*Journal of Infrastructure, Policy and Development* 2024, 8(x), 7231.
https://doi.org/10.24294/jipd.v8ix.7231

Article

# Crossing the willingness-behavior gap: A study of factors influencing the e-commerce selling behavior of cherry farmers

**Yiming Song[1], Jie Han[2,*], Zhenjie Li[3,*], Cem Işık[4,5,6,7], Renyan Long[8]**

[1] School of Economics and Management, Yantai Nanshan University, Yantai 265713, China
[2] School of Economics and Management, China University of Geosciences, Wuhan 430078, China
[3] School of Economics and Management, Yantai University, Yantai 264003, China
[4] Department of Economics, Faculty of Economics and Administrative Sciences Anadolu University, Eskişehir 26470, Turkey
[5] Faculty of Tourism, Atatürk University, Erzurum 25240, Turkey
[6] Clinic of Economics, Azerbaijan State University of Economics (UNEC), Baku AZ1001, Azerbaijan
[7] Economic Research Center (WCERC), Western Caspian University, Baku 1001, Azerbaijan
[8] School of Modern Logistics, Guangzhou Panyu Polytechnic College, Guangzhou 511483, China
*** Corresponding authors:** Jie Han, hanjie@cug.edu.cn; Zhenjie Li, Ytmysky@163.com

**CITATION**

Song Y, Han J, Li Z, et al. (2024). Crossing the willingness-behavior gap: A study of factors influencing the e-commerce selling behavior of cherry farmers. Journal of Infrastructure, Policy and Development. 8(x): 7231. https://doi.org/10.24294/jipd.v8ix.7231

**ARTICLE INFO**

Received: 19 June 2024
Accepted: 15 July 2024
Available online: xx xx 2024



**Abstract:** In the realm of evolving e-commerce sales channels, the e-commerce sale of agricultural products has become a vital avenue for cherry farmers. However, a notable discrepancy exists between the intentions and actual behaviors of cherry farmers regarding e-commerce participation. In this study, binary logistic regression and interpretive structural model were used, and the cherry producing area of Yantai City, Shandong Province, China, was taken as the study area, and a total of 501 actual valid questionnaires were returned, and the validity rate of the questionnaires was 95.1 per cent. The results of the study show that the deviation of cherry farmers' willingness and behavior is mainly affected by age, frequency of online shopping, whether to participate in e-commerce training, and whether to join a cooperative in farmers' individual characteristics, revenue expectations and profit expectations in behavioral attitudes, government publicity and neighborhood effects in subjective norms, e-commerce use in perceived behavioral attitudes, the number of agricultural population in household resource endowment and logistics costs and e-commerce training in external scenarios Impact. On this basis, the 11 influencing factors are analyzed in depth and three transmission paths are analyzed. The study further proposes recommendations to enhance the translation of cherry farmers' e-commerce intentions into action, such as bolstering e-commerce promotion, increasing the frequency of training, improving supporting infrastructure, and reducing logistics costs.

**Keywords:** cherry farmers; e-commerce; willingness-behavior deviation; Interpretive Structural Modeling（ISM）

## 1. Introduction

Since 2014, the Chinese government has consistently underscored the significance of agricultural e-commerce to the rural economy over nine consecutive years, coupled with a sustained increase in support for rural e-commerce initiatives. Enhancements to the rural logistics system have facilitated the flow of industrial products to rural areas, expanding consumer choices for farmers. Concurrently, advancements in agricultural e-commerce platforms have stimulated the upstream development of agricultural products, contributing to a rise in farmers' incomes (Li et al., 2022a; Su et al., 2021). Relevant data shows that in 2023, the national e-tailing of agricultural products reached 587.03 billion yuan, an increase of 12.5% over the

previous year. However, fresh food e-commerce sales constitute a mere 14.82% of total sales (51.972 billion yuan), suggesting substantial untapped potential in this sector (Su et al., 2021). Alibaba's agricultural e-commerce report highlights that, as the leading platform, its online sales of agricultural products totaled 397.5 billion yuan in 2020, reflecting a 27% year-on-year increase. Notably, during the 2020 COVID-19 pandemic, the e-commerce platform played a pivotal role in alleviating the sales slump of agricultural products, showcasing its resilience in times of crisis (Zhang et al., 2023). On a global scale, rural e-commerce has emerged as a vital channel for marketing agricultural products (Liu et al., 2021), with its evolution aiding in boosting sales volumes (Kim et al., 2022) and augmenting farmer incomes (Lorca et al., 2019). Despite these advancements, the interface between smallholder farmers and extensive markets in rural China remains impeded (Cui et al., 2019). Although smallholder farmers generally hold optimistic expectations for high earnings through e-commerce sales, a considerable gap exists between their intentions and actual engagement in the process.

Scholars have ventured into various fields to investigate the factors influencing the divergence between willingness and behavior, encompassing organic fertilizer application, ecological farming, waste segregation, and land transfer (Li et al., 2023a; Li et al., 2021a; Wang et al., 2011; Zhang et al., 2022). These studies have revealed disparities in the factors influencing the gap between intentions and behaviors, with hierarchical analysis offering insights into the logical connections among these factors. In the realm of consumer e-commerce purchases of vegetables, research has pointed to individual characteristics, family traits, e-commerce perceptions, quality perceptions, external factors, and subjective norms as determinants of willingness, behavior, and the alignment between the two (Li et al., 2020). Studies focusing on farmers' inclination or actions to sell agricultural products via e-commerce have examined how personal and familial attributes, along with rural resource endowments, influence their participation in e-commerce (Zhang et al., 2021). Wang et al. (2024) discovered that social capital positively influences farmers' e-commerce entrepreneurial actions, with higher levels of education among farmers intensifying the impact of social networks on such entrepreneurial behaviors(Wang et al., 2024). Furthermore, factors such as the age of the household head, educational level, family size, health status, leadership roles in the village, entrepreneurial experience, and cultivated land area also bear upon the decision of farmers to utilize e-commerce for product sales (Li et al., 2021a). In essence, the transition from farmers' willingness to engage in e-commerce sales of fresh agricultural products to their ultimate actions is a complex process from awareness to acceptance, influenced by numerous factors and potentially leading to a misalignment between willingness and behavior.

Existing research findings offer valuable insights for examining the gap between farmers' willingness and actions in selling fresh agricultural products via e-commerce. Nevertheless, there is ample room for further exploration. Prior studies have predominantly concentrated on either the willingness or actions of farmers in e-commerce, with less focus on the interplay between the two. There is a scarcity of research on the divergence between the willingness of farmers to sell fresh agricultural products via e-commerce and their actual conduct. Additionally, while most studies have examined agricultural e-commerce in a broad sense, fewer have delved into

segmented studies based on different agricultural product categories. Considering the distinct external factors and variability across regions and product types, such segmented studies can more precisely capture the nuances in farmers' demands for e-commerce sales. Lastly, while the Theory of Planned Behavior has been the cornerstone for most existing studies, there is a dearth of research integrating this theory with the Attitude-Behavior-Situation Theory. Moreover, logistic models are frequently employed in empirical analyses to identify factors contributing to the will-behavior gap; however, these models tend to focus on the factors themselves rather than an in-depth examination of their interrelationships and hierarchical structures. The current research findings indicate that, with strong governmental backing, farmers generally exhibit a high willingness to sell agricultural products via e-commerce, yet their actual participation falls short. Therefore, analyzing the differences between farmers' willingness and actions in e-commerce sales of agricultural products and identifying the factors hindering farmers' transformation from willingness to actions are conducive to the formulation of relevant policy recommendations and measures by the local government to improve the inconsistency between farmers' willingness and actions in e-commerce sales of fresh agricultural products, which will in turn effectively and efficiently promote the transformation of farmers' e-commerce willingness to e-commerce behaviors, increase the incomes of farmers, improve the competitiveness of regional fresh agricultural products, and enhance the value of the brand, which is of great significance for the realization of China's rural revitalization.

Based on the above considerations, this study takes 501 Yantai cherry farmers as the research object, combines the theory of planned behavior and the attitude-behavior-situation theory, and constructs an econometric model to systematically analyse the various factors affecting farmers' e-commerce sales willingness and behavior deviation in terms of their e-commerce sales willingness and behavior from the theory of planned behavior and attitude-behavior-situation theory. The Interpretative Structural Model (ISM) method is further used to analyse in depth the interrelationships and hierarchical structure among these factors, aiming to provide policy recommendations and measures to assist local governments in improving farmers' e-commerce sales of fresh agricultural products, increasing farmers' e-commerce sales participation rate, and effectively and efficiently promoting farmers' e-commerce sales willingness to be transformed into action.

This study introduces the following innovative points in the field of research on the e-commerce sales behavior of cherry farmers: Firstly, we innovatively integrate the Theory of Planned Behavior (TPB) with the Attitude-Behavior-Situation (ABS) theory, focusing on the e-commerce sales of cherry farmers to address the gap between intention and behavior, filling a research void. Secondly, we have constructed a refined multidimensional analytical framework that comprehensively assesses the individual characteristics, behavioral attitudes, subjective norms, perceived behavioral control, household resource endowments, and external situational factors affecting the e-commerce sales behavior of cherry farmers. Additionally, we applied binary logistic regression and Interpretive Structural Modeling (ISM), providing a new methodological perspective to deeply explore the hierarchical structure and interplay of influencing factors. Our empirical research deeply analyzes the e-commerce sales behavior of cherry farmers, identifying key factors affecting the consistency between

intention and behavior. Concurrently, we propose specific policy recommendations aimed at facilitating the realization of cherry farmers' e-commerce sales intentions through enhanced e-commerce training and improved infrastructure. Lastly, the dual contributions of this study lie in not only providing new theoretical insights for the academic community but also offering valuable guidance for the practical application of e-commerce in agriculture, with significant social and economic implications.

The subsequent sections of this paper are organized as follows: the second section presents the theoretical analysis; the third section reviews the literature; the fourth section details the data sources, model construction, and variable selection; the fifth section discusses the empirical results; and the sixth section concludes the paper.

## 2. Literature review

Recognizing that farmers' participation in e-commerce can increase their incomes, reduce poverty, and improve their quality of life (Huang et al., 2020), the development of e-commerce in China's rural areas holds great significance. However, fewer studies focus specifically on farmers' willingness to engage in e-commerce sales and the behavioral deviations involved, while more research exists on related indirect aspects. These studies can be categorized into three main areas.

### 2.1. Study on the development of e-commerce for fresh agricultural products

In recent years, e-commerce has expanded from urban centers to rural areas in China, with many rural areas experiencing remarkable growth rates in e-commerce (Peng et al., 2021). E-commerce development in rural and remote areas is seen as a tool to eradicate poverty. Analyses of e-commerce development status in these areas reveal that progress remains uneven across different regions (Li et al., 2021b; Karine, 2021). While the overall growth of e-commerce sales has been rapid, the online sales of fresh produce still lag behind (Park et al., 2021).

The COVID-19 pandemic and advancements in cold chain technology have significantly accelerated the fresh food e-commerce industry (Zhang, 2023). The government has introduced various policies to support agricultural development, promote the upgrading of the agricultural industry, and actively encourage the development of rural e-commerce (Li et al., 2021c). Farmers' choice of sales channels for fresh agricultural products directly impacts their income, playing a crucial role in stabilizing the supply of these products (Zhang et al., 2017).

Although studies have been conducted to explore the application of e-commerce in the sale of agricultural products, research on the choice of e-commerce sales channels for fresh agricultural products and their impact on farmers' income and supply chain stability is still limited. This study aims to fill this gap by providing theoretical and practical guidance for rural e-commerce policy formulation and farmer participation enhancement by analysing the differences between e-commerce sales willingness and behavior.

### 2.2. Influencing factors of farmers' e-commerce sales willingness and behavior

Existing research identifies factors influencing farmers' willingness or behavior regarding e-commerce sales, broadly categorized into internal and external factors.

Internal factor includes individual characteristics, family situations, levels awareness, resource endowments, technology usability, and perceived behavioral control. Farmers' individual traits, experiences, and family contexts shape their perceptions of e-commerce, significantly impacting their behavior to engage in it (Zheng et al., 2024). Higher levels of e-commerce awareness and resource endowments facilitate easier adoption of e-commerce sales (Lin et al., 2021). Knowledge of e-commerce also critically affects farmers' decision-making behaviors (Mican et al., 2020). Increased internet use and higher risk tolerance enhance farmers' willingness to participate in e-commerce (Ma et al., 2020).

External factors include Infrastructure, logistics conditions,e-commerce training, social capital, government policies, brand building, and transaction costs. Infrastructure elements, such as express logistics points and road accessibility, significantly impact farmers' marketing method choices (Li et al., 2022b; Yang et al., 2021). Farmers' entrepreneurial experience and e-commerce training positively affect their e-commerce behavior (Zeng et al., 2019). Mass communication channels and organizational communication channels are also influential (Fecke et al., 2018). Social capital expands farmers' access to information, significantly enhancing their e-commerce sales behavior (Qiao et al., 2024). Strong government support for rural e-commerce correlates with more active participation by e-commerce operators (Chen et al., 2024). Researchers also highlight the critical role of infrastructure and policy support in farmers' e-commerce sales (Beckman et al., 2022). E-commerce participation improves farmers' price search capabilities, reducing transaction costs (Leong et al., 2016).

## 2.3. The relationship between willingness and behavior

There are fewer studies directly exploring the relationship between farmers' willingness to engage in e-commerce and their actual behavior, but research in other domains provides relevant insights. This research can be divided into two areas:

Studies investigate how well intentions translate into behavior. For instance, analyzing the consistency between customers' willingness to purchase eco-friendly products and their actual behavior reveals that the shopping context, consumption planning, and control significantly influence this consistency (Grimmer et al., 2017). Analyzing the influencing factors affecting farmers' willingness, behavior, and willingness-behavior consistency to adopt PV agriculture, perceived usefulness and technical training had a significant positive effect on farmers (Li et al., 2020).

Research examines why willingness may not translate into behavior, highlighting deviations or discrepancies. Studies on inconsistent purchasing behavior, both in self-purchase and gift-purchase intentions, show that initial strong purchase intentions can wane (Knuth et al., 2021). Individual characteristics, family characteristics, perceptions, and information channels of kiwifruit growers affect the translation of intentions into actual adoption behavior, as well as generational differences between the new and older generations of kiwifruit growers (Dong et al., 2024). Discrepancy exists between farmers' willingness and action on energy-efficient tricycles,

influenced positively by age, village cadre status, and residence topography. Ignoring this could lead to flawed policy decisions (Qiu et al., 2022).

The existing literature reveals the complexity of the relationship between farmers' willingness to participate in e-commerce and their behavior. However, research in the specific area of e-commerce for fresh produce remains insufficient. In particular, more research is needed to gain a deeper understanding of the specific factors that influence the translation of farmers' willingness to participate in e-commerce into behavior, and how these differences can be reduced through policy interventions.

## 3. Theoretical analysis

Based on the assumption of rational economic behavior among farmers, economists like Schultz argue that farmers act in accordance with the rational economic man model, aiming to maximize profits. The Attitude-Behavior-Situation (ABS) theory posits that both attitudes and situational factors jointly influence behavior. Unlike the Theory of Planned Behavior (TPB), the ABS theory emphasizes the fundamental role of attitudes in human behavior under certain conditions and highlights the impact of situational factors on behavior.

Attitudes do not always translate into expected behaviors because a series of external situational factors can interfere with behavior. Farmers' participation in e-commerce sales is a type of investment behavior (Yang et al., 2021), where they consider the input-output ratio to maximize profits. Farmers develop a willingness to participate in e-commerce sales with the goal of maximizing family income. Since e-commerce sales typically offer higher profit margins compared to traditional sales, many farmers are willing to engage in e-commerce. Some farmers successfully transform this willingness into actual behavior, demonstrating the alignment between their willingness to sell via e-commerce and their actions.

However, this willingness does not always materialize into behavior. Factors such as farmers' own capabilities, household resources, behavioral attitudes, subjective norms, perceived behavioral control, and external situational factors influence this transformation (Turner, 2016). If farmers' cognition and external environmental factors are insufficient to support the corresponding participation behavior, they will exhibit lower demand and engagement.

Existing research extensively explores the factors influencing farmers' willingness and behavior in e-commerce sales. These influencing factors do not operate independently; instead, they overlap. The interaction of multiple influencing factors can hinder the transformation of farmers' willingness to engage in e-commerce sales into actual behavior.

This study employs the TPB and ABS theories to construct a theoretical model, analyzing the current state of e-commerce sales of Yantai cherries. The model considers six main factors: individual characteristics, behavioral attitudes, subjective norms, perceived behavioral control, family resource endowment, and external situational factors. These factors are used to analyze the determinants of cherry farmers' e-commerce sales willingness and behavioral deviations. The theoretical analysis framework is depicted in **Figure 1**.

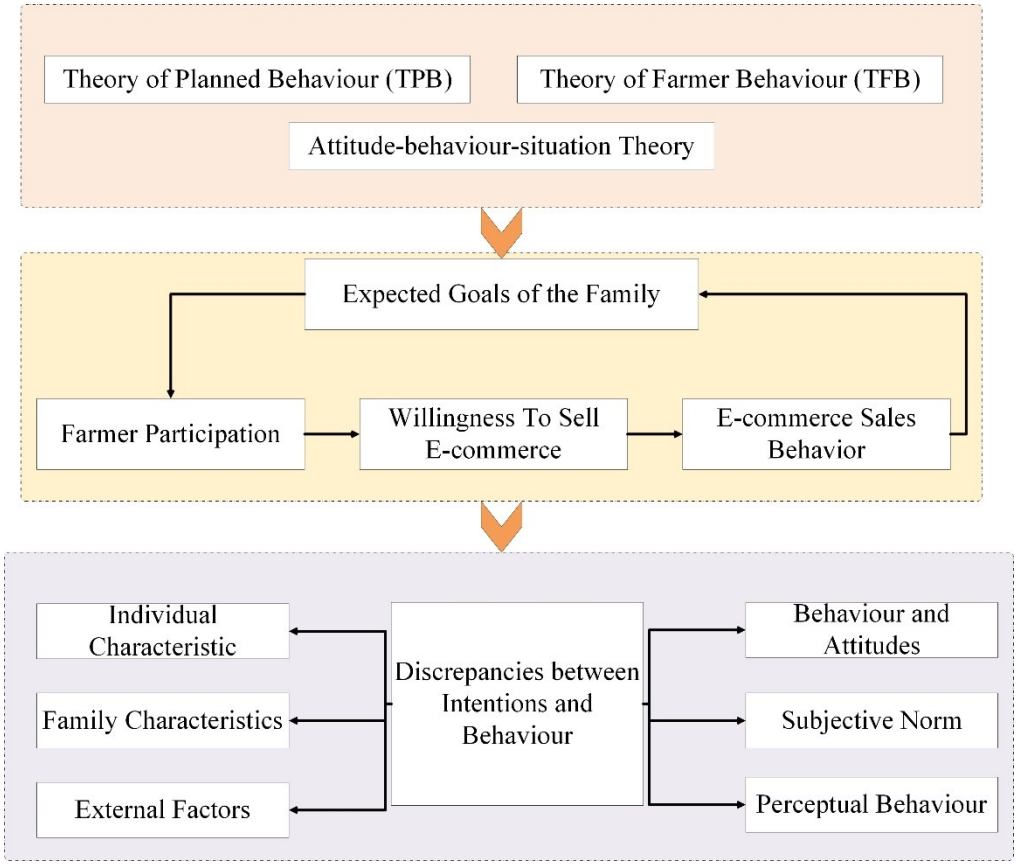


**Figure 1.** Theoretical analysis framework diagram.

### 3.1. The effect of individual characteristics on cherry farmers' e-commerce selling willingness and behavior

Farmers' willingness to engage in e-commerce sales stems from personal choices and is significantly influenced by their individual characteristics. These characteristics can lead to varying degrees of willingness and behavior in e-commerce participation, creating a gap between intent and action. In this study, factors such as gender, age, education level, frequency of online shopping, e-commerce training experience, and cooperative membership are used to describe farmers' individual characteristics (Song, 2016; Zheng et al., 2024).

Individual traits like gender, age, and education level affect farmers' capacity to access and process information, which subsequently influences their willingness and behavior to sell through e-commerce. For instance, younger and more educated farmers might be more adept with Internet technology and thus more inclined to sell agricultural products on e-commerce platforms (Schwering et al., 2022). Higher frequency of online shopping reflects greater acceptance and familiarity with e-commerce, likely facilitating their participation in e-commerce sales (Schwering et al., 2022).

Moreover, farmers who have undergone e-commerce training acquire knowledge through learning exchanges, enhancing both their e-commerce operational skills and their willingness to try e-commerce sales (Karine et al., 2021). Conversely, farmers who are members of cooperatives may show less inclination to sell their agricultural

products through e-commerce channels, as these cooperatives often provide stable sales channels and price guarantees (Chen et al., 2023).

### 3.2. The effect of behavioral attitudes on cherry farmers' e-commerce selling willingness and behavior

Behavioral attitudes, which encompass individuals' perceptions and evaluations of specific behaviors, significantly impact farmers' participation in e-commerce (Lee, 2013). These attitudes directly influence the willingness to act and indirectly affect actual participation. When farmers perceive that engaging in e-commerce for fresh produce will result in income growth, they develop a positive attitude towards e-commerce sales. This positive attitude facilitates the transformation of their willingness to sell into actual behavior. Conversely, negative attitudes can impede this transformation, leading to a discrepancy between willingness and behavior.

Additionally, farmers' tolerance for risk is a crucial factor influencing their e-commerce sales behavior (Li et al., 2021d). Those with higher risk tolerance are more likely to participate in e-commerce sales and manage the uncertainties involved more effectively. In this study, behavioral attitude variables are characterized by evaluating farmers' expectations regarding returns, profits, and risks. This assessment provides a deeper understanding of the relationship between farmers' willingness to engage in e-commerce sales and their actual behavior.

### 3.3. The effect of subjective norms on cherry farmers' e-commerce selling willingness and behavior

Subjective norms refer to the social pressure individuals feel when making behavioral decisions (Hwang, 2010). This social pressure significantly impacts farmers' participation in e-commerce sales. Farmers' actions are influenced not only by their personal intentions but also by the expectations of friends and family (Quintal, 2010). When considering e-commerce sales, individuals often feel pressure from family members or significant others (Khan et al., 2019). The involvement of neighbors in e-commerce particularly boosts farmers' motivation to participate (Wang et al., 2023).

Moreover, in rural areas, policy advocacy plays a crucial role in fostering a favorable environment for e-commerce development (Chen et al., 2019). This study assesses the influence of subjective norms on cherry farmers' willingness and behavior in e-commerce sales by examining factors such as neighborhood effects and government publicity.

### 3.4. The effect of perceived behavioral control on cherry farmers' e-commerce selling willingness and behavior

Perceived behavioral control encompasses individuals' perceptions of the constraints, such as time, effort, and experience, required to perform a specific behavior, as well as their judgments about how controllable these conditions are (Nguyen et al., 2015). The perception of technology plays a critical role in influencing e-commerce sales behavior (Li et al., 2023b). Farmers who find e-commerce technology easy to use tend to have a stronger willingness to sell agricultural products

online and are more likely to convert this willingness into actual behavior. Conversely, if farmers perceive e-commerce technology as difficult to master, this perception may obstruct their willingness to engage in e-commerce sales.

Additionally, knowledge of e-commerce policies significantly affects farmers' willingness and behavior regarding e-commerce sales. The more farmers understand e-commerce policies, the better they can make informed decisions about participating in e-commerce based on personal judgment (Gao et al., 2024). Active support policies for e-commerce are instrumental in transforming the willingness to sell into actual behavior. Furthermore, government policies interact with farmers' basic characteristics to shape their willingness and participation behavior (Ma et al., 2024).

### 3.5. The impact of household resource endowment on cherry farmers' e-commerce selling willingness and behavior

Household resource endowments, such as agricultural area, annual income, and number of laborers, significantly influence farmers' willingness to participate in e-commerce sales, with a positive correlation observed between these factors. Smaller-scale households and those with lower initial incomes may benefit more from engaging in e-commerce sales (Li et al., 2021d). E-commerce sales of agricultural products involve not only picking and shipping but also sorting, packaging, and pre-sale and after-sale services, requiring additional labor. A larger family size typically provides richer human resources, facilitating the conversion of e-commerce selling willingness into actual action.

Conversely, farmers with larger planting areas might prefer traditional large-scale sales channels to quickly sell their products, especially given the seasonality and perishability of fresh produce (Sheng et al., 2020). Moreover, there is a positive relationship between average annual net income and the adoption of e-commerce selling behavior. Higher household income levels increase the likelihood of transforming e-commerce selling willingness into actual behavior (Zheng et al., 2016).

### 3.6. The effect of external situational factors on cherry farmers' e-commerce selling willingness and behavior

External situational factors significantly influence individual behavioral choices, particularly when personal attitudes alone are insufficient to drive behavior. A supportive external environment can notably encourage e-commerce participation. Key infrastructure elements, such as network configuration, transportation distance, and transportation difficulty, are crucial in determining farmers' preferred agricultural marketing methods (Luo et al., 2019). Inadequate infrastructure can impede the conversion of farmers' willingness to engage in e-commerce into actual behavior.

For fresh agricultural products, maintaining freshness and ensuring timely delivery are critical. The cost of local logistics is a significant factor influencing farmers' decisions to participate in e-commerce (Zhang et al., 2019). High logistics costs can deter farmers from adopting e-commerce sales channels. Additionally, the frequency of e-commerce training is an important external situational factor affecting farmers' e-commerce behavior. Regular participation in e-commerce training allows farmers to interact with e-commerce professionals and experienced peers, thereby

acquiring more expertise and increasing the likelihood of engaging in e-commerce sales (Li et al., 2024).

## 4. Data and model construction

### 4.1. Data sources

Yantai large cherry production area planting area of 110,000 acres, accounting for 20% of the national planting area, is one of the world's few large cherry gold production area. In recent years, the development of Yantai's large cherry industry has made remarkable achievements, e-commerce development and construction of four town-level service centres, the cumulative development of 60 village-level service stations, the cultivation of 10 village Tao demonstration sites, and the average annual sales through e-commerce exceeded 800 million yuan. Based on this, this study takes the Fushan large cherry production area in Yantai City, Shandong Province as the research area, and in order to ensure the representativeness of the samples, this study adopts the stratified sampling method to select the samples. Firstly, five townships (streets) planting cherries were randomly selected from the Yantai large cherry production area, then three to five villages were randomly selected from the townships, and another 15–25 farmers were selected from the selected villages. Finally 527 questionnaires from farmers were retrieved, 26 invalid questionnaires were excluded, and 501 valid questionnaires were actually obtained, with an effective rate of 95.1%. The distribution of the total sample is shown in **Table 1**:

Structured questionnaires and face-to-face interviews were used to obtain personal characteristics (e.g., age, gender, education, etc.), behavioral attitudes (return expectations, risk expectations, profit expectations), subjective norms (government publicity, neighbourhood effects), perceived behavioral controls (network skills, policy support, e-commerce use), household resource endowments (number of people engaged in agriculture, area of cultivated agricultural products, annual household income), external information on situational factors (infrastructure, logistics costs, logistics distance, e-commerce training).

**Table 1.** Distribution of the total sample.

| Research area | Total number of samples (persons) | Effective sample size (persons) | Effective rate (percent) |
|---|---|---|---|
| DT Town | 138 | 135 | 97.5% |
| ML Town | 111 | 105 | 94.6% |
| GT Town | 90 | 87 | 96.6% |
| HL Town | 120 | 105 | 87.5% |
| ZZ Town | 68 | 67 | 98.5% |
| Total | 527 | 501 | 95.1% |

Source: Based on research data.

### 4.2. Variable selection

#### 4.2.1. Selection and assignment of explanatory variables

The explanatory variables examined in this study are cherry farmers' e-commerce willingness, behavior, and willingness-behavior deviation study, all of which are a typical binary problem, and are assigned values of 1 and 0, respectively. if cherry farmers have e-commerce sales willingness, it is assigned the value of 1, and if they do not have the value of 0. If cherry farmers have e-commerce sales behavior is assigned as "1", if not assigned as "0". If cherry farmers have e-commerce sales willingness under the premise of e-commerce sales behavior also exists, the value is assigned as "1". If cherry farmers only have e-commerce sales willingness but do not pay e-commerce sales action, assigned a value of "0".

### 4.2.2. Explanatory variable selection and assignment

Based on theoretical analysis and related literature, the explanatory variables for analyzing farmers' e-commerce willingness and behavioral deviation include individual characteristics, behavioral attitudes, subjective norms, perceived behavioral control, household resource endowment, and external situational factors. These factors are subdivided into 21 secondary indicators. The variable assignments and descriptions are provided in **Table 2** below:

**Table 2.** Variable assignment and description.

| Variable category | Variable name | Variable assignments and descriptions | Average (standard deviation) |
|---|---|---|---|
| Explanatory variable | E-commerce willingness | Willing = 1; unwilling = 0 | |
| | E-commerce behavior | With behavior = 1; without behavior = 0 | |
| | Deviation of willingness from behavior | Deviation = 1; No deviation = 0 | |
| Explanatory variable | | | |
| Individual characteristic | Sex | Male = 1; Female = 2 | 1.539(0.499) |
| | Age | Under 20 = 1; 20 to 30 = 2; 31 to 40 = 3; 41 to 50 = 4; 51 and over = 5 | 3.706(0.890) |
| | Educational | Primary schools and below = 1; Junior high school = 2; High school or post-secondary school = 3; University and above = 4 | 2.625(0.724) |
| | Internet shopping frequency | Never = 1; Largely never = 2; Occasionally = 3; Fairly often = 4; Very often = 5 | 3.395(0.996) |
| | E-commerce training | No = 0; Yes = 1 | 0.311(0.464) |
| | Membership in cooperatives | No = 0; Yes = 1 | 0.213(0.410) |
| Behavioral attitude | Income expectations | Agricultural e-commerce can increase returns: Strongly Disagree = 1; Quite Disagree = 2; Fairly = 3; Quite Agree = 4; Strongly Agree = 5 | 3.689(0.868) |
| | Risk expectation | Agricultural e-commerce poses a risk: Strongly Disagree = 1; Quite Disagree = 2; Fairly = 3; Quite Agree = 4; Strongly Agree = 5 | 3.078(0.795) |
| | Profit expectations | Participating in e-commerce sales of agricultural products can be more profitable: Strongly Disagree = 1; Quite Disagree = 2; Fairly = 3; Quite Agree = 4; Strongly Agree = 5 | 3.657(0.85) |
| Subjective norm | Government publicity | Government and social promotion of agricultural e-commerce has an impact on you: Strongly Disagree = 1; Quite Disagree = 2; Fairly = 3; Quite Agree = 4; Strongly Agree = 5 | 3.173(1.014) |
| | Neighbourhood effect | Neighbours' and friends' participation in e-commerce sales of | 3.375(0.918) |

| | | | |
|---|---|---|---|
| | | agricultural products has influenced you: Strongly Disagree = 1; Quite Disagree = 2; Fairly = 3; Quite Agree = 4; Strongly Agree = 5 | |
| Perceptual-behavioral control | Networking skill | Ability to master the online transaction process: Strongly Disagree = 1; Quite Disagree = 2; Fairly = 3; Quite Agree = 4; Strongly Agree = 5 | 3.156(1.005) |
| | Policy support | Relevant policies help to engage in agricultural e-commerce: Strongly Disagree = 1; Quite Disagree = 2; Fairly = 3; Quite Agree = 4; Strongly Agree = 5 | 3.228(0.993) |
| | E-commerce use | The threshold for selling agricultural products by e-commerce is low: Strongly Disagree = 1; Quite Disagree = 2; Fairly = 3; Quite Agree = 4; Strongly Agree = 5 | 3.078(0.898) |
| Household resource endowment | Agricultural population | 1 person or less = 1; 2 persons = 2; 3 persons = 3; more than 3 persons = 4 | 2.435(0.774) |
| | Planting area | Less than 3 acres = 1; 3 to 5 acres = 2; 3 to 8 acres = 3; more than 8 acres = 4 | 1.700(0.858) |
| | Annual family income | Below 10,000 RMB = 1; 10,000 to 30,000 RMB = 2; 30,000 to 50,000 RMB = 3; 50,000 to 100,000 RMB = 4; above 100,000 RMB = 5 | 3.184(0.962) |
| External situational factors | Infrastructure | The condition of the infrastructure in your village: Very imperfect = 1; rather imperfect = 2; fair = 3; rather perfect = 4; very perfect = 5 | 3.401(0.839) |
| | Logistics costs | What do you think of the local logistics costs: Very low = 1; relatively low = 2; average = 3; relatively high = 4; very high = 5 | 3.352(0.703) |
| | Logistics distance | Your distance to the logistics point: Very far = 1; relatively far = 2; average = 3; relatively close = 4; very close = 5 | 3.280(0.918) |
| | E-commerce training | How often you attend e-commerce training: Very low = 1; relatively low = 2; average = 3; relatively high = 4; very high = 5 | 1.784(0.990) |

## 4.3. Model construction

### 4.3.1. Logistic regression model construction

The focus of this study is to examine whether farmers' willingness and behavior to sell fresh produce via e-commerce deviates from the typical dichotomous choice question, i.e., whether there is deviation or not. Given that e-commerce sales willingness and behavioral deviation are influenced by multiple factors, the study employs a binary logistic regression model to analyze the influencing factors. The logistic regression model is formulated as follows:

$$Ln\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_{i1}X_{i1} + \beta_{i2}X_{I2} + \ldots + \beta_{in}X_{in} + \mu_i \quad (1)$$

In Equation (1): Pi is the probability that the e-commerce selling intention and behavior of the ith cherry farmer deviate from each other; $\beta_0$ is the intercept; $\beta_1$–$\beta_n$ is the regression coefficient of the independent variable,μi is the error term.

### 4.3.2. Interpretive structural modelling construction (ISM modelling)

The model was first proposed by (Warfield, 2007) and is mainly used to deal with complex system structure problems in the economy and society. The main purpose is to carry out hierarchical and correlation analyses of the influencing factors, so as to show the hierarchical relationship between the factors more clearly. Therefore, after clarifying the factors affecting cherry farmers' e-commerce sales intention and behavioral deviation, the ISM model can then be used to analyse the hierarchical and associative relationships between the influencing factors.

The main steps are as follows:

Firstly, it is assumed that there are N factors that have a significant effect on the cherry farmers' e-commerce sales willingness and behavioral deviation, denoting the farmers' e-commerce sales willingness and behavioral deviation of agricultural products, with ($i$ = 1, 2, ..., N) denotes the ith factor affecting the cherry farmers' e-commerce sales willingness and behavior deviation, where the elements constituting the adjacency matrix B .

The reachability matrix between factors can be calculated according to Equation (2):

$$M = (B+1)^{\lambda+1} = (B+1)^{\lambda} \neq (B+1)^{\lambda-1} \neq \ldots \neq (B+1)^{2} \neq (B+1) \quad (2)$$

I in equation. is the unit matrix, $2 \leq \lambda \leq K$, and the Boolean algorithm is used for power operations in the matrix.

The factors included from the highest to the lowest level are determined according to Equation (3):

$$L = \{S_i | P(S_i) \cap Q(S_i)\} = P(S_i) \quad (3)$$

In the equation i = 1, 2, ..., k. $P(S_i)$ is the reachable set, denoting the set of all factors that can be reached from the factor; $Q(S_i)$ is the prior set, which represents the set of all factors that can reach the factor. The elements contained in the highest layer L1 are obtained, removing the rows and columns corresponding to the highest level L1 in the reachable matrix. After obtaining the new matrix M1, the above is repeated to obtain L2, and so on until the bottom contained element is reached.

A rearranged reachability matrix is obtained according to the order of the elements of the hierarchy,the factors in the same and adjacent layers are then connected using the interrelationships between the influencing factors, thus obtaining a hierarchical structure between the factors influencing the e-commerce sales willingness and behavioral deviations of the cherry farmers.

## 5. Empirical results

### 5.1. Cross-tabulation analysis

Preliminary assessment of the Yantai cherry production area farmers' e-commerce willingness and behavior of the paradox situation through cross-analysis (**Table 3**). From the actual research, cherry farmers' participation willingness and behavior are divided into four categories: willingness to have behavior, willingness to have no behavior, no willingness to have behavior and no willingness to have no behavior. 135 cherry farmers have the willingness to participate in e-commerce and also participate in e-commerce behavior, 212 cherry farmers have the willingness to participate in e-commerce but do not participate in e-commerce behavior, 4 cherry farmers do not have the willingness to participate in e-commerce but do participate in e-commerce behavior, and 150 cherry farmers did not participate in e-commerce willingness and did not participate in e-commerce behavior. To sum up, the phenomenon of the deviation of farmers' e-commerce sales willingness and behavior in Yantai cherry producing area is more common, which has become a more obvious obstacle factor in the process of e-commerce sales in this region.

**Table 3.** Cross-tabulation of willingness and behavior.

| options | | Willingness to sell e-commerce | | Total |
|---|---|---|---|---|
| | | Willingness | Unwillingness | |
| Ecommerce sales practices | Participation | 135 | 4 | 139 |
| | Not Participation | 212 | 150 | 362 |
| Total | | 347 | 154 | 501 |

## 5.2. Regression results

This study conducted binary logistic regression analysis to examine the factors influencing the e-commerce sales willingness and behavior deviation of Yantai cherry farmers. The data of 347 farmers were processed using SPSS22, and the model results are presented in **Table 4**:

**Table 4.** Model regression results.

| Variable name | | B | S.E. | Wald | Df | *P*-value | Exp(B) |
|---|---|---|---|---|---|---|---|
| Individual characteristic | Sex | −0.477 | 0.440 | 1.175 | 1 | 0.278 | 0.621 |
| | Age | 0.459 | 0.269 | 2.914 | 1 | 0.088* | 1.582 |
| | Educational | −0.458 | 0.374 | 1.494 | 1 | 0.222 | 0.633 |
| | Internet shopping frequency | −0.580 | 0.276 | 4.419 | 1 | 0.036** | 1.786 |
| | E-commerce training | −0.872 | 0.458 | 3.618 | 1 | 0.057* | 0.418 |
| | Membership in cooperatives | −0.979 | 0.531 | 3.401 | 1 | 0.065* | 0.376 |
| Behavioral attitude | Income expectations | −0.585 | 0.279 | 4.381 | 1 | 0.036** | 0.557 |
| | Risk expectation | 0.353 | 0.259 | 1.859 | 1 | 0.173 | 1.423 |
| | Profit expectations | −0.927 | 0.328 | 7.963 | 1 | 0.005*** | 0.396 |
| Subjective norm | Government publicity | −0.562 | 0.284 | 3.906 | 1 | 0.048** | 0.570 |
| | Neighbourhood effect | −0.627 | 0.320 | 3.843 | 1 | 0.050** | 0.534 |
| Perceptual-behavioral control | Networking skill | −0.421 | 0.268 | 2.461 | 1 | 0.117 | 0.657 |
| | Policy support | −0.101 | 0.306 | 0.109 | 1 | 0.741 | 0.904 |
| | E-commerce use | −0.529 | 0.295 | 3.208 | 1 | 0.073* | 0.589 |
| Household resource endowment | Agricultural population | −0.751 | 0.292 | 6.629 | 1 | 0.010** | 0.472 |
| | Planting area | 0.266 | 0.242 | 1.202 | 1 | 0.273 | 1.304 |
| | Annual family income | −0.389 | 0.246 | 2.500 | 1 | 0.114 | 0.678 |
| External situational factors | Infrastructure | −0.402 | 0.258 | 2.425 | 1 | 0.119 | 0.669 |
| | Logistics costs | 0.757 | 0.318 | 5.666 | 1 | 0.017** | 2.132 |
| | Logistics distance | −0.358 | 0.229 | 2.448 | 1 | 0.118 | 0.699 |
| | E-commerce training | −0.479 | 0.247 | 3.764 | 1 | 0.052* | 0.619 |

### 5.2.1. The effect of individual characteristics on e-commerce sales willingness and behavior deviations of cherry farmers

The analysis of individual characteristics reveals significant effects on the deviation between e-commerce sales willingness and behavior among cherry farmers. Age emerges as a significant factor, with older farmers exhibiting a greater tendency for deviation. This finding suggests that older farmers may face challenges in adopting new technologies, hindering the translation of willingness into actual e-commerce

behaviors. Conversely, the frequency of online purchases demonstrates a negative association with deviation, indicating that farmers with a higher frequency of online transactions are more likely to align their willingness with behavior. Participation in e-commerce training also plays a crucial role, with non-participation resulting in a higher likelihood of deviation. Similarly, membership in cooperatives is associated with reduced deviation, highlighting the benefits of cooperative engagement in aligning willingness with behavior. These findings underscore the importance of considering individual characteristics, such as age, online purchasing habits, training participation, and cooperative membership, in promoting consistency between e-commerce sales willingness and behavior among cherry farmers.

#### 5.2.2. The effect of behavioral attitudes on cherry farmers' e-commerce sales willingness and behavior deviations

The analysis emphasizes the significant influence of behavioral attitudes on the deviation between e-commerce sales willingness and behavior among cherry farmers. Specifically, cherry farmers' earnings and profit expectations play pivotal roles in shaping this relationship. The findings reveal that more positive expectations regarding earnings and profits from e-commerce sales are associated with a reduced incidence of deviation, indicating a higher likelihood of aligning willingness with behavior. Conversely, negative expectations may lead to deviation, hindering the transformation of willingness into behavior. Farmers' attitudes toward earnings and profit expectations emerge as crucial determinants in driving the alignment between willingness and behavior in e-commerce sales endeavors. Cultivating positive attitudes toward earnings and profit expectations is essential for promoting consistency and minimizing deviation between willingness and behavior among cherry farmers engaged in e-commerce sales.

#### 5.2.3. The effect of subjective norms on cherry farmers' e-commerce sales willingness and behavior deviations

Government publicity emerges as a significant factor at the 5% level, with a negative coefficient of −0.562, indicating its substantial negative impact on cherry farmers' e-commerce sales willingness and behavior deviation. This suggests that government publicity plays a crucial role in promoting e-commerce sales behavior among cherry farmers, thereby facilitating a higher degree of alignment between willingness and behavior. Similarly, the neighborhood effect shows significance at the 5% level, with a negative coefficient of −0.627. This underscores the significant negative impact of neighborhood attitudes and experiences on cherry farmers' e-commerce sales willingness and behavior deviation. Positive or negative perceptions among neighbors and the success or failure cases of friends and relatives exert considerable influence on cherry farmers' decisions and judgments, influencing their willingness to engage in e-commerce sales behavior.

#### 5.2.4. The effect of perceived behavioral control on cherry farmers' e-commerce sales willingness and behavior deviations

The effect of e-commerce use exhibits significance at the 10% level, with a negative coefficient of −0.529. This indicates a significant negative impact of e-commerce use on cherry farmers' e-commerce sales willingness and behavior

deviation. Farmers who perceive e-commerce technology as easily accessible are more inclined to translate their willingness into specific e-commerce behaviors. Conversely, a higher perception of the difficulty of e-commerce use results in a lesser extent of transformation of willingness into behavior among cherry farmers.

#### 5.2.5. The effect of household resource endowment on cherry farmers' e-commerce sales willingness and behavior deviations

The number of agricultural populations show significance at the 5% level, with a negative coefficient of −0.751. This suggests a significant negative impact of the number of agricultural populations on cherry farmers' e-commerce sales willingness and behavior deviation. A lower number of labor force available for e-commerce sales, compared to traditional sales methods, reduces the likelihood of cherry farmers translating their willingness into e-commerce sales behaviors. Conversely, an increase in the number of labor force available enhances the alignment between willingness and behavior among cherry farmers.

#### 5.2.6. The effect of external situational factors on cherry farmers' e-commerce sales willingness and behavior deviations

Logistics costs exhibit significance at the 5% level, with a positive coefficient of 0.757. This indicates a significant positive effect of logistics costs on cherry farmers' e-commerce sales willingness and behavior deviation. Higher logistics costs pose a hindrance to cherry farmers' participation in e-commerce sales, particularly considering their relatively limited liquidity. Additionally, the effect of e-commerce training is significant at the 10% level, with a negative coefficient of −0.479. An increase in e-commerce training opportunities enhances cherry farmers' knowledge and perception of e-commerce sales, facilitating the transformation of e-commerce sales willingness into behavior.

### 5.3. Hierarchical analysis of influencing factors

The hierarchical analysis of influencing factors for cherry farmers' e-commerce sales willingness and behavioral deviation is structured based on the results of binary logistic regression (Participation in e-commerce training or not in individual characteristics is discarded here. Consider duplication with e-commerce training in external contextual factors). The system components, denoted as Si = (S1, S2, …, S11), encompass various factors including age, frequency of online shopping, cooperative membership, revenue expectations, profit expectations, government publicity, neighborhood effect, e-commerce use, number of agricultural population, logistic costs, and e-commerce training. These factors collectively determine the degree of cherry farmers' e-commerce sales willingness and behavior deviation.

Drawing from practical research and expert insights, the hierarchical logical relationship among these influencing factors is delineated in **Table 5**. In the table, "A" signifies that the column factor influences the row factor, "V" indicates that the row factor influences the column factor, and "0" denotes no discernible effect between the row and column factors. This hierarchical analysis provides a structured framework for understanding the interplay and relative importance of various factors shaping cherry farmers' e-commerce sales willingness and behavior deviation.

**Table 5.** Logic of influencing factors.

| A | A | A | A | A | A | A | A | A | A | A | $S_0$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | V | 0 | 0 | 0 | 0 | 0 | V | $S_1$ | |
| 0 | A | A | V | 0 | 0 | 0 | 0 | 0 | $S_2$ | | |
| V | 0 | 0 | V | 0 | 0 | 0 | 0 | $S_3$ | | | |
| 0 | A | 0 | 0 | V | V | 0 | $S_4$ | | | | |
| 0 | A | 0 | 0 | V | V | $S_5$ | | | | | |
| 0 | 0 | 0 | 0 | 0 | $S_6$ | | | | | | |
| 0 | 0 | 0 | 0 | $S_7$ | | | | | | | |
| A | 0 | 0 | $S_8$ | | | | | | | | |
| 0 | 0 | $S_9$ | | | | | | | | | |
| 0 | $S_{10}$ | | | | | | | | | | |
| $S_{11}$ | | | | | | | | | | | |

According to **Table 5**, the adjacency matrix between the influencing factors B is obtained (omitted), and based on Equation (2) and applying Matlab 7.0 the reachable matrix M is calculated as shown in **Figure 2**.

$$M=\begin{bmatrix}
1&0&0&0&0&0&0&0&0&0&0&0\\
1&1&1&0&0&0&0&0&1&0&0&0\\
1&0&1&0&0&0&0&0&1&0&0&0\\
1&0&0&1&0&0&0&0&1&0&0&1\\
1&0&0&0&1&0&1&1&0&0&0&0\\
1&0&0&0&0&1&1&1&0&0&0&0\\
1&0&0&0&0&0&1&0&0&0&0&0\\
1&0&0&0&0&0&0&1&0&0&0&0\\
1&0&0&0&0&0&0&0&1&0&0&0\\
1&0&1&0&0&0&0&0&1&1&0&0\\
1&0&1&0&1&1&1&1&1&0&1&0\\
1&0&0&0&0&0&0&0&1&0&0&1
\end{bmatrix}$$

**Figure 2.** Impact factor reachability matrix.

According to Equation (3), it is first determined to obtain = L1 = {S0}, Then according to the method of determining the other hierarchical factors in turn, we get L2 = {S6, S7, S8}, L3 = {S2, S4, S5, S11}, L4 = {S1, S3, S9, S10}.The sorted reachable matrix M* is obtained from L1, L2, L3, L4 as shown in **Figure 3**.

From the factors contained in L and the sorted reachability matrix M*, it can be seen that S0 is in the first level, S6, S7, S8 is in the second level, S2, S4, S5, S11 is in the third level, and S1, S3, S9, S10 is in the fourth level, forming a chain of factors with logical relationships. Connecting with directed arrows to get as in **Figure 4**, we get the hierarchical structure of the influencing factors on the deviation of e-commerce sales willingness and behavior of cherry farmers.

$$M^*=\begin{array}{c}
\begin{array}{cccccccccccc} & S_0 & S_6 & S_7 & S_8 & S_2 & S_4 & S_5 & S_{11} & S_1 & S_3 & S_9 & S_{10} \end{array}\\
\begin{bmatrix}
1&0&0&0&0&0&0&0&0&0&0&0\\
1&1&0&0&0&0&0&0&0&0&0&0\\
1&0&1&0&0&0&0&0&0&0&0&0\\
1&0&0&1&0&0&0&0&0&0&0&0\\
1&0&0&1&1&0&0&0&0&0&0&0\\
1&1&1&0&0&1&0&0&0&0&0&0\\
1&1&1&0&0&0&1&0&0&0&0&0\\
1&0&0&1&0&0&0&1&0&0&0&0\\
1&0&0&1&1&0&0&0&1&0&0&0\\
1&0&0&1&1&0&0&0&0&1&0&0\\
1&0&0&1&1&0&0&0&0&0&1&0\\
1&1&1&1&1&1&1&0&0&0&0&1
\end{bmatrix}
\end{array}$$

**Figure 3.** Re-arranged reachable matrix.

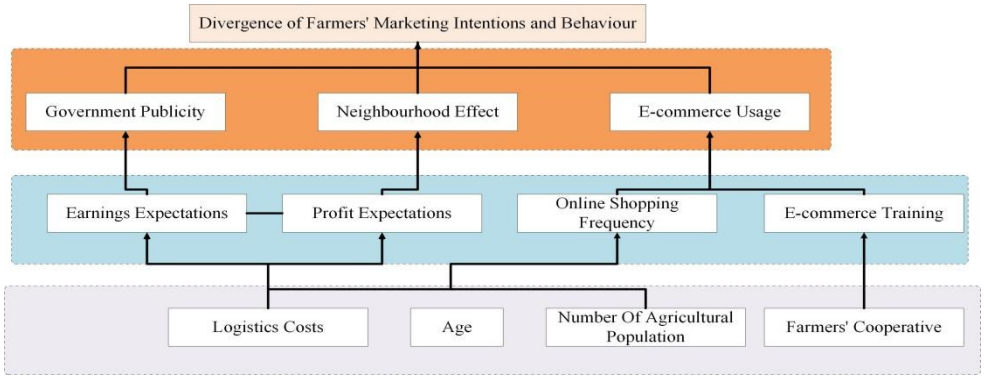


**Figure 4.** Explanatory structure of deviation.

Among the 11 dominant factors affecting the deviation of cherry farmers' e-commerce sales willingness and behavior, government publicity, neighborhood effect, and e-commerce use are surface-level direct factors. Revenue expectation, profit expectation, online shopping frequency, and e-commerce training are middle-level indirect factors, while logistics cost, age, number of agricultural population, and cooperative membership are deep-root factors. There are three main transmission paths:

Path 1: Logistics costs→revenue expectations, profit expectations→government publicity, neighborhood effects→cherry farmers' e-commerce sales willingness and behavior deviation. Fresh agricultural products like cherries have high added value, and e-commerce sales require extensive cold chain logistics, leading to high costs. When cherry farmers' revenue expectations minus logistics and other related costs yield lower profits than traditional sales channels, this affects their willingness to convert e-commerce intentions into actions. Government publicity and neighborhood effects also influence these expectations. In rural China, neighbors and friends significantly impact each other, so positive attitudes and expected results from neighbors regarding e-commerce sales facilitate the transformation of willingness into actual behavior. Conversely, inadequate government promotion and negative neighborhood expectations hinder this transformation, causing deviations.

Path 2: Logistics costs, age, number of people in agriculture → online shopping frequency→e-commerce use→cherry farmers' e-commerce sales willingness and behavior deviations. Logistics costs, age, and the number of agricultural population fundamentally affect online shopping frequency. Low or free logistics costs increase the number of online purchases. Older farmers are more conservative and less likely to adopt new purchasing methods like e-commerce. A higher number of agricultural population increases the needs of farming households, leading to more online shopping. Increased online shopping frequency enriches their experience, lowers the e-commerce sales threshold, and reduces the deviation between willingness and behavior.

Path 3: Cooperative membership→e-commerce training→e-commerce use→cherry farmers' e-commerce sales willingness and behavior deviation. Farmers' cooperatives, as new agricultural management entities, play a dynamic role in agricultural production. They serve as a bridge for small farmers to enter the larger e-commerce market. Cooperatives provide marketing solutions, technical guidance, and

more opportunities for continuous e-commerce training, helping farmers understand e-commerce processes and technologies comprehensively. This systematic training addresses problems encountered in e-commerce sales, promoting the transformation of willingness into behavior and reducing the deviation between cherry farmers' e-commerce sales willingness and behavior.

## 6. Conclusions and recommendations

This study aims to delve into the factors influencing the deviation between cherry farmers' e-commerce sales willingness and their actual behavior to effectively promote the conversion of their willingness into concrete actions. Through a literature review and framework analysis, the study constructs a relevant model and conducts empirical analysis focusing on farmers in Yantai's cherry-producing areas. The conclusions are as follows:

First, binary logistic analysis shows that age in individual characteristics and logistics cost in external situational factors have a significant positive effect on cherry farmers' e-commerce sales willingness and behavior deviation; frequency of online purchasing, whether to participate in e-commerce training, and whether to join cooperatives in individual characteristics, revenue expectation and profit expectation in behavioral attitudes, government publicity and neighbourhood effect in subjective norms, e-commerce use in perceived behavioral control, the number of agricultural people in household resource endowment, and e-commerce training in external situational factors all have a significant negative effect on cherry farmers' e-commerce sales willingness and behavior deviation.

Second, ISM Explanatory Structural Model Analysis: This analysis reveals the hierarchical structure and correlations between influencing factors. Surface-level direct factors include government publicity, neighborhood effects, and e-commerce use, while middle-level indirect factors include revenue expectations and profit expectations, and logistics costs, age, number of people in agriculture, and whether or not to join a co-operative were deep rooted factors.

Third, the main transmission paths. This section reveals the complex interactions among factors such as logistics costs, online shopping frequency and e-commerce training. The specific paths are as follows: logistics costs→revenue expectations, profit expectations→government publicity, neighbourhood effects→cherry farmers' e-commerce sales willingness and behavior deviations; logistics costs, age, number of people in agriculture→frequency of online purchases→e-commerce use→cherry farmers' e-commerce sales willingness and behavior deviations; whether or not to join a cooperative→e-commerce training→e-commerce use→cherry farmers' e-commerce sales willingness and behavior deviations.

In summary, this paper uncovers the internal mechanisms behind the deviation between cherry farmers' e-commerce sales willingness and behavior, providing an important reference for policy formulation to promote e-commerce sales among cherry farmers.

Based on the findings, the study makes the following recommendations:

1) Increase E-commerce Publicity and Encouraging New Farmers: The government should enhance publicity through diverse modes, combining traditional

and modern media, to raise awareness about the opportunities and advantages of e-commerce sales of fresh agricultural products. Additionally, cultivating open-minded and internet-savvy new farmers to serve as role models can encourage active participation and elevate psychological expectations among the broader farming community.

2) Enhance E-commerce Training and Encourage Cooperative Participation: Regular e-commerce training activities should be organized, inviting professionals and successful e-commerce entrepreneurs to share experiences. This will improve farmers' e-commerce operation skills and awareness. Encouraging farmers to join cooperatives for e-commerce sales can also be beneficial. Policy guidance and financial subsidies can promote e-commerce development within cooperatives, providing advanced e-commerce technology training and guidance.

3) Improve Supporting Facilities and Reduce Logistics Costs: The government should focus on enhancing external situational factors that hinder e-commerce sales. This includes investing in network infrastructure, accelerating rural broadband construction, optimizing logistics and distribution systems, and reducing logistics costs. Tax policies could attract more logistics companies to participate in the transportation of fresh agricultural products, thereby improving the logistics environment, streamlining channels at all levels, reducing farmers' sales costs, and promoting the circulation of fresh agricultural products through e-commerce.

Future studies should consider expanding the scope and diversifying methodologies. This includes strengthening the control and discussion of influencing factors, providing more specific and feasible policy recommendations, and integrating quantitative support and effect assessments with the actual situation to enhance the study's credibility and practicality.

**Author contributions:** Conceptualization, YS and ZL; methodology, JH; software, YS; validation, JH, ZL and Cml; formal analysis, YS; investigation, ZL; resources, JH; data curation, ZL; writing—original draft preparation, YS; writing—review and editing, JH; visualization, RL; supervision, Cml; project administration, JH; funding acquisition, YS. All authors have read and agreed to the published version of the manuscript.

**Conflict of interest:** The authors declare no conflict of interest.

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