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Nonlinear Diffusion Evolution Model of Unethical Behavior among Green Food Enterprise

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Abstract: Under the background of low-carbon economy, the unethical behavior of green food enterprises has aggravated the uncertainty and frequency of green food safety problems and even triggered a contagion of unethical behavior among green food enterprises. In view of this, considering the characteristics of organizational behavior, external environmental intervention and social networks, we construct an infectious disease model of the nonlinear spread of unethical behavior in green food enterprises and simulated the mechanism and evolution characteristics of the spread of unethical behavior among them. The main conclusions are as follows. (1) Single adjustment of the level of enterprise moral clarity, damage degree of unethical behavior, and enterprise influence can only reduce the diffusion probability of unethical behavior to a certain extent. (2) Enterprise ethical climate plays a crucial role in the diffusion of unethical behavior among green food enterprises and exerts a "strengthening effect" on other organizational behavior and external environmental intervention factors. (3) The strength of external supervision and strength of punishment exert a "suppression effect" on the diffusion of unethical behavior among green food enterprises.

Keywords: nonlinear evolution; unethical behavior; behavior diffusion; complex networks

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1. Introduction

In recent years, with the continual exposure of the Enron financial fraud, the GlaxoSmithKline commercial bribery, and other scandals, ethical crises in enterprises have occurred frequently worldwide. Moral and ethical issues of green food enterprises are transcending the traditional research category of philosophy, and unethical behavior has gradually become a common concern in the field of enterprise management theory and practice [1,2]. With the continuous development of green food, green food safety has gradually become the focus of attention [3–6]. Green food enterprise refers to enterprises in accordance with the scientific method to produce and process pollution-free safe, high-quality and nutritious foods. In product production, transportation, storage and packaging are pollution-free, and the entire production process contributes to pollution prevention [7,8]. Unethical behavior refers to the behavior that violates widely accepted social ethics and is not recognized by most people [9]. Many kinds of unethical behaviors are common, such as corruption, cheating on taxes and academic dishonesty. Unethical behaviors widely occur in various enterprises [10,11]. Moreover, unethical behavior diffuses easily [12], which can cause an adverse impact on the long-term performance of an enterprise and the sustainable development of society. Therefore, studying the influencing factors and evolution mechanisms of unethical behavior diffusion is necessary. Such knowledge can provide theoretical reference for the formulation of strategies to prevent and control the diffusion of unethical behavior.

Various researches have been conducted on the generation and diffusion of unethical behavior [13]. These studies are mainly carried out from three perspectives: organizational behavior, external environmental intervention and social network structure. In terms of organizational behavior, enterprises often fail to be completely rational in decision making due to various factors, which may result in behavioral deviations. Organizational behaviors include the micro-behavior of individuals within an enterprise (such as the level of individual moral clarity) and the overall macro-behavior of an enterprise (such as the enterprise management system and enterprise ethical climate) [14,15]. All of them can affect the diffusion of unethical behavior among enterprises [16].

Wiltermuth and Flynn [17] found that different individuals will make different ethical judgments when faced with the same situation, owing to their different behavioral ethical standards, which can affect the generation and diffusion of unethical behavior. Werbel and Balkin [18] confirmed the importance of management systems to the control of unethical behavior in workplaces. Organizational justice, which is an important part of a management system, can weaken the negative emotions of members, thus effectively controlling unethical behaviors [19]. In addition, the enterprise ethical climate is also an important factor that can affect the generation and diffusion of unethical behavior [2,20]. Gorsira et al. [21] found that employees of private enterprises generally believe that their ethical climate is biased toward egoism and they are likely to implement unethical behavior. According to the research above, the generation of unethical behavior is affected by various organizational behavior factors. Unethical behavior can also diffuse within the enterprise network under the influence of the herd effect, thus intensifying the effects of unethical behavior. Studies that only consider organizational behavioral factors are widely questioned and their scope of interpretation is limited; hence, scholars have begun to turn their research directions to the study of external environmental intervention factors [22].

In the aspect of external environmental interventions, Gino et al. [23] found that external supervision can stimulate team members' sense of guilt and collective honor and reduce the risk of collective immorality. In general, individuals must weigh benefits and penalties before implementing unethical behavior. When penalties are greater than benefits, people do not make unethical decisions [24]. In addition, the external competitive environment of enterprises can affect the generation and diffusion of unethical behavior. Li et al. [25] empirically analyzed the impact of competition on unethical decision-making through the data of 727 employees in Chinese hospitals. The results showed that competition orientation can influence employees' unethical decision making through the adjustment of relation conflict and hostile attribution bias. In a case study of Enron, Kulik et al. [12] found that unethical behavior likely diffuses among enterprises, which are in a fiercely competitive industry. The research perspective of external environmental intervention focuses on a wide range of factors and increases the intensity of theoretical interpretation. However, most of the research above is limited to static analysis, which is inconsistent with the dynamic characteristics of unethical behavior diffusion. Therefore, it is necessary to conduct research further.

In recent years, scholars have gained awareness that unethical behavior is a social phenomenon involving complex interactions of enterprises. This relationship is organically embedded in the social network. Therefore, the researches on the diffusion of unethical behavior from the perspective of social networks have become a hotspot. The main studies are as follows. Brass et al. [26] initially studied unethical behavior from the perspective of social networks and defined them as a set of actors with a certain degree of relevance. On the basis of this definition, they proposed that network relevance characteristics (relationship strength, multivariate relationship, asymmetric relationship, and status), network structural characteristics (structural holes, centrality, and network density), and their interactions have great impact on unethical behavior of individuals within a network. After [26], the study of the relationship between social network characteristics and unethical behavior has been expanded. Bizjak et al. [27] found that social networks

have an "infectious effect," which means that the network relationship may lead to a consistency of internal individuals' behavior. Sullivan et al. [28] found that network characteristics of enterprises may change when enterprises implement unethical behavior, which may reduce network cohesion. Brown et al. [29] studied the impact of social networks on the tax avoidance behavior of enterprises. The results show that tax avoidance behaviors can present a convergence effect among highly connected enterprises. Zuber [30] studied the transmission mechanism of unethical behavior among victims, perpetrators, and observers. The result reveals that social network relationships may change after unethical behaviors occur, thus having an indirect negative impact on enterprises. The research perspective of social networks considers dynamic factors, and its research premise is in line with the internal and external environment of enterprises. This type of research has greatly expanded the research pattern of unethical behavior.

However, most of the current articles on unethical behavior are from the perspective of organizational management, studying unethical behavior between leaders and employees [31–33]. For example, by integrating arguments from social identity and moral disengagement theories, Schuh et al. [31]. developed and tested a model to explain how leaders respond to unethical pro-organizational behavior (UPB) among employees. The results showed that leader perceptions of employee UPB were positively related to leader trust in employees when leaders identified strongly with their organization or when they had a strong propensity to morally disengage. Pablo et al. [32] examined personal growth satisfaction as a mediator and responsibility climate as a moderator of the relationship and found that personal growth satisfaction mediated the negative impact of unethical supervision on intention to stay. In terms of moderation, high responsibility climate weakened the negative relationship between unethical leadership and subordinates' personal growth satisfaction, as well as the indirect negative impact of unethical leadership on subordinates' intention to stay. However, from a corporate perspective, there are very few studies on the impact of unethical behavior by companies or organizations regarding consumers and society, and those are as follows:

Olofsson et al. [34] investigated the time-varying volatility and risk measures of ethical and unethical investments and found that ethical investments are less affected during global financial crises compared to unethical and conventional investments. Moreover, these studies do not delve into the change mechanism of the spread of unethical behavior in the process of elaboration, and at the same time, they do not take into account the evolutionary characteristics of the contagion of unethical behavior in green food enterprises under the current green economy conditions.

The current epidemic model that is based on a complex network is not only limited to the study of virus transmission but also widely used in the field of social science [35–37], such as technology and innovation diffusion [38], financial crisis contagion [39,40], and the spread of rumors [41,42]. The epidemic model provides the necessary technological means for solving social problems, and it also offers theoretical basis for devising coupling strategies. In addition, similar diffusion mechanisms are observed between behaviors and viruses. For example, they both diffuse among individuals through social connection in most cases, in which social connection is their diffusion medium [43]. In the environment of enterprises, a large number of physical contacts transmit various information and affect one another's behaviors. Once an unethical behavior is formed, it would bring additional benefits to the implementer and be imitated and learned by other enterprises under appropriate conditions. Therefore, the diffusion of unethical behavior among enterprises has many mechanisms similar to the spread of infectious diseases.

On the basis of the research above, unethical behaviors have adverse impact on enterprises and society. Without effective controlling, unethical behavior may be imitated by an increasing number of enterprises, and its negative effects will spread rapidly. Eventually, this spread will cause an irrational outbreak of unethical behavior [44]. If the unethical behavior of green food enterprises cannot be effectively controlled, the unethical behavior may be imitated by more and more enterprises, thus forming a contagion in the

enterprise network, resulting in the aggravation and spread of food safety problems. Therefore, in order to better formulate a reasonable and effective control of the unethical behavior of green food enterprises and the contagion of their unethical behavior, it is necessary to study the influencing factors and evolutionary mechanism of the spread of unethical behavior in depth. However, current researches have three main shortcomings. First, these studies are only conducted from a single perspective of organizational behavior, external environmental intervention, or social network structure, and they lack comprehensive consideration of the three perspectives above. Second, most of the existing researches are static research. They ignore the dynamic evolution characteristics of unethical behavior diffusion. Third, existing researches focus on the diffusion effect of unethical behavior within an enterprise, but they ignore the diffusion among enterprises. Finally, existing researches only focus on the diffusion effect of unethical behavior within ordinary enterprises, and ignore the diffusion effect of green food enterprises on unethical behaviors such as food safety.

In view of these shortcomings, this study analyzes the influencing factors of unethical behavior diffusion from the cross perspective of organizational behavior and organizational management. Based on the SIR epidemic model, a nonlinear diffusion evolution model of unethical behavior among green food enterprise is constructed. Organizational behavior, external environmental intervention, and social network characteristics are considered. Using MATLAB R2018a software, this study simulates the diffusion mechanisms and evolution characteristics of the diffusion of unethical behavior among green food enterprises. This study makes contributions in three ways. (1) Unlike existing studies that are only based on a single perspective, this study conducts research on the diffusion of unethical behavior among green food enterprise with the comprehensive consideration of organizational behavior, external environmental intervention, and social network characteristics. (2) This study analyzes the dynamic evolution characteristics of the diffusion of unethical behavior among green food enterprise, thus making the research conclusion realistic. (3) This study provides novel conclusions that have theoretical and practical application value: single adjustment of the level of enterprise moral clarity, damage degree of unethical behavior, and enterprise influence can only reduce the diffusion probability of unethical behavior to a certain extent. Even if the formulation of control strategies is based on their interaction, the diffusion remains unable to disappear. However, enterprise ethical climate plays a crucial role in the diffusion of unethical behavior among green food enterprises and exerts a "strengthening effect" on other organizational behavior and external environmental intervention factors.

The rest of this study is organized as follows. The second part analyzes the epidemic mechanisms of unethical behavior diffusion among green food enterprise. The third part constructs a nonlinear diffusion evolution model of unethical behavior among green food enterprise under the interaction of organizational behavior and external environmental intervention. The fourth part simulates the evolution characteristics of the diffusion of unethical behavior among green food enterprise and proposes strategies to prevent and control the diffusion of unethical behavior. The last part puts forward the conclusions.

2. Materials and Methods

In this paper, by analyzing the contagion mechanism of unethical behavior of green food enterprises, under the influence of organizational behavior and external environmental intervention factors, a model of the diffusion of unethical behavior of green food enterprises is constructed based on the epidemic model, and the model construction process is shown in Figure 1.

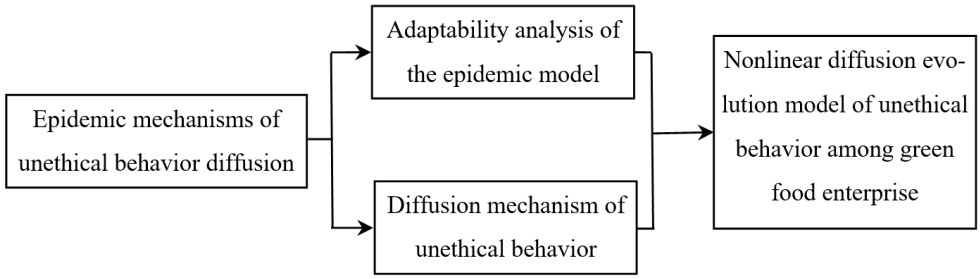

Figure 1. System process flow of the model of unethical behavior diffusion among green food enterprises.

2.1. Epidemic Mechanisms of Unethical Behavior Diffusion among Green Food Enterprise

2.1.1. Adaptability Analysis of the Epidemic Model

The epidemic model, as a classic model of viral transmission, has been widely used in the study of social behavior diffusion [36,45]. The original meaning of contagion is the diffusion of pathogens from infected organisms to other organisms. Assuming that corporate unethical behavior is the contagion virus in this model, the spread of unethical behavior is assumed to be the spread of unethical behavior of green food enterprises in the network of interrelated green food enterprises, and the contagion of unethical behavior will affect the stakeholders in the network. The principal representations are as follows.

(1) Pathogen–Diffusion Source

In the green food enterprises network, some green food enterprises lack completed management system and internal cohesiveness, which causes some members to be vulnerable to profits. Hence, these members may exhibit behavioral deviations and unethical behaviors. As a source of diffusion, unethical behavior is a "pathogen" with potential transmission ability. It can diffuse among green food enterprises through various diffusion mediums, thus presenting a significant herd effect in the green food enterprises network.

(2) Infectious Medium–Diffusion Medium

A diffusion medium is a carrier of the diffusion source. In the green food enterprises network, each enterprise is not isolated. Direct or indirect associations always exist between them, such as cooperations between green food enterprises and communications between members of different green food enterprises. Unethical behaviors can diffuse rapidly among green food enterprise through the mediums, which has a great impact on society.

(3) Infectious

Green food enterprise with unethical behavior may transmit their status, behaviors, and other information to the external environment during the daily cooperation and communication with other green food enterprises. When associated green food enterprises receive the information, cognitive and behavioral deviations may be generated. Hence, associated green food enterprise may be infected with unethical behavior, indicating that unethical behavior is infectious.

(4) Immunity

Some high-level green food enterprises exist in the green food enterprises network. Such green food enterprises usually have strict and reasonable management systems and first-class leaders. These leaders usually have strong management skills and a strong sense of social responsibility. In addition, they are often good at resolving conflicts of interest in and coordinating team members' thoughts and behaviors. Therefore, unethical behavior is difficult to incite in this type of green food enterprise, because they exhibit immunity to unethical behavior.

In summary, the diffusion of unethical behavior among green food enterprises has a similar infectious mechanism to the contagion of infectious diseases. Therefore, analyzing

the diffusion mechanism and evolution characteristics of unethical behavior by using the epidemic model is reasonable and feasible. The analysis provides theoretical reference for preventing the rapid diffusion of unethical behavior among green food enterprises. Table 1 shows that the key concepts in the epidemic model are applied in the network diffusion model of unethical behavior.

Table 1. The corresponding concepts of unethical behavior diffusion.

Diffusion of Unethical Behavior	Meaning
Diffusion source	Unethical behavior
Susceptible green food enterprise	Green food enterprises that have not been infected with unethical behavior
Infected green food enterprise	Green food enterprise that are infected with unethical behavior
Immune green food enterprise	Green food enterprise that are not affected by unethical behavior or had been infected with unethical behavior but eliminated it through adjustment

2.1.2. Diffusion Mechanism of Unethical Behavior

In the green food enterprises network, green food enterprises are divided into three states. S represents a susceptible enterprise, which does not implement unethical behavior but is easily affected by other green food enterprises' unethical behavior. I represents an infected enterprise, which is infected with unethical behavior and can affect other associated green food enterprises. R represents an immune enterprise, which is not affected by unethical behavior or had been infected with unethical behavior and but eliminated it through adjustment. Moreover, S, I, and R are used to express the number of three states of green food enterprises in the network. Figure 2 illustrates the rule of transformation mechanism among the three states of green food enterprises.

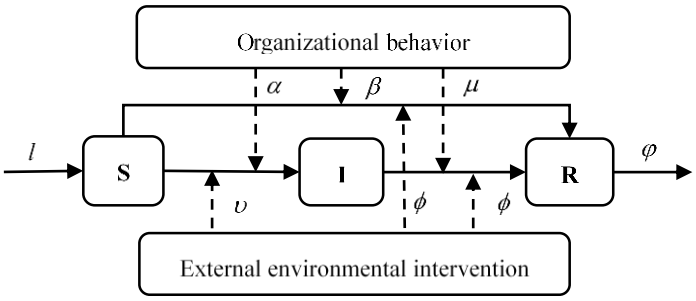

Figure 2. The rule of transformation mechanism among the three states of green food enterprises.

(1) Affected by organizational behavior factors, infected green food enterprises' unethical behavior diffuses to susceptible green food enterprise at the rate of $\alpha\ (0 \le \alpha \le 1)$ during daily cooperating and communicating. Under the influence of external environmental intervention, infected green food enterprise' unethical behavior further diffuses to susceptible green food enterprise at the rate of $\upsilon\ (0 \le \upsilon \le 1)$.

(2) Susceptible green food enterprise may turn into the immune state directly with the probability of $\beta\ (0 \le \beta \le 1)$ by introducing a high-level management team and optimizing the management system. Adjusting the organizational behavior can also make infected green food enterprise immune with the probability of $\mu\ (0 \le \mu \le 1)$.

(3) Under the influence of external environmental intervention factors, susceptible green food enterprise may turn into the immune state directly with the probability of ϕ (

$0 \le \phi \le 1$). In the process of implementing unethical behavior, infected green food enterprise may eliminate it and become immune with the probability of ϕ ($0 \le \phi \le 1$) if they are discovered and punished by external regulators.

(4) In each period, the entry probability of some new green food enterprises is l ($0 \le l \le 1$), and the exit probability of some old green food enterprises is φ ($0 \le \varphi \le 1$).

2.2. Nonlinear Diffusion Evolution Model of Unethical Behavior among Green Food Enterprises

To construct the network diffusion model of unethical behavior among green food enterprises, this study assumes that N is the total number of green food enterprise. s, i, and r account for the proportion of susceptible green food enterprise, infected green food enterprise, and immune green food enterprise, namely $s = S/N$, $i = I/N$, $r = R/N$, and $s + i + r = 1 (0 \le s, i, r \le 1)$. Moreover, the density of infected green food enterprises that have a degree of k is assumed to be $i_k(t)$ at moment t. The probability that susceptible green food enterprise connected to infected green food enterprise is $\Theta(t)$.

In view of the important influence of individual behavior on decision-making or profit, Sundaresan [46] defined a behavior effective function:

$$U(W) = -\frac{1}{\gamma} e^{-\gamma W} \tag{1}$$

where W represents individual patience and γ represents coefficient of individual risk aversion.

Some organizational behavior factors affect the diffusion of unethical behavior. These factors mainly include the level of enterprise moral clarity ψ ($0 < \psi < 1$) [17,24,47]. The accuracy of determining whether a particular behavior is ethical becomes higher with the increase of ψ. Another factor is damage degree of unethical behavior ε ($0 < \varepsilon < 1$) [2,48]. The damage degree of unethical behavior and the impact to the green food enterprises network become greater with the increase of ε. Moreover, the damage degree may have a negative influence on society. Enterprise influence θ ($0 < \theta < 1$) [12,28,49] refers to the relationship strength of green food enterprise in the green food enterprises network. The relationship strength of green food enterprise becomes greater with the increase of θ. Furthermore, it will have a more significant influence on other green food enterprises. Strictness of the enterprise management system τ ($0 < \tau < 1$) [18,50] becomes stricter with the increase of τ. Enterprise ethical climate ρ ($0 < \rho < 1$) [2,21] is also included. When ρ is closer to 0, enterprise ethical climate tends to be egocentric. This means that green food enterprise may focus on individual interests without considering the negative social influence. When ρ is closer to 1, the enterprise ethical climate tends to become principled, which represents that green food enterprises have a higher degree of ethical cognitive constraints. Therefore, the function of organizational behavior $g(\psi, \varepsilon, \theta, \tau, \rho)$ is defined as:

$$g(\psi, \varepsilon, \theta, \tau, \rho) = \rho^{1+\tau^{\frac{1}{4}}} e^{-\frac{\varepsilon \psi^{\frac{1}{\varepsilon}} \tau^{\frac{-1}{\rho^2}}}{\theta}} \tag{2}$$

Hence, the infection rate α ($0 \le \alpha \le 1$) under the influence of organizational behavior factors is defined as:

$$\alpha = g(\psi, \varepsilon, \theta, \tau, \rho) = \rho^{1+\tau^{\frac{1}{4}}} e^{-\frac{\varepsilon \psi^{\frac{1}{\varepsilon}} \tau^{\frac{-1}{\rho^2}}}{\theta}} \tag{3}$$

According to the behavioral state transition equation proposed by [51] and external environmental intervention factors that affect the diffusion of unethical behavior among

green food enterprises, it mainly includes the strength of external supervision δ ($0<\delta<1$) [23,52]. The probability of which green food enterprises' unethical behavior is discovered becomes higher with the increase of δ. In addition, strength of punishment ξ ($0<\xi<1$) [24,53] to green food enterprise with unethical behavior is included. Strength of punishment to green food enterprise with unethical behavior becomes greater with the increase of ξ. Moreover, it also includes external competitiveness λ ($0<\lambda<1$) [12,25] among green food enterprises. External competitiveness becomes greater with the increase of λ. Therefore, the function of external environmental intervention is defined as:

$$f(\delta,\xi,\lambda)=\frac{1}{1+e^{\frac{\lambda-\xi}{\delta}}} \tag{4}$$

Therefore, the infection rate υ ($0\le\upsilon\le1$) under the influence of external environmental intervention factors is defined as:

$$\upsilon=[1\text{-}f(\delta,\xi,\lambda)]=1-\frac{1}{1+e^{\frac{\lambda-\xi}{\delta}}} \tag{5}$$

Considering that the diffusion of unethical behavior among green food enterprises is influenced by the interaction of organizational behavior and external environmental intervention factors, the total infection rate σ ($0\le\sigma\le1$) is defined as:

$$\sigma=\alpha\cdot\upsilon=g(\psi,\varepsilon,\theta,\tau)\cdot[1-f(\delta,\xi,\rho)]=\rho^{1+\tau^{\frac{1}{4}}}e^{-\frac{\varepsilon\psi^{\frac{1}{\varepsilon}}\tau^{\frac{-1}{\rho^2}}}{\theta}}\left(1-\frac{1}{1+e^{\frac{\lambda-\xi}{\delta}}}\right) \tag{6}$$

According to the rule of state transition mechanism among green food enterprises discussed in Figure 2 and mean field theory [40,54], the differential equations of network diffusion model of unethical behavior among green food enterprises under the interaction of organizational behavior and external environmental intervention are expressed as follows:

$$\begin{cases}\dfrac{ds_k(t)}{dt}=l-k\alpha\upsilon s_k(t)\Theta(t)-\beta\pi s_k(t)\\ \dfrac{di_k(t)}{dt}=k\alpha\upsilon s_k(t)\Theta(t)-\mu\pi i_k(t)\\ \dfrac{dr_k(t)}{dt}=\mu\pi i_k(t)+\beta\pi s_k(t)-\varphi r_k(t)\end{cases} \tag{7}$$

According to (7), for the steady-state condition $\frac{di_k(t)}{dt}=0$, the steady state value becomes $i_k(t)$:

$$i_k(t)=\frac{k\alpha\upsilon s_k(t)\Theta(t)}{\mu\phi}=\frac{kl\alpha\upsilon\Theta(t)}{\beta\mu\phi^2+k\alpha\upsilon\mu\phi\Theta(t)} \tag{8}$$

The average density of infected green food enterprise becomes $i=\sum_k P(k)i_k(t)$. Based on (8), $\Theta(t)$ becomes:

$$\Theta(t)=\sum_k\frac{kP(k)i_k(t)}{\sum_s sP(s)}=\frac{1}{<k>}\sum_k kP(k)i_k(t) \tag{9}$$

where $<k>$ represents the network average degree of the diffusion of unethical behavior.

Given that $< k >= \sum_k kP(k)$ and $< k^2 >= \sum_k k^2 P(k)$, (8) and (9) can be combined as follows:

$$\Theta(t) = \frac{1}{< k >} \sum_k kP(k) \frac{kl\alpha\upsilon\Theta(t)}{\beta\mu\phi^2 + k\alpha\upsilon\mu\phi\Theta(t)} \tag{10}$$

Given that $\Theta = \Theta(t)$, (10) has a trivial solution: $\Theta = 0$. If (10) has a non-trivial solution, $\Theta \neq 0$, then the necessary condition becomes:

$$\frac{d}{d\Theta}\left(\frac{1}{< k >} \sum_k kP(k) \frac{kl\alpha\upsilon\Theta}{\beta\mu\phi^2 + k\alpha\upsilon\mu\phi\Theta} \right) \Big| \Theta = 0 \geq 1 \tag{11}$$

Therefore,

$$\frac{1}{< k >} \sum_k kP(k) \frac{kl\alpha\upsilon}{\beta\mu\phi^2} \geq 1 \tag{12}$$

Thus, the basic reproduction number of the diffusion of unethical behavior under the influence of organizational behavior and external environmental intervention factors is R_0:

$$R_0 = \frac{l\alpha\upsilon \sum_k k^2 P(k)}{\beta\mu\phi^2 \sum_k kP(k)} = \frac{l\rho^{1+\tau^{\frac{1}{4}}} e^{-\frac{\varepsilon\psi^{\frac{1}{\varepsilon}} \tau^{\frac{-1}{\rho^2}}}{\theta}} \left(1 - \frac{1}{1 + e^{\frac{\lambda - \xi}{\delta}}}\right) \sum_k k^2 P(k)}{\beta\mu\phi^2 \sum_k kP(k)} \tag{13}$$

Equation (13) was simulated to study the influence of green food enterprise organizational behavior and external environmental factors on the contagion of the unethical behavior of green food enterprises.

The basic reproduction number R_0 ($R_0 > 0$) indicates the average number of susceptible green food enterprises that are infected by infected green food enterprise [55]. $R_0 = 1$ represents the threshold of the disappearance of diffusion. The diffusion becomes extinct gradually when $R_0 < 1$ and the diffusion occurs with nonzero probability when $R_0 > 1$. Moreover, the greater the value of R_0 is, the greater the diffusion probability becomes.

3. Simulation Analysis and Results Discussion

This study sets the initial parameters as follows: $\rho = 0.1$, $\tau = \theta = \delta = \xi = 0.2$, $l = \psi = 0.3$, $\varepsilon = \mu = \beta = \phi = \lambda = 0.4$. Most nodes in a BA scale-free network have a few connections and only a few nodes have many connections. Moreover, the degree distribution of nodes also follows power law distribution [56]. It is similar to the actual enterprise network in which the number of large-scale and influential green food enterprise is small. However, small-scale green food enterprises are numerous, and yet they only have a few connections with other green food enterprises in the network [57]. Therefore, on the basis of the BA scale-free network ($m = m_0 = 5$, network scale $N = 500$), we use the MATLAB R2018a software to simulate the evolution characteristics of unethical behavior diffusion among green food enterprises under the interaction of organizational behavior and external environmental intervention.

3.1. Organizational Behavior and Diffusion of Unethical Behavior among Green Food Enterprises

3.1.1. Single Organizational Behavior Factor and Diffusion of Unethical Behavior among Green Food Enterprises

Figure 3a,b,d demonstrate that the diffusion probability of unethical behavior among green food enterprises shows the decreasing characteristic of increasing margins with the increase of the level of enterprise moral clarity Ψ, damage degree of unethical behavior ε and strictness of enterprise management system τ. Figure 3a indicates that when the level of enterprise moral clarity Ψ is less than 0.4, the change of diffusion probability of unethical behavior is not evident. When it exceeds 0.4, the variation of diffusion probability increases gradually, but its overall change is not significant. Therefore, the method of improving level of enterprise moral clarity Ψ can only reduce the diffusion probability of unethical behavior among green food enterprise to a certain extent. Figure 3b indicates that when damage degree of unethical behavior ε is less than 0.4, the diffusion probability of unethical behavior is less variable. When it exceeds 0.4, the variation of diffusion probability increases gradually, but its overall change is not significant. The reasons of this phenomenon are as follows: unethical behavior with high damage degree may often violate the law and be extremely harmful to the enterprise and society. In addition, its probability of being discovered is also high. Therefore, the implementation of such unethical behavior is often worthless. Figure 3d indicates that the overall change is evident and when strictness of enterprise management system τ is less than 0.4, the diffusion probability of unethical behavior declines. When it exceeds 0.4, the downward trend tends to be flat. This phenomenon reflects that completed enterprise management system can effectively control the diffusion of unethical behavior among green food enterprises. However, when strictness of enterprise management system τ reaches a certain level, the controlling effect of continuously increasing it on the diffusion of unethical behavior is rapidly weakened. Therefore, green food enterprise should follow the principle of appropriateness to avoid invalid allocation of management resources when determining the strictness of enterprise management system.

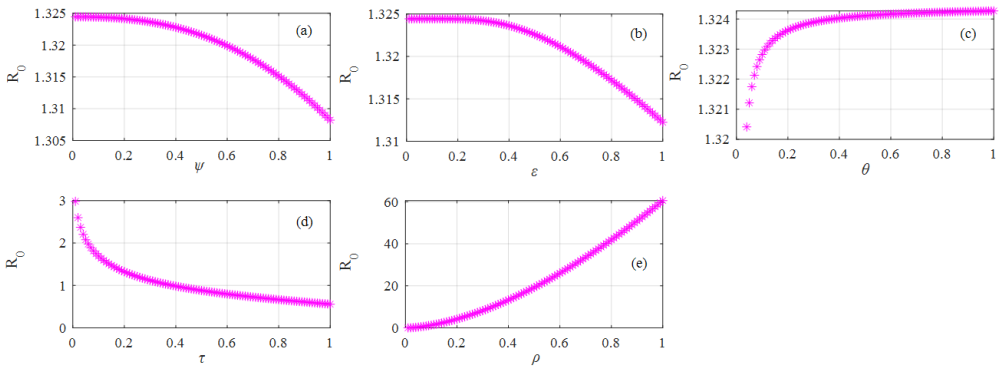

Figure 3. The influence of organizational behavior factors on the diffusion of unethical behavior among green food enterprises. (**a**–**e**) refer to level of enterprise moral clarity ψ, damage degree of unethical behavior ε, enterprise influence θ, strictness of enterprise management system τ and enterprise ethical climate ρ, respectively.

Figure 3c,e demonstrates that the diffusion probability of unethical behavior among green food enterprises shows the increasing characteristic of diminishing margins with the increase of enterprise influence θ and enterprise ethical climate ρ. Figure 3c indicates that when enterprise influence θ is less than 0.2, the diffusion probability of unethical behavior appears jump points, and the upward trend is very obvious. However, when it exceeds 0.2, the upward trend becomes gradually flat and its overall change is not significant. This phenomenon reflects that influential green food enterprise are not only small in number but also stable in status. However, more green food enterprises have small

influence in the food green enterprises network. Small enterprise size and lack of a complete management system make them vulnerable to the influence of other green food enterprises, thus causing the diffusion of unethical behavior among green food enterprises. Figure 3e reflects that a large-scale diffusion tendency of unethical behavior in the green food enterprises network as enterprise ethical climate changes from principled to egocentric. Ethical climate of an enterprise is often regarded as the standard of enterprise behavior ethics. A principled enterprise ethical climate is a cognitive constraint on unethical intentions, thus having a controlling effect on the diffusion of unethical behavior. However, under the ethical climate of egoism, green food enterprises tend to focus on individual interests without considering social consequences, which makes them more inclined to implement unethical behavior, thus causing large-scale diffusion of unethical behavior among green food enterprises. This phenomenon also embodies that enterprise ethical climate ρ, is the key factor that affects the diffusion of unethical behavior among green food enterprises. A principled ethical climate has a strong blocking effect on the diffusion of unethical behavior among green food enterprise.

In addition, Figure 3 shows that the single adjustment of the level of enterprise moral clarity ψ, damage degree of unethical behavior ε, and enterprise influence θ affect the diffusion of unethical behavior among green food enterprises, but their blocking effect is weak. The basic reproductive number R_0 remains greater than 1. Unethical behavior can still diffuse with non-zero probability in the enterprise network. If the prevention and control strategies are only based on this, then causing deviation is easy and the effect is limited. However, the strictness of enterprise management system and enterprise ethical climate have a greater impact on the diffusion of unethical behavior among green food enterprise. Adjustment them can make the basic reproductive number R_0 become less than 1. In particular, enterprise ethical climate plays a leading role in the diffusion of unethical behavior among green food enterprises. Therefore, formulating targeted prevention and control strategies from these two aspects is effective.

3.1.2. Multiple Organizational Behavior Factors and Diffusion of Unethical Behavior among Green Food Enterprises

Figure 4 indicates that the single adjustment of level of enterprise moral clarity ψ, damage degree of unethical behavior ε, and enterprise influence θ cannot make unethical behavior disappear gradually in the enterprise network. Figure 4a shows that when level of enterprise moral clarity ψ interacts with damage degree of unethical behavior ε, the diffusion probability of unethical behavior among green food enterprises shows the characteristic of increasing margins with the increase of these two factors. However, the overall change is not significant and the basic reproductive number R_0 is still greater than 1. Figures 4b,e also indicate that when enterprise influence θ interacts level of enterprise moral clarity ψ and damage degree of unethical behavior ε, the diffusion probability of unethical behavior among green food enterprises shows the increasing characteristic with the increase of enterprise influence θ. However, only when level of enterprise moral clarity ψ and damage degree of unethical behavior ε are high, the increasing trend become evident. In other cases, enterprise influence θ has little effect on the diffusion probability of unethical behavior among green food enterprises, and the basic reproductive number R_0 cannot be less than 1. This finding is consistent with the phenomenon reflected in Figure 3, which shows that level of enterprise moral clarity ψ, damage degree of unethical behavior ε, and enterprise influence θ have little influence on the diffusion of unethical behavior among green food enterprises. Even if the formulation of control strategies is based on their interaction, these strategies are unable to eliminate the diffusion of unethical behavior.

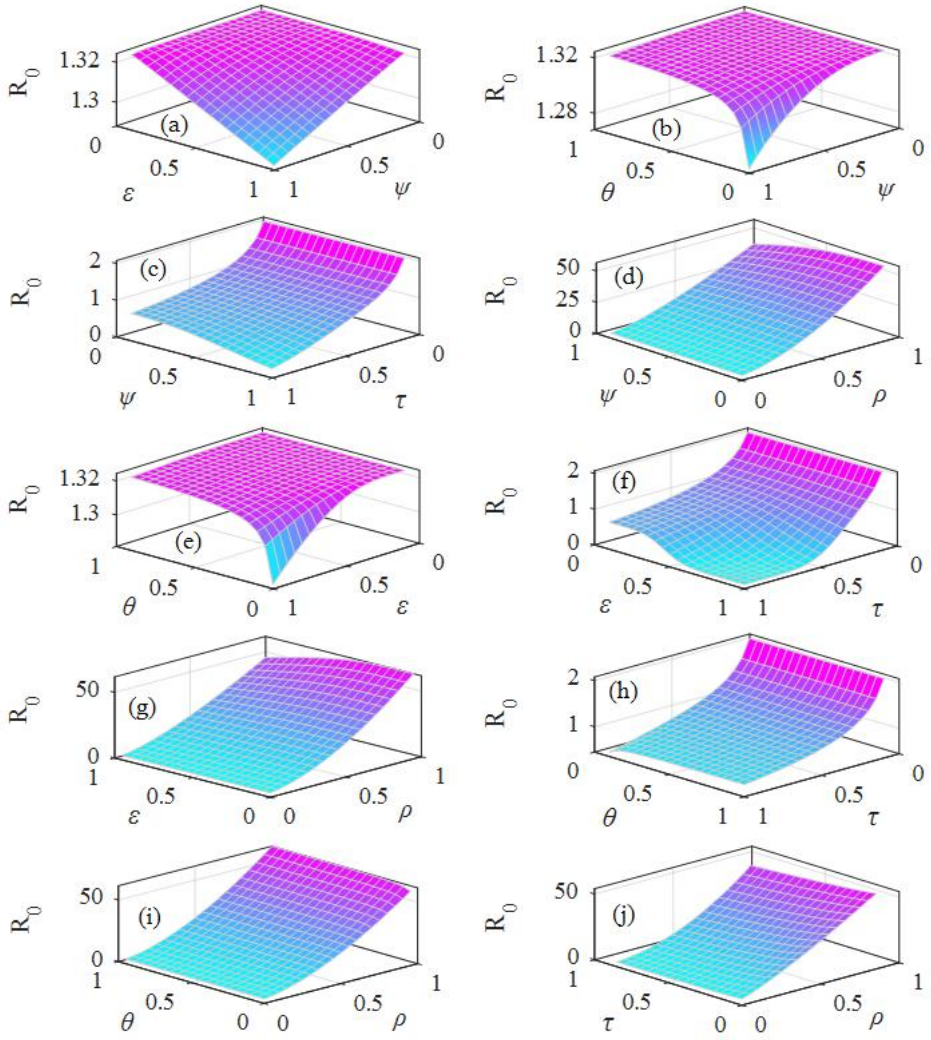

Figure 4. The interactive influence of organizational behavior factors on the diffusion of unethical behavior among green food enterprises. The factors involved in the figure are level of enterprise moral clarity ψ, damage degree of unethical behavior ε, enterprise influence θ, strictness of enterprise management system τ, and enterprise ethical climate ρ.

Figure 4c,f,h show that when strictness of the enterprise management system τ interacts with level of enterprise moral clarity ψ, damage degree of unethical behavior ε, and enterprise influence θ, the diffusion probability of unethical behavior among green food enterprises shows a significant downward trend with the increase of level of enterprise moral clarity ψ, damage degree of unethical behavior ε, strictness of enterprise management system τ, and the decrease of enterprise influence θ. In addition, the basic reproductive number R_0 can be controlled to become less than 1. This phenomenon reflects the suppression effect of strictness of enterprise management system τ on the diffusion of unethical behavior among green food enterprises. If enterprise management system is established clearly, fairly, and effectively, it will increase the cost of implementing unethical behavior and greatly reduce the possibility of the emergence and diffusion of unethical behavior, thus leading to the gradual elimination of the diffusion of unethical behavior among green food enterprises.

Figure 4d,g,i show that when enterprise ethical climate ρ interacts with level of enterprise moral clarity ψ, damage degree of unethical behavior ε, and enterprise influence θ, the diffusion probability of unethical behavior increases with the change of these

organizational behavior factors. Such interaction presents a large-scale diffusion crisis in the green food enterprises network. This phenomenon shows that although under the single influence of the three organizational behavioral factors of level of enterprise moral clarity ψ, damage degree of unethical behavior ε, and enterprise influence θ, the diffusion probability of unethical behavior among green food enterprises is less affected. However, with the transformation of enterprise ethical climate ρ from principled to egocentric, the green food enterprise may pay too much attention to individual interests and neglect social influences. When an egocentric enterprise ethical climate becomes a part of enterprise culture, members will be used to unethical behavior. At this point, ethical climate of the entire green food enterprises network has been almost destroyed. This scenario will result in deviation from enterprise cognition and behavior, which, in turn, leads to the large-scale diffusion of unethical behavior in the network under the influence of the herd effect. This phenomenon also shows that enterprise ethical climate ρ plays a crucial role in the diffusion of unethical behavior among green food enterprises. Therefore, the purpose of eliminating the diffusion of unethical behavior can be achieved by establishing a principled enterprise ethical climate.

According to Figure 4, on the one hand, enterprise ethical climate ρ exerts a "strengthening effect" on other organizational behavior factors. Other organizational behavioral factors have an impact on the diffusion probability of unethical behavior among green food enterprises are stronger under an egocentric enterprise ethical climate. Therefore, this scenario may cause irrational outbreaks of unethical behavior among green food enterprises. On the other hand, strictness of the enterprise management system τ exerts a "suppression effect" on the diffusion probability of unethical behavior among green food enterprises. A strict enterprise management system can enhance other organizational behavior factors' controlling effect on the diffusion of unethical behavior, thus gradually eliminating the diffusion of unethical behavior among green food enterprises. In addition, the "strengthening effect" of the enterprise ethical climate ρ is stronger than the "suppression effect" of strictness of the enterprise management system τ. Therefore, when formulating prevention and control strategies, we should take principled enterprise ethical climate as a foundation from a global perspective and increase the level of enterprise moral clarity. Furthermore, we must maintain the strictness of enterprise management system moderately and strengthen the control of the core green food enterprise with greater influence.

3.2. External Environmental Intervention and Diffusion of Unethical Behavior among Green Food Enterprises

3.2.1. Single External Environmental Intervention Factor and Diffusion of Unethical Behavior among Green Food Enterprises

Figure 5a shows that the diffusion probability of unethical behavior among green food enterprises has a decreasing trend of diminishing margins with the increase of strength of external supervision δ and strength of punishment ξ. Figure 5a indicates that when strength of external supervision δ is less than 0.1, the variation of diffusion probability of unethical behavior is almost negligible. When the strength of external supervision δ is greater than 0.1 and less than 0.5, the diffusion probability of unethical behavior diffusion shows a downward trend and the variation is significant. When strength of external supervision δ is greater than 0.5, the downward trend becomes flat gradually. This phenomenon demonstrates that increasing strength of external supervision δ can reduce the diffusion probability of unethical behavior among green food enterprises to a certain extent. However, when strength of external supervision δ has reached a high level, the effect of strengthening supervision becomes limited.

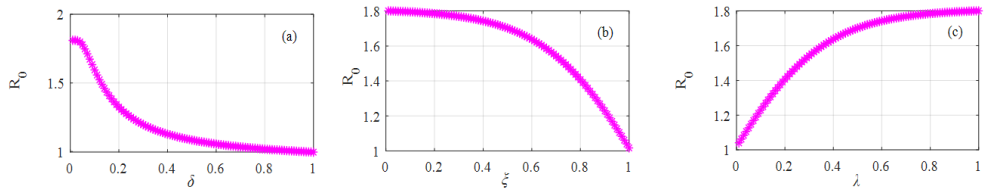

Figure 5. The influence of external environmental intervention factors on the diffusion of unethical behavior among green food enterprises. (**a**–**c**) refer to strength of external supervision δ, strength of punishment ξ, and external competitiveness λ.

Figure 5b indicates that when strength of punishment ξ is less than 0.5, the diffusion probability of unethical behavior declines slowly. When it is greater than 0.5, the downward trend is evident. This phenomenon demonstrates that the inhibitory effect of slight punishment on the diffusion of unethical behavior is weak. On the contrary, the most severe punishment to unethical behavior can shock and control the diffusion of unethical behavior among green food enterprises effectively.

Figure 5c shows the diminishing trend of the diffusion probability of unethical behavior among green food enterprises with the increase of external competitiveness λ. The analysis of Figure 5c indicates that when external competitiveness λ is less than 0.5, the diffusion probability of unethical behavior shows an upward trend. When it is greater than 0.5, the upward trend becomes flat. This phenomenon demonstrates that unethical behavior is more likely to diffuse among green food enterprises that are in a competitive external environment. Therefore, relevant departments should carry out key supervision on industries with fierce competition to prevent hazards.

In addition, increasing strength of external supervision δ, strength of punishment ξ, and reducing external competitiveness λ can suppress the diffusion of unethical behavior. However, with the single adjustment of these external environmental intervention factors, the basic reproductive number R_0 remains greater than 1. Therefore, the goal of eliminating the diffusion of unethical behavior among green food enterprises cannot be achieved.

3.2.2. Multiple External Environmental Intervention Factors and Diffusion of Unethical Behavior among Green Food Enterprises

Although Figure 5 reflects that the single adjustment of strength of external supervision δ, strength of punishment ξ, and external competitiveness λ can only play a role in reducing the diffusion probability of unethical behavior to a certain extent, and the goal of gradual elimination of diffusion cannot be achieved. Figure 6a shows that when strength of external supervision δ interacts with strength of punishment ξ, the diffusion probability of unethical behavior among green food enterprise shows a significant downward trend with the increase of these two factors, and the basic reproductive number R_0 can be reduced to less than 1. This phenomenon reflects that the supervision and punishment system is an integral organic entirety. If green food enterprises are only supervised without severe punishment, then a shocking effect cannot be achieved. If green food enterprise believe that supervision or punishment is insufficient, and implementing unethical behavior will not involve high risks, then this perception will increase the diffusion possibility of unethical behavior. On the contrary, an effective and enforceable supervision and punishment system will increase the cost of implementing unethical behavior, thereby greatly reducing the diffusion probability of unethical behavior. Therefore, the goal of gradual elimination of unethical behavior can be achieved.

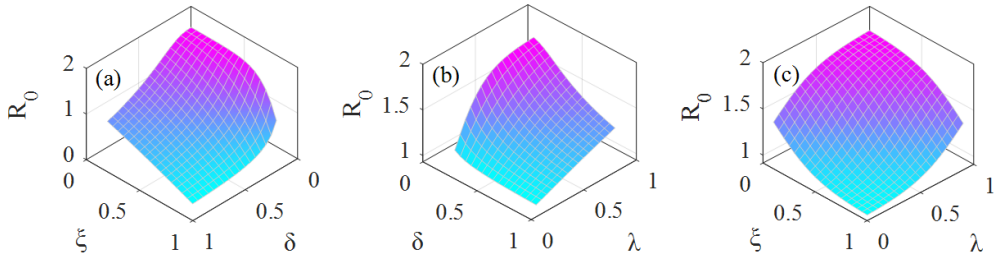

Figure 6. The interactive influence of external environmental intervention factors on the diffusion of unethical behavior among green food enterprises. The factors involved in the figure are strength of external supervision δ, strength of punishment ξ, and external competitiveness λ.

Figure 6b,c show that when external competitiveness λ interacts with strength of external supervision δ and strength of punishment ξ, the diffusion probability of unethical behavior has a significant downward trend with the increase of strength of external supervision δ, strength of punishment ξ, and the decrease of external competitiveness λ. Only when external competitiveness λ is extremely low, adjusting strength of external supervision δ and strength of punishment ξ make the basic reproductive number R_0 less than 1, thus causing the gradual elimination of unethical behavior diffusion. However, when a certain degree of competitiveness exists in the external environment, the single adjustment of strength of external supervision δ and strength of punishment ξ cannot make the basic reproductive number R_0 less than 1. Therefore, adopting a method of adjusting supervision and punishment together is necessary to control the hazard. Relevant authorities need to implement flexible supervision and punishment strategies for green food enterprises in different industries to optimize the allocation of management resources, thereby effectively controlling the social harm of the diffusion of unethical behavior among green food enterprises and maintaining social stability.

On the one hand, Figure 6 shows that external competitiveness λ exerts a "strengthening effect" on other external environmental intervention factors. Other external environmental intervention factors' impacts on the diffusion of unethical behavior among green food enterprises are significant in a competitive external environment. On the other hand, strength of external supervision δ and strength of punishment ξ exert a "suppression effect" on the diffusion of unethical behavior among green food enterprises. Therefore, when formulating prevention and control strategies, combining supervision and punishment organically is necessary to increase the cost of implementing unethical behavior. We need to take the different external competitiveness of different industries into formulating the most reasonable and efficient supervision and punishment strategies to avoid inefficient allocation of management resources, thus effectively controlling the diffusion of unethical behavior among green food enterprises.

3.3. Diffusion of Unethical Behavior among Green Food Enterprises under the Interaction of Organizational Behavior and External Environmental Intervention

Figure 7a,d,g show that when strength of external supervision δ interacts with level of enterprise moral clarity ψ, damage degree of unethical behavior ε, and enterprise influence θ, the diffusion probability of unethical behavior among green food enterprises has a decreasing characteristic with the increase of level of enterprise moral clarity ψ, damage degree of unethical behavior ε, strength of external supervision δ, and the decrease of enterprise influence θ. Moreover, the basic reproductive number R_0 can be reduced to less than 1, which means that gradual elimination of diffusion of unethical behavior can be achieved. This phenomenon reflects that the level of enterprise moral clarity ψ plays a regulatory role in the diffusion of unethical behavior among green food

enterprises. On the one hand, the behavioral ethical norms of green food enterprises often have a standard ambiguity, which makes accurate judgments on whether a behavior is ethical or not unethical. On the other hand, given that individuals usually have unique behavioral ethical standards, different individuals may make different moral judgments when faced with the same situation. The ambiguity in ethical judgment affects individuals' moral decision-making, which, in turn, increases the probability of implementing unethical behavior. When enterprise members have a high level of moral clarity, they are more certain on whether they violate ethical norms. Therefore, level of enterprise moral clarity ψ can play a significant role in the prevention and control of the diffusion of unethical behavior.

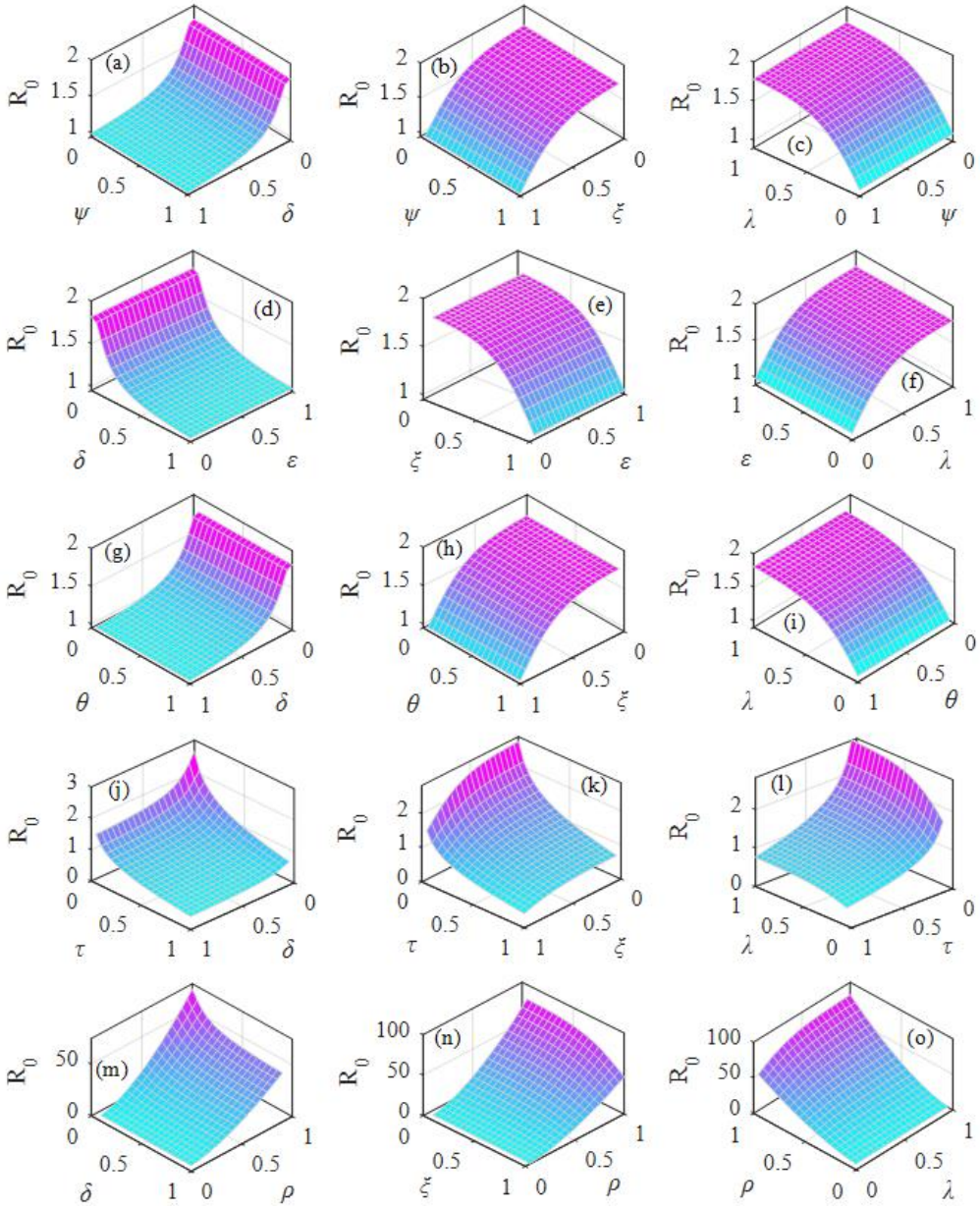

Figure 7. The interactive influence of organizational behavior and external environmental intervention factors on the diffusion of unethical behavior among green food enterprises. The factors involved in the figure are level of enterprise moral clarity ψ, damage degree of unethical behavior ε, enterprise influence θ, strictness of enterprise management system τ, enterprise ethical climate ρ, strength of external supervision δ, strength of punishment ξ, and external competitiveness λ.

Figure 7b,e,h show that when strength of punishment ξ interacts with level of enterprise moral clarity ψ, damage degree of unethical behavior ε, and enterprise influence θ, the diffusion probability of unethical behavior among green food enterprises has the decreasing characteristic with the increase of level of enterprise moral clarity ψ, damage degree of unethical behavior ε, strength of punishment ξ, and the decrease of enterprise influence θ. Figure 7c,f,i show that when external competitiveness λ interacts with level of enterprise moral clarity ψ, damage degree of unethical behavior ε and enterprise influence θ, the diffusion probability of unethical behavior among green food enterprises has a decreasing characteristic with the increase of level of enterprise moral clarity ψ, damage degree of unethical behavior ε, decrease of enterprise influence θ, and external competitiveness λ. These results are consistent with the conclusions obtained from Figures 3 and 5. Under the interaction of the organizational behavior and external environmental intervention factors above, the gradual elimination of unethical behavior among green food enterprises can be achieved.

Figure 7j,k,l show that when strictness of enterprise management system τ interacts with strength of external supervision δ, strength of punishment ξ, and external competitiveness λ, the diffusion probability of unethical behavior among green food enterprises has a diminishing characteristic with the increase of strictness of enterprise management system τ, strength of external supervision δ, strength of punishment ξ, and the decrease of external competitiveness λ. Moreover, the basic reproductive number R_0 can be reduced to less than 1. Therefore, strengthening the linkage of internal and external factors is possible by adjusting strictness of enterprise management system τ and external environmental intervention factors simultaneously. This adjustment can achieve the purpose of gradual elimination of unethical behavior.

Figure 7m,n,o show that when enterprise ethical climate ρ interacts with strength of external supervision δ, strength of punishment ξ, and external competitiveness λ, the diffusion probability of unethical behavior among green food enterprises has a large-scale increasing trend with the increase of external competitiveness λ, enterprise ethical climate ρ, and the decrease of strength of external supervision δ and strength of punishment ξ. Thus, enterprise ethical climate ρ is an important regulatory variable that inhibits the generation and diffusion of unethical behavior. Enterprise ethical climate is essentially formed by the superposition of ethical behavioral cognition of general members, managers, and senior leaders of enterprises. Although individual moral values and enterprise ethical climate can affect each other, individual morality must play an active role through the catalysis of enterprise ethical climate. An egocentric enterprise ethical climate will enable green food enterprise to put their own interests above other considerations. Therefore, they may implement unethical behavior to maximize benefits. On the contrary, a principled enterprise ethical climate emphasizes compliance with ethical norms within the enterprise, and the probability of implementing unethical behavior is greatly reduced.

In addition, Figure 7 indicates that level of enterprise moral clarity ψ, damage degree of unethical behavior ε, and enterprise influence θ exert a "strengthening effect" on external environmental intervention factors. Thus, external environmental intervention factors' impacts on the diffusion of unethical behavior among green food enterprises can be strengthened, and the diffusion will gradually be eliminated if level of enterprise moral clarity ψ and damage degree of unethical behavior ε are high or enterprise influence θ is low. In addition, enterprise ethical climate ρ exerts a strong "strengthening effect" on external environmental intervention factors. The influence of external environmental intervention factors on the diffusion probability of unethical behavioral among green food enterprises is significant in the egocentric enterprise ethical climate. For such green food enterprises, strengthening external interventions is necessary to prevent large-

scale diffusion of unethical behavior. Therefore, when formulating prevention and control strategies, creating a principled enterprise ethical climate from a global perspective is necessary to prevent core green food enterprises from implementing unethical behavior. Moreover, adjusting the strength of external supervision and punishment flexibly according to different competitive environments outside green food enterprise can be significant. We also need to increase the strictness of enterprise management system and the level of enterprise moral clarity. In this scenario, the diffusion of unethical behavior can gradually be eliminated.

3.4. Sensitivity Analysis of Parameters

To describe the evaluation characteristics of unethical behavior diffusion better, we conduct the sensitivity analysis by changing the key parameters of strictness of enterprise management system τ, enterprise ethical climate ρ, strength of external supervision δ, and strength of punishment ξ. Under the circumstance of $m = m_0 = 5$, network scale $N = 500$, $\theta = 0.2$, $l = \psi = 0.3$, $\varepsilon = \mu = \beta = \phi = 0.4$, we change the key parameters as follows: (1) $\rho = 0.1$, $\delta = \xi = \tau = 0.2$, $\lambda = 0.4$; (2) $\rho = 0.15$, $\delta = \xi = \tau = 0.3$, $\lambda = 0.5$; (3) $\rho = 0.2$, $\delta = \xi = \tau = 0.4$, $\lambda = 0.6$; (4) $\rho = 0.25$, $\delta = \xi = \tau = 0.5$, $\lambda = 0.7$.

This section analyzes the sensitivity of these parameters to the nonlinear diffusion of unethical behavior among green food enterprises. Table 2 show the simulation results. The basic reproductive number R_0 maintains the original trend under different key parameters, indicating that the conclusions obtained from the simulation analysis are robust.

Table 2. A sensitivity analysis of the impact of strictness of enterprise management system τ, enterprise ethical climate ρ, strength of external supervision δ, and strength of punishment ξ on the evolution characteristics of unethical behavior diffusion among green food enterprises.

τ	ρ									Expectation	Variance
	0.1	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**		
						$\lambda = 0.4\ \xi = \delta = 0.2$					
0.1	2.98	7.42	12.60	18.40	24.70	31.40	38.40	45.70	53.30	26.10	270.00
0.2	2.20	6.00	10.80	16.30	22.40	29.10	36.30	44.00	52.10	24.40	267.00
0.3	1.75	5.08	9.48	14.70	20.80	27.40	34.70	42.60	51.00	23.10	262.00
0.4	1.43	4.41	8.49	13.50	19.40	26.00	33.40	41.40	50.10	22.00	256.00
0.5	1.20	3.88	7.69	12.50	18.20	24.80	32.20	40.30	49.20	21.10	250.00
0.6	1.02	3.44	7.01	11.60	17.20	23.70	31.10	39.30	48.40	20.30	244.00
0.7	0.87	3.07	6.43	10.90	16.30	22.70	30.10	38.40	47.60	19.60	238.00
0.8	0.75	2.76	5.91	10.20	15.50	21.80	29.10	37.50	46.80	18.90	231.00
0.9	0.65	2.48	5.45	9.53	14.70	20.90	28.30	36.60	46.10	18.30	226.00
						$\lambda = 0.5\ \xi = \delta = 0.3$					
0.1	2.70	6.71	11.40	16.70	22.30	28.40	34.70	41.30	48.20	23.60	221.00
0.2	1.99	5.42	9.72	14.70	20.30	26.30	32.80	39.80	47.10	22.00	218.00
0.3	1.58	4.59	8.57	13.30	18.80	24.80	31.40	38.50	46.10	20.80	214.00
0.4	1.29	3.98	7.68	12.20	17.50	23.50	30.20	37.40	45.30	19.90	209.00
0.5	1.08	3.50	6.95	11.30	16.50	22.40	29.10	36.40	44.50	19.10	204.00
0.6	0.92	3.11	6.34	10.50	15.60	21.40	28.10	35.50	43.70	18.40	199.00
0.7	0.79	2.78	5.81	9.81	14.70	20.50	27.20	34.70	43.00	17.70	194.00
0.8	0.68	2.49	5.34	9.18	14.00	19.70	26.30	33.90	42.30	17.10	189.00
0.9	0.59	2.24	4.93	8.61	13.30	18.90	25.50	33.10	41.60	16.50	184.00
						$\lambda = 0.6\ \xi = \delta = 0.4$					
0.1	2.54	6.32	10.80	15.70	21.00	26.70	32.70	38.90	45.40	22.20	196.00
0.2	1.88	5.11	9.16	13.90	19.10	24.80	30.90	37.50	44.30	20.70	193.00
0.3	1.49	4.33	8.07	12.60	17.70	23.40	29.60	36.30	43.50	19.70	190.00
0.4	1.22	3.75	7.23	11.50	16.50	22.20	28.40	35.30	42.70	18.80	186.00
0.5	1.02	3.30	6.55	10.60	15.50	21.10	27.40	34.30	41.90	18.00	181.00
0.6	0.87	2.93	5.97	9.90	14.70	20.20	26.50	33.50	41.20	17.30	177.00
0.7	0.74	2.62	5.47	9.24	13.90	19.30	25.60	32.70	40.50	16.70	172.00
0.8	0.64	2.35	5.03	8.65	13.20	18.60	24.80	31.90	39.80	16.10	168.00
0.9	0.55	2.11	4.64	8.11	12.50	17.80	24.10	31.20	39.20	15.60	164.00

$\lambda = 0.7\ \xi = \delta = 0.5$										
0.1	2.44	6.08	10.40	15.10	20.20	25.70	31.40	37.40	43.70	21.40	181.00
0.2	1.81	4.91	8.81	13.30	18.40	23.90	29.80	36.00	42.70	20.00	179.00
0.3	1.43	4.16	7.76	12.10	17.00	22.50	28.50	34.90	41.80	18.90	176.00
0.4	1.17	3.61	6.96	11.10	15.90	21.30	27.30	33.90	41.00	18.00	171.00
0.5	0.98	3.17	6.30	10.20	14.90	20.30	26.40	33.00	40.30	17.30	168.00
0.6	0.83	2.82	5.74	9.52	14.10	19.40	25.50	32.20	39.60	16.60	164.00
0.7	0.71	2.52	5.26	8.89	13.30	18.60	24.60	31.40	39.00	16.00	159.00
0.8	0.61	2.26	4.84	8.32	12.70	17.90	23.90	30.70	38.30	15.50	155.00
0.9	0.53	2.03	4.46	7.80	12.00	17.20	23.10	30.00	37.70	15.00	151.00

The results in Table 2 further verified the conclusions obtained in Figures 4 and 7. Enterprise ethical climate ρ exerts a "strengthening effect" on other factors. Moreover, Table 2 and Figure 4 indicate that enterprise ethical climate ρ plays a leading role in the diffusion of unethical behavior among green food enterprises. The effect of enterprise ethical climate ρ to inhibit the diffusion of unethical behavior among green food enterprises is much stronger than other factors. Therefore, formulating targeted prevention and control strategies from this aspect is effective.

4. Conclusions

This study comprehensively considers organizational behavior and external environmental intervention factors, and builds a nonlinear diffusion evolution model of unethical behavior among green food enterprises. Then, we conduct a simulation analysis of the diffusion mechanisms and evolution characteristics of the diffusion of unethical behavior among green food enterprises. The main conclusions are as follows:

(1) In the green food enterprises network, the diffusion probability of unethical behavior has a decreasing trend with the increase of the level of enterprise moral clarity, damage degree of unethical behavior, strictness of enterprise management system, and the decrease of enterprise influence and enterprise ethical climate. The single adjustment of the level of enterprise moral clarity, damage degree of unethical behavior, and enterprise influence has little influence on the diffusion of unethical behavior. Even if the formulation of control strategies is based on their interaction, the strategies can only reduce the diffusion probability to a certain extent and is unable to eliminate the diffusion. When the level of enterprise moral clarity, damage degree of unethical behavior, and enterprise influence interact with enterprise ethical climate, the diffusion probability shows an evident variation. The variation reflects that enterprise ethical climate exerts a "strengthening effect" on other organizational behavior factors. Moreover, strictness of the enterprise management system exerts a "suppression effect" on the diffusion of unethical behavior, and the "strengthening effect" of the enterprise ethical climate is stronger than the "suppression effect" of the strictness of the enterprise management system. Therefore, when formulating prevention and control strategies, we should take a principled enterprise ethical climate as the foundation and increase level of enterprise moral clarity. We must maintain the strictness of the enterprise management system moderately and strengthen the control of the core enterprise with greater influence, reduce the emergence and contagion of unethical behaviors of enterprises, effectively prevent the spread of immoral contagion of green food enterprises in the green food market, and even cause major food safety problems.

(2) In the green food enterprises network, the diffusion probability of unethical behavior shows a decreasing trend with the increase of strength of external supervision, strength of punishment, and the decrease of external competitiveness. However, the single adjustment of strength of external supervision, strength of punishment, and external competitiveness can only play a role in reducing the diffusion probability to a certain extent, and it cannot gradually eliminate unethical behavior. However, when strength of external supervision interacts with strength of punishment, the diffusion probability of unethical behavior shows a significant downward trend with the increase of these two

factors. As a result, diffusion can be eliminated gradually. When external competitiveness interacts with strength of external supervision and strength of punishment, the diffusion probability of unethical behavior shows a downward trend. However, when external competitiveness is extremely low, the single adjustment of strength of external supervision and strength of punishment will eliminate the diffusion gradually. In addition, external competitiveness exerts a "strengthening effect" on other external environmental intervention factors. Furthermore, strength of external supervision and strength of punishment exert a "suppression effect" on the diffusion of unethical behavior. Therefore, when formulating prevention and control strategies, relevant departments such as enterprises or governments should combine supervision and punishment organically is necessary to increase the cost of implementing unethical behavior and through the interaction of supervision and punishment mechanisms, the impact of unethical behavior of green enterprises is minimized. On the basis of considering the external competitiveness of green food enterprises, we need to increase the supervision of green food by relevant departments and the punishment of green food enterprises on food safety issues. By doing so, inefficient allocation of management resources and the fluke psychology of green food enterprises can be avoided, and the diffusion of unethical behavior among food enterprise can be effectively controlled.

(3) In the green food enterprises network, when the level of enterprise moral clarity, damage degree of unethical behavior, and enterprise influence interact with external environmental intervention factors, the diffusion probability of unethical behavior shows an evident decreasing characteristic. In addition, such adjustments can gradually eliminate the diffusion. Moreover, when strictness of an enterprise management system and enterprise ethical climate interact with external environmental intervention factors, the diffusion probability of unethical behavior can be reduced to a level that is close to 0, thus controlling the diffusion of unethical behavior effectively. Moreover, level of enterprise moral clarity, damage degree of unethical behavior, enterprise influence, and enterprise ethical climate exert a "strengthening effect" on the external environmental intervention factors. The "strengthening effect" of enterprise ethical climate is much stronger than the other three factors. Therefore, when formulating the prevention and control strategies, constructing a principled enterprise ethical climate is necessary to prevent core green food enterprise from implementing unethical behavior. Adjusting the strength of external supervision and punishment flexibly according to different competitive environments outside green food enterprise is also significant. Finally, we need to increase the strictness of the enterprise management system and the level of enterprise moral clarity. By doing so, the diffusion of unethical behavior can be eliminated gradually.

Under the interaction of organizational behavior and external environmental intervention, this study analyzes the diffusion mechanisms and evolution characteristics of the diffusion of unethical behavior among green food enterprises. The analysis enriches the theoretical results and helps us understand the evolution process of the diffusion of unethical behavior among green food enterprises. The conclusions of this study can provide theoretical references for relevant functional departments to prevent and control the large-scale diffusion of unethical behavior among green food enterprise, so as to provide a theoretical reference for food safety and other food problems in society. At the same time, the infection model constructed in this paper can also be applied to the development of control strategies for problems caused by the contagion of unethical behaviors; for example, the problem of medical data leakage is related to unethical behaviors such as the purchase and sale of private information by related enterprises. However, in order to deeply consider the differences between various corporate ethical standards and their impact on the diffusion of unethical behaviors, and also to consider the influence of consumers, governments, and corporate emotions on moral judgment, this paper can enrich and improve the theoretical analysis framework of the diffusion of unethical behaviors from the perspectives of differences in corporate ethical standards and moral disgust of market entities in the future.

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