studied as the main body of the model; Third, for the classification of commodity categories, the previous literature still uses dichotomy method in either information economics or hedonistic economics, resulting in category classification that simply considers the consumer's information search process rather than the

consumer's decision-making process, making the study fail to reflect the impact of commodity categories on consumers' online shopping intention. This classification method is not suitable for agricultural products.

This article believes that under the circumstances that online channel sales are slowing down and the proportion of agricultural products online is still small, it is of great theoretical and practical significance to study the impact of agricultural product categories on consumers' online shopping intentions. This article will present hypotheses based on the literature review and use experimental methods to verify hypotheses. This article's structure is as follows: the second part is literature review; the third part builds models, puts forward hypotheses, and introduces experimental design; the fourth part analyzes data, and the fifth part deals with management discussions and deficiencies.

2 Literature Review

Technology Acceptance Model (TAM) was initially developed by Davis [12] and is considered a powerful and concise model. The TAM evolves from the psychological ABC Attitude Model, Rational Behavior Model, and Planned Behavior Model, assuming that a person's acceptance of a technology is determined by his willingness to use the technology voluntarily. This willingness, in turn, is determined by his attitude towards technology and its usefulness. An individual's attitude is formed from two beliefs in his technology use: the first belief is called perceived usefulness, that is, the use of an application system will increase the subjective possibility of his work performance; the second belief is that perception is easy to use, that is, the degree to which the user expects the target system to be used without much experience. The TAM was mainly used to detect the acceptance of new technologies by users and was used to predict the intention of online shopping after the rise of online shopping channels. If the online shopping channel is regarded as a new technology of consumer shopping, the TAM can be evolved into the consumer online shopping channel acceptance model, as shown in Fig. 1.

Valencia et al. [13] studied the online shopping intention of Colombian College students using TAM. This study validates that the TAM has a reliable and suitable effect in the interpretation and prediction of consumers' online shopping trends, and further confirms the consumer attitude, online shopping ease of use, online shopping usefulness perception, and trust in explaining online shopping trends. Ha and Nguyen [14] used the TAM to study the online shopping intention of Vietnamese consumers. Studies have found that perceived usefulness, ease of use, attitude, subjective norms, and trust positively affect consumers' online shopping intentions. Guzzo et al. [15] used social influence factors and demographic factors as the antecedents of TAM use in online channel shopping situations and studied how demographic factors affect consumers' online shopping intentions. These studies have proved that the TAM is useful in explaining online shopping behavior. However, none of the existing researches considers the target products of online shopping into the model or selects only individual products as scenarios for online shopping. Therefore, it fails to explain and verify the impact of agricultural product characteristics on consumers' online shopping decisions.

The purpose of this article is to explore the impact of agricultural product categories on consumers' online shopping propensities. The following literature illustrates five

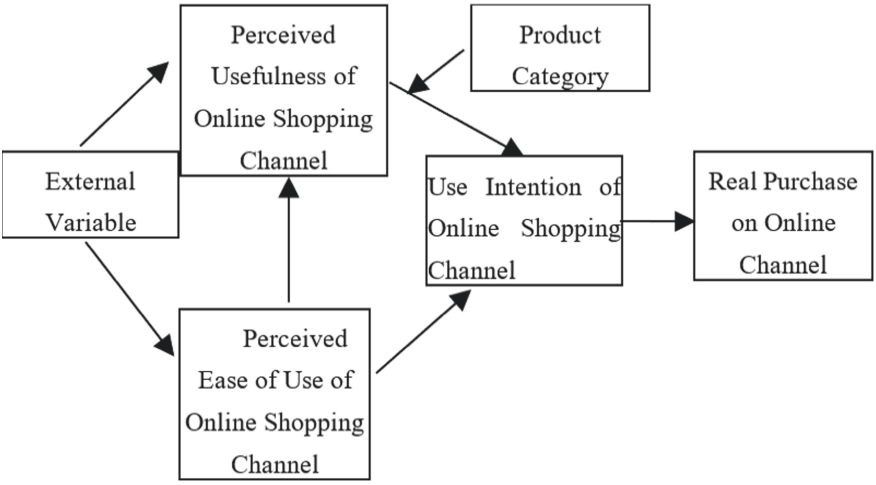

Fig. 1. Online shopping intention model

types of agricultural product categories that may affect consumers' online shopping propensities. Muhammad and Permana [16] studied the factors that affect consumers' online shopping intentions and found that there is a positive impact on product prices and consumer satisfaction on consumer online shopping tendencies. Liu and Li [17] studied the factors influencing consumers' willingness to purchase online on the mobile end. The study concluded that consumers' product familiarity has an impact on their online purchase intentions. Wen et al. [18] studied the factors that affect consumers' intention to use online shopping in China, including purchase frequency and purchase motivation, and found that as consumers' purchase frequency increases, their online shopping intention rise. Peng et al. [19] studied the impact of the time urgency of online shopping on the perceived value of online shopping and the intention of using online shopping on social platforms. The relationship played a moderating role. Ahmad et al. [20] studied the impact of consumer involvement in product purchases, lifestyles, and Internet self-efficacy on their intentions to use online shopping. They also found that consumer involvement in goods positively affects their online purchase intentions.

In summary, previous research on consumer online shopping intention using TAM has focused on the impact of demographic factors and social variables on channel use. In the literature concerning commodity categories or commodity category characteristics, the category and its characteristics are used as independent variables to study the correlation between them, thus failing to reveal the mechanism and mode of influence of commodity category characteristics on consumers' online shopping intention, and the lack of agricultural products the study. This article takes five objective category characteristics, including consumer price perception, purchase frequency, familiarity, time to think before purchase, and involvement, as examples. This article explicitly studies the mechanism and effect of commodity category characteristics on consumers' online shopping intentions.

3 Model Assumptions and Experimental Design

The consumer online shopping intention model is a causal relationship model based on the psychological process of decision-making. This paper intends to use an experimental method to test the mechanism of the characteristics of agricultural product categories on the consumer online shopping intention. The experimental method is widely used in the verification of causality. To simplify the complexity of the experimental analysis, this article only focuses on the primary relationship of the model: the influence of perceived usefulness of online shopping on online shopping intention, Fig. 2.

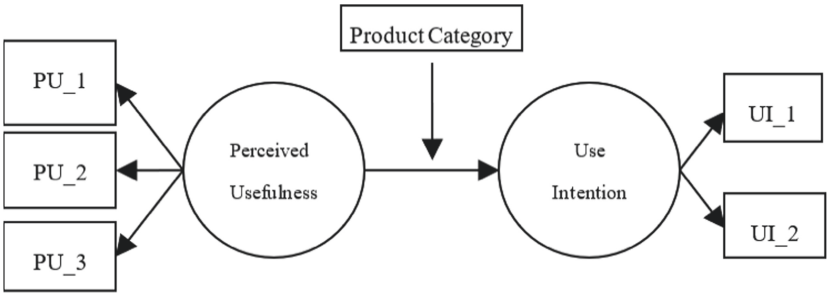

Fig. 2. Simplified model for experiment

The explanation of external factors will be analyzed in a separate paper. Ignoring the perceived ease of use variable differs from the new technology and new software fields in which TAM is widely used. The online shopping technology studied in this article is a relatively mature and straightforward application. Empirical evidence also shows that perceived ease of use has a weaker effect on behavioral intentions. The actual use of online shopping variables is not in the scope of this article, because the actual use of online shopping will be subject to objective conditions, such as the existing agricultural product e-commerce websites that can be improved but not improved, and the intensity of consumer willingness to buy [21]. This leads to Hypothesis 1.

Hypothesis 1: Consumers' perceived usefulness of online shopping has a positive effect on their online shopping intention.

According to the literature, this article selects fifteen specific agricultural products from grain and oil, dairy, vegetables and fruits, animal meat, and aquatic products, corresponding to consumers' price perception, purchase frequency, familiarity, time to think, and involvement. The five categories of characteristics must be low, medium, and high. This article argues that the causal relationship between consumers' perceived usefulness of online shopping for agricultural products and their online shopping intention is affected by the moderating effect of category characteristics. Specifically, when the perceived usefulness of online shopping is the same, the intention of shopping online affected by the characteristics of agricultural products is lower than shopping online that is not affected by the category characteristics. This leads to Hypothesis 2.

Hypothesis 2: Consumers' online shopping intention affected by specific agricultural product categories is lower than that of not affected by specific product categories.

The impact of involvement characteristics of agricultural products with different levels on consumers' online shopping intention is analyzed as an example below. According to the consumer's involvement in agricultural products at the time of purchase, agricultural products are classified into low-involved agricultural products, medium-involved agricultural products, and high-involved agricultural products, and specific commodities are selected as representatives from aquatic agricultural products. For the daily aquatic product purchases that must be completed, struggling to search will not be the choice of most consumers, so consumers are expected to have a lower tendency to purchase such agricultural products through online channels. For aquatic products that require time to choose, such as cod, prawns, salmon, etc., consumers will generally be willing to spend more energy searching for products that they need and cost-effective compared to lower-involved aquatic products. This article predicts their online shopping intention would be high. For lobsters, cods, crabs, etc., which require high freshness, consumers may be willing to invest great interest in searching and enjoying the process of careful selection. Therefore, consumers are expected to have lower online shopping intentions. This leads to Hypothesis 3.

Assumption 3-a/b/c/d/e: subject to three different levels of price perception (a), purchase frequency (b), familiarity (c), time to think before buying (d), As well as involvement (e), there is a statistically significant difference in the path coefficient of the relationship between perceived usefulness of online shopping and online shopping intention.

To avoid the highly concentrated perceived usefulness of online shopping perceived by participants participating in the experiment, and to form high and low levels of perceived usefulness of online shopping in the data to facilitate data analysis, we designed two scenarios that can affect consumers' perceived usefulness of online shopping. Six new subjects were asked to test and evaluate. The test results show that the two experimental scenarios have different guidance on the perceived usefulness of online shopping of the experimental subjects.

We used the experimental questionnaire group that did not mention specific agricultural product categories as the control group. The group that asked about the online shopping propensity variable for 15 specific commodities in the questionnaire as the experimental group, a total of 16 groups. There were 60 participants in each group. Half of the random participants received a questionnaire guided by low online shopping perceived usefulness, and the other half received a questionnaire guided by great online shopping perceived usefulness. According to the PLS Handbook [22], this experimental model involves a total of 2 variables, and each group of 20 samples can support the analysis. Each experimental questionnaire has a total of 5 items. The first three items are a scale for the perceived usefulness of online shopping, and the last two items are a scale for online shopping intention. The perceived usefulness of online shopping uses Frasquet et al. [23] scale and online shopping use the Venkatesh et al. [24] scale. Both scales are reflection scales, using 7 Likert scales. To ensure the objectivity and non-interference of the experiment, each subject can only see one type of questionnaire. At the same time, the subjects are told that they are participating in the online shopping willingness questionnaire without any knowledge of the experiment's objective.

The experiment uses the WJX website, which is distributed and collected in Shanghai through WeChat within two weeks from September 12 to September 26, 2019. Because the experimental questionnaire itself is relatively simple, with only five items, and no personal information is collected, the experimental recovery rate reaches 100%. A total of 960 valid questionnaires have been recovered. There is no defect value in the data.

4 Data Analysis

The data collection place for this experiment is located in Shanghai. The demand, acceptance, and penetration rate of online shopping in this area is generally high. At the same time, this experimental questionnaire was transmitted via WeChat, so we expect that the usefulness of online shopping perception in experimental data will be generally high. The distribution of data will deviate from the normal distribution. Therefore, this study uses Partial Least Squares (PLS) software to analyze the structural equation model's data. The advantage of PLS is that it can appropriately relax the normal distribution requirements of the data, and is suitable for data analysis with a small amount of data in each group. This paper uses SmartPLS 2 software for data analysis.

Each agricultural product characteristic that needs to be compared in this study involves three levels of the high, medium, and low, that is, for each product characteristic, we need to perform three sets of comparisons to verify whether the differences in the three groups of path coefficients are statistically significant. However, the PLS software can only perform a comparison between two groups, so we use the Omnibus Test of Group differences (OTG) method proposed by Sarstedt et al. [25], Chin et al. [26] for multi-group comparison and the Double Bootstrap by Shi et al. [27] using Programming in R to verify the statistical significance of the hypothesis that agricultural product category characteristics are used as moderators.

4.1 Preliminary Data Analysis

From the recovered data, the perceived usefulness is generally consistent with the experimental contextual guidance expectations; that is, the low contextual guidance group is lower than the high contextual guidance consumer online shopping perceived usefulness. In the control group without corresponding variables for specific agricultural products, the average value of consumers' online shopping intention (6.02) and the average value of perceived usefulness of online shopping (6.04) is almost at the same level. Consumers' judgment of online shopping intention and perceived usefulness are almost identical. Data from five experimental groups of agricultural product characteristics show that, at three different levels, the mean value of the perceived usefulness is basically at the same level. However, after the corresponding variables are inquired about specific agricultural product categories, the average value of consumers' online shopping intention is significantly lower than the corresponding average value of perceived usefulness by about 1 to 2 points. The difference is enlarged. Compared with the control group, consumers in the experimental group affected by agricultural product categories tend to have lower online shopping intentions than those in the control group who are not affected by agricultural

product categories. This change is due to the moderating effect of agricultural product categories. Hypothesis 2 is verified.

Judging from the slope formed by the average value of consumers' online shopping intention in each of the agricultural product feature groups in the low context guidance group and the high context guidance group, intuitively speaking,

Under the influence of three different levels of all five category characteristics, consumers in the case of high and low perceived usefulness of online shopping have reported differences in their online shopping intention. In general, consumers with higher online shopping perceived usefulness tend to gain more than those with low online shopping perceived usefulness. The correlation coefficient of the effect of perceived usefulness on online shopping intention, and whether there are statistically significant differences between online shopping intention at three different characteristic levels of each agricultural product characteristic, needs to be calculated by structural equation calculation using PLS software and R programming.

4.2 Econometric Model Evaluation

The results of SmartPLS 2 show that the external load coefficients of all groups' independent and dependent variables are greater than the minimum standard of 0.708, indicating that the indicators of all variables are reliable. The composite reliability of independent and dependent variables is higher than the standard 0.708, which means that all variables' internal consistency reliability is high. The Average Variance Extracted (AVE) index of independent and dependent variables of all groups is higher than the standard 0.50, which means that all variables have good convergence validity. According to the Fornell-Larcker standard, the square roots of the independent and dependent variable's AVE of all groups are greater than their correlation coefficients, indicating that all variables enjoy good discriminant validity.

4.3 Structural Model Evaluation

Since this experimental model has only one independent variable and one dependent variable, there is no collinearity problem. The determination coefficient R^2 of endogenous variables for online shopping in all groups is higher than the standard of R^2 value of 0.20 in consumer behavior research. It can be said that the model predicts endogenous variables with higher accuracy. The path coefficients affected by the independent variables of all groups are positive and greater than the standard value of 0.20, indicating that online shopping's perceived usefulness has a positive effect on online shopping intention. Hypothesis 1 is verified.

To test the statistical significance of the path coefficients, we performed 5000 times bootstrapping calculations on each group's experimental data. The results show that the T-test values of the calculation were higher than the two-sided test T critical value of 2.57 (Significance level of 1%), showing that the path coefficients of each group of the model are significant. To evaluate the predictive correlation of the model, we ran a Blindfolding program with a missing distance of 7, and the results showed that Q^2 values were all greater than 0, which meant that the corresponding variables of the model had predictive correlation. Table 1 shows the index values of the calculation results of each group.

Table 1. The PLS results for the model.

Group		Path coefficient	R^2	T	Q^2
Control Group		0.8085	0.6537	9.9896	0.5741
Price Perception	Low	0.4272	0.1825	3.6124	0.1592
	Medium	0.6452	0.4162	9.6754	0.3678
	High	0.3705	0.1373	4.9041	0.1225
Purchase Frequency	High	0.3772	0.1423	4.3453	0.0685
	Medium	0.6669	0.4448	8.2632	0.4105
	Low	0.3834	0.1470	3.4658	0.1233
Familiarity	High	0.6110	0.3733	6.3149	0.3462
	Medium	0.4681	0.2191	3.0397	0.1958
	Low	0.7518	0.5652	8.5393	0.5321
Thinking Time	Low	0.6096	0.3716	7.1812	0.3471
	Medium	0.7837	0.6142	11.6271	0.5661
	High	0.4308	0.1856	4.9253	0.1813
Involvemetn	Low	0.7778	0.6050	10.8696	0.5617
	Medium	0.8574	0.7352	23.9951	0.7109
	High	0.5155	0.2658	5.5403	0.2353

To determine whether the independent variable's path coefficients on the dependent variable of each category group at every level have statistically significant differences, we use a multiple-group comparison OTG method (B = 5000, U = 5000). The FR of the price feature group is 11998.47, the FR of the purchase frequency feature group is 13793.46, the FR of the familiarity feature group is 5806.89, the FR of the think time feature group is 22634.39, the FR of the involvement feature group is 32721.87, and the P values are all 1. It is shown that all the differences between the five feature groups are significant at $p \leq 0.01$. At least one set of path coefficients of each agricultural product characteristic of the relationship between the perceived usefulness and online shopping intention is different from the other two groups. Hypothesis 3-a/b/c/d/e is verified.

To determine which group is significantly different from the other groups in the three levels of each category feature, we use the non-parametric Double Bootstrap simplified calculation method (B1 = B2 = 500) to use R programming to calculate confidence intervals for each group of path coefficients obtained. Table 2 lists the confidence intervals for each category characteristic group's 95% correction rate and the corresponding multi-group comparison analysis results. If the path coefficients of one group (Table 1) do not fall within the confidence interval of the other group, and vice versa, then we judge that the path coefficients of the two groups have a statistically significant difference at this level of significance. Table 2 shows that there was a significant difference in the path coefficients for medium and high price product groups, high and medium frequency product groups, medium and low-frequency product groups, medium and low familiar product groups, each commodity group in think time and involvement (significance level 95%). The path coefficients of the other groups were not significantly different at a significant level of 95%.

Table 2. Rectifying Deviation at 95% Confidence Interval (Shi 1992 methodology) and Multi-group Comparison Results.

Group	Confidence Interval 95%			Comparison	Significant @ 5%
Control Group	[0.7230153,0.8754204]				
Price Perception	Low PP	Medium PP	High PP		
	[0.07981551, 0.75299025]	[0.4205368, 0.8200263]	[0.1571652, 0.6151002]	Low PP vs. Medium PP	Not Sig
				Low PP vs. High PP	Not Sig
				Medium PP vs. High PP	Sig
Frequency	High Fr	Medium Fr	Low Fr		
	[0.3366327, 0.4571384]	[0.5913473, 0.7318270]	[0.2737296, 0.4878295]	High Fr vs. Medium Fr	Sig
				High Fr vs. Low Fr	Not Sig
				Medium Fr vs. Low Fr	Sig
Familiarity	High Fa	Medium Fa	Low Fa		
	[0.5323346, 0.6992964]	[0.3861742, 0.7148848]	[0.6977097, 0.8564919]	High Fa vs. Medium Fa	Not Sig
				High Fa vs. Low Fa	Not Sig
				Medium Fa vs. Low Fa	Sig
Thinking Time	Low TT	Medium TT	High TT		
	[0.5420411, 0.6900313]	[0.7227880, 0.8329695]	[0.3538202, 0.5241846]	Low TT vs. Medium TT	Sig
				Low TT vs. High TT	Sig
				Medium TT vs. High TT	Sig
Involvement	Low I	Medium I	High I		
	[0.7305404, 0.8287949]	[0.8352369, 0.8914794]	[0.4472404, 0.5803213]	Low I vs. Medium I	Sig
				Low I vs. High I	Sig
				Medium I vs. High I	Sig

5 Conclusion and Outlook

5.1 Analysis of Conclusion

Through an experimental design, this paper uses 960 sample data to study the moderating effect of agricultural product category characteristics on consumers' online shopping intentions. The results show that: (1) The customer online shopping perceived usefulness has a positive effect on online shopping intention. (2) The online shopping intention affected by the characteristics of agricultural products is lower than that of not affected by the characteristics of agricultural products. (3) The moderating effect of agricultural product category characteristics on consumers' online shopping intention is statistically significant.

5.2 Management Inspiration

This paper validates the causal relationship between online shopping perceived usefulness and online shopping intention in the hypothetical model, and the moderating effect of the five category characteristics of agricultural products on the above causal relationship. The results of this article show that, in the context of increasingly mature online shopping channels and high perceptions of consumers' usefulness of online shopping, agricultural product retailers must fully consider the impact of agricultural product categories on consumer online shopping intention in the formulation of retail competition strategies, to take a comprehensive and effective analysis of features to avoid blind distribution.

At the same time, by verifying that there are statistically significant differences between the three levels of agricultural product category characteristics, the results of this paper also show that the trichotomy method of agricultural products has use value in analyzing consumers' intention to use online shopping channels. Compared with the dichotomy method, the trichotomy method for category characteristics more accurately describes the differences and changes in consumers' intention to purchase different types of agricultural products through online channels. The purchase frequency, familiarity, thinking time, and involvement characteristics of agricultural products show the highest online shopping intention for agricultural products with a medium level of characteristics compared with other characteristic levels. As for the characteristics of price perception, consumers tend to have a higher online purchase intention for agricultural products with medium and low price perception levels. Therefore, the retailer can make decisions on the sales channels according to the different category characteristics of the agricultural products sold. For example, if a retailer sells agricultural products with a medium or low price perception, or a medium purchase frequency, familiarity, thinking time, or level of involvement, then sales on the online channel will be better than on the physical channel. Conversely, if the agricultural products sold belong to high price perception, purchase frequency, familiarity, thinking time, involvement level, or low purchase frequency, familiarity, thinking time, and involvement level, the sales in physical channels will be more than that of the shop online.

Judging from the size of each group's path coefficients, the path coefficients of the medium-price perception, purchase frequency, thinking time, involvement, and low familiarity of the agricultural product group are larger than in other level groups with corresponding characteristics. This shows that for agricultural products with these characteristic levels, the online shopping perceived usefulness has a greater effect on online shopping intention than other levels of corresponding characteristics. If a retailer sells agricultural products that belong to the medium price perception, frequency of purchase, thinking time, involvement, and low familiarity group, and also choose to sell online. Efforts to improve the perceived usefulness will greatly promote consumers' online shopping intention for these agricultural products, and get more results with less effort. If the retailer sells agricultural products with other levels of category characteristics, then even if the company strives to increase the level of perceived usefulness, it will seem an extremely limited increase in online shopping intention. The retailer should consider changing other variables that affect the online shopping intention to promote sales in online channels.

5.3 Future Research

Future related research can be carried out in the following aspects. First, consumers' online shopping intentions for different types of agricultural products change over time. This is a long-term process. Due to the limited time of this study, this evolutionary process cannot be tracked. Future research will try to track this process. Second, the experimental data were collected in Shanghai. Shanghai is a more economically developed region in China and enjoys mature online shopping. From a representative perspective, consumers in Shanghai are challenging to represent the situation of the entire Chinese consumer. Future research can consider expanding the geographic scope of research. Third, this

study only selects categories of agricultural products for experiments. It does not involve whether the research model is universal to other commodities, so the research's general applicability needs to be strengthened. Future research can try to expand the range of product selection. It can also use more rigorous methods, such as clustering analysis to obtain classifications based on consumer perception of product characteristics.

References

1. China Internet Network Information Center. 44th Statistical Report on Internet Development in China (2019)
2. Official Website of China Statistics Bureau. 2018 China Statistical Bulletin (2019)
3. Lee, W.I., Cheng, S.Y., Shih, Y.T.: Effects among product attributes, involvement, word-of-mouth, and purchase intention in online shopping. Asia Pacific Manag. Rev. S1029313216303931 (2017)
4. Rudi, J., Çakır, M.: Vice or virtue: how shopping frequency affects healthfulness of food choices. Food Policy **69**, 207–217 (2017)
5. Yoo, B., Jeon, S., Han, T.: An analysis of popularity information effects: field experiments in an online marketplace. Electron. Commer. Res. Appl. **1**(17), 87–98 (2016)
6. https://www.cnbc.com/2019/03/01/grocery-store-stocks-take-a-beating-on-report-that-amazon-will-launch-its-own-chain-of-supermarkets.html
7. John, G., Viswanathan, M., Ghosh, M.: A transaction cost approach to channel design with application to multichannels settings. In: Handbook of Research on Distribution Channels 2019 22 February. Edward Elgar Publishing
8. Banerjee, T., Banerjee, A.: Web content analysis of online grocery shopping web sites in India. Int. J. Bus. Anal. **5**(4), 61–73 (2018)
9. Harris, P., Riley, F.D., Riley, D., Hand, C.: Online and store patronage: a typology of grocery shoppers. Int. J. Retail Distrib. Manag. **45**(4), 419–445 (2017)
10. Chocarro, R., Cortinas, M., Villanueva, M.L.: Different channels for different services: information sources for services with search, experience and credence attributes. Serv. Ind. J. **9**, 1–24 (2018)
11. Zheng, X., Men, J., Yang, F., Gong, X.: Understanding Impulsive Buying in mobile commerce: an investigation into hedonic and utilitarian browsing. Int. J. Inf. Manag. **48**, 151–160 (2019)
12. Davis, F.D.: Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. **13**(3), 319–340 (1989)
13. Valencia, D.C., Alejandro, V.A., Bran, L., Benjumea, M., Valencia, J.: Analysis of e-commerce acceptance using the technology acceptance model. Scientific papers of the University of Pardubice. Series D, Faculty of Economics and Administration. 45/2019 (2019)
14. Ha, N., Nguyen, T.: The effect of trust on consumers' online purchase intention: an integration of TAM and TPB. Manag. Sci. Lett. **9**(9), 1451–1460 (2019)
15. Guzzo, T., Ferri, F., Grifoni, P.: A model of e-commerce adoption (MOCA): consumer's perceptions and behaviours. Behav. Inf. Technol. **35**(3), 196–209 (2016)
16. Muhammad, F., Permana, H.: Influence of information technology, quality of service, trust, price, customer satisfaction on e-commerce. Qual. Serv. Trust Price Cust. Satis. E-Commerce (2019)
17. Liu, D., Li, M.: Exploring new factors affecting purchase intention of mobile commerce: trust and social benefit as mediators. Int. J. Mobile Commun. **17**(1), 108–125 (2019)
18. Wen, X., Li, Y., Yin, C.: Factors influencing purchase intention on mobile shopping web site in China and South Korea: an empirical study. Tehnički vjesnik. **26**(2), 495–502 (2019)

19. Peng, L., Zhang, W., Wang, X., Liang, S.: Moderating effects of time pressure on the relationship between perceived value and purchase intention in social E-commerce sales promotion: considering the impact of product involvement. Inf. Manag. **56**(2), 317–328 (2019)
20. Ahmad, W., Attiq, S., Ahmad, A., Ilyas, A., Kulsoom, K.: Investigating the impact of consumer's involvement, risk-taking personality, internet self-efficacy, life style and privacy concern on online purchase intention and shopping adoption. Pakistan Bus. Rev. **20**(3), 582–599 (2019)
21. Weyden, W.: Introduction to Psychology (9th edition of the original book) (US). Mechanical Industry Press (2016)
22. Handbook of Partial Least Squares, pp. 171–193. Springer, Heidelberg (2010). https://doi.org/10.1007/978-3-540-32827-8
23. Frasquet, M., Mollá, A., Ruiz, E.: Identifying patterns in channel usage across the search, purchase and post-sales stages of shopping. Electron. Commer. Res. Appl. **14**(6), 654–665 (2015)
24. Venkatesh, V., Davis, F.D.: A theoretical extension of the technology acceptance model: four longitudinal field studies. Manage. Sci. **46**(2), 186–204 (2000)
25. Sarstedt, M., Henseler, J., Ringle, C.M.: Multigroup analysis in partial least squares (PLS) path modeling: alternative methods and empirical results. Soc. Sci. Electron. Publish. **22**, 195–218 (2011)
26. Chin, W.W., Dibbern, J.: An introduction to a permutation based procedure for multi-group PLS analysis: results of tests of differences on simulated data and a cross cultural analysis of the sourcing of information system services between Germany and the USA. In: Esposito Vinzi, V., Chin, W., Henseler, J., Wang, H. (eds.) Handbook of Partial Least Squares. Springer Handbooks of Computational Statistics, pp.171–193. Springer, Heidelberg (2019). https://doi.org/10.1007/978-3-540-32827-8_8
27. Shi, S.G.: Accurate and efficient double-bootstrap confidence limit method. Comput. Stat. Data Anal. **13**(1), 21–32 (1992)