

Authenticity Guarantee Insurance in Online Market and Platform Supply Chain Decisions

Xiaopu Guo

*School of Economics and Management, Chongqing Jiaotong University, Chongqing, China
2320922871@qq.com*

Abstract. Providing authenticity insurance services for consumers on online platforms can effectively solve the problem of fake goods in online shopping and improve consumers' purchase intention. Based on the supply chain structure composed of brand suppliers and online platforms, this paper takes brand suppliers and online platforms as the main bodies respectively under the influence of fake goods, establishes two decision models before and after the platform joins the authenticity guarantee insurance under different channel modes, considers that the cooperation mode between the platform and insurance companies is fixed insurance commission, compares different modes, obtains the optimal pricing, demand and profit, and analyzes the impact of adding authenticity guarantee insurance services on the supply chain and the channel mode preferences of supply chain members under different situations.

Keywords: online platform, authenticity guarantee insurance, supply chain decisions

1. Introduction

As the scale of e-commerce transactions exceeds 46.83 trillion yuan (nearly 40% of GDP), e-commerce has become an indispensable pillar in the global retail ecology. However, its virtuality, cross-regional nature and information asymmetry have brought convenience, but also caused the persistent problem of lack of commodity trust. The risk of fake goods not only directly infringes consumers' rights and interests, but also constitutes a core problem restricting the healthy development of the e-commerce industry. To solve this trust dilemma, major e-commerce platforms have introduced authenticity guarantee insurance, aiming to rebuild consumer confidence and ensure transaction safety. From the consumer's perspective, it is a direct response to the core demand for genuine goods, trying to turn uncertain rights protection risks into definite insurance compensation and improve shopping security; from the platform's perspective, it is a key part of building platform reputation and differentiated competition strategy. Therefore, this study aims to deeply analyze the operation mechanism of e-commerce authenticity guarantee insurance and the platform supply chain decision-making process under authenticity guarantee insurance.

As a specific application of Internet insurance in the field of e-commerce, authenticity guarantee insurance follows the general model of Internet insurance. In the research related to Internet insurance, Zhao Hui and Kang Min [1] pointed out that modern insurance is not only a product, but also a tool that can be embedded in a specific business ecology to solve scene pain points. Teresa's

[2] research further shows that the integration of e-commerce and insurance industry has transformative potential. Cai [3] found through comparative research that property insurance focuses more on the consultation and underwriting links in the early stage of transactions. This feature is highly consistent with the operation focus of authenticity guarantee insurance: its effectiveness lies in the pre-screening of merchants and commodities, and the clear transmission of guarantee information to consumers. In addition, Luo et al. [4] proved in an empirical study on sharing economy platforms that the protection insurance provided by the platform can significantly affect the behavior and trust relationship between buyers and sellers. This conclusion provides key methodological enlightenment for this study: the effectiveness of authenticity guarantee insurance can also be empirically tested from the dimensions of consumer perception, purchase intention and merchant reputation mechanism. Some scholars also pointed out that online insurance products should start from demand. Ma Shucui et al. [5] called for increasing the development of financial protection and health products and fine insurance products, and accelerating product innovation to enrich the product system. On this basis, Hou Xuhua [6] suggested increasing the proportion of long-term insurance products, because such products have high technical difficulty and cost, and are difficult to be copied. Once the products are launched, they will steadily occupy the insurance market.

In addition to the general research on Internet insurance, some scholars focus on another important insurance type in e-commerce scenarios - return freight insurance. Yang et al. [7] found that when two retailers with different reputations sell the same product, the retailer with lower reputation is more likely to provide return freight insurance. Fan et al. [8] considered the supply chain composed of manufacturers and online retailers, established mathematical models in three cases: no return freight insurance, seller's freight insurance and buyer's freight insurance, and made a comparative analysis. Li et al. [9] studied whether a monopolistic online retailer should provide free freight insurance or paid freight insurance, and found that providing paid freight insurance can achieve a win-win situation for retailers and consumers. Yang Lei and Chang Na [10] established three models under different freight insurance strategies based on the newsboy model, and compared the retailer's revenue and ordering strategy, logistics company profit, insurance company profit and total social welfare. The study found that when the return rate is low, the introduction of freight insurance is Pareto inefficient. Zhao et al. [11] discussed the applicability and effectiveness of two strategies: consumers bear return freight and retailers pay return freight when retailers face uncertain demand and uncertain consumer valuation. Zhang et al. [12] studied whether manufacturers should provide return freight insurance and consumers' return channel choices in the context of live streaming sales. Return freight insurance focuses on logistics cost compensation, such as freight sharing for 7-day return, while authenticity guarantee insurance undertakes the function of commodity authenticity guarantee.

In the research of channel models, scholars have established a rich foundation from the perspectives of competition motivation, profit structure and operation strategies. Justin [13] pointed out through constructing a dynamic platform competition model that the consumer lock-in effect will affect the platform's choice between reselling and agency models. Wang et al. [14] compared channel models from the dimensions of profit, inventory and market share. Shen Fengping et al. [15] conducted a game analysis based on the O2O e-commerce scenario. Li et al. [16] further confirmed in the research on the cooperation between hotels and online travel agencies that the choice of business model (wholesale and agency) depends on the combined effect of enterprise scale and commission rate. Yu et al. [17] found through research under the framework of price dynamic response that the dual-channel structure composed of reselling and agency models can usually better

meet the profit optimization needs of traditional physical retailers and online platforms. Sun Jiayi et al. [18] analyzed the influence of consumer preference, service factors and cost parameters on sales channels and bundling strategies of short-dated products. Zhang et al. [19] studied the channel structure selection when there are deceptive goods in the general channel. Zhang Chuan et al. [20] and Nan et al. [21] respectively discussed the interactive relationship between sales model and information sharing, protection level and pricing strategy under the background of e-commerce platform dominance and platform's own anti-counterfeiting negative effect. Xue Yihong [22] put forward a specific path to improve the copyright administrative penalty system based on the new version of the Administrative Penalty Law to serve brand anti-counterfeiting governance, and pointed out that all departments should coordinate to prevent fake and shoddy goods from entering the market.

In summary, this paper aims to study the supply chain structure composed of brand owners and online platforms. Under the background of fake goods risk, taking the channel model as the starting point, this paper compares and analyzes its influence on the decision of introducing authenticity guarantee insurance, and combines the fixed insurance commission cooperation model to finally clarify the applicable conditions for platforms to provide authenticity insurance and the profit optimization path under each channel model.

2. Problem description and model assumptions

This study considers a supply chain system composed of brand suppliers and platform operators. Because counterfeit products may penetrate the market, and under deceptive counterfeiting, consumers do not have enough knowledge to distinguish genuine products from counterfeit products. Define the counterfeit penetration rate λ , and $0 < \lambda < 1$, which means the proportion of counterfeit products in the products circulating in the market.

The utility of genuine products is v , and the utility of counterfeit products is 0. Assume that θ represents the consumer's preference intensity for purchasing one unit of product, where $\theta \in [0,1]$. If consumers buy genuine products, their utility is $\theta v - p$; when buying counterfeit products, consumers can apply for return compensation, and the utility is $s - c - p$. Among them, s is the compensation that consumers can get from claims. Generally speaking, if consumers buy fake goods without genuine product insurance protection, they need to pay a lot of costs to get basic compensation, because merchants will prevaricate. Moreover, in real life, it is difficult for platforms to fulfill their promise of ten compensations for one fake. Consumers need to provide a series of evidence, spend time and testing costs, and may not get the promised compensation in the end. Assume that c is the cost for consumers to obtain compensation by claiming. Thus, the expected utility of consumers for purchasing goods is: $U_1 = (1 - \lambda) \cdot \theta v + \lambda \cdot (s - c) - p$. Obviously, consumers will buy goods only when their expected utility is $U_1 \geq 0$, so $\bar{\theta} = \frac{p - \lambda(s - c)}{(1 - \lambda)v}$, the purchase interval of goods is $[\frac{p - \lambda(s - c)}{(1 - \lambda)v}, 1]$ according to consumers' rational expectation to make maximizing decisions. Product demand is: $D_1 = \int_{\frac{p - \lambda(s - c)}{(1 - \lambda)v}}^1 d\theta = 1 - \frac{p - \lambda(s - c)}{(1 - \lambda)v}$

When the platform provides value insurance services, consumers can independently choose to purchase genuine product guarantee insurance while purchasing products. Therefore, it is assumed that when the platform provides genuine product guarantee insurance, consumers can independently choose whether to pay the premium t to purchase. If they buy fake goods after purchasing genuine product insurance, they can get compensation m , $m > s$. Therefore, when consumers choose to purchase genuine product insurance, define the expected utility of consumers buying genuine

products in the market as $\theta v - p - t$, and the utility of buying counterfeit products as $m - p - t$. From this, the expected utility of consumers purchasing platform goods when purchasing insurance services is:

$$U_2 = (1 - \lambda) \cdot \theta v + \lambda \cdot m - p - t$$

When $U_2 \geq U_1$, the additional compensation brought by insurance is enough to cover the premium, that is, $\lambda m - \lambda(s - c) \geq t$, then consumers will choose to purchase insurance when buying goods. Under the condition of genuine product insurance protection, when $U_2 \geq 0$, consumers will choose to buy platform goods, that is $\theta \geq \frac{p+t-\lambda m}{(1-\lambda)v}$, product demand is:

$$D_2 = \int_{\frac{p+t-\lambda m}{(1-\lambda)v}}^1 d\theta = 1 - \frac{p+t-\lambda m}{(1-\lambda)v}$$

There are two main channel modes for product sales on online platforms: reselling and agency. In different channel modes, the payer of compensation for fake goods is different. In the resale mode, the platform sells goods to consumers, that is, the platform bears the compensation amount; in the agency mode, the supplier directly trades with consumers, and when consumers buy fake goods, the payer is the supplier. At the same time, combined with whether to provide genuine product guarantee insurance, four different modes can be obtained:

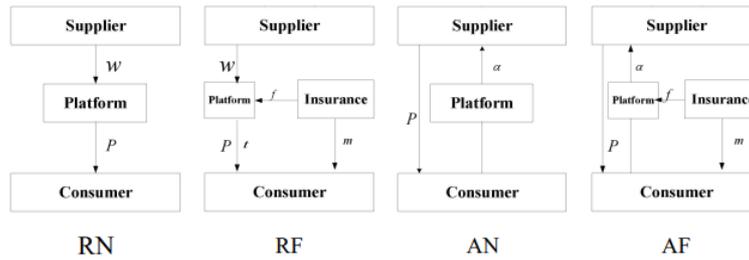


Figure 1. Four modes

3. Insurance decisions under different modes

3.1. RN mode

In RN mode, the brand supplier first sets the wholesale price w^{RN} , then the platform operator sets the final retail price p^{RN} according to the wholesale price. At this time, the brand supplier is the Stackelberg price decision leader, and the online platform is the follower. In RN mode, when consumers buy fake goods, the basic compensation for fake goods s shall be paid by the platform. The profits of the supplier and the platform are respectively:

$$\pi_B^{RN} = w^{RN} \cdot D_1$$

$$\pi_P^{RN} = D_1 \cdot (p - w - \lambda s)$$

Lemma 1 Under the resale mode, when the e-commerce platform does not provide authenticity insurance, the optimal retail price and optimal wholesale price of the product are respectively:

$$w^{RN} = [(1 - \lambda)v - \lambda c] / 2$$

$$p^{RN} = 3[(1 - \lambda)v - \lambda c] / 4 + \lambda s$$

The equilibrium demand at this time is:

$$D_1^{RN} = [(1 - \lambda)v - \lambda c] / 4(1 - \lambda)v$$

The equilibrium profits of the corresponding brand supplier and platform operator are respectively:

$$\pi_B^{RN} = [(1 - \lambda)v - \lambda c]^2 / 8(1 - \lambda)v$$

$$\pi_p^{RN} = [(1 - \lambda)v - \lambda c]^2 / 16(1 - \lambda)v$$

Solve this game using backward induction. Given a wholesale price w^{RN} , the platform operator determines the equilibrium retail price $p(w)$ by $p = \text{argmax}_p \pi_p$. Then, substitute this value back into the brand supplier's profit to determine its wholesale price by $w = \text{argmax}_w \pi_B$; further substitution yields the equilibrium conditions w^{RN} and p^{RN} .

Lemma 1 gives the equilibrium decision in the supply chain when the online platform does not provide authenticity guarantee insurance under the resale mode. It can be seen intuitively that the pricing and profits of the brand supplier and the platform are significantly affected by multiple parameters such as counterfeit penetration rate (λ), consumer claim cost (c) and basic value of genuine products (v). This shows that when there is a risk of fake goods in the market, the pricing of goods must not only be based on the value of the product itself, but also comprehensively consider the market risk structure and consumer behavior response.

3.2. RF mode

In RF mode, the platform cooperates with insurance companies in a fixed insurance commission mode. Assume that the fixed commission agreed between the platform and the insurance company is f , that is, when the platform sells the authenticity guarantee insurance contract, it can obtain a fixed commission from the insurance company. Consumers choose whether to pay the premium t to purchase the authenticity guarantee on the platform according to their own situation. At the same time, the brand supplier still first determines the wholesale price w^{RF} , and then the platform operator sells at the retail price p^{RF} . The profit of the platform includes the income from platform

commodity sales and the fixed insurance commission paid by the insurance company. In case of fake goods, the insurance company pays compensation m to consumers. At this time, the profits of the brand supplier and the platform operator are respectively:

Supplier profit: $\pi_B^{RF} = w^{RF} \cdot D_2$ Platform profit: $\pi_P^{RF} = (p^{RF} - w^{RF} + f) \cdot D_2$ Lemma 2

Under the resale mode, when the e-commerce platform provides authenticity insurance, the optimal retail price and optimal wholesale price of the product are respectively:

$$w^{RF} = [(1 - \lambda)v + \lambda m - t + f]/2$$

$$p^{RF} = 3[(1 - \lambda)v + \lambda m - t + f]/4 - f$$

The equilibrium profits of the corresponding brand supplier and platform operator are respectively:

$$\pi_B^{RF} = [(1 - \lambda)v + \lambda m - t + f]^2/8(1 - \lambda)v$$

$$\pi_P^{RF} = [(1 - \lambda)v + \lambda m - t + f]^2/16(1 - \lambda)v$$

The equilibrium demand at this time is:

$$D_2^{RF} = [(1 - \lambda)v + \lambda m - t + f]/4(1 - \lambda)v$$

Lemma 2 gives the equilibrium decision in the supply chain when the online platform provides authenticity guarantee insurance under the resale mode. It can be found that the system profit is comprehensively affected by genuine product value (v), fake goods compensation (m) and insurance commission (f). After the online platform provides authenticity guarantee insurance, the insurance commission f directly increases the platform revenue, thus encouraging the platform to provide authenticity insurance. The setting of compensation m and premium t balances consumer risks. A higher m can enhance consumer trust, but may also push up premium costs, which needs to be optimized to maximize profits.

3.3. AN mode

The difference between agency mode and resale mode is that in agency mode, the supplier directly sells products to consumers at retail price p^{AN} through the e-commerce platform, and the e-commerce platform charges a fee share α of the supplier's sales revenue. In AN mode, the platform acts as a bridge between suppliers and consumers. We assume that the platform charges a fee share α , and the supplier determines the retail price p^{AN} according to its product sales revenue share

$(1 - \alpha)$. When consumers buy fake goods, the supplier shall pay basic compensation s to consumers.

At this time, the supplier profit is: $\pi_B^{AN} = [(1 - \alpha)p^{AN} - \lambda s] \cdot D_1$ The platform profit is: $\pi_P^{AN} = \alpha \cdot p^{AN} \cdot D_1$

Lemma 3 Under agency mode, when the e-commerce platform does not provide authenticity insurance, the optimal retail price of the product is:

$$p^{AN} = \left\{ (1 - \alpha) \cdot \left[(1 - \lambda)v + \lambda(s - c) \right] + \lambda s \right\} / 2(1 - \alpha)$$

The equilibrium demand at this time is:

$$D_1^{AN} = \left\{ (1 - \alpha) \cdot \left[(1 - \lambda)v + \lambda(s - c) \right] - \lambda s \right\} / 2(1 - \alpha)(1 - \lambda)v$$

The equilibrium profit of the brand supplier is:

$$\pi_B^{AN} = \frac{[(1 - \alpha)A - \lambda s]^2}{4(1 - \alpha)(1 - \lambda)v}$$

The equilibrium profit of the platform is:

$$\pi_P^{AN} = \frac{\alpha \cdot [(1 - \alpha)^2 A^2 - \lambda^2 s^2]}{4(1 - \alpha)^2(1 - \lambda)v}$$

Where $A = (1 - \lambda)v + \lambda(s - c)$

Lemma 3 gives the equilibrium decision of the supply chain when the online platform does not provide authenticity guarantee insurance under agency mode. At this time, the platform has no anti-counterfeiting measures and cannot actively suppress the penetration of fake goods. Brand owners and platform operators can only passively accept the impact, and the supply chain profit is significantly affected by multiple parameters.

3.4. AF mode

In AF mode, the platform still charges a fee share α , and the supplier determines the retail price p^{AF} according to its product sales revenue share $(1 - \alpha)$. In addition, the platform operator joins authenticity guarantee insurance to improve its competitiveness, cooperates with insurance companies and agrees on a fixed insurance commission f . When consumers choose to buy authenticity guarantee insurance, if fake goods are encountered, the insurance company will pay compensation m to consumers.

Then the profits of the supplier and the platform under agency mode are respectively:
 $\pi_B^{AF} = (1 - \alpha)p^{AF} \cdot D_2$ $\pi_P^{AF} = (\alpha p^{AF} + f) \cdot D_2$

Lemma 4 In AF mode, the retail price of the product under equilibrium condition is:
 $p^{AF} = [(1 - \lambda)v + \lambda m - t] / 2$

The equilibrium demand at this time: $D_2^{AF} = [(1 - \lambda)v + \lambda m - t] / 2(1 - \lambda)v$

The corresponding equilibrium profits of the brand supplier and platform operator are respectively:

$$\pi_B^{AF} = (1 - \alpha)B^2 / 4(1 - \lambda)v$$

$$\pi_P^{AF} = \frac{\alpha B^2}{4(1 - \lambda)v} + \frac{fB}{2(1 - \lambda)v}$$

Where $B = (1 - \lambda)v + \lambda m - t$

Lemma 4 gives the equilibrium decision of the supply chain when the online platform provides authenticity guarantee insurance under agency mode. At this time, platform profit comes from two aspects: sales share and insurance commission. Platform profit is directly proportional to the fixed insurance commission f , that is, it increases with the increase of fixed insurance commission f . At the same time, from Lemma 4, it can be seen that the profit of brand suppliers and platform operators is directly proportional to the claim amount m and inversely proportional to the premium t . The profit of brand owners is inversely proportional to the fee share α , and the profit of platform operators is directly proportional to the fee share. In addition, when $m > t$, we can conclude that the counterfeit penetration rate is directly proportional to consumer demand by $\partial D_2^{AF} / \partial \lambda = m - t / 2(1 - \lambda)^2 v > 0$. This shows that when insurance compensation can cover premium expenses, consumers are willing to buy insurance. Moreover, when there are many fake goods in the market, consumers are more willing to buy regular products to protect themselves because of worrying about product quality, so demand will increase with the increase of counterfeit penetration rate.

4. Comparative analysis

4.1. Platform profit comparison

This study compares the equilibrium profits of the platform before and after providing authenticity insurance under different channel modes, and obtains the profit change of the platform when it provides authenticity guarantee insurance for consumers.

Proposition 1 By comparing the equilibrium profits of the platform under different channel modes, we can get:

$$(i) \text{ when } \lambda(m - c) > t, \pi_P^{RF} > \pi_P^{RN} \quad (ii) \text{ when } \lambda(m - c) > t, \pi_P^{AF} > \pi_P^{AN}$$

Proof: In resale mode, $\Delta\pi_p^R = \pi_p^{RF} - \pi_p^{RN} = \frac{[\lambda(m+c)+f-t][\lambda(m-c)+f-t+2(1-\lambda)v]}{16(1-\lambda)v}$, it is easy to get when $\lambda(m-c) > t$, $\pi_p^{RF} > \pi_p^{RN}$; in agency mode, $\Delta\pi_p^A = \pi_p^{AF} - \pi_p^{AN} = \frac{\alpha(B^2-A^2)}{4(1-\lambda)v} + \frac{2(1-\alpha)^2fB+\alpha\lambda^2s^2}{4(1-\alpha)^2(1-\lambda)v}$, according to the known conditions, it is easy to get when $\lambda(m-c) > t$, $\pi_p^{AF} > \pi_p^{AN}$, Proposition 1 is proved.

Proposition 1 shows that when $\lambda(m-c) > t$, that is, the unit expected net income brought by insurance is greater than the premium expenditure, adding authenticity guarantee insurance will increase the platform profit. Assume that all consumers are risk-averse. In resale mode, with the increase of counterfeit penetration rate in the market, consumers' worry about fake goods will also increase. Therefore, consumers prefer to buy goods with authenticity guarantee insurance to reduce the risk of buying fake goods. When the platform cooperates with insurance companies, when the expected net income is greater than the premium cost, insurance creates net value for the platform and increases the platform's profit. In agency mode, the supplier sets the price directly, and the platform profits through commission and insurance commission. Authenticity guarantee insurance transfers the liability for fake goods compensation from the supplier (indirectly affecting the platform) to the insurance company, and the addition of insurance enhances consumer confidence and stimulates demand growth. Platform profit is positively correlated with sales volume, and demand growth directly drives the increase of platform profit. In addition, it can be found that for the platform, after adding authenticity guarantee insurance, the profit growth in resale mode is greater than that in agency mode. In resale mode, the platform bears the risk of fake goods, but after the introduction of insurance, it not only exempts the compensation cost but also increases the income of fixed insurance commission; in agency mode, the supplier is responsible for fake goods compensation, and the addition of insurance mainly increases commission income, so the profit increase is relatively small. Generally speaking, when the unit expected net income brought by insurance is greater than the premium expenditure, insurance becomes the core driving force for platform profit growth by reducing consumer risk and expanding market base, and RF and AF modes are better.

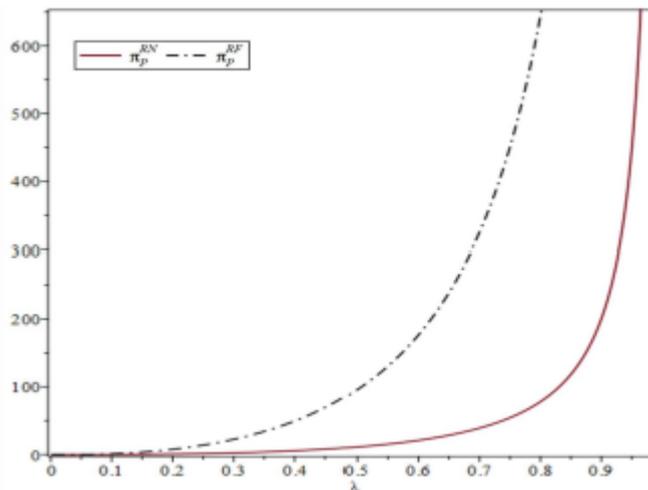


Figure 2. Profit comparison before and after the platform provides authenticity guarantee insurance in resale mode

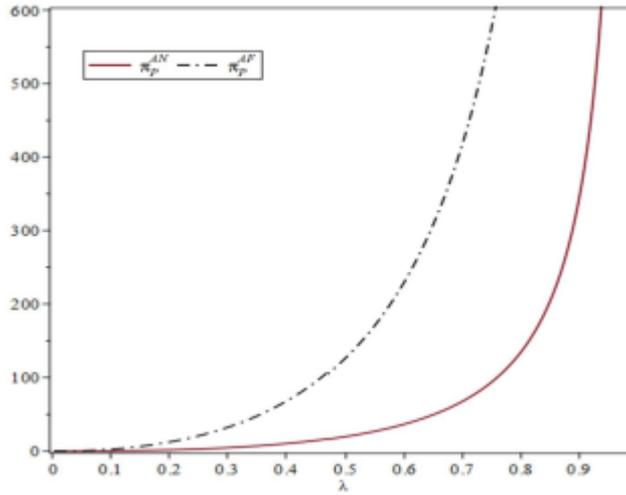


Figure 3. Profit comparison before and after the platform provides authenticity guarantee insurance in agency mode

4.2. Supplier profit comparison

This study compares the supplier's equilibrium profit before and after the platform provides authenticity insurance under different channel modes, and obtains the profit change of the supplier.

Proposition 2 By comparing the equilibrium profits of suppliers under different channel modes, we can get:

$$(i) \text{ when } \lambda(m - c) > t, \pi_B^{RF} > \pi_B^{RN} \quad (ii) \text{ when } \lambda(m - c) > t, \pi_B^{AF} > \pi_B^{AN}$$

Proof: In resale mode, $\Delta\pi_B^R = \pi_B^{RF} - \pi_B^{RN} = \frac{[\lambda(m+c)+f-t][\lambda(m-c)+f-t+2(1-\lambda)v]}{8(1-\lambda)v}$, it is easy to obtain when $\lambda(m - c) > t, \pi_B^{RF} > \pi_B^{RN}$; in agency mode, $\Delta\pi_B^A = \pi_B^{AF} - \pi_B^{AN} = \frac{(1-\alpha)(B^2-A^2)}{4(1-\lambda)v} + \frac{\lambda s[2(1-\alpha)A-\lambda s]}{4(1-\alpha)(1-\lambda)v}$, according to the known conditions, it is easy to obtain when $\lambda(m - c) > t, \pi_p^{AF} > \pi_p^{AN}$, Proposition 2 is proved.

Proposition 2 shows that when the unit expected net income brought by insurance is greater than the premium expenditure, adding authenticity guarantee insurance will increase the supplier's profit. In resale mode, the platform buys goods from suppliers at wholesale price and sells them to consumers after markup. After the platform introduces authenticity guarantee insurance, consumer demand for products increases, and supplier profit also increases with the increase of demand. In agency mode, suppliers sell goods directly to consumers, and the platform charges a certain fee share. After introducing authenticity guarantee insurance, supplier profit also increases with the increase of demand. At the same time, the risk of compensation for fake goods was originally borne by suppliers (such as refunds and reputation losses), but after adding authenticity guarantee insurance, the liability for compensation is transferred to insurance companies, reducing the expected loss of suppliers. When the premium cost is lower than the fake goods compensation, the net income of suppliers increases. In both modes, authenticity guarantee insurance benefits suppliers by expanding the total market size. For suppliers, after adding authenticity guarantee insurance, the profit growth in agency mode is greater than that in resale mode. In resale mode, insurance has no direct impact on suppliers, only indirectly increases product demand to increase supplier profit. In

agency mode, after adding insurance, it not only exempts the fake goods compensation originally borne by suppliers but also expands market demand.

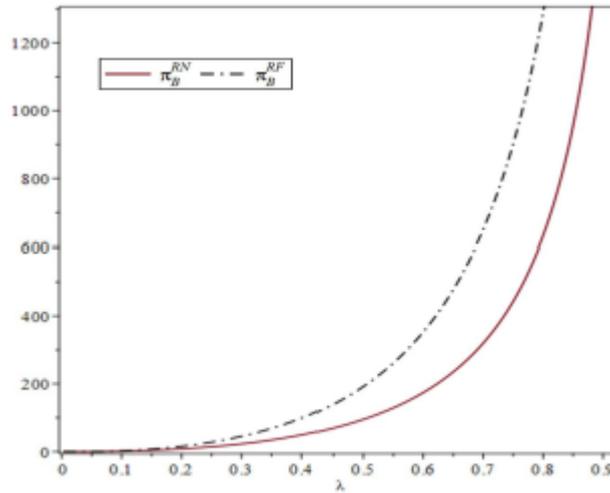


Figure 4. Supplier profit comparison before and after providing authenticity guarantee insurance in resale mode

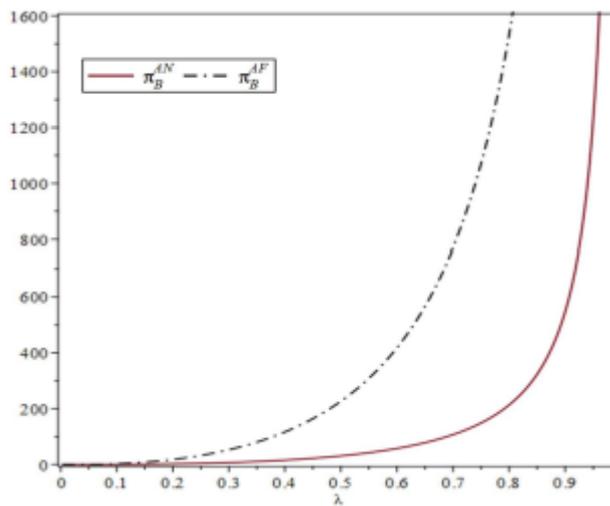


Figure 5. Supplier profit comparison before and after providing authenticity guarantee insurance in agency mode

4.3. Channel mode selection

We have analyzed the impact of the platform providing authenticity insurance on profits under different channel modes. Then another new question arises: which channel mode is more suitable for providing authenticity guarantee insurance? First, by comparing and analyzing the equilibrium profits of suppliers and platform operators under RF and AF modes, Proposition 3 can be obtained as follows:

Proposition 3 When the platform provides authenticity guarantee insurance, the profit comparison under different channel modes satisfies:

- (i) When $\alpha \in (0, 1/4)$, $\pi_B^{RF} < \pi_B^{AF}$, $\pi_p^{RF} > \pi_p^{AF}$

(ii) When $\alpha \in (1/4, 1/2)$, $\pi_B^{RF} < \pi_B^{AF}$, $\pi_p^{RF} < \pi_p^{AF}$

(iii) When $\alpha \in (1/2, 1)$, $\pi_B^{RF} > \pi_B^{AF}$, $\pi_p^{RF} < \pi_p^{AF}$

Proof: Compare the equilibrium profits of suppliers under RF and AF modes:

$$\pi_B^{RF} - \pi_B^{AF} = \frac{(2\alpha-1)B^2+f^2+2fB}{8(1-\lambda)v}$$

, it is easy to obtain when $\alpha > 1/2$, $\pi_B^{RF} > \pi_B^{AF}$; when $\alpha < 1/2$,

$\pi_B^{RF} < \pi_B^{AF}$. Compare the equilibrium profits of platforms under RF and AF modes:

$$\pi_P^{RF} - \pi_P^{AF} = \frac{(1-4\alpha)B^2+f^2-6fB}{16(1-\lambda)v}$$

, let $\lambda > [6(v-t)-f]/6(v-m)$, it is easy to obtain when ,

$\alpha < 1/4$, $\pi_P^{RF} > \pi_P^{AF}$; when $\alpha > 1/4$, $\pi_P^{RF} < \pi_P^{AF}$, Proposition 10 is proved.

Proposition 3 shows that when the online platform provides authenticity guarantee insurance, there exists a region $\alpha \in (1/4, 1/2)$ where the profits of both brand suppliers and platform operators under AF mode are higher than those under RF mode. At this time, the brand owners and online platforms have the same choice of sales mode. Outside this region, the level of fee share will form different mode selection preferences of brand suppliers and platform operators. That is, when $\alpha \in (0, 1/4)$, brand suppliers prefer agency mode, and platform operators prefer resale mode; when $\alpha \in (1/2, 1)$, brand suppliers prefer resale mode, and platform operators prefer agency mode. It can be seen that authenticity guarantee insurance transforms the uncertain fake goods risk faced by consumers into negotiable and manageable costs between platforms and suppliers through insurance contracts. In the context of authenticity guarantee insurance, platforms and brand owners can achieve risk sharing and benefit coordination through commission ratio negotiation.

5. Conclusion

With the rapid development of e-commerce economy, more and more people choose online shopping, and the prevention and control of fake products is also a matter of great concern to everyone. There are two different channel modes in e-commerce: resale mode and agency mode. Based on these different channel modes, this paper studies the impact of authenticity guarantee insurance on fake goods prevention and consumer rights protection in the supply chain, as well as the channel mode selection of the supply chain. This paper establishes two models before and after the platform provides authenticity guarantee insurance, discusses the optimal decisions of brand suppliers and platform operators under different channel modes in the two models, and analyzes the impact of factors such as counterfeit penetration rate on supply chain profits in different modes. The study finds that the addition of authenticity guarantee insurance can enhance consumer trust and have a positive pulling effect on product demand. With the increase of counterfeit penetration rate, brand suppliers and platform operators are more inclined to cooperate with insurance companies to provide authenticity guarantee for consumers. When the counterfeit penetration rate is lower than a certain value, there is no need for consumers to buy authenticity insurance. Finally, this paper also studies which sales channel mode is the most beneficial to the supply chain after the platform joins authenticity guarantee insurance. The study finds that for the platform, the profit improvement is larger in the resale mode, and for the supplier, the profit improvement is larger in the agency mode. The product distribution ratio α is the core factor that determines the sales channel mode selection and profit distribution of brand suppliers and platform operators. This shows that the platform should avoid blindly pursuing a high commission rate, but should guide cooperation to a win-win area by reasonably setting the share ratio and providing value-added services such as insurance and anti-counterfeiting. Suppliers also need to comprehensively evaluate the channel value and cost structure of the platform and rationally select the cooperation mode.

References

- [1] Zhao, H., & Kang, M. (2016, November 28). ZhongAn Insurance: The more connected, the stronger. *China Insurance News*, (006).
- [2] Borges-Tiago, T. (2009). A critical examination of e-insurance: The Portuguese case. *The Business Review, Cambridge*, 14(1), 179–185.
- [3] Cai, P. (2025). Construction of innovative customer service system for property insurance enterprises. *Journal of Human Resource Development*, 7(1).
- [4] Luo, X., Tong, S., Lin, Z., et al. (2021). The impact of platform protection insurance on buyers and sellers in the sharing economy: A natural experiment. *Journal of Marketing*, 85(2), 50–69.
- [5] Ma, S., & Qin, H. (2017). Reflections on the development of China's Internet insurance industry. *Finance and Accounting Monthly*, (05), 119–123.
- [6] Hou, X. (2019). Profitability challenges and solutions for Internet insurance companies. *Journal of Jishou University (Social Sciences Edition)*, 40(6), 78–85.
- [7] Yang, Y., Chai, R., Sun, X., et al. (2022). Optimal pricing and return-freight insurance: Strategic analysis of e-sellers in the presence of reputation differentiation. *Journal of Systems Science and Complexity*, 35(6), 2302–2318.
- [8] Fan, Z. P., & Chen, Z. (2020). When should the e-tailer offer complimentary return-freight insurance? *International Journal of Production Economics*, 230, 107890.
- [9] Li, Y., Li, G., Tayi, G. K., et al. (2021). Return shipping insurance: Free versus for-a-fee? *International Journal of Production Economics*, 235, 108110.
- [10] Yang, L., & Chang, N. (2018). Supply chain operation decisions under return-freight insurance. *Systems Engineering*, 33(1), 116–124.
- [11] Zhao, X., Hu, S., & Meng, X. (2020). Who should pay for return freight in online retailing? Retailers or consumers. *Electronic Commerce Research*, 20, 427–452.
- [12] Zhang, T., Guo, X., & Wu, T. (2022). An analysis of cross-channel return processing with return-freight insurance for live streaming platforms. *Computers & Industrial Engineering*, 174, 108805.
- [13] Justin, P. J. (2020). The agency and wholesale models in electronic content markets. *International Journal of Industrial Organization*, 69, 58–81.
- [14] Wang, C., Leng, M., & Liang, L. (2018). Choosing an online retail channel for a manufacturer: Direct sales or consignment? *International Journal of Production Economics*, 195, 338–358.
- [15] Shen, F., Chen, Q., & Xu, G. (2019). Channel sales strategy selection of supply chain members under e-retailing. *Science & Technology Progress and Policy*, 15(05), 490–496.
- [16] Li, Z., Xu, X., Bai, Q., et al. (2021). The interplay between blockchain adoption and channel selection in combating counterfeits. *Transportation Research Part E: Logistics and Transportation Review*, 155, 98–113.
- [17] Yu, D., Wan, M., & Luo, C. (2022). Dynamic pricing and dual-channel choice in the presence of strategic consumers. *Managerial and Decision Economics*, 43(6), 2392–2408.
- [18] Sun, J., Wang, X., & Teng, C. (2024). Consumer utility-based sales channel selection and bundling strategies for near-expiration products. *Journal of Management*, 21(09), 1401–1410.
- [19] Zhang, X., Zhang, X., Luo, X. C., & Yue, W. T. (2021). The impact of revenue models on anti-counterfeiting measures for online intermediaries. *Information Systems Frontiers*, 75(2), 357–371.
- [20] Zhang, C., & Ma, H. (2021). Sales mode selection and information-sharing strategies of dominant e-retailers under competitive environments. *China Management Science*, 29(12), 115–124.
- [21] Nan, G. F., Yao, L. N., & Ho, Y. C. (2019). An economic analysis of platform protection in the presence of content substitutability. *Journal of Management Information Systems*, 36(3), 1002–1036.
- [22] Xue, J. H. (2025). Copyright administrative penalties and brand anti-counterfeiting governance from the perspective of market regulation. *China Brand & Anti-Counterfeiting*, (11), 39–41.