Traceability and Purchase Intention for Online Fresh Food in China: An Application of the Theory of Planned Behaviour

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Abstract

Background: Persistent food safety challenges have heightened concerns about food safety among Chinese consumers. To mitigate food risks, a potential strategy is to include traceable information across the supply chain within product labellings.

Objectives: Based on the theory of planned behaviour (TPB), the objective of this dissertation is, first, to explore how traceable information on online fresh food affects Chinese consumers' purchase intentions. The second objective is to examine the factors that mediate or moderate the relationship between traceable information and consumers' purchase intentions.

Methodology: This study expands on the traditional TPB model by including three potential moderating variables: gender, educational level, and age. 208 valid data were obtained via online surveys sent to Chinese residents via the WeChat platform, and analyzed by SPSS software and Hayes Process modelling.

Findings: This study found that 1) most respondents are concerned about food safety and agree that traceable information can help reduce potential risks, but are hesitant to pay a premium for this information; 2) older buyers are more likely to pay a higher price for traceable information; 3) consumers with higher food safety concerns are willing to pay more for traceable information; 4) gender and educational level directly influence the relationship between traceable information and consumers' purchase intention.

Conclusion: By applying an expanded TPB model to the online purchase of fresh food, this research would be regarded as an extension of the TPB literature. Regarding practical implications, this research is beneficial for various stakeholders such as food marketers and policy makers.

Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor used artificial intelligence tools or generative artificial intelligence tools (unless it is clearly stated, and referenced, along with the purpose of use), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

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Chapter 1 Introduction

1.1 Introduction

This chapter introduces the dissertation on the subject of online fresh food with traceable information, including the research background, research objectives, methodology, key findings, contribution, and structure of the dissertation. Beginning with the background of online fresh food in China, this chapter discusses the aspects of the Chinese e-commerce fresh food market, food safety issues, and the introduction of a traceability system. Subsequently, an exploration of previous research relating to traceability systems is undertaken, thereby identifying the research gap and establishing the research objectives. Moreover, the chapter introduces the Theory of Planned behaviour (TPB) model and explains the methodology employed in this research. Then, key findings and contributions are examined. Lastly, the structure of the dissertation is explained.

1.2 Background

China, as the world's largest e-commerce market, has experienced remarkable growth in its fresh food e-commerce sector. The Chinese fresh food e-commerce market size reached an impressive $40.43 billion in 2019, which marks a substantial twenty-two-fold increase since 2013 (Ma et al., 2021). Simultaneously, with significant economic advancements in China and an increase in disposable income, Chinese consumers now possess higher expectations for food quality (Huang & Gale, 2009). However, numerous countries have encountered food safety challenges in recent years (Hsu et al., 2021), and China is not exempt from this trend. In fact, China has been subject to a series of recurring food scandals, thereby increasing customer concerns regarding the quality and safety of food (Wang et al., 2019). Past research highlights consumer concerns. For example, in 2011, Ortega et al. conducted research affirming that Chinese consumers demonstrate serious concerns regarding the safety of pork products they purchase and are willing to pay a premium to ensure the safety of their food. Wang et al. (2019) noted that a succession of severe food safety scandals has extensively undermined consumer trust in the Chinese food industry. Similarly, Liu et al. (2020) concluded that China has experienced a series of high-profile food safety scandals in recent years, which have significantly challenged public confidence in the domestic food industry. When shopping on online platforms, the risks of food safety might be magnified due to the fact that consumers are unable to visually inspect, touch, or smell the actual products.

As outlined by Phillips and Vredenburg (2023), consumers are more inclined to engage in information searching to mitigate perceived risks and attain a sense of

assurance regarding the management of risks. Consequently, one potential strategy to address the food safety crisis involves the adoption of QR code scanning on fresh food products, enabling consumers to access traceable information that can, in turn, restore their trust and confidence in the safety of the food they consume (Wu et al., 2015). Recently, a number of prominent fresh food retailers operating in China, such as Meituan and Hema Grocery Store, have begun offering traceable fresh food options to cater to consumers' evolving demands and expectations. Generally speaking, traceable information on fresh food comes from a comprehensive system that integrates information across all stages of the fresh food supply chain, including the origin, production methods, ingredients, manufacturers, storage warehouses, distributors, and sales outlets. By scanning QR codes attached to fresh food packaging, Chinese consumers gain access to a record of the complete journey of the product, from farm to table (Chen & Huang, 2013). The implementation of a traceability system is effective in enhancing information transparency, ensuring food safety, and reducing costs associated with recalling flawed product, thereby making it popular in the Chinese food market. Previous research has indicated that providing customers with comprehensive production information through traceability systems can significantly influence their purchase intention, and consumers are willing to pay a premium for traceable information (Liu et al., 2020). Consequently, a study investigating traceable online fresh food holds significant value in enhancing our understanding of how traceability influences consumers' purchase intentions in the online fresh food industry. Additionally, it can provide meaningful insights for retailers and manufacturers.

1.3 Research objectives

Existing research on food traceability has primarily concentrated on two main areas: the development and implementation of traceability system technologies, and consumers' acceptance of traceable food products (Ding et al., 2022). Regarding traceability system technology, George et al. (2019) and Feng et al. (2020) highlighted the potential of incorporating Blockchain technology into food traceability systems for enhanced security and transparency, while Qian et al. (2020) suggested AI technology could further enhance the modern development of food traceability systems. Regarding consumers' acceptance of traceable food products, Verbeke & Ward (2006) found that a campaign to raise interest in beef traceability and origins significantly increased consumers' acceptance of a beef product. Also, Wu et al. (2011) investigated the acceptability of certified traceable food among Chinese consumers and found that after the respondents were fully informed about the food traceability system, their acceptance level for certified traceable food significantly increased. In addition, Wu et al. (2015) and Lu et al. (2016) found that consumer preferences and willingness to pay for traceable information were significantly influenced by age, monthly family income, and education level. While

plenty of studies have explored the technology of traceability systems and consumers' willingness to pay a premium for traceable food, there is no in-depth analysis of the factors affecting consumers' purchase of traceable food. Additionally, limited attention has been given to the fresh food industry, especially within the context of online channels. That is to say, research on the factors that affect the relationship between traceable information and consumer purchase intention in the online fresh food industry is nearly absent.

With the emphasis on food safety issues, for Chinese consumers, traceable information of online fresh food has emerged as a valuable additional service. This study is valuable in advancing the development of the food traceability system in China and also helps to improve the development of the online fresh food industry, therefore, aiming to contribute to a deeper understanding of the dynamics surrounding traceable fresh food in China, as well as offer insights to inform policy and industry practices. The research has two objectives:

1) to investigate how the traceability information on online fresh food influences consumers' purchase intentions;

2) to explore the factors that mediate or moderate the relationship between traceable information and consumers' purchase intentions.

To achieve the above research objectives, based on previous studies, three research questions are generated:

1) How can traceable information increase consumer intentions for the online purchase of fresh food?

2) In what ways is the relationship between traceable information and consumer purchase intention mediated by subjective norms, perceived behavioural control, and attitude?

3) In what ways is the relationship between traceable information and consumer purchase intention moderated by gender, age, and educational level?

1.4 Methodology

Employing the Theory of Planned behaviour (TPB) as an analytical framework, this study aims to explore the relationship between traceable online fresh food and consumers' purchase intentions. TPB theory is used to interpret human behaviour and identify the factors that drive such behaviour (Ajzen, 1991). TPB model includes three variables: attitude, subjective norms, and perceived behavioral control (PBC),

which serve as motivating factors for individuals' purchase intentions and subsequent actual behaviour (Ding et al., 2022). In contrast to previous research, this study extends the traditional TPB model by incorporating three potential moderating factors: gender, educational level, and age. 208 valid responses were collected from Chinese consumers via an online survey distribution. By analyzing the results via SPSS software and Hayes Process modelling, this study identifies the key factors that influence Chinese consumers' purchasing behaviour for traceable fresh food. The findings of this study provide valuable insights for policymakers to refine regulations and assist online suppliers to improve marketing strategies and generate sales revenue.

1.5 Key findings

This research uses a modified TPB model to examine the impact of traceable information on consumer purchase intention for online fresh food in Chinese market, which revealed that: 1) while most respondents are concerned about food safety and will use QR codes with traceable information to detect potential food risks, they are unwilling to pay a premium for traceable information; 2) older consumers are more likely to pay a higher price for traceable information compared to younger consumers; 3) consumers with higher food safety concerns prioritize traceable information in purchases and are willing to pay more for traceable information; and 4) gender, age, and educational level do not moderate the mediation effect of PBC on traceable information and purchase intention, but gender and educational level directly influence the relationship between traceable information and purchase intention.

1.6 Contribution

Other than introducing the original factors of TPB (subjective norms, attitude, and perceived behavioral control), this study has significant theoretical implications as it expands upon the traditional TPB model by examining how various moderators (age, gender, and educational level) might influence the mediated relationship between traceable information and purchase intention. In addition, this extended TPB model provides a more comprehensive understanding of the factors that affect consumers' decision-making processes in the context of the online fresh food industry in China, which contributes to the existing literature by exploring a new research direction in this developing industry, thereby enriching the knowledge base in the research of food traceability.

This research has practical implications for various stakeholders, including food marketers and policy makers. Specifically, this study provides valuable insights in three main areas: understanding consumer perceptions of traceable information in

online fresh food, the impact of traceable information on consumer purchase intentions, and the influence of other factors (such as perceived behavioural control, gender, and educational level) on the relationship between traceable information and purchase intention. These insights can help retailers enhance market share and profitability by tailoring their strategies to meet consumer preferences. Policymakers can also use these findings to refine regulations and promote the adoption of traceability systems, thus ensuring consumer safety and confidence in the food market. Based on the findings, this study proposes several recommendations:

1. Pricing Strategies: Online sellers should provide traceable information without obviously increasing the pricing of their products. Employing pricing tactics such as discounts can create a perception that traceable fresh food is economical, thereby encouraging more consumers to make purchase decisions.

2. Food Safety Campaigns: Public campaigns, that emphasize the benefits and importance of traceability systems in ensuring food safety, should be conducted. These campaigns can educate the public and enhance consumer understanding and trust in traceable fresh food.

3. Targeting Specific Consumer Groups: Female and less educated consumers place higher value on traceable information. Consequently, for online retailers, marketing strategies should be designed to target and appeal to these groups.

By implementing these recommendations, online sellers and policymakers can effectively promote the adoption of traceable fresh food, reduce food risks, enhance consumer trust, and drive higher purchase intentions among different consumer segments.

1.7 Structure

The structure of the remaining chapters of this dissertation is as follows: Chapter 2 provides a literature review, including the history and development of the Chinese fresh food market, the emerging trend of online grocery shopping, the significance of traceability systems in China (including food safety issues and information asymmetry), as well as the origin and determinants of the TPB model. Chapter 3 establishes the hypotheses based on the TPB framework, the conceptual model for this study, as well as the research methodology which includes research philosophy, sample selection, measurement techniques, survey design, and the planned process of data analysis. The empirical results are presented in Chapter 4, which includes the analysis of the socio-demographic characteristics of the respondents, descriptive and ANOVA analysis, correlation analysis, and hypothesis testing using Hayes Process modelling. Chapter 5 presents the summary of key findings, theoretical implications,

practical implications, limitations, suggestions for future research, and the final conclusions of this study. With an organized structure, this research aims to provide a systematic analysis of the relationship between traceable information on online fresh food and consumers' purchase intention.

1.8 Conclusion

This chapter introduced the dissertation and identified the aim of this study. The research aim is to explore the relationship between traceable information on online fresh food and consumers' purchase intentions. This chapter started with an overview of the research background, which includes the flourishing Chinese e-commerce market, the negative impact of recent food safety issues on Chinese consumers, and the introduction and application of traceability systems. The chapter highlighted previous research on traceable information, identifying research gaps, establishing research objectives, and formulating research questions. Additionally, this chapter outlined the methodology employed in this dissertation, encompassing the research framework, data collection, and methods of data analysis. Moreover, key findings that provide valuable insights for various stakeholders were included in this chapter. This chapter discussed the theoretical contributions of this research and proposed recommendations for online suppliers and policymakers. Finally, the chapter provided an overview of the structure of the dissertation.

Chapter 2 Literature Review

2.1 Introduction

This chapter provides an account of previous studies regarding the Chinese fresh food market. Beginning with the historical evolution of the Chinese fresh food market, the chapter discusses the emerging trend of online grocery shopping. Furthermore, the chapter includes an analysis of previous research regarding to the significance of food traceability systems in China, combining with the studies concerning food safety issues and information asymmetry. Additionally, the chapter summarizes previous research on the theoretical foundations of the TPB model, explored its origin and determinants.

2.2 Chinese fresh food market

Fresh food, including vegetables, fruit, meat, fish, and milk, is essential for daily consumption and has a limited shelf life, which requires necessary chilling storage (Ma et al., 2021) and is consumed more frequently than other products (Chen et al., 2021), making it a significant part of people's daily lives. With improving living standards, people now have higher expectations regarding the quality of fresh products (Chen et al., 2021). In addition, as fresh food has a shorter shelf life and is easily spoiled during delivery, more attention has been paid to its access, security, traceability, and storage technology (Stonehouse & Evans, 2015).

2.2.1 The history of the Chinese fresh food market

Since the 1980s, "open-air marketplaces" (also referred to as "wet markets") have been the primary method by which the Chinese acquire fresh goods. In China, "wet market" commonly refers to an open area comprising multiple stalls where fresh produce, poultry, live seafood, and fresh meat are sold (Goldman et al., 1999). As the primary distribution and retail channel for fresh products, wet markets have a number of significant advantages, such as offering food products that are fresher and cheaper. Moreover, consumers may obtain their preferences in food from a selection of fresh products, and the pleasure of a negotiation price (Maruyama et al., 2016). However, the limitations of wet marketplaces become more obvious as the current retail system evolves. For example, shops within wet markets are often cluttered, dirty, and lacking in organization (Goldman et al., 1999). This not only leads to an unpleasant shopping environment but also poses food safety hazards because of the difficulties in monitoring food sources.

By contrast, supermarkets, the modern retail format, has expanded significantly in developing countries over the past few decades (Maruyama et al., 2016), which offers significant advantages such as safer products and more organized service. This trend could be viewed as an enhancement over traditional fresh food markets (Ho, 2005).

As supermarkets are more efficient than the previous market system, since 2002, the Chinese government has worked to construct sophisticated national supply and logistic systems, the "Wet Market Transforming into Food Supermarket" programme, in numerous significant cities such as Fuzhou, Shenzhen, and Wuhan (Maruyama et al., 2016). This programme tries to transform wet markets into fresh food supermarkets that employ the highly organised, standardised products and services of supermarkets. However, because of the high cost of transformation, the difficulty of arranging vendors on the original market, the high cost of fresh product operations (Maruyama et al., 2016), and the challenges that changing shopping habits and attitude of traditional consumers (Ho, 2005), this programme is not practical enough. Consequently, the adoption of WMTFS programmes has progressed at a sluggish pace. Consumers still continued to prefer shopping at traditional wet markets rather than modern supermarkets (Maruyama & Wu, 2014). Nevertheless, the important role of WMTFS programmes cannot be ignored. It not only develops fresh food supermarket chains, simplifies the process of purchasing fresh food, and improves cold chain logistics (Chen et al., 2021), but also provides the prerequisites for an online fresh food market.

2.2.2 The online grocery shopping trend

With the growth of online purchasing and the advancement of internet technology, an increasing number of individuals will prefer to purchase online. The fresh food market is no exception. According to research by Nakano and Kondo (2018), the number of people doing their grocery shopping online has dramatically increased in recent years all across the world. In the UK, for example, 41% of shoppers bought fresh food online in 2017, and this figure is anticipated to increase by over 50% between 2017 and 2022 (Brand et al., 2020), which is driven by recent technology advancements including fast deliveries, unattended delivery choices, and voice-based ordering systems (Brand et al., 2020).

In China, the trend of online shopping has grown immensely over the past 10 years. In 2018, online retail sales surpassed 9 trillion RMB (approximately US $1.27 trillion), showing a 23.9% rise from the previous year (Chen et al., 2021). As the world's largest e-commerce market, China is seeing tremendous development in its online fresh food industry (Ma et al., 2021). Because the online market is expanding at such a rapid rate, there are several fresh shopping apps in China, such as Pinduoduo,

Meituan, and Eleme. These apps are able to deliver fresh food to clients within a few hours of payment being received for an order. However, as fresh food is easily contaminated during delivery, the time of delivery is highly connected to the unstable traffic situation, and the higher price regarding the delivery cost, shoppers often complained about the online grocery channel (Chen et al., 2021). Hence, it is not easy for most traditional Chinese consumers to accept online channels to get their daily fresh food.

Not only are fresh food online channels developing rapidly, but traditional groceries companies are also seeking new opportunities. With the maturity of the fresh food supermarket chains, to attract more customers and attain a higher market share, traditional fresh food stores have started to develop multichannel retail strategies. For example, huge fresh food companies such as Hema grocery store provides both offline and online products as well as service together. This means consumers can order online and pick it up in-store, or select the product in-store and have it delivered by staff to the appropriate address. This trend is consistent with the world trend: online shoppers commonly participate in multi-channel shopping, often integrating online purchases with visits to supermarkets and convenience stores (Ganesh et al., 2010; Lee et al., 2017).

A number of researchers have investigated the factors that affect the development of online fresh food market. In 2020, for instance, Brand et al. claimed that online payment technologies will disrupt traditional purchase patterns and customers will shift from brick-and-mortar to online shopping. In 2022, Wang et al. indicate that under the influence of COVID-19, the online purchasing channel will develop rapidly as consumers accept contactless technologies to meet their consumption requirements. Specifically, with the outbreak of COVID-19 in Wuhan city, as few businesses offered such a convenient service for fresh food, consumers turned to online purchasing for fresh food (Chen et al., 2021), which changed consumer shopping behaviour and created opportunities for the online fresh food market. Due to the development of modern technology such as online payment system and contactless technologies, the fresh food e-commerce sector has experienced significant growth, with its market size forecasted to reach $200 billion by 2025, doubling its size from 2020 (Ma et al., 2021). Given that purchasing fresh food online has become a trend, how to control online food risks and keep food safe has become a matter that needs attention.

2.3 Traceability

2.3.1 Food safety issues and traceability system

Food safety concerns can never be ignored. Due to a series of food safety crises, including incidents like mad cow disease, consumer trust in the quality and safety of food has gradually eroded throughout the world (De Jonge et al., 2004). Hence, guaranteeing food safety has become a global concern. As one the the biggest global economies, China has faced a series of prominent food safety scandals over the past few years (Liu et al., 2020). These incidents have not only resulted in direct economic and human losses (Ortega et al., 2011) but have also profoundly undermined the confidence of Chinese consumers in their domestic food industry (Cicia et al., 2016; Wang et al., 2019; Liu et al., 2020). One of the most notorious food safety incidents occurred in 2008 with the "melamine milk powder and infant formula" scandal. Due to ingested melamine contamination in certain of milk formula products from Sanlu (China's top infant formula maker) around 300,000 infants got kidney-related diseases (Feng et al., 2012). Other subsequent Chinese food safety incidents have also shocked domestic and international consumers. For instance, in 2011, one of the main Chinese meat producers was implicated in a scandal involving the prevalence of clenbuterol hydrochloride in pork (Qiao et al., 2012). In 2013, a considerable number of deceased pigs were found floating in Shanghai's Huangpu River (Hu et al., 2014). Subsequently, in 2015, "Zombie meat," refering to meat products that had been frozen for extended periods, was discovered in fresh markets across numerous cities in China (Liu et al., 2020). These events created local and international mistrust of the Chinese food system. At the same time, China has maintained high economic growth rates above 7 percent for more than three decades and is presently undergoing rapid urbanization (Zhao et al., 2015). With the improvement of income and living standards, Chinese consumers tend to consume high-quality food (Huang & Gale, 2009). Therefore, exploring strategies to address food safety crises, as well as providing high-quality safe food to Chinese consumers represents a valuable area of study.

Using both quantitative and qualitative methods, research has explored a number of food attributes, including organic or green food labeling, country of origin/local produce, quality certification, and traceability to investigate consumer concerns regarding food safety issues (e.g., Gao & Schroeder, 2009; Liu et al., 2013; Wu et al., 2017; Gao et al., 2019; Liu et al., 2019; Liu et al., 2020). Existing studies indicate that consumers are willing to pay a premium price for safer food, even though they exhibit varying preferences for different food safety attributes. For example, using cluster analysis in 2009, Gao & Schroeder categorised respondents into distinct consumer groups and examined the variation in responses to new attribute information across consumer groups and found that single families with low earnings are more responsive to new food safety information than married households with high incomes. In 2013, Liu et al. assessed the decision-making patterns of Chinese

consumers concerning safe food, focusing on their utilization and trust in safe food information, as well as their knowledge, attitude, and behaviours toward safe food. Their findings revealed that Chinese consumers, despite possessing limited knowledge about safe food, typically exhibit positive attitude toward information about a food's safety and express willingness to pay higher prices for this. In 2017, Wu et al. conducted a survey involving 110 consumers in Wuxi, Jiangsu Province, China. They investigated consumer preferences for traceable pork in a real-choice experiment, and found that consumers exhibited a strong willingness to pay (WTP) for government certification, origin labeling, and traceability for the slaughter and processing of pork. In 2019, Gao et al. conducted mall intercept surveys to explore Chinese consumer preferences regarding the country of origin (COO) and genetically modified (GM) foods, along with assessing the influence of COO on consumer preferences for GM foods. Their research revealed that consumers generally exhibited a negative willingness to pay for genetically modified (GM) orange juice from all countries due to increased uncertainty surrounding food quality. In 2019, Liu et al. utilized data from a choice experiment conducted on Fuji apples through face-to-face surveys across six Chinese cities to examine Chinese consumers' preferences and willingness to pay (WTP) for food traceability, and also to evaluate the interaction between consumers' trust in the government's supervision of food safety and food labels and their preferences for traceable food products. The findings indicate that consumers are willing to pay for traceable food, aligning with subsequent research conducted by the same authors in 2020 that Liu et al. (2020) found Chinese consumers, in general, are willing to pay a higher price for selected food safety attributes, especially for traceable information (Liu et al., 2020). In conclusion, from previous literature, a number of studies have declared that consumers have a higher preference and are prepared to pay a premium for food safety attributes (Wang et al., 2008; Wu et al., 2015;Wongprawmas & Canavari, 2017; Meixner & Katt, 2020).

2.3.2 Information asymmetry and traceable information

Traceability plays a vital role in mitigating food safety risks and successfully managing supply chains (Vriezen et al., 2022). According to Kehagia et al. (2007), traceability is defined as: "the ability to trace and follow a food, feed, food producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution". Food traceability systems Food traceability systems can help to identify dependable and continuous information flow in supply chains, detect the core causes of food safety issues, and recall high-risk items from the market (Liu et al., 2019). There is a burgeoning literature on consumers' preferences for food traceability. For instance, Jin and Zhou (2014) investigated Japanese consumers' interest in food traceability system information using an online survey conducted in 2006 with a nationally representative sample of 6243 Japanese consumers. Their findings revealed that women with higher

educational levels expressed a stronger desire for detailed information on fresh produce, whereas men with lower educational levels showed more interest in tracing information through fresh produce traceability systems. In 2017, Dandage et al. analyzed the prevailing traceability methods in India, encompassing RFID, holograms, barcodes, nuclear techniques, and other tracking technologies, to oversee the production process and found that effective traceability in the Indian food sector could mitigate food safety incidents and instances of fraud. Also in 2017, Jin et al. employed a random nth price experimental auction using apples as their research subject to explore consumer willingness to pay (WTP) for traceability based on both detailed and abbreviated information among Chinese consumers. Their findings indicated : 1) there is a positive WTP for the food traceability system; 2) the average premium consumers were willing to pay for traceability with detailed information exceeded that for traceability with abbreviated information by 10%. In 2017, Yin et al. used the mixed logit model to explore consumer willingness to pay (WTP) for infant milk formula amd found that, for Chinese consumers, traceability information holds greater significance than brand or country of origin. Moreover, there is a positive correlation between the perception of higher food safety risks and the willingness to pay (WTP) for traceability information. In 2018, Liu et al. utilized the best-worst scaling method to explore consumer preferences for traceability information related to vegetables, pork, and dairy products. Their findings indicated that consumers prioritize different types of information depending on the product. For vegetables, Pesticide/veterinary use, picking/slaughtering date, and fertilizer/feed use were the most preferred traceable information. Regarding pork, picking/slaughtering date and history of illness and protective measures were favored. For dairy products, consumers showed preference for processing information, environmental information of the origin, and traceable tag certification information. In 2019, Hou et al. discovered that consumers' willingness to pay (WTP) for traceability information is influenced by individual characteristics such as age, education, and income, as well as their level of concern and satisfaction regarding food safety, and their confidence in food safety labeling.

From a food safety perspective, why are consumers so concerned about traceability? Multiple research studies have indicated that information asymmetries represent a leading factor contributing to food safety issues, which is a challenge that traceable information can mitigate. As Wu et al. (2011) highlight, information asymmetry often emerges between producers and consumers, when producers and consumers lack equal access to information about the product, enabling producers to potentially employ deceptive or inaccurate information to persuade consumers to purchase substandard goods. In 2001, Feddersen and Gilligan argued that consumers make purchasing decisions based on a company’s operating practices in addition to the utility of its products and services. However, it can be difficult to obtain information about a company’s operating practices, leading to information asymmetry and food safety issues. Zhang et al. (2017) argued that information asymmetry exists between two parties when the information is only available to one party and the other party

could conceivably benefit from having the information. They support the idea that food safety concerns frequently stem from issues related to unequal information sharing between consumers and food producers regarding specific attributes or characteristics of the product. To deal with the problem, traceability network systems could be a potential method to mitigate the information asymmetry among market participants and alleviate inefficiencies stemming from asymmetric information (Ortega et al., 2011). A food traceability system could be used to monitor food production and distribution by ensuring a consistent and dependable flow of information throughout the supply chain, pinpointing the source of issues, and facilitating the recall of relevant products as needed (van Rijswijk et al., 2008).

Due to the food safety crisis that has afflicted China for so many years, previous research indicates that Chinese consumers are willing to pay a price premium (higher price) for traceability information to obtain safer food (Louviere et al., 2008; Liu et al., 2018). For example, Wu et al. (2011) mentioned that in supermarkets, the cost of certified traceable vegetables is typically 10 to 20 percent higher than that of organic produce, which itself commands a significantly higher price compared to conventional vegetables. Zhang et al. (2012) found that Nanjing (a city of China) consumers demonstrate a significant willingness to pay a positive price premium for food traceability, although this willingness varies across different products. Jin et al. (2017) found that consumers exhibited a positive willingness to pay for the food traceability system, and on average, they were willing to pay a premium of 10% more for traceability with detailed information compared to abbreviated information.

In addition, researchers have argued that traceability information has a significant influence on consumer preferences (Dandage et al., 2017; Jin et al., 2017; Jin & Zhou, 2014), which means Chinese consumers prefer to purchase food products with traceable information. However, other research as revealed different findings. For instance, Wu et al. (2012) decalred that majority of consumers in China are concerned about food safety, but consumers' willingness to pay (WTP) a price premium for certified traceable food is limited. This finding is in line with Liu et al. (2015), who proposed that even though most consumers in China significantly concern tea safety, but their willingness to pay a higher price for certified traceable tea was not high. Due to varying perspectives on the willingness to pay (WTP) for traceable food, further investigation is warranted. Moreover, to the best of my knowledge, there has been no research focused on the specific reason other than food safety attributes that affect consumers' preferences for traceable information on fresh food in China, especially in the online fresh food industry. To discover the factors that determine consumers' intentions to purchase online fresh food with traceable information, the Theory of Planned Behaviour could be employed.

2.4 The Theory of Planned Behaviour

The Theory of Planned behaviour (TPB) (Ajzen, 1991) is a widely used theory (Ding et al., 2022) of the proximal determinants of behaviour (Conner, 2020) that can identify the specific factors that drive human behaviour (Ding et al., 2022). It is a valuable framework for understanding and predicting consumer behaviour and has been widely applied in different research fields.

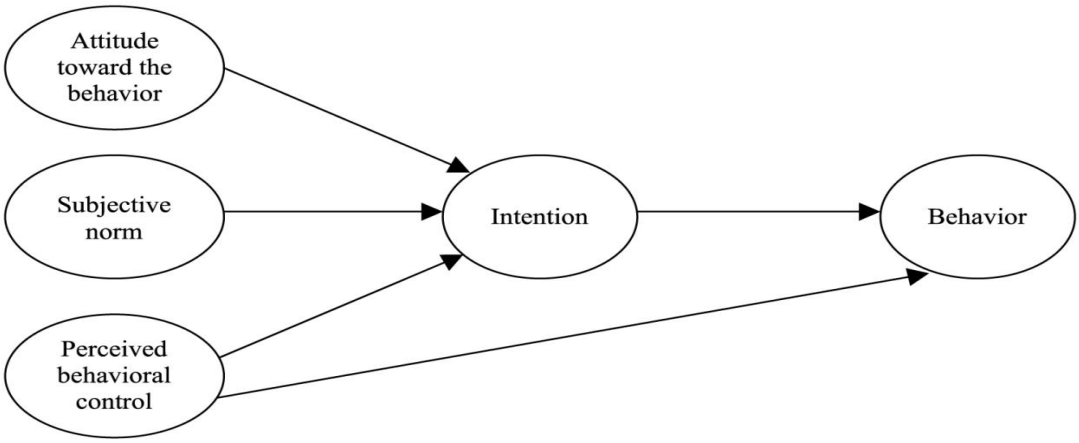
2.4.1 TPB and its origin

The theory of planned behaviour (TPB) originated from the Theory of Reasoned Action (TRA) (Ajzen, 1991). Both models involve the deliberate processing of accessible information and aim to elucidate the psychological motivations influencing human behaviour. According to Conner & Armitage (1998), individual behaviour decisions are based on careful consideration of available information. In comparison, TRA examines the impact of individuals' beliefs on their subjective norms and attitude, while TPB expands upon TRA by incorporating control beliefs regarding non-voluntary behaviours (George, 2004).

According to the Theory of Reasoned Action (TRA), subjective norms is the first factor influencing behavioural intentions, representing an individual's perceptions regarding the extent to which significant others believe they should perform a particular behaviour. Subjective norms are believed to assess the social pressures individuals face to either engage in or abstain from specific behaviours (Conner & Armitage, 1998). Furthermore, attitude are identified as the second factor of intentions within the TRA framework, representing individuals' overall views of the behaviour (Lee & Tsai, 2010).

The Theory of Planned Behavior (TPB) expands the Theory of Reasoned Action (TRA) by incorporating perceived behavioural control (PBC) as a third determinant influencing intention (George, 2004). PBC represents an individual's perception of the ease or difficulty associated with performing a behavior (Ajzen, 1991). Ajzen proposed that PBC and intentions would interact in predicting behavior. Thus, attitude, subjective norms, and PBC constitute the three factors of TPB. Ajzen (1991) argued that PBC can directly and indirectly influence intention and behavior, although it is not specified whether attitude and subjective norms have a similar impact (The components of TPB are shown in Figure 1).

Figure 1. TPB model



Source: From Azjen (1991)

According to existing literature, the Theory of Planned Behaviour (TPB) is widely employed as a framework to explore the decision mechanism of consumer behavior. For example, Ramus and Asger Nielsen (2005) conducted focus group research, employing Theory of Planned Behaviour (TPB) to analyze consumer beliefs regarding online grocery shopping. In 2007, based on the concepts of the Theory of Planned Behaviour, Liao et al. predicted and explained whether an individual would continue to use online services. Lee (2009) utilized TPB models to examine e-payment systems and probe consumer responses to online banking. In 2010, Teo & Beng Lee employed the Theory of Planned Behaviour (TPB) as the research framework to examine teachers' intention to use technology. In 2015, Al Ziadat utilized the Theory of Planned Behaviour (TPB) to analyze the tourism sector in Jordan by investigating the factors influencing revisit intention and actual visit behaviour, as well as the mediating role of revisit intention in the relationship between perceived behavioral control (PBC) and actual visit behaviour. In 2015, Ruizalba Robledo et al. utilized the Theory of Planned Behaviour (TPB) to examine how social norms influence the entrepreneurial intentions of university students and also explored the potential moderating effects of gender. Their findings revealed that the entrepreneurial intentions of university students are influenced by perceived behavioural control and attitude, while subjective norms do not play a significant role. Additionally, the moderating effect of gender positively influences the relationship between subjective norms and perceived behavioural control, particularly for women. In 2017, Ayob et al. employed the Theory of Planned Behaviour (TPB) to ascertain the primary factors influencing waste separation intention among students at Universiti Teknologi Malaysia (UTM). Their study revealed that only two determinants significantly influence intention: attitude and perceived behavioural control, whereas subjective norms do not. Ghazali, Mutum, Chong, and Nguyen (2018) employed TPB to explore factors influencing customer intentions to adopt online purchasing channels. Kasilingam (2020) evaluated consumers' intent to use chatbots on smartphones for

purchasing goods based on the TPB model. Brand et al. (2020) utilized TPB-based psychographic segmentation to identify different categories of grocery consumers.

Mou and Benyoucef (2021) investigated consumer behavior in social commerce, evaluating derived factors in online shopping decision-making. Tsai & Tiwasing (2021) incorporated resource matching theory, innovation diffusion theory, and TPB to explain consumer intentions to use smart lockers.

TPB may also be integrated with other theories to give a new perspective and help achieve diverse research objectives. For example, Lin (2007) merged the Technology Acceptance Model (TAM) and the Theory of Planned Behaviour (TPB) to assess their effectiveness in predicting consumers' intentions to buy online. Lin contended that while both models are relatively succinct, TAM outperforms TPB in forecasting the adoption of online shopping. In 2016, Idris et al. combined rational choice theory and the theory of planned behaviour to explain the effects of religion on ethnic tolerance in Malaysia and found that religion can affect behaviour, subjective norms, and perceptions of how one deals with ethnic tolerance (social behaviour). In 2019, Haldar & Goel integrated the theory of planned behaviour (TPB) and Technology Acceptance Model (TAM) to investigate the willingness of Indian consumers to utilize car sharing apps by exploring the connections among perceived ease of use (PEOU), perceived usefulness (PU), subjective norms (SN), perceived behavioural control (PBC), attitude, and the willingness to use car sharing apps. This research found that perceived utility (PU), subjective norms (SN), and attitude had a substantial favourable influence on desire to use car sharing applications, whereas perceived behavioral control (PBC) had no significant impact.

2.4.2 The determinants of TPB

To explore the factors influence individuals' purchase intentions and subsequent behavior, the Theory of Planned Behaviour (TPB) introduces three fundamental variables within its model: subjective norms, and perceived behavior control, and attitude (Ding et al., 2022).

A. Subjective norms

Subjective norms refer to an individuals' perceptions of the preferences of other influential people in their lives concerning whether or not one should partake in a behavior (Conner & Armitage, 1998). The more an individual's view that influential others feel they should engage in the behaviour, the higher the individual's incentive to conform to those influencing others (Conner & Armitage, 1998). Mathieson (1991)

and Sykes et al. (2009) discovered that subjective norms significantly determine the adoption of technology-based services such as online shopping. Consumer acceptance of technology is shaped by socialization pressures linked to the desire to conform to norms established by reference groups (Kulviwat et al., 2009). Given the novelty of technology-dependent purchasing, consumers may exhibit hestitation in integrating it into their everyday spending and rely heavily on the input of significant friends and relatives when making decisions. In summary, subjective norms are perceptions of significant others' preferences regarding whether a behavior should be engaged in or not.

B. Perceived behavioural control

Perceived behavioural control refers to beliefs related to an individual's abilities and the resources required to participate in a behaviour; an individual's assessment of the amount of control they have over a certain behaviour (Ajzen, 1991). Taylor & Todd (1995) define perceived behavioral control as perceptions regarding the availability of resources, the ease of resources use, and the ability to engage in the behavior. Perceptions of user control always serve as a significant indicator of technology adoption (Taylor & Todd, 1995). When consumers feel they have control over technology, they perceive a sense of mastery over the innovation, thereby enhancing their confidence. Conversely, consumers are less likely to accept new technology if they perceive a lack of control over its use (Hoffman et al., 1999).

C. Attitude

As the third determinant of behavioral intention/ actual behaviour in the TPB model, (Ajzen, 1991), attitude can be defined as a general assessment of the behavior under investigation. According to Davis (1989), attitude denotes a consumer's positive or negative emotion towards engaging in a specific behavior, which can be explained by prominent beliefs and evaluations of outcomes (Ajzen & Fishbein, 1980). Attitude is formed through conscious processing of available data, including an evaluation of subjective norms and perceived behavioural control (Wang et al., 2022). Hence, subjective norms and perceived behavioural control (PBC) primarily influence attitude, while the impact of attitude on subjective norms and perceived behavioural control (PBC) is secondary (Wang et al., 2022). That is to say, perceiving a behavior as socially acceptable leads to a favorable attitude towards it. And conversely, a positive attitude may influence perceptions, resulting in a favorable assessment of subjective norms (Wang et al., 2022). In the context of online shopping, consumers are more likely to shop online if they perceive it as socially acceptable and within their control, and a positive attitude towards online shopping ultimately boosts their online purchasing behavior (Wang et al., 2022). In this study, attitude is defined as the inclination of consumers to purchase traceable online fresh food. If consumers have a

positive attitude, they are more inclined to buy traceable online fresh food.

2.4.3 The decomposed TPB

The Theory of Planned Behaviour (TPB) is utilised to analyse and determine the factors that contribute to human behaviour (Ajzen, 1991). Just as intentions and behaviours are supposed to have determinants, it is also assumed that attitude, subjective norms, and PBC have determinants, which may be seen as indirect predictors of intentions. Prior literature suggests that subjective norms, perceived behavioral control (PBC), and attitude can be broken down into more specific factors (Pavlou and Fygenson 1986; Cialdini et al. ,1991; MacCoun, 1993; Eagly & Chaiken, 2007).

A. Subjective norms

According to Cialdini et al. (1991), there are both descriptive norms and injunctive norms for the subjective norms.

i. Descriptive norms motivate conduct by displaying what is likely to be an adaptive and productive course of action.: “If everyone is doing, thinking, or believing it, it must be a sensible thing to do, think, or believe.”

According to Cialdini et al. (1991), to make an educated decision in a situation, it’s common to observe and mimic the conduct of others, which gives ease and information-processing benefit. For instance, marketers always include images of people entering their shops or grabbing things off of shelves in their television ads to show how the products are the "fastest growing" or "largest selling" ones. In such a scenario, advertisers simply use the descriptive norms to persuade us that a lot of other customers do, rather than explicitly persuading us that their product is excellent (Cialdini et al., 1991).

ii. Injunctive norms: individuals’ concern for others’ perceived social acceptance drives conduct through social pressure.

Injunctive norms indicate what should to be done, which is related to the group’s moral rules. By providing social benefits and penalties (informal sanctions), injunctive norms disencourage behaviour (MacCoun, 1993). By contrast, injunctive norms forbid conduct, while descriptive norms guide it. Therefore, it may be claimed that in some culture, being helpful involves acting in accordance with the helpfulness standard, which is positively sanctioned (Cialdini et al., 1991). This also means that if a person is not helpful, he will face moral judgment from others. Similar to this, one

reason individuals could return the gifts, favors, or services they have received is to follow the convention of reciprocity in order to gain social acceptance and prevent social rejection (Sherry, Jr., 1983).

B. Perceived behavioural control

Perceived behavioural control (PBC) is defined as an individual's estimate of how simple or hard an action would be to carry out (Ajzen 1991). Ajzen (2002) highlighted that PBC refers to a subjective level of control over the performance of an action, not the perceived probability that doing so would result in a certain outcome, to distinguish it from attitude. Ajzen suggested that PBC "should be read as perceived control over the performance of a behaviour" (2002, p. 668). Therefore, PBC could be seen as the consumer's perceived ease or difficulty of getting product information from a vendor's website or accepting a new technology, respectively. PBC generally has two functions in TPB. First, it is a co-determinant of purpose, together with attitude and subjective norms. Second, it influences behaviour in conjunction with purpose.

Pavlou and Fygenson (1986) describe perceived behavioural control (PBC) as an individual's beliefs about their capacity to effectively execute the behaviour and the enabling conditions connected with it. Perceived behavioural control (PBC) can be decomposed into internal beliefs about people's confidence in utilising shopping resources and external beliefs about the resources required to assist the shopping experience.

i. Self - efficacy: the degree to which an activity can be performed easily or difficultly, together with people's belief that they can if they so choose, which is closely related to the idea of capacity.

Self-efficacy is defined by Pavlou and Fygenson (1986) as an individual's perception of their own capacity to carry out an activity. Self-efficacy, as used in relation to e-commerce, refers to customers' assessments of their own capacity to find product information and make online purchases.

ii. Resource availability: an individual's assessment of the opportunities and resources available to carry out the activity determines controllability (Pavlou & Fygenson, 1986).

Resource availability, when it relates to e-commerce, refers to customers' views of whether they have full control over their ability to get information and make purchases online due to the availability of resources and possibilities.

C. Attitude

Attitude represent the comprehensive assessments individuals hold toward behavior. Fishbein and Ajzen (1975) characterize attitude as “a learned inclination to consistently respond in a favorable or unfavorable manner toward a specific object.” Typically, attitude are assessed using semantic differential measures (Ajzen, 2002).

In TPB research, the semantic differential measures employed to gauge attitude toward behavior frequently emphasize instrumental or cognitive dimensions (e.g., healthy-unhealthy, valuable-worthless) or experiential or affective dimensions (e.g., pleasant-unpleasant, interesting-boring) (Conner, 2020). Affective and cognitive attitude are two distinct components of an individual's attitude or evaluation of a particular object, person, place, concept, or issue. These components represent different aspects of how someone feels and thinks about the subject of their attitude:

i. Affective aspects: An affective attitude represents affective influences on intentions and behaviour that involve the emotional or feeling aspect of one's attitude. It reflects how an individual emotionally responds to the object of their attitude (Eagly & Chaiken, 2007). These emotions can range from positive (liking, affection, joy) to negative (disliking, anger, fear), such as pleasant-unpleasant, interesting-boring.

ii. Cognitive aspects: A cognitive attitude involves the cognitive or thinking aspect of one’s attitude. It reflects an individual’s beliefs, thoughts, and knowledge about the object of their attitude (Eagly & Chaiken, 2007). It is based on information, thoughts, and reasoning, such as healthy-unhealthy, and valuable-worthless.

In conclusion, the theory of planned behaviour (TPB) is derived from the theory of reasoned action (TRA), which explains psychological motivations influencing human behaviour. Subjective norms, attitude, and perceived behavioural control (PBC) are three factors that influence intentions in TPB. Subjective norms evaluate social constraints on individuals to engage in or refrain from specific behaviours, while attitude are overall evaluations of the behaviour. PBC is the perceived difficulty of performing the behaviour. By decomposing each factor, subjective norms could be subdivided into injunctive norms and descriptive norms, PBC could be subdivided into self-efficacy and controllability, and attitude could be subdivided into affective and cognitive attitude.

2.5 Conclusion

This chapter provided an overview of previous studies conducted on the Chinese fresh food market, traceability systems, and the Theory of Planned Behaviour. Firstly, it included an analysis of the historical development and progression of the Chinese fresh food market, particularly in relation to the transformation of wet markets into supermarkets and then online fresh food channels. As consumers are unable to directly touch or smell the products, they face more food safety challenges in the online fresh food sector.

Additionally, the chapter assessed prior research focused on the significance of traceability systems in China, examining key aspects such as food safety issues and information asymmetry. Specifically, food safety is a global concern and various food scandals that have occurred in China have undermined public confidence in the domestic food industry as well as fostered mistrust of the Chinese food system. Research indicates that information asymmetry between producers and consumers are a major cause of food safety challenges. Traceability network systems can help bridge this gap thus improving efficiency and reducing risks related to food safety. In China, consumers are willing to pay a premium for traceability information for safer food.

Furthermore, the chapter discussed previous studies related to the theoretical foundations of the Theory of Planned Behaviour, including its origin and determinants. Building upon the Theory of Reasoned Action (TRA), the TPB model is widely employed to understand and predict consumer behaviour in various research areas, such as e-payment systems, online shopping, and technology adopotion. The determinants of the TPB model, including subjective norms, perceived behavioural control, and attitude, can be further examined by decomposing them into more specific factors, such as injunctive norms, descriptive norms, self-efficacy, resource availability, cognitive aspects, and affective aspects. This chapter has provided the foundations for the current study.

Chapter 3 Research Design

3.1 Introduction

This chapter identifies the methodological approach that guides this research. Firstly, this chapter explains the research aims and research philosophy. Next, the chapter establishes 7 hypotheses related to purchase intention, factors in the TPB, as well as age, gender, and educational level. The chapter explains the conceptual model that illuminate the possible linking within various variables. Additionally, the chapter provides a detailed explanation of the methods of this research, including sample selection, and the measures employed in the survey. Furthermore, the chapter explains the design of the survey questionnaire. Finally, this chapter includes the data analysis design, which comprises descriptive analysis and Hayes Models (the mediation effect and moderation effect).

3.2 Research aims and research philosophy

Focusing on traceable information on online fresh food, the purpose of this research is: 1) to explore how the traceability information on online fresh food influences consumers' purchase intentions, and 2) to examine the factors that mediate or moderate the relationship between traceable information and consumers' purchase intentions. In addition to the two research objectives, this research poses three research questions:

i. Can traceable information increase consumer intentions for the online purchase of fresh food?

ii. Is the relationship between traceable information and consumer purchase intention mediated by subjective norms, perceived behavioural control, and attitude?

iii. Is the relationship between traceable information and consumer purchase intention moderated by gender, age, and educational level?

Based on the research objectives and research questions, this study employs a positivist research philosophy. Positivism, which is often adopted as a philosophical framework in business research, holds that reality is stable (Collins, 2010). The positivist will act as a neutral analyst, providing impartial interpretations of the data collected; the research can be objective, with quantified observations leading to

statistical analysis (Wilson, 2014). Specifically, this study adopts a quantitative approach by utilizing surveys as the data collection tool.

3.3 Hypotheses and conceptual model

Based on the research objectives, 7 hypotheses are established.

3.3.1 Purchase intention

Purchase intention refers to the probability that an individual consumer will make a purchase of a specific product (Hsu et al., 2015). Studies have found that consumers exhibit a greater willingness to pay a premium for traceability information, which means traceability information significantly affects consumer preferences (Liu et al., 2020). Based on this, this research formally predicts:

Hypothesis 1: Presenting traceable information on fresh food (via a QR code) will increase consumer purchase intention for that food.

3.3.2 Factors in the TPB

The Theory of Planned Behaviour (TPB) was initially formulated by Ajzen (1991), positing that consumer intentions are influenced by three key determinants: subjective norms, perceived behavioral control, and attitude. In light of this, this study formally predicts:

Hypothesis 2: Attitude mediates the effect of the traceability information (via a QR code) on purchase intention.

Hypothesis 3: Subjective norms mediate the effect of the traceability information (via a QR code) on purchase intention.

Hypothesis 4: perceived behavioral control mediates the effect of the traceability information (via a QR code) on purchase intention.

3.3.3 Age, gender and educational level

Prior research has demonstrated there is a positive correlation between age and a consumer's level of concern about food safety (Knight & Warland, 2004). Based on the aforementioned information, this research predicts:

Hypothesis 5: The effect of traceability information (via a QR code) on purchase intention will be moderated by age.

Additionally, it has been observed that there are gender disparities in risk perceptions, which subsequently impact purchase intentions of food products, with women tending to exhibit greater apprehension regarding food safety compared to males (Laufer & Gillespie, 2003). Based on the above-mentioned knowledge, this research anticipates:

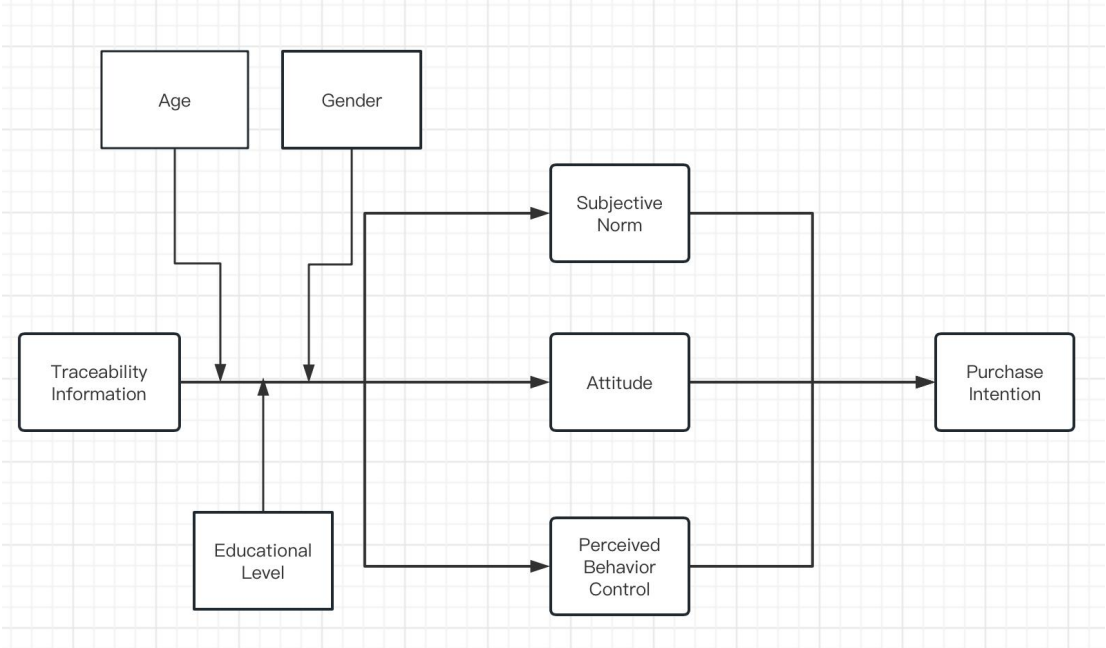
Hypothesis 6: The effect of traceability information (via a QR code) on purchase intention will be moderated by gender.

Hoogland et al. (2005) found that customers with varying levels of education exhibited distinct levels of concern about food safety, consequently affecting their purchasing intentions. Hence, it can be hypothesised that an increased level of education will result in a greater inclination to buy fresh food through online channels that possess a traceable attribute.

Hypothesis 7: The effect of traceability information (via a QR code) on purchase intention will be moderated by educational level.

According to the hypotheses above, the conceptual model (Figure 2) which contains the key variables is presented. Specifically, the independent variable is traceability information, while the dependent variable is purchase intention. Additionally, the model includes mediators such as attitude, subjective norms, and perceived behavioral control (PBC). Furthermore, the model incorporates moderators, including age, gender, and educational level.

Figure 2. Conceptual model



3.4 Methods

This dissertation conducted a survey to understand Chinese consumers' purchase intention for traceable online fresh food.

3.4.1 Sample

Chinese consumers aged 18 or over who are experienced with or have heard of an online fresh food platform such as Eleme or Meituan were invited to participate in the research. The survey was conducted on Qualtrics and distributed through the WeChat platform, the most popular social media channel in China. The survey was sent out after getting permission from the leader of the WeChat group. To get all participants thinking about fresh food, before starting the survey, a QR code and an image of fresh food with the attribute of traceability were shown and explained to respondents. A small packet of lucky money ("hongbao" in China, which represents blessing and luck) was offered via WeChat in appreciation of respondents' time in answering the questions. Specifically, 2000 RMB in total was distributed in 200 lucky money packets (Red Packets) each containing 10 RMB to participants who have completed a questionnaire using WeChat.

Prior to the main survey, a pilot survey was conducted among ten Chinese online consumers of fresh food in order to ascertain the robustness of the research. The pre-test participants completed the questionnaire and offered feedback related to its clarity,

vocabulary, and structure. Several measurement items were reworded in response to their feedback to eliminate any potential for confusion. For the main survey, more than 200 participants were surveyed from 21st November to 4th December 2023. Following the main survey, participants were able to access a link to see a summary of the findings.

Participation was completely voluntary. The survey was anonymous and all information provided was kept strictly confidential. Participants' WeChat user names and contact information were gathered via a link leading to an independent questionnaire, with the purpose of transmitting a Red Packet. The data provided remained strictly confidential and was utilized exclusively for the intent of distributing the WeChat credit (Red Packet).

3.4.2 Measure and survey

17 rating questions composed the survey, which was developed in accordance with a review of the relevant literature. Completion of the survey took respondents between 5 and 10 minutes. The bilingual researcher translated the initial English questionnaire into Chinese.

Five-point Likert scales are widely employed in research of Chinese consumers because they are easy for Chinese consumers to understand (Kim et al., 2006; Eves & Cheng, 2007). Consequently, the present study employed such scales to evaluate the degree to which participants agree with the statements contained in the survey instrument. On the basis of prior research concerning TPB, three dimensions and six beliefs were identified, as explained in the following.

A. Subjective norms

Cialdini et al.(1991) classified the subjective norms into two beliefs.

i. **Injunctive norms** refer to people's behaviour being influenced by social pressure when they worry about whether or not other people think well of them (Cialdini et al., 1991). According to Ajzen (2002), injunctive standards should be weighed against a measure of compliance incentive. A sample question is " The people in my life do not support my purchase of fresh food without a QR code (traceable information)".

ii. **Descriptive norms** refer to the tendency of individuals to emulate the behaviours exhibited by others in their immediate surroundings (Cialdini et al., 1991). According to Ajzen (2002), the magnitude of descriptive norms can be assessed by evaluating the degree of concurrence with the collective or individual. A

sample question is “ The people around me always purchase online fresh food with a QR code (traceable information) ”.

B. Perceived behavioral control

PBC was distinguished by Pavlou and Fygenson (2006) as an external belief (resource availability) and an internal belief (self-efficacy).

i. **Self - efficacy:** the easiness or difficulty of performing a behaviour, along with people's belief that they can perform it if they so choose, which is very close to the concept of capacity (Pavlou and Fygenson, 2006). A sample question is “ Getting information about online fresh food from scanning a QR code is completely under my control.”

ii. **Resource availability:** The presence of abundant and easily accessible resources contributes to a perception of consumer control (Wang et al., 2022). A sample question is “For me to scan the QR code and get the traceable information on fresh food would be easy.”

C. Attitude

According to Conner (2020), attitude can be decomposed into two aspects:

i. **Cognitive aspects** such as healthy–unhealthy, valuable–worthless. A sample question is “ I would like to scan the QR code on online fresh food to get traceable information because it is useful to keep food safe”.

ii. **Affective aspects** such as pleasant–unpleasant, interesting–boring. A sample question is “I would like to scan the code to get traceable information because it is cool”.

3.5 Questionnaire design

The questionnaire (Table 1) comprises three segments: (1) the purpose of questionnaire; (2) demographic details of respondents, encompassing gender, education, and age; (3) specific questions. Aligned with the factors outlined, questions were devised as outlined in Table 1. Questions Q3-Q13 were assessed using a 5-point Likert scale: "1" = strongly disagree, "2" = disagree, "3" = neutral, "4" = agree, "5" = strongly agree.

Table 1. Questionnaire design

	Variables	Questions
Shopping Habits	Q1	Have you ever purchased fresh food online?
	Q2	How often do you purchase fresh food online?
	Q4	How often do you use QR codes in your daily life?
General Ideas	Q3 (importance level)	I think the QR code (traceable information) of online fresh food is important.
	Q5 (Purchase intention)	I intend to purchase online fresh food with a QR code (traceable information).
	Q10 (Food safety concern)	I am really concerned about the safety of the food I consume
	Q11 (Relate QR code and safe food)	Scanning QR codes on food products would make me feel more informed about potential food safety risks.
	Q14 (Willingness to pay a price premium)	I would like to pay a higher price for the online fresh food with QR code (traceable information).
Subjective Norms	Q6 (Injunctive norms)	The people in my life do not support my purchase of fresh food without a QR code (traceable information).
	Q7 (Descriptive norms)	The people around me always purchase online fresh food with a QR code (traceable information).
PBC	Q8 (Resource availability)	For me to scan the QR code and get the traceable information on fresh food would be easy
	Q9 (Self-efficacy)	Getting information about online fresh food from scanning QR code is completely under my control
Attitude	Q12 (Cognitive aspects)	I would like to scan the QR code on online fresh food to get traceable information because it is useful to keep food safe
	Q13 (Affective aspects)	I would like to scan the QR code on fresh food to get traceable information because it is cool.

3.6 Data analysis

SPSS software was employed as the research tool to do the analysis. The data analysis of this research comprised two aspects. Firstly, frequency analysis, descriptive analysis, ANOVA analysis and correlation analysis to offer broad insights into Chinese consumers' attitude toward traceability features and their preferences for online fresh food. Secondly, to explore the relationship between traceable information on online fresh food and consumers' purchase intentions, based on the modified TPB model, Hayes Process Analysis was employed, which is frequently used to assess mediation and moderation effects (Hayes, 2015).

3.6.1 Basic analysis

Firstly, this study uses frequency analysis to analyze socio-demographic features and consumer shopping behaviours. Secondly, descriptive analysis explores key variables like traceable information importance, purchase intention, food safety concerns, and willingness to pay a price premium. Next, ANOVA analysis compares these variables

among different consumer groups. Finally, correlation analysis reveals relationships between these variables.

3.6.2 Hayes Process analysis

A. Mediation effect

To examine the three potential mediators (subjective norms, attitude and PBC) simultaneously, this research conducted Hayes Model 4, with 5000 bootstrapped samples. Mediation analyses aim to ascertain the extent to which the relationship between a causal variable X and an outcome Y is influenced by one or more mediator variables (Hayes, 2012). A mediation analysis involves establishing a causal relationship between X and Y through the utilization of an intermediary mediator variable M to estimate the indirect effect of X on Y (i.e., a model in the form X M Y). Under the assumption that Y and X are continuous, two linear models can be used to calculate the indirect effect of X on Y via M:

$M = iM + aX + eM \qquad Y = iY + cX + bM + eY$

where b and c are the estimated regression coefficients, iM and iY are the estimated regression intercepts, and eM and eY are the estimated errors. By combining a and b, we can find the indirect effect of X on Y and guess how much two cases that are different by one unit on X are different on Y because of X's effect on M. A confidence interval or inferential test that shows an indirect effect that is not zero supports the idea that M moderates the effect of X on Y (Hayes, 2015). In the current research, several studies show that traceability attributes may enhance consumer purchase intention (Lee et al., 2011; Wu et al., 2015). Based on TPB, subjective norms, perceived behavioral control and attitude could be regarded as potential mediators which could be assessed via Hayes Process Analysis.

B. Moderation effect

To examine the three potential moderators (gender, age and educational level), this research employed Hayes model 8 with 5000 bootstrapped samples. The purpose of a moderation analysis is to determine whether the magnitude of the effect of a causal variable X on an outcome Y is affected by moderator variables (Hayes, 2012). Based on the literature review, age, gender and educational level could be regarded as potential moderators which could be assessed via Hayes Process Analysis.

3.7 Conclusion

In conclusion, this chapter outlined the quantitative approach to the research. It starts with the research aims and the underlying research philosophy. Subsequently, seven hypotheses, related to purchase intention and factors in the TPB, were introduced. Next, the conceptual model, shedding light on potential interconnections among various variables, was presented. Moreover, the chapter offered an explanation of the research methods, including sample selection and the measures implemented in the survey. Additionally, the data analysis design was described, covering both basic analysis and the application of Hayes Process Analysis.

Chapter 4 Findings

4.1 Introduction

A total of 208 valid responses were obtained from the participants in China for this investigation. Using this data, a frequency analysis was initially performed to profile the socio-demographic features and shopping behaviours of the entire sample. Furthermore, the study used descriptive analysis to profile the key variables of food safety concerns, QR code and safe food, and willingness to pay a price premium. This approach aims to gather general perspectives from the survey respondents, to offer a overview of consumer behaviour in the Chinese online fresh food market. In addition, this research used ANOVA analysis to compare the means of the major variables such as food safety concerns, association between QR code and safe food, willingness to pay a price premium, the importance of QR code, and purchasing intention of online fresh food with a QR code among different groups (by gender, educational level, and age) in order to assess any possible differences between the groups. In this research, correlation is used to gain an understanding of the relationships between QR code (traceable information), purchase intention, and willingness to pay a price premium. This research examined mediation effects between traceable information (IV) and purchase intention (DV) by testing three mediators: attitude, subjective norms, and perceived behavioral control using Hayes Model 4. Also, the current study investigated the moderating effect using Hayes Model 8 to examine how the relationship between traceable information (IV) and purchase intention (DV) may be influenced by gender, educational level, and age.

4.2 Socio-demographic characteristics of the respondents

After excluding missing information, this research acquired 208 complete responses from the participants in China, out of a total of 242 responses. The demographic information and features of the entire study sample are presented in Table 2.

Table 2. Socio-demographic characteristics of the respondents

	Frequency	Percent(%)
Gender		
Male	59.000	28.50%
Female	148.000	71.50%
Age group		
18-30	60.000	28.80%
31-45	87.000	41.80%
above 45	61.000	29.30%
Educational level		
Under High school	12.000	5.80%
High school	22.000	10.60%
Technical Qualification	40.000	19.20%
Bachelors Degree	88.000	42.30%
Postgraduate Qualification	46.000	22.10%

Out of the participants, 59 (28.50%) were male and 148 (71.50%) were female. The gender distribution suggests that females may exhibit a higher level of interest in online fresh food purchases compared to males. Regarding the age range, the majority of respondents were in the 31-45 year old category (n=87, 41.80%). The majority of respondents possessed a bachelor's degree (n=88, 42.30%) or a postgraduate qualification (n=46, 22.10%).

The online fresh food shopping habits of the total study sample are shown in Table. 3.

Table 3. General online fresh food shopping habits

Have you ever purchased fresh food online?			
Yes	187	90.80%	90.80%
No	19	9.20%	100.00%
How often do you purchase fresh food online			
Daily	9	4.30%	4.30%
4-6 times a week	7	3.40%	7.70%
2-3 times a week	33	15.90%	23.60%
Once a week	44	21.20%	44.70%
Less often than weekly	101	48.60%	93.30%
Never	14	6.70%	100.00%
How often do you use a QR code in your daily life			
Daily	123	59.10%	59.10%
4-6 times a week	27	13.00%	72.10%
2-3 times a week	24	11.50%	83.70%
Once a week	13	6.30%	89.90%
Less often than weekly	17	8.20%	98.10%
Never	4	1.90%	100.00%

In all, 187 respondents (90.80%) reported having experience with online buying for fresh food, while 19 respondents (9.20%) did not have such experience. Nevertheless, the insights provided by participants without prior experience are still valuable, as they could be potential customers. According to the data, 48.60% of respondents stated that they buy fresh food online less frequently than once a week, which amounts to 101 individuals. Furthermore, a majority of respondents (n=123, 59.10%) utilise QR codes on a daily basis.

4.3 Descriptive analysis and ANOVA analysis

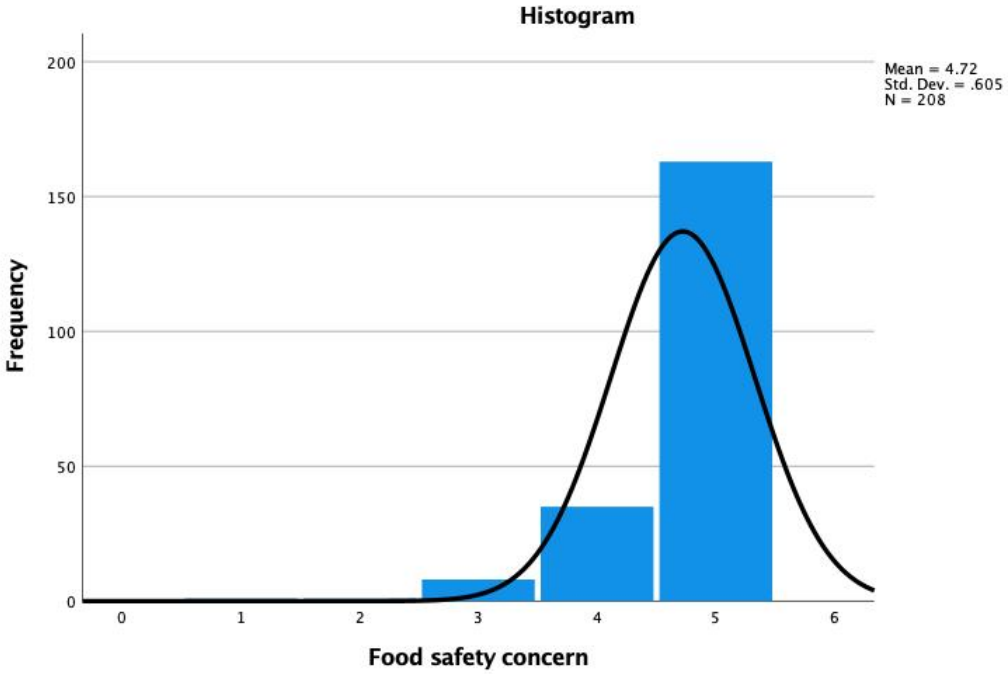
This research employed descriptive analysis and ANOVA to investigate the average responses of Chinese consumers regarding their thoughts on food safety and traceable information. The study focused on questions such as food safety concerns, the association between QR traceability codes and safe food, willingness to pay a premium, the importance of QR code, and purchasing intentions for online fresh food with a QR code. The aim was to obtain an understanding of the general opinions held by Chinese consumers. The statistical analysis of food safety and traceability information is presented in Table 4.

Table 4. The descriptive statistics of food safety and traceability information

Descriptive Statistics

	N	Mean	Std. Deviation
Food safety concerns	207	4.73	.576
QR code (traceability information) reminds potential food safety risks	208	4.49	.761
Willingness to pay a price premium	207	3.21	1.296
The importance of QR code (traceable information)	208	3.94	1.036
Purchasing intention for online fresh food with a QR code (traceable information)	208	4.20	.936

(1) Food safety concerns



The average food safety concern level is 4.73, which is nearly 5.00. This indicates the majority of respondents in the sample show a significant level of concern over food safety problems.

Food safety concern * gender

	N	Mean
Male	58	4.71
Female	148	4.74
Total	206	4.73

A comparison was made of the degree of food safety concerns between males and females using a one-way analysis of variance (ANOVA). The outcome is statistically insignificant (F=0.165, p=0.685). Based on the descriptive table, it is evident that

males have a mean value of 4.71 for their concern about food safety, while females have a mean value of 4.74 for their concern about food safety. The mean values of the two groups are extremely close. Hence, we can deduce that an overwhelming majority of participants expressed significant apprehension on matters pertaining to food safety regardless of gender.

Food safety concern * educational level

	N	Mean
Under High school	12	4.50
High school	21	4.86
Technical Qualification	40	4.72
Bachelors Degree	88	4.72
Postgraduate Qualification	46	4.78
Total	207	4.73

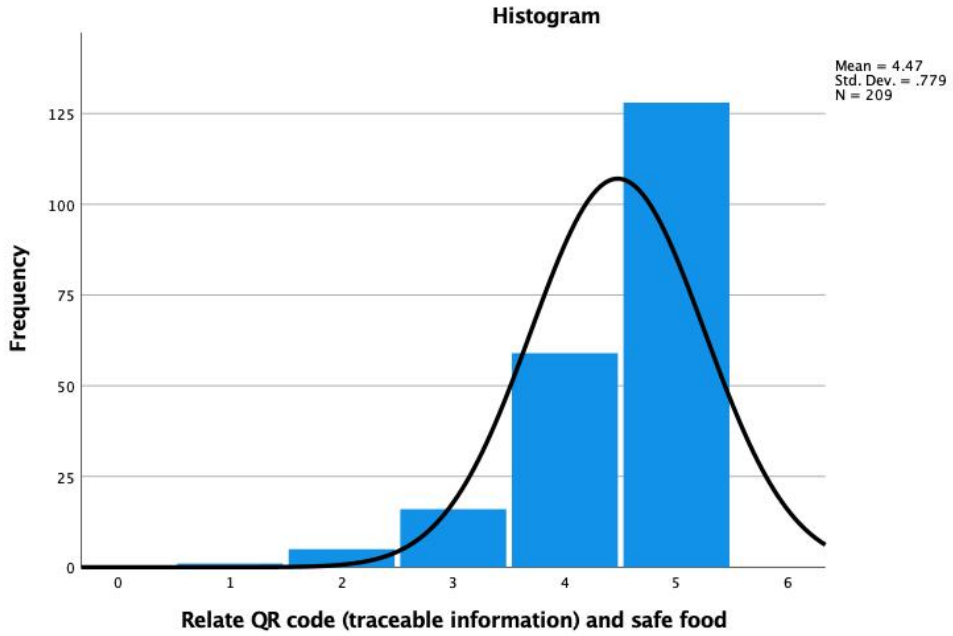
In addition, levels of "food safety concern" were compared for 5 levels of education- under high school, high school, technical qualification, bachelors degree and postgraduate qualification, using a one-way ANOVA. The result is not significant (F=0.838, p=0.503).

Food safety concern * age

	N	Mean
18-30	59	4.49
30-45	87	4.83
Above 45	61	4.84
Total	207	4.73

A one-way ANOVA was used to assess the levels of "food safety concern" among three age groups: 18-30 years old, 31-45 years old, and above 45 years old. The outcome is statistically significant with a significant F-value of 7.814 and a p-value less than 0.001. A post-hoc Tukey test reveals that consumers of different age groups exhibit varying levels of worry over food safety. More precisely, individuals between the ages of 31 and 45 (M=4.83) and those above 45 years old (M=4.84) exhibit a greater degree of attentiveness towards matters of food safety, in contrast to younger participants aged 18-30 (M=4.49).

(2) QR code (traceability information) reminds potential food safety risks



Furthermore, with regards to the inquiry "Scanning QR codes on food products would enhance my awareness of potential food safety hazards", the majority of respondents (N=128, 53.1%) agree with this idea, with the average agreement level among participants is 4.47.

QR code (traceability information) reminds of potential food safety risks * gender

	N	Mean
Male	59	4.46
Female	148	4.49
Total	207	4.48

Using a one-way ANOVA, the levels of "QR code (traceability information) reminds of potential food safety risks" were compared between males and females. It is not

statistically significant (F=0.092, p=0.762). Based on the descriptive table, it is evident that the mean value for the male group is 4.46, which is in close proximity to the mean value for the female group (M=4.49). As a result, it can be inferred that an overwhelming majority of the participants would concur with the statement "Being more informed about potential food safety risks by scanning QR codes on food products."

QR code (traceability information) reminds of potential food safety risks * educational level

	N	Mean
Under High school	12	4.58
High school	22	4.55
Technical Qualification	40	4.65
Bachelors Degree	88	4.43
Postgraduate Qualification	46	4.39
Total	208	4.49

A one-way ANOVA was used to compare the levels of “QR code (traceability information) reminds of potential food safety risks” for five different educational levels: under high school, high school, technical qualification, bachelor's degree, and postgraduate qualification. F=0.833, p=0.505 indicates that the outcome is not significant.

QR code (traceability information) reminds potential food safety risks * age

	N	Mean
18-30	60	4.32
31-45	87	4.48
Above 45	61	4.66
Total	208	4.49

One-way ANOVA was used to examine the levels of “QR code (traceability information) reminds potential food safety risks” for three age groups: 18–30 years old, 31–45 years old, and above 45 years old. F=3.061, p=0.049 indicates that the outcome is not significant.

(3) Willingness to pay a price premium

When the respondents were asked if they would be willing to pay a higher price for online fresh food that comes with a QR code containing traceable information, the majority of them gave a neutral response (Mean= 3.2, Median=3.0, Mode=4.0). The research indicates that while the majority of participants express a high level of worry over food safety (M=4.73) and feel that QR codes which provide traceable information might mitigate food risks (M=4.49), they are not inclined to pay an extra cost for this further protection (M=3.2). This phenomenon could be attributed to the ongoing economic downturn and the resultant volatility in individuals' incomes, which has been exacerbated by the global recession triggered by the Covid-19 pandemic. However, additional research is required to fully explore this matter.

Willingness to pay a price premium* gender

	N	Mean
Male	59	3.17
Female	147	3.21
Total	206	3.20

Levels of “willingness to pay a price premium” were compared for male and female, using a one-way ANOVA. The result is not significant (F=0.043, p=0.836).

Willingness to pay a price premium* educational level

	N	Mean
Under High school	11	3.27
High school	22	3.41
Technical Qualification	40	3.33
Bachelors Degree	88	3.11
Postgraduate Qualification	46	3.17
Total	207	3.21

A one-way ANOVA was used to assess the levels of “willingness to pay a price premium” across five levels of education: under high school, high school, technical qualification, bachelor's degree, and postgraduate qualification. The obtained result is statistically insignificant (F=0.341, p=0.850).

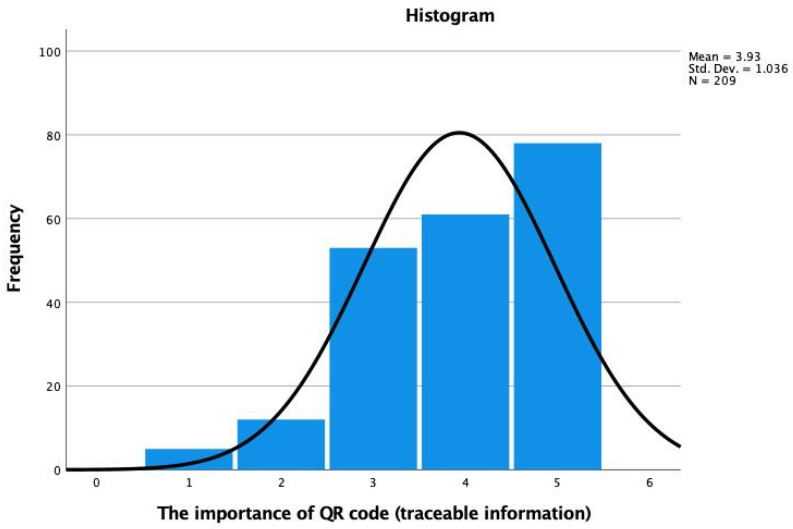
Willingness to pay a price premium* age

	N	Mean
18-30	60	2.92
31-45	87	3.23
Above 45	60	3.47
Total	207	3.21

A one-way ANOVA was used to assess the levels of "willingness to pay a price premium" among three age groups: 18-30 years old, 31-45 years old, and above 45

years old. The outcome is statistically significant at the 0.1 level (F=2.770, p=0.065). A post-hoc Tukey test reveals that consumers of varying age groups exhibit distinct levels of readiness to pay a price premium for online fresh food with QR code (providing traceable information). Participants aged above 45 (M=3.47) exhibit a greater inclination to pay a higher price compared to younger participants aged 18-30 (M=2.92). The willingness to pay among participants aged 31-45 is neutral, with a mean score of 3.23.

(4) The importance of QR codes



Moreover, while inquiring about the significance of QR codes (which provide traceable information) for online fresh food, the majority of participants assigned quite a high rating (M= 3.93). The value in question surpasses the "willingness to pay a price premium" (M=3.2), but falls short of both the "food safety concern" (M=4.72) and the "relation between QR code and safe food" (M=4.47). Which means even though consumers consider QR codes as one of the effective means to enhance food safety, it is not so important nor deserve paying a higher price. According to the literature review, there might be other information cues such as appearance or quality certification (organic food) denoting quality and safety of food product, which could be explored in the future research.

Importance of QR codes * gender

	N	Mean
Male	59	3.86
Female	148	3.96
Total	207	3.93

A one-way ANOVA was used to compare the levels of “the importance of QR codes” for men and women. The outcome is not significant (F=0.354, p=0.552).

Importance of QR codes * educational level

	N	Mean
Under High school	12	4.17
High school	22	4.14
Technical Qualification	40	4.18
Bachelors Degree	88	3.86
Postgraduate Qualification	46	3.72
Total	208	3.94

A one-way ANOVA was employed to compare the levels of “the importance of QR codes” across five educational levels: pre-high school, high school, technical qualification, bachelor's degree, and postgraduate qualification. There is no significance to the result (F=1.521, p=0.197).

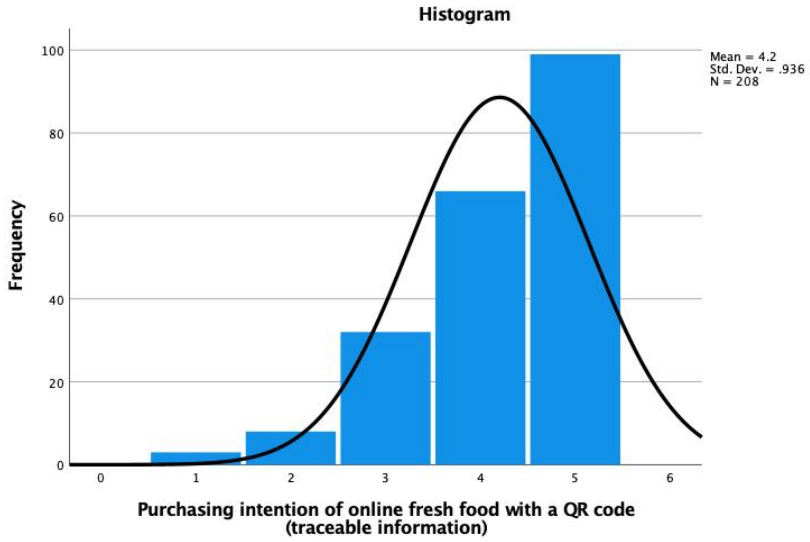
Importance of QR codes * age

	N	Mean
18-30	60	3.78
31-45	87	3.84
Above 45	61	4.23
Total	208	3.94

A one-way ANOVA was conducted to examine the levels of importance attributed to QR codes among three age groups: 18-30 years old, 31-45 years old, and above 45 years old. The outcome is statistically significant (F=3.566, p=0.030). A post-hoc Tukey test reveals that consumers of varying age groups hold differing opinions

regarding the significance of QR codes (for traceable information) in the context of online fresh food. individuals aged 45 and above (M=4.23) place greater importance on the QR code compared to younger individuals aged 18-30 (M=3.78). The significance of QR codes (which provide traceable information) is rated as neutral (M=3.84) by participants aged 31-45.

(5) Purchasing intention for online fresh food with a QR code (traceable information)



In addition, the average purchasing intention for online fresh food with a QR code is 4.20. This indicates the majority of respondents in the sample show a high level of purchasing intention on fresh food with traceable information.

Purchasing intention * gender

	N	Mean
Male	59	4.20
Female	148	4.20
Total	207	4.20

This study aimed to examine the degrees of "purchasing intention of online fresh food with a QR code" between males and females using a one-way analysis of variance (ANOVA). The outcome is statistically insignificant (F=0.003, p=0.959). Based on the descriptive table, it is evident that males and female have the same mean value of purchasing intention (M=4.20). Hence, we can deduce that the purchasing intention

for online fresh food with a QR code is not affected by gender.

Purchasing intention * educational level

	N	Mean
Under High school	12	4.25
High school	22	3.95
Technical Qualification	40	4.30
Bachelors Degree	88	4.19
Postgraduate Qualification	46	4.24
Total	208	4.20

In addition, levels of "purchasing intention of online fresh food with a QR code" were compared for 5 levels of education- under high school, high school, technical qualification, bachelors degree and postgraduate qualification, using a one-way ANOVA. The result is not significant (F=0.517, p=0.724). This means the purchasing intention of online fresh food with a QR code is not affected by educational level.

Purchasing intention * age

	N	Mean
18-30	60	4.10
30-45	87	4.25
Above 45	61	4.23
Total	208	4.20

A one-way ANOVA was used to assess the levels of "purchasing intention of online fresh food with a QR code" among three age groups: 18-30 years old, 31-45 years old, and above 45 years old. The outcome is not significant (F=0.508, p=0.602)). This means the purchasing intention of online fresh food with a QR code is not affected by age.

4.4 Correlation analysis

This research utilises correlation analysis to gain an understanding of the association between key variables, including QR code (which provides traceable information), purchase intention, and willingness to pay a price premium. The correlation results are displayed in Table 5.

Table 5. Correlation results

Variables	Pearson Correlation	P value
The importance of QR code * food safety concern	0.197	0.004
The importance of QR code * relate QR code and safe food	0.327	<0.001
The importance of QR code * willingness to pay a price premium	0.219	0.002
Food safety concern * relate QR code and safe food	0.482	<0.001
Food safety concern * willingness to pay a price premium	0.104	0.136
relate QR code and safe food * willingness to pay a price premium	0.28	<0.001
Purchasing intention of online fresh food * food safety concern	0.166	0.017
Purchasing intention of online fresh food * relate QR code and safe food	0.343	<0.001
Purchasing intention of online fresh food * willingness to pay a price premium	0.205	0.003

(1) The importance of QR code * food safety concerns

A bivariate analysis was conducted to assess the association between the significance of QR codes and the level of worry for food safety. The Pearson correlation coefficient revealed a weak positive correlation ($r=0.197$, $n=207$, $p=0.004$).

(2) The importance of QR code * QR code (traceability information) reminds of potential food safety risks

The strength of relationship between the importance of QR code and "QR code (traceability information) reminds of potential food safety risks" was tested, the pearson correlation shows a weak to moderate positive relationship ($r=0.327$, $n=208$, $p<0.001$).

(3) The importance of QR code * willingness to pay a price premium

The study examined the association between the significance of QR codes and the inclination to pay a higher price. The Pearson correlation coefficient indicates a weak positive correlation ($r=0.219$, $n=207$, $p=0.002$).

(4) Food safety concern * QR code (traceability information) reminds of potential food safety risks

A Pearson correlation analysis was conducted to determine the strength of the association between food safety concerns and "QR code (traceability information) reminds of potential food safety risks". The results indicate a moderate positive relationship ($r=0.482$, $n=208$, $p<0.001$).

(5) Food safety concern * willingness to pay a price premium

A correlation analysis was conducted to examine the association between the level of concern regarding food safety and the willingness to pay a higher price. The Pearson correlation coefficient revealed that there is no statistically significant relationship between these variables ($r=0.104$, $n=206$, $p=0.136$).

(6) QR code (traceability information) reminds of potential food safety risks * willingness to pay a price premium

Using the Pearson correlation, we found a weak positive link ($r=0.280$, $n=208$, $p<0.001$) between "QR code (traceability information) reminds of potential food safety risks" and willingness to pay a price premium.

(7) Purchasing intention for online fresh food * food safety concern

According to the Pearson correlation, there is a very weak positive link ($r=0.166$, $n=207$, $p=0.017$) between the desire to buy fresh food online and concerns about food safety.

(8) Purchasing intention for online fresh food * QR code (traceability information) reminds of potential food safety risks

The pearson correlation shows a weak to moderately positive relationship between the desire to buy fresh food online and "QR code (traceability information) reminds of potential food safety risks" ($r=0.343$, $n=208$, $p<0.001$).

(9) Purchasing intention for online fresh food * willingness to pay a price premium

The study examined the link between the intention to purchase fresh food online and the willingness to pay a higher price. The Pearson correlation coefficient revealed a weak positive relationship (r=0.205, n=207, p=0.003).

4.5 Hypotheses testing

This research adopted correlation analysis, factor analysis, and Hayes Process analysis (Hayes Model 4 and Hayes Model 8) to examine the seven hypotheses we proposed above. All empirical results were demonstrated displayed in Table 6.

Table 6. Hypotheses testing results

Hypotheses	Status of hypotheses
H1	Supported
H2	Rejected
H3	Rejected
H4	Supported
H5	Rejected
H6	Supported
H7	Supported

4.5.1 Correlation analysis

Hypothesis 1: Presenting traceable information on fresh food (via a QR code) will increase consumer purchase intention for that food.

Correlations

		The importance of QR code (traceable information)	Purchasing intention of online fresh food with a QR code (traceable information)
The importance of QR code (traceable information)	Pearson Correlation	1	.695**
	Sig. (2-tailed)		.000
	N	208	208
Purchasing intention of online fresh food with a QR code (traceable information)	Pearson Correlation	.695**	1
	Sig. (2-tailed)	.000	
	N	208	208

**. Correlation is significant at the 0.01 level (2-tailed).

A bivariate analysis was conducted to test the strength of the association between

traceable information (independent variable) and purchase intention (dependent variable). The Pearson correlation coefficient indicates a robust and highly positive connection ($r=0.695$, $n=208$, $p<0.001$). This means the H1 is confirmed.

4.5.2 Factor analysis

The six items used to measure subjective norms, attitude and perceived behavioral control were examined using factor analysis (principal component analysis with varimax rotation). The rotated component matrix identifies three distinct factors.

Rotated Component Matrix[a]

	Component		
	1	2	3
Injunctive norms	.880	.135	.100
Descriptive norms	.874	.167	.136
Resource availability	.374	.264	.734
Self-efficacy	.003	.133	.924
Experiential aspects	.182	.854	.148
Affective aspects	.123	.852	.186

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 4 iterations.

By employing factor analysis, we identified that injunctive norms and descriptive norms comprise the first factor; resource availability and self-efficacy comprise the second factor; and cognitive aspects and affective aspects form the third element. As a result, this study introduced three new variables: “Subjective norms”, which includes both injunctive norms and descriptive norms; “Perceived behavior control”, which encompasses resource availability and self-efficacy; and “Attitude”, which consists of cognitive aspects and affective components.

4.5.3 Hayes Process analysis

Hypothesis 2: Attitude mediates the effect of the traceability information (via a QR code) on purchase intention.

Hypothesis 3: Subjective norms mediate the effect of the traceability information (via a QR code) on purchase intention.

Hypothesis 4: perceived behavioral control mediates the effect of the traceability

information (via a QR code) on purchase intention.

By employing Hayes Model 4, this research examined the three potential mediators: subjective norms, attitude and perceived behavioral control simultaneously (Figure 3). The independent variable (IV) is traceable information, the dependent variable (DV) is purchase intention, and the mediators are Subjective norms (M1), Attitude (M2) and PBC (M3). The results are presented in Table 7.

Figure 3. Mediation effect

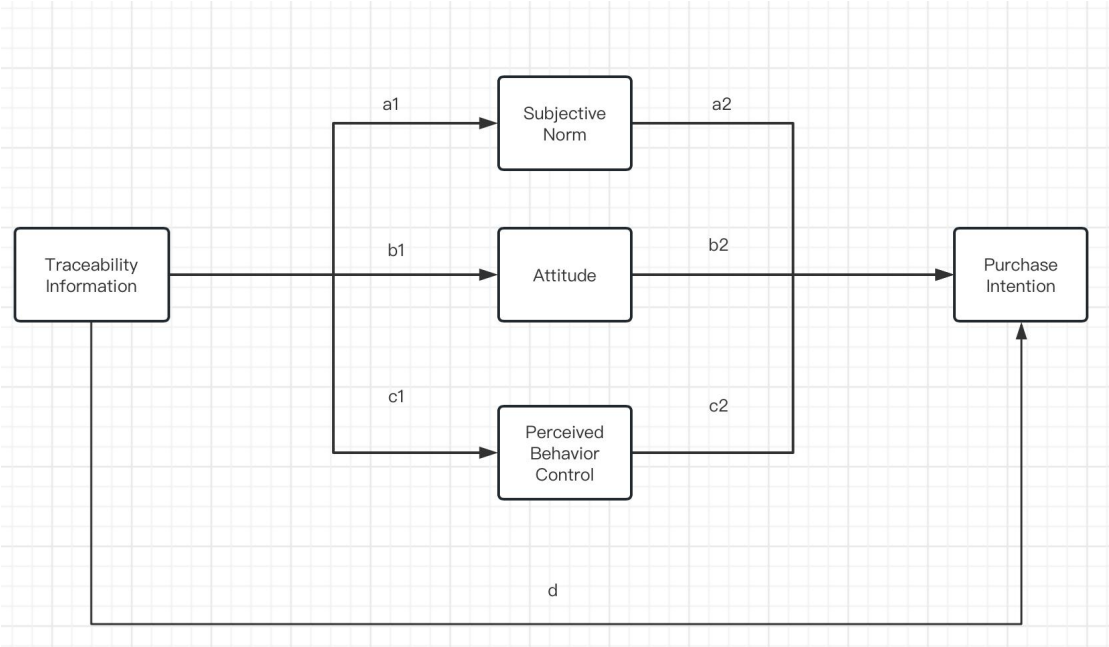


Table 7. The results of mediation analysis

Path	P value	95%CI	Result
a1-path (IV->M1)	<0.001	[0.245, 0.527]	Significant
b1-path (IV->M2)	<0.001	[0.204, 0.413]	Significant
c1-path (IV->M3)	<0.001	[0.242, 0.467]	Significant
d-path (IV->DV)	<0.001	[0.454, 0.655]	Significant
a2-path (M1->DV)	0.720	[-0.106, 0.073]	Not significant
b2-path (M2->DV)	0.104	[-0.021, 0.226]	Not significant
c2-path (M3->DV)	0.020	[0.022, 0.253]	Significant
a1*a2 path (IV-M1-DV)	-	[-0.043, 0.028]	Not significant
b1*b2 path (IV-M2-DV)	-	[-0.012, 0.090]	Not significant
c1*c2 path (IV-M3-DV)	-	[0.002, 0.117]	Significant
Total indirect effect	-	[0.013, 0.152]	Significant
Total direct effect (IV-DV)	<0.001	[0.454, 0.655]	Significant
Total effect	<0.001	[0.539, 0.718]	Significant

From the results, it is concluded that perceived behavioral control mediates the relationship between traceable information and purchase intention, but Subjective norms and Attitude have no mediating effect. Hypothesis 4 is accepted, however, hypothesis 2 and hypothesis 3 are rejected (The full printout of the Hayes Model 4 analysis is provided in Appendix V).

Hypothesis 5: The effect of traceability information (via a QR code) on purchase intention will be moderated by age.

By employing Hayes Model 8, this research examined the potential moderator: age (Figure 4). The independent variable (IV) is traceable information, the dependent variable (DV) is purchase intention, the mediator (M) is PBC, and the moderator is age (W). The results are presented in Table 8.

Figure 4. Moderation analysis (age)

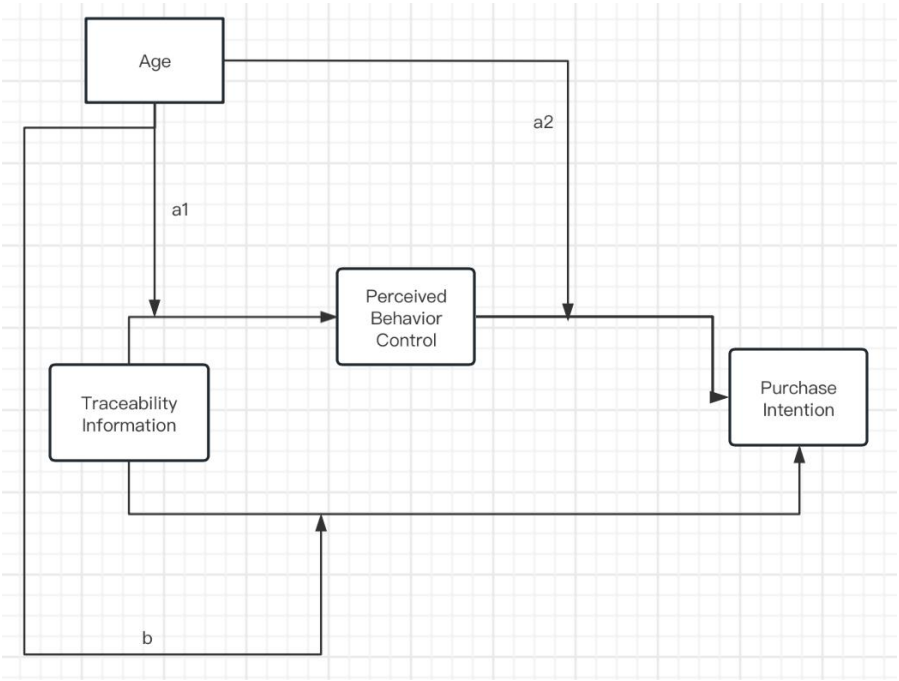


Table 8. The results of moderation effect (age)

Path	P value	95%CI	Result
a1-path (IV->M)	0.942	[-0.148, 0.160]	Not significant
a2-path (M->DV)	0.002	[0.060, 0.274]	Significant
b-path (IV->DV)	0.415	[-0.070, 0.169]	Not significant
Total indirect effect	-	[-0.032, 0.034]	Not significant

The index of moderated mediation was not significant, 95% percentile CI [-0.032, 0.034], providing evidence that age does not moderate the mediation impact of PBC (mediator) on traceable information ((IV) and purchase intention (DV). Furthermore, The direct effect (b-path) from traceable information (IV) to purchase intention (DV) wasn't moderated by age (moderator) either. Thus, we found no evidence for a moderated mediation, which rejected the H5 (The full printout of the Hayes Model 8 analysis (age) is provided in Appendix VI).

Hypothesis 6: The effect of traceability information (via a QR code) on purchase intention will be moderated by gender.

By employing Hayes Model 8, this research examined the potential moderator: gender (Figure 5). The independent variable (IV) is traceable information, the dependent

variable (DV) is purchase intention, the mediator (M) is PBC, and the moderator is gender (W). The results are presented in Table 9.

Figure 5. Moderation effect (gender)

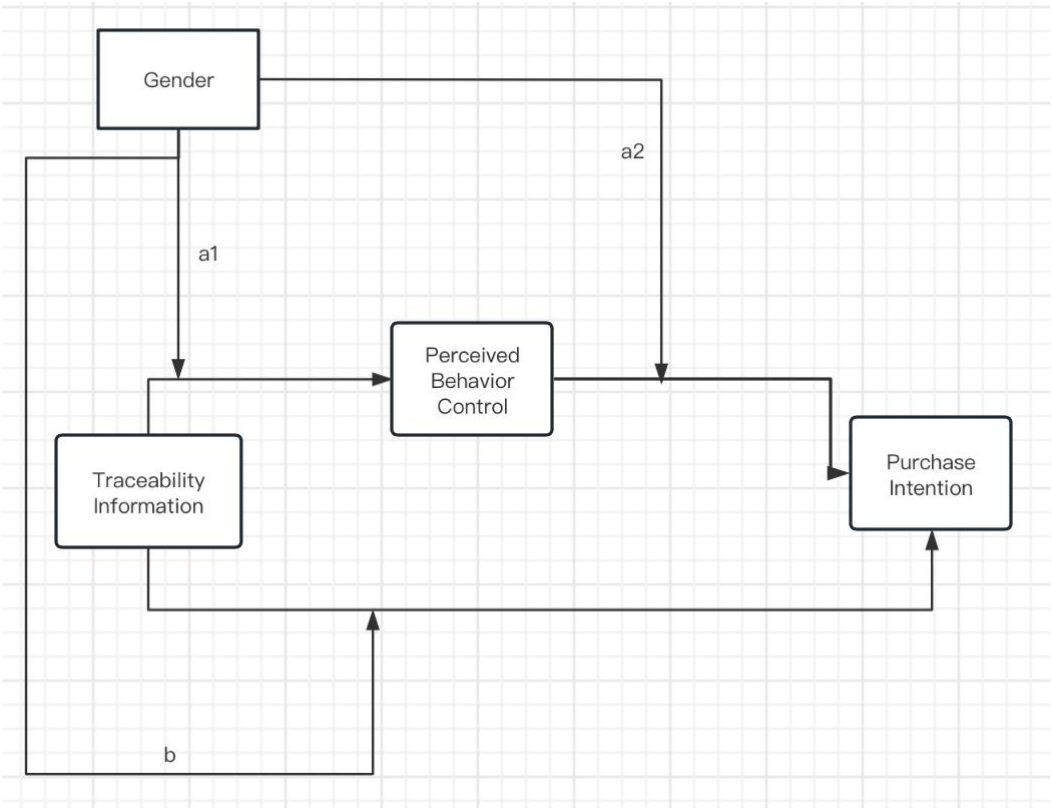


Table 9. The results of moderation analysis (gender)

Path	P value	95%CI	Result
a1-path (IV->M)	0.156	[-0.399, 0.064]	Not significant
a2-path (M->DV)	0.001	[0.074, 0.289]	Significant
b-path (IV->DV)	0.020	[0.034, 0.395]	Significant
Total indirect effect	-	[-0.102, 0.023]	Not significant

The index of moderated mediation was not significant, 95% percentile CI [-0.102, 0.023], providing evidence that gender does not moderate the mediation impact of PBC (mediator) on traceable information (IV) and purchase intention (DV). However, the direct effect (b-path) from traceable information (IV) to purchase intention (DV) was moderated by gender (moderator). Conditional direct effects on path b (IV-DV) found a weaker association between traceable information (IV) and purchase intention for males (effect = 0.430, SE = 0.076, t=5.622, p<0.001, 95% CI = 0.279; 0.580)

relative to females (effect = 0.644, SE = 0.058, t=11.060, p<0.001, 95% CI = 0.529; 0.759). Female participants with higher importance level of traceable information had higher purchase intention for fresh food with a QR code than did males, which proved H6 (The full printout of the Hayes Model 8 analysis (gender) is provided in Appendix VII).

Hypothesis 7: The effect of traceability information (QR code) on purchase intention will be moderated by educational level.

By employing Hayes Model 8, this research examined the potential moderator: educational level (Figure 6). The independent variable (IV) is traceable information, the dependent variable (DV) is purchase intention, the mediatior (M) is PBC, and the moderators is educational level (W). The results are presented in Table 10.

Figure 6. Moderation effect (educational level)

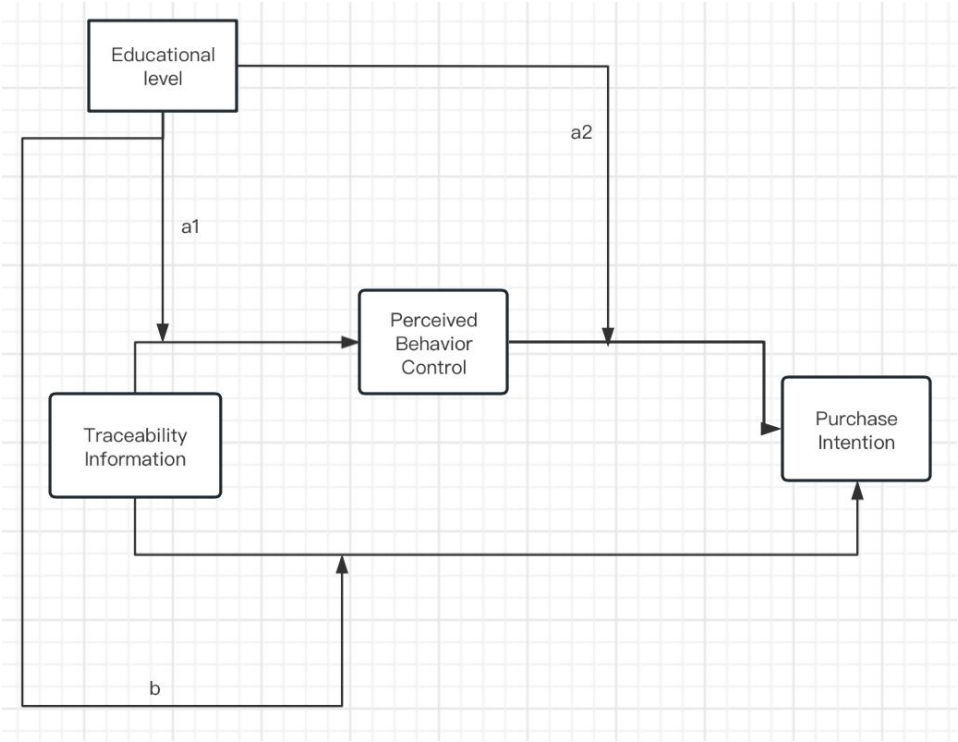


Table 10. The results of moderation analysis (educational level)

Path	P value	95%CI	Result
a1-path (IV->M)	0.156	[-0.193, 0.029]	Not significant
a2-path (M->DV)	0.005	[0.045, 0.255]	Significant
b-path (IV->DV)	0.036	[-0.175, -0.006]	Significant
Total indirect effect	-	[-0.042, 0.010]	Not significant

The index of moderated mediation was not significant, 95% percentile CI [-0.042 0.010], providing evidence that educational level does not moderate the mediation impact of PBC (mediator) on traceable information (IV) and purchase intention (DV). However, the direct effect (b-path) from traceable information (IV) to purchase intention (DV) was moderated by educational level (moderator). Conditional direct effects on path b (IV-DV) for high values (+ 1 *SD*) of educational level was the weakest, (effect=0.503, SE = 0.063, t=7.942, p<0.001, 95% percentile CI [0.378, 0.628]), it was weak but still significant for medium values (*M*) of educational level (effect=0.604, SE = 0.048, t=12.557, p<0.001, CI [0.509, 0.698]) and for small values (- 1 SD) of educational level (effect=0.704, SE = 0.072, t=9.796, p<0.001, CI [0.563, 0.846]). This indicates participants with lower educational level and higher importance level of traceable information had higher purchase intentions for fresh food with a QR code than those with higher educational levels, which proved H7 (The full printout of the Hayes Model 8 analysis (gender) is provided in Appendix VIII).

4.6 Conclusion

This research collected 208 responses from Chinese participants, analyzing socio-demographic characteristics, shopping habits, food safety concerns, QR code-related issues, and willingness to pay a premium for traceability information. It used ANOVA analysis to compare means across different groups and correlation to understand the association between the key variables of QR code, purchasing intention, and willingness to pay a premium. The study also tested mediation effects of attitude, subjective norms, and perceived behavioral control, and explored the moderation effects of gender, educational level, and age.

Chapter 5 Discussion

5.1 Introduction

Traceable fresh food has been introduced to the Chinese market and triggered interest among consumers as well as researchers in recent years. By employing the TPB model and introducing additional factors (age, gender, educational level), this research has focused on food safety issues in China and sought to explore how traceable information of online fresh food contributes to consumer perceptions and purchase intentions. The key findings of this research could aid in understanding the mechanism linking traceable information and consumers' purchase intentions, helping resolve the food safety crisis, as well as assisting online retailers and producers in generating revenue by offering consumer-preferred products.

5.2 Summary of findings

5.2.1 General findings on traceable information

As the occurrence of food safety crises has become more prevalent around the world, the implementation of a traceability system could be regarded as a method to enhance food safety. For example, Dupuy et al. (2005) highlighted that traceable information has the potential to mitigate the impacts of a food crisis. This study has followed this trend and investigated the overarching ideas of food safety and traceability information among Chinese consumers.

First of all, the research found a significant percentage of participants, regardless of their gender and educational background, expressed a remarkable level of concern about food safety issues. This could be viewed as consumers' reasonable response to a sequence of food safety crises that occurred in China, which significantly eroded public confidence in the Chinese food industry (Liu et al., 2020). Secondly, age groups showed varying levels of concern, with individuals aged 31-45 and 45 and above showing greater attentiveness towards food safety issues compared to younger consumers aged 18-30. This is in line with previous literature that in China elderly people were more concerned about food safety issues (Liu & Niyongira, 2017). Thirdly, irrespective of gender, education, or age, most participants concur that scanning QR codes on online fresh food can increase consciousness of potential food safety risks. This aligns with the conclusions of van Rijswijk et al. (2008), which state that traceable information for food guarantees an efficient flow of information in the supply chain, identifies issues, and facilitates the recall of related products, effectively mitigating food safety hazards. Fourthly, a substantial number of participants provided a neutral response when queried about their willingness to pay a higher price

for online fresh food accompanied by a QR code that includes trackable data. Although many individuals express significant worry over food safety concerns and acknowledge the potential benefits of traceable information in QR codes for mitigating food dangers, they are often unwilling to incur additional expenses for the additional protection. In other words, Chinese consumers place great importance on food safety issues and strongly associate QR codes, which provide traceable information, with safer food, but are still not willing to pay extra for this benefit. This contrasts with the study done by Liu et al. (2020), which pointed out that Chinese consumers have a willingness to pay a price premium for food safety characteristics such as traceable information. The main reason could be that there are various other food attributes, such as organic or green food labeling, country of origin information, appearance, and quality certification, which could also assist consumers in choosing safer food products (Gao & Schroeder, 2009; Liu et al., 2013; Wu et al., 2017; Gao et al., 2019; Liu et al., 2019; Liu et al., 2020). Consumers tend to view traceability as an additional, rather than necessary, piece of information. In addition, another possible reason is the persistent economic slump and the worldwide recession caused by the COVID-19 epidemic which is constraining consumer spending (Shibata, 2020). However, further research is needed to fully understand the underlying reasons behind this phenomenon. Fifthly, the results also showed that, compared to the younger generation, senior consumers were more willing to pay a higher price for a QR code that contained traceable information. This could be seen as a supplement to previous findings that males, married subjects, and those with a relatively low educational level placed a higher premium on traceability with detailed information (Jin et al., 2017). Finally, most consumers in this study demonstrated a strong inclination to purchase fresh food online that includes traceable information. This aligns with the assertion made by Yu et al. (2021) that traceability information on fresh agricultural products has a noticeable positive impact on customers' purchase intentions. This suggests that consumers are more likely to select a product that possesses traceable information compared to a product lacking such information, as long as they are not required to pay extra for this service.

Overall, the research found that the majority of respondents expressed severe concerns about food safety and concurred that using QR codes on food products (which provide traceable data) can aid in detecting possible food risks. However, despite most participants being markedly inclined to purchase traceable food online, they are unwilling to pay a price premium for traceable information. Furthermore, senior buyers exhibited a greater inclination to pay a higher price for traceability information in comparison to younger generations.

2 Key findings related to the research objectives

This study addressed two objectives: (i) to investigate how traceable information on online fresh food influences Chinese consumers' purchase intentions; and (ii) to explore the factors that mediate or moderate the relationship between traceable information and consumer purchase intentions.

The first research objective aimed to gain an understanding of traceable information and its impact on consumers' purchase intention. Based on previous literature, this study investigates several key variables including the importance of QR code (traceable information), food safety concerns, QR code (traceability information) reminds of potential food safety risks, willingness to pay a price premium, and purchasing intentions.

When examining the significance of QR codes in providing traceable information, empirical findings indicate a positive correlation between the level of food safety concerns and the importance assigned to traceable information. This suggests that consumers who have higher concerns about food safety regularly give more value to traceable information. This finding may be seen as an additional demonstration of prior discoveries that the level of consumers' apprehension over food safety has a substantial impact on their understanding and acceptance of food traceability systems (Yu & Qiao, 2016). Furthermore, there exists a direct association between the significance of QR codes (which provide traceable information) and a willingness to pay a price premium. This means if consumers think a QR code (traceable information) is more important, they would more likely to pay a higher price for traceability attribute.

By investigating the purchasing intention of online fresh food, this study reveals a positive correlation between food safety concerns and purchasing intentions for online fresh food, as well as a positive association between "QR code (traceability information) reminds potential food safety risks" and purchasing intentions for online fresh food. Therefore, if consumers have heightened concerns about food safety or perceive food with traceable information as a safer product, they are more inclined to purchase fresh food online that has traceable information. This aligns with the claim that perceived risk and knowledge of traceability directly influence the intention to purchase traceable food (Ge, 2022). Additionally, this research indicates a direct correlation between the purchasing intentions for online fresh food and the willingness to pay a price premium. This implies that a greater purchase intention for online fresh food with traceable information is associated with an increased willingness to pay a higher price for the traceability attribute. This finding adds to the existing literature, as there is limited research that investigates the relationship between purchase intention and willingness to pay a price premium in the fresh food sector.

Moreover, this study discovered a strong positive correlation between traceable information and consumers' purchase intention. This means traceable information has a apparently positive impact on consumers' willingness to buy, aligning with the opinion that the introduction of a food traceability system can decrease consumers' perceptions of uncertainty, consequently enhancing their intention to make a purchase (Chen & Huang, 2013).

In sum, consumers with higher food safety concerns are more likely to prioritize traceable information in their purchases and also more willing to pay a premium for traceability attributes, as they perceive food with traceable information as safer. That is to say, traceable information could help consumers to reduce perceived uncertainty and strengthen their purchase intentions.

For the second research objective, this study utilised a modified TPB model to examine mediation and moderation effects. The study specifically examined if subjective norms, perceived behavioural control (PBC), and attitude act as mediators in the relationship between food traceability and customer purchase intention. Additionally, it evaluated whether this impact is moderated by gender, age, and educational level.

The findings indicate that PBC serves as a mediator in the connection between traceable information and purchase intention, but subjective norms and attitude do not have such mediation impacts. This finding partially supports the previous assertion made by Spence et al. (2018) that attitude, subjective norms, and PBC are all important factors influencing purchase intention for traceable minced beef. Additionally, it somewhat aligns with the conclusion of Ding et al. (2022) that attitude, subjective norms, and PBC have significant positive impacts on purchase intention for traceable seafood.

Moreover, the results show that age does not have a direct or indirect impact on the association between traceable information and purchase intention. However, gender does have a direct impact on this relationship. That is to say, female consumers who placed a greater emphasis on traceable information had a higher inclination to purchase fresh food with QR codes (traceable information) compared to male consumers. Partially, this outcome aligns with the discoveries made by Yu et al. (2021) that women exhibit a much greater inclination than males to purchase agricultural goods that include with traceability information. Additionally, educational level doesn't affect the mediation effect of PBC on traceable information and purchase intention. However, educational level directly moderates the association between traceable information and purchase intention. This means if consumers with lower educational levels value traceable information more highly, they would have a stronger inclination to purchase fresh food with QR codes (traceable information) compared to those with higher educational attainment. This conclusion partially aligns with the findings of Jin et al. (2017) indicating that consumers with a lower

educational level prioritise traceability with detailed information. However, it is somewhat inconsistent with the findings of Bai et al. (2013) which suggest that consumers with higher education value traceability more.

To summarise, whereas PBC influences the effect on traceable information and purchase intention, this mediation effect is not affected by gender, age, or educational level. Nevertheless, the association between traceable information and purchase intention can be influenced by gender and educational level directly.

5.3 Theoreotical implications

This research enriches extant literature in several ways. On the one hand, this research is one of the first to examine customers' decision-making processes in the online fresh food industry by adopting the TPB model. More specifically, it employs the TPB model's theoretical framework to explore how traceable information influences consumers' purchase intention in the online fresh food industry. On the other hand, this study introduces the previously underexplored moderating role of age, gender, and educational level in the TPB model, which explores the conditions under which the relationship between traceable information and purchase intention could be strengthened or weakened. This could be regarded as a contribution to the traditional TPB model.

In sum, this study discusses the pressing issue of food safety by taking into account the unique cultural context and practical requirements of Chinese consumers. It expands upon the traditional TPB model by incorporating three moderators - age, gender, and educational level - to examine the mediation and moderation mechanisms potentially operating in the online fresh food market. This research contributes to the existing research on the TPB model and traceable information in the purchase of on online fresh food.

5.4 Practical implications

By exploring Chinese consumers’ purchase intentions for traceable online fresh food, this research holds significant practical implications for a number of stakeholders, including academics, food marketers, and policy practitioners. Specifically, this research can assist fresh food sellers in comprehending: 1) How consumers perceive traceable information about online fresh food; 2) How traceable information about online fresh food influences consumers’ purchase intentions; 3) How the relationship between traceable information and purchase intention could be impacted by other

factors such as perceived behavioral control (PBC), gender and educational level, which would help retailers to increase market share and generate profit.

According to the empirical results, we find the following outcomes. Firstly, regardless of gender, educational level, or age, the majority of respondents have a high level of purchasing intention for online fresh food with traceable information, however, they are unlikely to pay higher prices for such information. Secondly, older consumers are more concerned about food safety issues and are more likely to pay a price premium for traceable information on online fresh food. Thirdly, if consumers have higher food safety concerns or are more likely to regard food with traceable information as safe food, they are more likely to give traceable information higher importance and purchase online fresh food with traceable information, as well as pay a price premium for traceable information. Fourthly, traceable information can affect consumers' purchase intention. The more significance consumers place on traceable information, the more likely they are to purchase a product having traceable information, and this link is mediated by perceived behavioral control (PBC). Finally, female participants who place a higher value on traceable information had higher purchase intentions for fresh food with QR codes than male participants. In addition, participants with a lower educational level and a greater importance level of traceable information were more likely to purchase fresh food with a QR code than those with a higher educational level.

According to the aforementioned findings, this research proposes the following recommendations. Firstly, consumers tend to prefer products that have traceable information compared to those that do not, as long as they aren't required to pay extra for this benefit. Simply stated, if customers believe they are paying the same or a lesser price for traceable fresh food compared to traditional products without traceable information, they are more inclined to make the purchase. Therefore, online sellers may provide traceable information for fresh food without increasing the pricing. For example, retailers could employ discounts or other pricing strategies to create a perception that traceable fresh food is more economical compared to normsal products, which has the potential to bolster both sales volumes and profitability. In addition, legislators or marketers might conduct food safety campaigns to enlighten the public about the benefits of a traceability system in protecting food safety, which would be effective in boosting sales and managing the food risks associated with online fresh food. Moreover, PBC mediates the effect of traceable information and purchase intention, which implies that the level of difficulty in obtaining traceable information might directly impact the desire to make a purchase. Therefore, the presentation of traceable information of online fresh food should be unambiguous and readily accessible and comprehensible. Finally, compared to male or well-educated consumers, if female participants or less educated consumers place a higher value on traceable information, they showed higher purchase intentions for fresh food with QR codes. This indicates when designing marketing strategies or implementing marketing campaigns, food marketers might focus more on targeting female and less-educated

consumers, as they are considered to be two of the most receptive and responsive consumer groups.

5.5 Limitation and future research

Despite its contributions, this study has several caveats to be addressed by future research. Firstly, out of the participants, 59 (28.50%) were male and 148 (71.50%) were female. The female sample bias was problematic for this research and more male participants should be included in future research. Secondly, the study only takes into account consumers' purchase intention, without considering their actual purchase behaviour. Thirdly, this study solely employed a survey as its research method. To gain an in-depth understanding of consumer perceptions and purchase behaviour for traceable online fresh food, it would be beneficial to incorporate qualitative analysis, which contains open-ended questions to gather several perspectives and go deeper into the subject matter.

Moreover, there might be other potential processes that underlie the effects between traceable information and purchase intention. For example, the trust factor or technology acceptance model could also be explored in future research. In addition, future research can integrate the current model with other demographic characteristics such as citizenship and income. Furthermore, future investigations might explore the potential applications of the current research findings in other food sectors, the dairy industry for instance, which is one of the hardest hit for food safety issues in China. In 2008, melamine-tainted milk and powdered infant formula sickened 300,000 infants and caused six infant fatalities (The Lancet, 2012). At the time, this incident seriously damaged the reputation of Chinese food products in global markets and significantly eroded consumer confidence in the domestic food industry (Liu et al., 2020).

Finally, although most participants expressed significant concern regarding food safety issues and acknowledged the potential benefits of traceable information in mitigating food hazards, they were not inclined to incur additional costs for this safeguard. Investigating the underlying factors contributing to this phenomenon could be a promising avenue for future research.

5.6 Conclusion

Employing a modified TPB model, this research explored the impact of traceable information of online fresh food on consumers' purchase intention in China. The research reveals that: 1) food safety concerns are prevalent among all respondents. The majority of the research participants agree that scanning QR codes (with traceable

information) on food products can help to identify potential food hazards; 2) even though most respondents show high purchasing intention for traceable food online, they are not willing to paying a price premium for traceable information; 3) older consumers were more willing to pay more for traceable QR codes compared to younger generations; 4) consumers who are more concerned about food safety are more inclined to prioritise traceable information in their purchases and are also more prepared to pay a premium for traceability features; 5) traceable information can reduce consumers' perceived uncertainty and reinforce their purchase intentions; 6) while perceived behavioral control (PBC) mediates the relationship between traceable information and purchase intention, gender, age, and educational level do not moderate this effect; 7) less educated or female consumers who place higher value on traceable information show higher purchase intentions for fresh food with QR codes compared to well-educated or male consumers.

From a theoretical standpoint, this study introduces the TPB model in the online fresh food market and expands it by introducing three potential moderators, age, gender, and educational level, which may be viewed as an enrichment of prior literature about the TPB model as well as traceable information in the online fresh food domain. Also, this study provides significant practical suggestions for a variety of stakeholders, including academics, food marketers, and policymakers: 1) online fresh food sellers can introduce traceable information to fresh food without setting higher prices; 2) legislation or marketers could run food safety campaigns to educate the public about the benefits of traceability systems; 3) the display of traceable information should be clear and easily understandable; 4) food marketers could target female and less-educated consumers more in the marketing strategies.

Future research should include more male participants, conduct experiments to test the actual purchase behaviour, and introduce qualitative analysis to deepen the understanding of consumers. Moreover, it is also suggested to explore other factors like the trust factor and technology acceptance, apply the findings to other food categories such as dairy products, and explore the underlying cause of consumers' lack of willingness to pay extra for traceable information.

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Appendices

Appendix I: Participant Information Sheet

Date Information Sheet Produced:

12/10/2023

Project Title

Traceability and Purchase Intention for Online Fresh Food in China: An Application of Theory of Planned Behavior

The AUTEC approval number: 23/292

An Invitation

Hello, my name is Jiamin Feng, a Master student at Auckland University of Technology. My master research focuses on online fresh food and consumer purchase intention. The results of the research will be of interest to academics, food marketers and legislators.

Please complete all question items in the following questionnaire. Access to this questionnaire will remain open for one week. The questionnaire will take approximately 5 minutes to complete. Once the survey response has been submitted it cannot be withdrawn as the survey is anonymous.

What is the purpose of this research?

The purpose of this research is to examine how the attribute of traceability of online fresh food would affect consumer purchase intention in China, and also explore the factors that would affect the relationship between the attribute of traceability and consumer purchase intention.

A traceability system may have a substantial impact on consumer preferences because it provides consumers with information regarding the production of fresh food. Therefore, a study on traceability systems in the online fresh food market is valuable. It may help to understand how much the traceability system could affect consumer preferences for online fresh food shopping, and how producers deal with food crises and then generate revenue with the aid of this system.

How was I identified and why am I being invited to participate in this research?

You are a Chinese. You have heard or used an online fresh food platform such as Meituan/Eleme to purchase fresh food, and you are 18 years old or older. You have received a link to this survey because you are a member of the WeChat group.

How do I agree to participate in this research?

Your participation is entirely voluntary and will not advantage or disadvantage you by any means. You can consent to the research by completing the online survey, after carefully reading and understanding this information sheet. Once the survey response has been submitted, it cannot be withdrawn as the survey is anonymous. All information you provide will be strictly confidential. Your responses will be presented only in aggregate and no individual results will be highlighted. Results will not be released to any third-party. The demographic information that I ask you to provide, at the end of the questionnaire, will be used for comparative purposes only.

What will happen in this research?

You will complete an online questionnaire. The questionnaire will present 17 questions. You will provide a numerical rating for each question.

What are the discomforts and risks?

There will be no discomforts or any risks to the participants.

How will these discomforts and risks be alleviated?

N/A

What are the benefits?

Your participation will provide you with some insight into your own consumer behaviour, as well as help the researcher complete a Master degree. Your participation will also help making contribution on online fresh food market.

How will my privacy be protected?

Your WeChat user name and contact details will be collected through a link to a separate survey so that a Red Packet can be sent.

Your information will be kept confidential and will only be used for the purpose of delivering your WeChat credit.

What are the costs of participating in this research?

About 5 minutes of participation will be required.

What opportunity do I have to consider this invitation?

About 5 minutes of participation will be required.

Will I receive feedback on the results of this research?

When the research is complete, you can view a summary of the results here https://www.dropbox.com/scl/fi/704wkgy8lwr3jjdr91f5l/Qualtrics-Survey-English.pdf?rlkey=btor7ie2ue4qazwkemp3e0vs1&dl=0

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisors, Assoc. Prof. Ken Hyde, ken.hyde@aut.ac.nz , (09) 921 9999 ext 5605.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC, *ethics@aut.ac.nz* , (+649) 921 9999 ext 6038.

Whom do I contact for further information about this research?

Please keep this Information Sheet for your future reference. You are also able to contact the research team as follows:

Researcher Contact Details:

Researcher Contact Details: Jiamin.Feng Flora.feng@aut.ac.nz

Project Supervisor Contact Details: Assoc.Prof. Ken Hyde, ken.hyde@aut.ac.nz , (09) 921 9999 ext 5605.

Project Supervisor Contact Details:

Project Supervisor Contact Details: Assoc.Prof. Ken Hyde, ken.hyde@aut.ac.nz , (09) 921 9999 ext 5605

Appendix II: Announcement

Dear all,

We are excited to invite you to participate in our research study on Traceability and Purchase Intention for Online Fresh Food in China: An Application of Theory of Planned Behaviour. Your valuable insights and opinions are critical to advancing our understanding in this area.

AUTEC approval number:23/292

To participate in this study, please click on the following link:

https://aut.au1.qualtrics.com/jfe/form/SV_2fwZ6IOFAbs8LVI (English version)

The survey will take approximately 5 minutes to complete.

Rest assured, all the information you provide will remain completely confidential. Your data will only be used for this study. Your involvement is vital, and we appreciate your time and effort in contributing to this research.

Best regards,

Jiamin Feng

Appendix III: English Questionnaire

1. Have you ever purchased fresh food online?

Yes

No

2. How often do you purchase fresh food online?

Daily

4-6 times a week

2-3 times a week

Once a week

Less often than weekly

Never

3. I think the QR code (traceable information) of online fresh food is important.

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

4. How often do you use QR codes in your daily life?

Daily

4-6 times a week

2-3 times a week

Once a week

Less often than weekly

Never

5. I intend to purchase online fresh food with a QR code (traceable information).

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

6. The people in my life do not support my purchase of fresh food without a QR code (traceable information).

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

7. The people around me always purchase online fresh food with a QR code (traceable

information).

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

8. For me to scan the QR code and get the traceable information on fresh food would be easy.

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

9. Getting information about online fresh food from scanning QR code is completely under my control.

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

10. I am really concerned about the safety of the food I consume.

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

11. Scanning QR codes on food products would make me feel more informed about potential food safety risks.

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

12. I would like to scan the QR code on online fresh food to get traceable information because it is useful to keep food safe.

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

13. I would like to scan the QR code on fresh food to get traceable information because it is cool.

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

14. I would like to pay a higher price for the online fresh food with QR code (traceable information).

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

15. My gender is

Male

Female

Another Gender

16. My educational level is

Under High school

High school

Technical Qualification

Bachelors Degree

Postgraduate Qualification

17. My age range is

18-30 years old

31-45 years old

Above 45 years old

Appendix IV: Chinese Questionnaire

1. 您是否在网上购买过生鲜食品?

是

否

2. 您多长时间在网上购买一次生鲜食品?

每天

每周 4-6 次

每周 2-3 次

每周一次

少于每周一次

3. 我认为网购生鲜食品的二维码（可追溯信息）很重要

非常不同意

有点不同意

既不同意也不反对

有点同意

非常同意

4. 您在日常生活中使用二维码的频率是?

每天

每周 4-6 次

每周 2-3 次

每周一次

少于每周一次

5. 我打算在网上购买带有二维码（可追溯信息）的生鲜食品。

非常不同意

有点不同意

既不同意也不反对

有点同意

非常同意

6. 生活中的人支持我购买有二维码（可追溯信息）的生鲜食品。

非常不同意

有点不同意

既不同意也不反对

有点同意

非常同意

7. 我周围的人在购买网购生鲜食品时都会扫二维码（可追溯信息）。

非常不同意

有点不同意

既不同意也不反对

有点同意

非常同意

8. 对我来说，扫描二维码并获取生鲜食品的可追溯信息很容易。

非常不同意

有点不同意

既不同意也不反对

有点同意

非常同意

9. 通过扫描二维码获取网上生鲜食品信息完全在我的掌控之中。

非常不同意

有点不同意

既不同意也不反对

有点同意

非常同意

10. 我非常关心我所食用食品的安全性

非常不同意

有点不同意

既不同意也不反对

有点同意

非常同意

11. 扫描食品上的二维码会让我更了解潜在的食品安全风险。

非常不同意

有点不同意

既不同意也不反对

有点同意

非常同意

12. 我希望扫描生鲜食品上的二维码以获取可追溯信息，因为这对保证食品安全很有用。

非常不同意

有点不同意

既不同意也不反对

有点同意

非常同意

13. 我愿意扫描生鲜食品上的二维码以获取可追溯信息，因为这很酷。

非常不同意

有点不同意

既不同意也不反对

有点同意

非常同意

14. 我愿意为带有二维码（可追溯信息）的在线生鲜食品支付更高的价格。

非常不同意

有点不同意

既不同意也不反对

有点同意

非常同意

15. 我的性别是_____。

男性

女性

其他性别

16. 我的教育程度是_____。

高中以下

高中毕业

专科毕业

本科毕业

研究生及以上

17. 我的年龄范围是_____。

18-30 岁

31-45 岁

45 岁以上

Appendix V: The full printout of the Hayes Model 4 analysis

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.1 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 4
    Y  : Q5
    X  : Q3
   M1  : PBC
   M2  : SN
   M3  : Attitude

Sample
Size:  208

**************************************************************************
OUTCOME VARIABLE:
 PBC

Model Summary
          R       R-sq        MSE          F        df1        df2          p
       .397       .158       .722     38.636      1.000    206.000       .000

Model
              coeff         se          t          p       LLCI       ULCI
constant      2.739       .232     11.800       .000      2.281      3.197
Q3             .354       .057      6.216       .000       .242       .467
```

```
**************************************************************************
OUTCOME VARIABLE:
 SN

Model Summary
          R       R-sq        MSE          F        df1        df2          p
       .351       .124      1.140     29.031      1.000    206.000       .000

Model
              coeff         se          t          p       LLCI       ULCI
constant      1.500       .292      5.143       .000       .925      2.074
Q3             .386       .072      5.388       .000       .245       .527

**************************************************************************
OUTCOME VARIABLE:
 Attitude

Model Summary
          R       R-sq        MSE          F        df1        df2          p
       .375       .141       .625     33.775      1.000    206.000       .000

Model
              coeff         se          t          p       LLCI       ULCI
constant      3.017       .216     13.970       .000      2.591      3.443
Q3             .308       .053      5.812       .000       .204       .413



**************************************************************************
OUTCOME VARIABLE:
 Q5

Model Summary
          R       R-sq        MSE          F        df1        df2          p
       .715       .512       .437     53.193      4.000    203.000       .000

Model
              coeff         se          t          p       LLCI       ULCI
constant      1.066       .269      3.959       .000       .535      1.598
Q3             .554       .051     10.905       .000       .454       .655
PBC            .137       .058      2.352       .020       .022       .253
SN            -.016       .045      -.359       .720      -.106       .073
Attitude       .103       .063      1.632       .104      -.021       .226
```

```
************************** TOTAL EFFECT MODEL ****************************
OUTCOME VARIABLE:
 Q5

Model Summary
          R       R-sq        MSE          F        df1        df2          p
       .695       .483       .455    192.742      1.000    206.000       .000

Model
              coeff         se          t          p       LLCI       ULCI
constant      1.728       .184      9.375       .000      1.364      2.091
Q3             .628       .045     13.883       .000       .539       .718

************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
     Effect         se          t          p       LLCI       ULCI
       .628       .045     13.883       .000       .539       .718

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI
       .554       .051     10.905       .000       .454       .655

Indirect effect(s) of X on Y:
             Effect     BootSE   BootLLCI   BootULCI
TOTAL          .074       .036       .013       .152
PBC            .049       .030       .002       .117
SN            -.006       .018      -.043       .028
Attitude       .032       .026      -.012       .090
(C1)           .055       .034      -.002       .131
(C2)           .017       .046      -.069       .112
(C3)          -.038       .034      -.111       .022

Specific indirect effect contrast definition(s):
(C1)          PBC       minus   SN
(C2)          PBC       minus   Attitude
(C3)          SN        minus   Attitude



*********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

------ END MATRIX -----
```

Appendix VI: The full printout of the Hayes Model 8 analysis (Moderator: age)

```
**************************************************************************
Model  : 8
    Y  : Q5
    X  : Q3
    M  : PBC
    W  : Agenew

Sample
Size:  208

**************************************************************************
OUTCOME VARIABLE:
 PBC

Model Summary
          R       R-sq        MSE          F        df1        df2          p
       .399       .160       .728     12.910      3.000    204.000       .000

Model
              coeff         se          t          p       LLCI       ULCI
constant      4.134       .060     68.862       .000      4.016      4.252
Q3             .349       .058      6.002       .000       .234       .463
Agenew         .049       .079       .617       .538      -.107       .204
Int_1          .006       .078       .072       .942      -.148       .160

Product terms key:
 Int_1    :        Q3       x        Agenew

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W       .000       .005      1.000    204.000       .942
----------
    Focal predict: Q3       (X)
          Mod var: Agenew   (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.



DATA LIST FREE/
   Q3         Agenew     PBC        .
BEGIN DATA.
     -1.036      -.765      3.740
       .000      -.765      4.097
      1.036      -.765      4.453
     -1.036       .000      3.773
       .000       .000      4.134
      1.036       .000      4.495
     -1.036       .765      3.805
       .000       .765      4.171
      1.036       .765      4.537
END DATA.
GRAPH/SCATTERPLOT=
 Q3       WITH     PBC      BY       Agenew    .
```

```
**************************************************************************
OUTCOME VARIABLE:
 Q5

Model Summary
          R       R-sq        MSE          F        df1        df2          p
       .715       .512       .437     53.198      4.000    203.000       .000

Model
              coeff         se          t          p       LLCI       ULCI
constant      3.506       .229     15.317       .000      3.055      3.957
Q3             .581       .049     11.915       .000       .485       .678
PBC            .167       .054      3.077       .002       .060       .274
Agenew        -.090       .061     -1.475       .142      -.211       .030
Int_1          .049       .060       .816       .415      -.070       .169

Product terms key:
 Int_1    :        Q3       x        Agenew

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W       .002       .666      1.000    203.000       .415
----------
    Focal predict: Q3       (X)
          Mod var: Agenew   (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.


 DATA LIST FREE/
    Q3         Agenew     Q5         .
 BEGIN DATA.
     -1.036      -.765      3.701
       .000      -.765      4.264
      1.036      -.765      4.828
     -1.036       .000      3.593
       .000       .000      4.195
      1.036       .000      4.798
     -1.036       .765      3.485
       .000       .765      4.127
      1.036       .765      4.768
 END DATA.
 GRAPH/SCATTERPLOT=
  Q3       WITH     Q5       BY       Agenew    .
```

```
****************** DIRECT AND INDIRECT EFFECTS OF X ON Y *****************

Conditional direct effect(s) of X on Y:
     Agenew     Effect         se          t          p       LLCI       ULCI
      -.765       .544       .066      8.251       .000       .414       .673
       .000       .581       .049     11.915       .000       .485       .678
       .765       .619       .069      9.033       .000       .484       .754

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 Q3          ->    PBC         ->    Q5

     Agenew     Effect     BootSE   BootLLCI   BootULCI
      -.765       .057       .032       .010       .135
       .000       .058       .030       .013       .130
       .765       .059       .032       .012       .137

      Index of moderated mediation:
            Index     BootSE   BootLLCI   BootULCI
Agenew       .001       .016      -.032       .034
---



************************ ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

W values in conditional tables are the mean and +/- SD from the mean.

NOTE: The following variables were mean centered prior to analysis:
          Agenew   Q3
```

Appendix VII: The full printout of the Hayes Model 8 analysis (Moderator: gender)

```
**************************************************************************
Model  : 8
    Y  : Q5
    X  : Q3
    M  : PBC
    W  : Q15

Sample
Size:  207

**************************************************************************
OUTCOME VARIABLE:
 PBC

Model Summary
          R       R-sq        MSE          F        df1        df2          p
       .417       .174       .714     14.272      3.000    203.000       .000

Model
              coeff         se          t          p       LLCI       ULCI
constant      4.038       .231     17.479       .000      3.582      4.493
Q3             .632       .199      3.175       .002       .240      1.024
Q15            .061       .130       .472       .637      -.195       .318
Int_1         -.167       .117     -1.423       .156      -.399       .064

Product terms key:
 Int_1    :        Q3       x        Q15

Test(s) of highest order unconditional interaction(s):
       R2-chng           F        df1        df2          p
X*W       .008      2.025      1.000    203.000       .156
----------
    Focal predict: Q3       (X)
          Mod var: Q15      (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.
```

```
DATA LIST FREE/
   Q3         Q15        PBC        .
BEGIN DATA.
     -1.036      1.000      3.618
       .000      1.000      4.099
      1.036      1.000      4.581
     -1.036      2.000      3.852
       .000      2.000      4.161
      1.036      2.000      4.469
END DATA.
GRAPH/SCATTERPLOT=
 Q3       WITH     PBC      BY       Q15      .

***************************************************************************
OUTCOME VARIABLE:
 Q5

Model Summary
          R       R-sq        MSE          F        df1        df2          p
       .720       .519       .431     54.459      4.000    202.000       .000

Model
              coeff         se          t          p       LLCI       ULCI
constant      3.566       .284     12.551       .000      3.005      4.126
Q3             .215       .158      1.358       .176      -.097       .528
PBC            .182       .055      3.334       .001       .074       .289
Q15           -.072       .101      -.716       .475      -.272       .127
Int_1          .214       .092      2.339       .020       .034       .395

Product terms key:
 Int_1    :        Q3       x        Q15

Test(s) of highest order unconditional interaction(s):
       R2-chng           F        df1        df2          p
X*W       .013      5.470      1.000    202.000       .020
----------
     Focal predict: Q3       (X)
           Mod var: Q15      (W)


Conditional effects of the focal predictor at values of the moderator(s):

        Q15     Effect         se          t          p       LLCI       ULCI
      1.000       .430       .076      5.622       .000       .279       .580
      2.000       .644       .058     11.060       .000       .529       .759

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   Q3         Q15        Q5         .
BEGIN DATA.
     -1.036      1.000      3.801
       .000      1.000      4.246
      1.036      1.000      4.691
     -1.036      2.000      3.506
       .000      2.000      4.173
      1.036      2.000      4.840
END DATA.
GRAPH/SCATTERPLOT=
 Q3       WITH     Q5       BY       Q15      .
```

```
****************** DIRECT AND INDIRECT EFFECTS OF X ON Y ****************

Conditional direct effect(s) of X on Y:
        Q15     Effect         se          t          p       LLCI       ULCI
      1.000       .430       .076      5.622       .000       .279       .580
      2.000       .644       .058     11.060       .000       .529       .759

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 Q3          ->    PBC         ->    Q5

        Q15     Effect     BootSE   BootLLCI   BootULCI
      1.000       .085       .043       .017       .183
      2.000       .054       .029       .012       .121

Index of moderated mediation (difference between conditional indirect effects):
         Index     BootSE   BootLLCI   BootULCI
Q15      -.030       .031      -.102       .023
---


*********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

NOTE: The following variables were mean centered prior to analysis:
          Q3

------ END MATRIX -----
```

Appendix VIII: The full printout of the Hayes Model 8 analysis (Moderator: educational level)

```
**************************************************************************
Model  : 8
    Y  : Q5
    X  : Q3
    M  : PBC
    W  : Q16

Sample
Size:  208

**************************************************************************
OUTCOME VARIABLE:
 PBC

Model Summary
          R       R-sq        MSE          F        df1        df2          p
       .408       .167       .722     13.611      3.000    204.000       .000

Model
              coeff         se          t          p       LLCI       ULCI
constant      4.120       .060     68.971       .000      4.002      4.238
Q3             .364       .058      6.288       .000       .250       .479
Q16            .018       .054       .332       .740      -.088       .124
Int_1         -.082       .056     -1.456       .147      -.193       .029

Product terms key:
 Int_1    :        Q3       x        Q16

Test(s) of highest order unconditional interaction(s):
       R2-chng           F        df1        df2          p
X*W       .009      2.119      1.000    204.000       .147
----------
    Focal predict: Q3       (X)
          Mod var: Q16      (W)



Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   Q3         Q16        PBC        .
BEGIN DATA.
     -1.036     -1.111      3.629
       .000     -1.111      4.100
      1.036     -1.111      4.572
     -1.036       .000      3.743
       .000       .000      4.120
      1.036       .000      4.498
     -1.036      1.111      3.857
       .000      1.111      4.140
      1.036      1.111      4.423
END DATA.
GRAPH/SCATTERPLOT=
 Q3       WITH     PBC      BY       Q16      .

**************************************************************************
```

```
**************************************************************************
OUTCOME VARIABLE:
 Q5

Model Summary
          R       R-sq        MSE          F        df1        df2          p
       .731       .535       .416     58.326      4.000    203.000       .000

Model
              coeff         se          t          p       LLCI       ULCI
constant      3.566       .224     15.944       .000      3.125      4.007
Q3             .604       .048     12.557       .000       .509       .698
PBC            .150       .053      2.821       .005       .045       .255
Q16            .125       .041      3.052       .003       .044       .206
Int_1         -.091       .043     -2.111       .036      -.175      -.006

Product terms key:
 Int_1    :        Q3       x        Q16

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W       .010      4.454      1.000    203.000       .036
----------
    Focal predict: Q3       (X)
          Mod var: Q16      (W)

Conditional effects of the focal predictor at values of the moderator(s):

        Q16     Effect         se          t          p       LLCI       ULCI
     -1.111       .704       .072      9.796       .000       .563       .846
       .000       .604       .048     12.557       .000       .509       .698
      1.111       .503       .063      7.942       .000       .378       .628

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.


 DATA LIST FREE/
    Q3         Q16        Q5         .
 BEGIN DATA.
      -1.036     -1.111      3.317
        .000     -1.111      4.047
       1.036     -1.111      4.777
      -1.036       .000      3.561
        .000       .000      4.186
       1.036       .000      4.811
      -1.036      1.111      3.804
        .000      1.111      4.325
       1.036      1.111      4.846
 END DATA.
 GRAPH/SCATTERPLOT=
  Q3       WITH     Q5       BY       Q16      .
```

```
****************** DIRECT AND INDIRECT EFFECTS OF X ON Y *****************

Conditional direct effect(s) of X on Y:
        Q16     Effect         se          t          p       LLCI       ULCI
     -1.111       .704       .072      9.796       .000       .563       .846
       .000       .604       .048     12.557       .000       .509       .698
      1.111       .503       .063      7.942       .000       .378       .628

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 Q3          ->    PBC         ->    Q5

        Q16     Effect     BootSE   BootLLCI   BootULCI
     -1.111       .068       .036       .010       .149
       .000       .055       .029       .008       .120
      1.111       .041       .028       .002       .108

      Index of moderated mediation:
         Index     BootSE   BootLLCI   BootULCI
Q16      -.012       .013      -.042       .010
---


************************ ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

W values in conditional tables are the mean and +/- SD from the mean.

NOTE: The following variables were mean centered prior to analysis:
          Q16      Q3

------ END MATRIX -----
```