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# THE "SELLING FAKE AND FIGHTING FAKE" GAME BETWEEN E-COMMERCE SHOPS AND PLATFORMS

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**ABSTRACT:** *In recent years, China's e-commerce has developed rapidly, and at the same time, many problems have been raised such such as the proliferation of counterfeit goods. In this paper, the game model is used to analyze the relationship between "selling fake" in e-commerce shops and "fighting fake" on platforms. The game results show that whether a store sells fake goods or not depends on the extra profit, punishment intensity and supervision cost of the platform. According to the research results, combined with the actual situation of China's e-commerce market, this paper will put forward the corresponding Suggestions.*

**KEYWORDS:** E-commerce, Shops "Selling Fake", Platform "Fighting Fake", Game

## INTRODUCTION

As a strategic emerging industry, e-commerce has developed rapidly in recent years. In the first half of 2015, China’s online retail sales reached 7.18 trillion yuan, a year-on-year increase of 32.2%. At the same time, there have been many problems such as the proliferation of fake goods and false propaganda. According to the results of the targeted monitoring of online trading commodities released by the State Administration for Industry and Commerce in the second half of 2015, the authentic rate of online trading products was 58.7%. The phenomenon of selling fake goods on the e-commerce platform has become more and more serious, and it has become a bottleneck hindering the development of China's e-commerce. As a result, The "fake goods" incident and the "fight against fake" declaration have been staged in turn on various major e-commerce platforms.

At present, there are few literatures on the behavior of counterfeit goods trading in e-commerce platforms in China, and the punishments for the behavior of selling fakes are often just notification. (Lianghe Song, 2018) (Zan Lu& Zhigang Chen, 2008). Based on the analysis of the game between shops selling fake goods on e-commerce platform and fighting against fake goods on platform, this paper explores the causes of shops selling fake goods and puts forward corresponding Suggestions, so as to contribute to the establishment of China's e-commerce market credit mechanism and sustainable and healthy development.

### Model Hypothesis

To facilitate the study, this article begins in the following premises.

1. "Selling fake goods" refers to the act that a merchant sells goods of inconsistent quality



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with what they advertised. "Fake goods" refers to the goods intended to be sold that do not conform to the advertisement. The e-commerce platform in this paper refers to e-commerce enterprises based on commodity trading.

2. E-commerce platform in this paper refers to e-commerce enterprises based on commodity transaction.

3. The "selling fake" behavior of e-commerce takes place in the platform shops, not considering the selling fake behavior of self-operated commodities on the platform.

4. In the game of "selling fake and fighting fake", platforms and shops are rational economic people. They all seek to maximize their economic utility in economic behavior.

5. Retail sales revenue positively affects platform revenue. In terms of short-term economic benefits, the sale of fakes not only brings extra profits to the shops, but also brings additional benefits to the platform, such as sales commission, advertising revenue, and popularity and so on. Although B2C, C2C and other forms of e-commerce platform profit models are not the same, such as part of the B2C platform revenue is transaction costs (or sales commission, deduction points) and technical service annual fees, C2C platform mainly depends on advertising revenue and value-added service (Dan Wang,2007). However, in general, the sales revenue of stores has a positive impact on the platform revenue.

6. The quality management of retail goods is the responsibility of the platform, and the government departments are not involved in supervision.

7. Shops selling fake goods will be punished by the platform once they are found. In reality, there are many punishment measures, such as reducing credit rating, freezing accounts, etc., and this paper only considers the penalty.

## MODELS AND ANALYSIS

### Pure strategy game model of shop selling fake and platform supervision

Assuming that there are many shops on an e-commerce platform, the economic benefits of the stores are positively affecting the benefits of the platform. The platform establishes quality management department to supervise shops. As a rational person, both parties pursue their own economic utility maximization in the game of selling fake and fighting fake. As one side of the game, the action strategy of the store is selling fake goods or not; the platform's strategy is to regulate or not regulate.

Assuming that the retail income is $R$. When the store does not sell fakes, the revenue is recorded as $R_1$; correspondingly, if the store sells fakes, the revenue is recorded as $R_2$. Generally speaking, if the shop sells fake goods, the sales volume will be higher than the normal sales volume. In



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addition, the cost of fake goods is low and the profit is high, that is $R_2 > R_1$.

If the store operators adhere to the integrity of management, in the short term, store cannot get profiteering, but it is conducive to establish a good shop image, conducive to long-term benefits. On the contrary, if fake goods are sold, the current economic benefits will be improved, but it damages the interests of consumers and the reputation of shops and platforms, and leads to consumers' resistance or negative evaluation of stores and platforms. We assume that this subjective negative evaluation of the fake shops can be measured by numerical value, namely, the reputation cost of the shops, recorded as *h*. Obviously *h* is related to the number of counterfeit goods sold in the store. Taking into account the reputation cost of selling fake shops, the economic benefit of selling fake shops is $R_2$-*h*. The revenue of the platform is directly related to the revenue of the stores. It can be understood that the revenue of the platform is a function of the revenue of the store, that is, $T = T(R)$. If the store operates in good faith, the platform revenue is $T_1$; if the shop sells fake goods, the platform profit is $T_2$,and it is easy to get $T_2 > T_1$. In addition, platform supervision requires cost. Assuming that the platform supervision cost is *C*. Once the shops are investigated and punished for selling fake goods, they will be fined. Assuming the penalty amount is *F*, the penalty is the income of the platform. At the same time, if the platform only runs after economic benefits and neglects its selling fakes behaviors , it will lead to consumers' negative evaluation of the platform. Similarly, we assume that such negative evaluation can also be measured numerically, denoted as H, which can also be regarded as the cost of the reputation of the platform. Under the above series of assumptions, the game payment matrix between the sales of fake goods and the supervision of the platform is as follows:

| | | PLATFORM | |
|---|---|---|---|
| | | SUPERVISION | NOT SUPERVISION |
| SHOPS | SALL FAKES | $R_2$-*h*-*F*, $T_2$-*H*-*C*+*F* | $R_2$-*h* ,$T_2$-*H* |
| | NOT SELL FAKES | $R_1$ ,$T_1$-*C* | $R_1$ ,$T_1$ |

The game's result shows that:

(1)When the penalty imposed by the platform on selling-fakes shops is less than the cost of the platform to supervise the selling of fake goods, the platform will choose not to supervise the selling of fake goods regardless of the existence of the selling of fake goods. That is, when $F<C$, the optimal strategy chosen by the platform is not to regulate. At this point, the store's strategy selection is based on the following factors: $R_2$ profits from selling fake goods, $R_1$ profits from not selling fake goods, and *h* represents costs of reputation. If $R_2$-*h*$<R_1$, the stores will not sell fake goods; if $R_2$-*h*$>R_1$, the stores are probably sell fake goods. Under the assumption of


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rational people, combined with the reality, the possibility of stores not selling fakes at this time is very small. After all, the profits generated by selling fakes are far greater than those of honesty.

(2)If $R_2$-$h$-$F$>$R_1$, whether the platform is regulated or not, the income from the shop selection and sales is always greater than the non-sales, and the optimal strategy for the store is the sale of the fake; that is, when the reputation cost and the penalty cost are lower than the additional income generated by the fake behavior, the shop will choose to sell fakes.

(3)In the case of $F$>$C$, $R_2$-$h$-$F$<$R_1$<$R_2$-$h$, there is no pure strategy Nash equilibrium in the game of shop selling and platform supervision. If the platform chooses to supervise, the store chooses not to sell fakes; conversely, if the platform chooses not to be supervised, the store chooses to sell for fake.

This game also explains why the sale of fakes will intensify when the e-commerce platform lacks supervision or supervision of shops.

**Mixed strategy game model of shop sales and platform supervision**

In actual operations, due to various restrictions on people's property and other reasons, the platform often cannot comprehensively supervise the quality of shops. The information between the platform and the store is asymmetric. Both parties cannot judge in advance the strategy that the other party will adopt. Therefore, the actual game between the two parties is closer to the mixed strategy game. It is an incomplete information game, that is, both sides have certain probability selects a strategy to achieve a mixed strategy equilibrium. In this case, no matter which of the two parties changes the action strategy, it will not add any benefits to itself. Let's analyze the Nash equilibrium under the hybrid strategy game.

Assuming that the probability of platform selection supervision is p, the probability of non-supervising is 1-p; the probability that the shop chooses to sell fake is q, then the probability of choosing not to sell is 1-q; the payment matrix of mixed strategy game is as follows:

| | | PLATFORM | |
|---|---|---|---|
| | | SUPERVISION*(p)* | NOT SUPERVISION *(1-p)* |
| SHOPS | SALL FAKES*(q)* | $R_2$-$h$-$F$, $T_2$-$H$-$C$+$F$ | $R_2$-$h$ ,$T_2$-$H$ |
| | DO NOT SELL FAKES*(1-q)* | $R_1$ ,$T_1$-$C$ | $R_1$ ,$T_1$ |

Assume that the expected returns of the shops under the sales and non-sales strategies are $U_1^R$ and $U_2^R$ respectively; the expected returns of the platform under the regulatory and non-regulatory strategies are $U_1^T$ and $U_2^T$, respectively, and the expected returns are calculated as


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follows:

$U_1^R=p\ (R_2-h-F)+(1-p)\ (R_2-h)$

$U_2^R=pR_1+(1-p)\ R_1=R_1$

$U_1^T=q\ (T_2-H-C+F)+(1-q)\ (T_1-C)$

$U_2^T=q\ (T_2-H)+(1-q)\ T_1$

When the mixed strategy Nash equilibrium is realized, the expected returns of the shop in the case of selling fake and non-sales are equal, and the expected returns under the same platform selection supervision and non-regulatory strategy are also equal， which is:

$U_1^R=U_2^R$

$U_1^T=U_2^T$

That is:

$p\ (R_2-h-F)+(1-p)\ (R_2-h)=R_1$

$q\ (T_2-H-C+F)+(1-q)\ (T_1-C)=q\ (T_2-H)+(1-q)\ T_1$

So

$p=(R_2-h-R_1)/F$

$q=C/F$

From this game we can get the probability of shop sales fake $q=C/F$; the probability of platform supervision $p=（R_2-h-R_1）/F$.

In the mixed strategy game of shops and platforms selling fake and fake, $q^*=C/F$， $p^*=(R_2-h-R_1)/F$ is the only mixed strategy Nash equilibrium.

The values of $p^*$ and $q^*$ of the mixed strategy Nash equilibrium state, we can also find the conditions for the shop to choose whether to sell the fake or not and whether the platform chooses supervision or not:

When $p>p^*$, the shop's optimal strategy is not for sale;

When $p<p^*$, the optimal shop strategy is for sale;

When $q>q^*$, the platform optimal strategy is supervision;

When $q<q^*$, the platform optimal strategy is not regulated.



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The $p^*$ value of the game equilibrium depends on the expected returns $R_1$ and $R_2$ when the shop is not for sale and sale, and the reputation cost of the enterprise $h$; the value of $q^*$ depends on the regulatory cost of the platform $C$, the retail sales penalty $F$. Obviously, the greater the cost $C$ of platform quality supervision, the smaller the punishment $F$ of the shop sales and selling behavior, the more the platform tends to not supervise, the more the shop tends to sell fake.

Similarly, the larger the income $R_2$ of the shop sales, the smaller the $R_1$ of the non-sales, the smaller the reputation cost $h$ of the sale, and the smaller the penalty of the sale, the more the shop tends to sell.

## FINDINGS

It can be seen from the game results that whether the shop sells or not depends on the additional income from the sale, the penalty strength, the platform supervision cost or the ease of platform supervision.

### Implication to Research and Practice

According to the results of the game, the platform has an inescapable responsibility and unique advantage in punishing the selling behaviors of shops. On the e-commerce platform, every transaction is technically recorded, and the information of each seller is traceable. This means that the platform has the ability to dig out the actual source of fake goods in reverse through big data (Li Mao, 2014).

In general, the platform first needs to define its own strategy, measure the importance of corporate reputation, and seriously crack down on counterfeit sales with the principle of adhering to the integrity management.

To solve the problems existing in online trading platforms, it is necessary to innovate network supervision methods and establish communication and interaction mechanisms. From a macro perspective, e-commerce platforms should set up special quality supervision departments to strengthen the supervision of shops and form a set of supervision mechanism to make the supervision simple and feasible. It mainly includes the qualification examination of market access to shops, the management of shops during their operation, and the punishment of illegal selling of fake goods.

### Qualification examination of platform access of shops

E-commerce platforms are very open, with low entry barriers for shops. In addition, the platform itself has basically no supervision, so the products are mixed. In the application process, strengthening the qualification examination of shop access is conducive to controlling the quality of shops from the source and establishing a prior prevention mechanism. We can start from the following aspects: improve the entry standard of stores, improve the entry mechanism of stores, strict qualification examination, require dealers to provide purchase


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documents, brand authorization letters, customs and tax bills, national quality inspection, health department, certification department issued by the inspection report, quality inspection report, certification report, etc. For non-brand sellers who open their own online store, they should be required to provide certain source channel certification to ensure that the source channels are legal. In addition, adhering to real-name certification is conducive to standardizing the registration process of outlets and facilitating the management of shops during business operations.

**Strengthen the daily operation and management of shops**

In daily operation, the platform should strengthen the quality management of stores and monitor product quality in real time. We can make use of the following methods: establish an information supervision system to track the sales of goods in stores and make all sales behaviors transparent.

In the anti-counterfeiting operation, the quality supervision department can adopt the big data anti-counterfeiting mode to make fakes from thousands of online products through technologies such as intelligent image recognition, data capture and cross-analysis, intelligent tracking, and big data modeling systems. Establish a seller's sales credit system, when the seller's historical record reaches a dangerous value, it will be pushed to the quality management department as the basis for the punishment. Regularly carry out honest management education for shops and deepen the importance of integrity to business.

**Strictly punish the sale of fake**

Through the analysis of commodity service information and big data, once the shop’s sale and sale behavior is found, it will not be tolerated and severely punishable. Set clear punishment standards for selling fake goods, such as reducing credit rating and fine according to the amount of selling fake goods. Serious counterfeiters freeze their accounts, close their shops and refuse to accept their applications for registration.

## CONCLUSION

In this paper, game analysis is applied to e-commerce platform shops selling fake goods and fighting fake goods, and the reasons for shops selling fake goods are preliminarily expounded. According to the game results, whether a store sells fake goods or not depends on the extra income, punishment intensity, platform supervision cost or the difficulty degree of platform supervision. On this basis, some feasible Suggestions are put forward.

**Future Research**

Of course, this paper only analyzes this problem from a simple perspective. The assumptions of the model are too simple. In the actual e-commerce operation, in addition to retailers, there are dealers, agents and other participants. Coupled with the consumers' consumption



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psychology of "knowing and buying fake", the fight against fake becomes more complicated. This is also the biggest shortcoming of this article.

In the follow-up research, on this basis, the government, consumers, agents and other participants can form a multi-party game, and explore the operation mechanism of counterfeit sales behavior, more close to the reality. In addition, online sales of fake goods are closely related to the sources and supply channels of real fake goods. The combination of online and offline research on the phenomenon of fake goods in the e-commerce supply chain is conducive to fundamentally solving the phenomenon of rampant e-commerce fake goods.

It needs to be pointed out that it is not enough to create a healthy e-commerce environment only by the power of the platform, and there may be collusion and mutual use of the platform shops (Xinxia Jiang, 2013). A more effective solution to the problem of fake goods in e-commerce also requires the strong cooperation of consumers and the assistance of relevant government departments. Consumers should set up the correct consumption concept, reduce the "know false buy false" behavior; the government departments must speed up the legislation of e-commerce and put an end to the appearance of fake goods by improving the legal system. Only by making joint efforts can we create a sound e-commerce environment and safeguard the interests of all parties in the market.

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