Research on Cross-Border e-Commerce Platforms' Pricing: Based on the Two-Sided Market Theory

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Abstract: China is deepening the development of a new economic form with "Internet plus" as its core idea. With the implementation of the Belt and Road Initiative, cross-border e-commerce platforms develop rapidly, and gradually become the unexpected winner in the e-commerce industry. It is of great practical significance to conduct in-depth research on the pricing behavior of cross-border e-commerce platforms. At the same time, cross-border e-commerce platforms are typical platform enterprises in the two-sided market. The increasingly perfect theory on two-sided market in the industrial organization economics can be used to study the pricing of cross-border e-commerce platforms. Based on the theory of two-sided markets, this paper builds models and analyzes the pricing behavior of cross-border e-commerce platforms, and tries to draw relevant conclusions and suggestions on the pricing strategy of cross-border e-commerce platforms.

1. Introduction

With the development of network information technology and the increasing of consumers' requirements on service, more and more economic activities have demands for platform enterprises. Both the providers and consumers of products and services aim to achieve efficient economic activities through the service platform, which leads to the emergence and development of two-sided markets. It has become an important direction in economic research. Among them, e-commerce platforms, as typical two-sided markets, rely on the rapid development of information technology and the new opportunity of users' high demands for service quality. They are developing rapidly as a new industry. In particular, the cross-border e-commerce market is showing a blowout growth rate with huge development potential. Its rise has brought consumers a variety of choices, products with high quality price ratios and new payment experience. The market has become a "black horse" in the foreign trade economy. The biggest advantage of cross-border e-commerce lies in the network operation mode based on the Internet. This new e-commerce mode is reshaping the international trade process of small and medium-sized enterprises. Cross border e-commerce has broken the monopoly on overseas channels in traditional foreign trade, such as importers, wholesalers and distributors. Export enterprises can directly communicate with the final demand side of commodities, such as retailers and even the final consumers. Companies have successfully reduced the costs of intermediate links in trade and commodity channels. The reduction of costs in intermediate channels and commodity circulation has greatly improved the profitability of enterprises; consumers can also benefit from this process. In the context of the gradually maturing e-commerce market, the scale of cross-border e-commerce transactions in China reached 3.1 trillion yuan in 2013. It is expected to reach 6.5 trillion yuan in 2016, while the sales volume in 2008 was only 0.8 trillion yuan. The average annual growth rate of cross-border e-commerce is nearly 30%.

At present, the research on cross-border e-commerce platform mainly focuses on the current situation and existing problems of the development; researches on the equilibrium price of platform manufacturers are relatively backward. The two-sided market has unique characteristics that are obviously different from one-sided market, such as network externality. Therefore, it is unreasonable to explain industrial behaviors in two-sided markets by the traditional theory for one-sided market industrial organization. The modern industrial organization theory should be used to systematically analyze the pricing behaviors of cross-border e-commerce platforms according to the characteristics of two-sided markets.

2. Definition and Characteristics of Two-Sided Markets

With the development of network information technology and the improvement of consumers' service requirements, more and more economic activities have generated the demand for platform enterprises. Both the providers and consumers of products and services aim to realize the efficient economic activities through the service platform, which leads to the emergence and rapid development of two-sided market, and stimulates the academic community to study the theory of two-sided markets in depth. In the study of two-sided markets, theory researches on the definition and characteristics are relatively mature.

2.1 Definition of Two-Sided Markets

The concept of two-sided markets originated from the "penny newspaper" movement in 1833. At present, there are various definitions on two-sided markets. For example, from the definition of pricing structure, in 2006, Rochet and Tirole defined two-sided market as follows.^[1] Under the assumption that the numbers of transactions between the platform and two-sided users are fixed, and condition that the sum of charges on both sides is fixed, if the transaction volume of the platform is related to the price structure (i.e. the distribution of two prices), the market will be twosided. If the trading volume has nothing to do with the price structure, the market will be one-sided. However, this definition does not take into account the important indirect network externalities of two-sided markets. It only mentioned the price structure. On the contrary, in 2006, Armstrong redefined the two-sided market from the perspective of network externality.^[2] Network externality is one of the important characteristics of two-sided markets. It is of great theoretical significance to analyze the definition of two-sided market from this perspective. His definition of two-sided market is as follows. The two-sided market is a market with intermediate layers or trading platforms, in which the seller and the buyer can trade through the intermediate layer or the trading platform. The seller's participation depends on buyers' participation. This definition considers the direct network externality effect in the two-sided market. In 2007, Minli Huang expanded the definition on that basis, adding the influence of indirect network externality. According to Huang, if the supply and demand sides of a product or service have cross network externalities, the platform enterprise will unite the buyer and the seller into a trading platform at the same time. If the total price charged by the platform enterprise business to the buyer and the seller is $P = P^B + P^S$, (P^B and P^S can be zero or negative; P is greater than zero), it indicates that it P^B or P^S directly affects the total demand of the platform enterprise as well as the transaction volume achieved by the platform.

2.2 Characteristics of Two-Sided Markets

When defining the two-sided market, we have already mentioned its characteristics. In fact, as a new network market, the two-sided market has three parts of market participants, which is different from the two parts of traditional one-sided markets. Therefore, the two-sided market has unique characteristics compared with the traditional one-sided market. There are many characteristics of two-sided markets. Here, we mainly introduce three main characteristics: network externality, complementarity of two kinds of consumers and price asymmetry.

First, there are network externalities in two-sided markets. Moreover, this kind of network externalities can be divided into two categories: direct network externalities and indirect network externalities. Direct network externality can be interpreted as, the number of users on one side of the platform can affect the number of users on the other side and the trading volume. Indirect network externality means, a big difference between the traditional one-sided market and the two-sided market is that all products in the traditional one-sided market only face one consumer group, and the externalities generated between different products cannot be internal in the same consumer group. But the two-sided market has this advantage.^[3] It can make use of the indirect network externalities to realize the internalization of externalities among various products by the end users. The direct network externalities and the indirect network externalities are not completely different. They also have similarities. The direct network externalities are the same as the indirect network externalities, both of which lie in the price mechanism. It denies the former theory which believes

that the direct network externality is independent and can exist without the market mechanism. The reason is that the spillover effect of direct network is obtained by users through receiving platform services, and users on the same side can understand the number and scale of users through receiving platform services.

Second, the two-sided market is interdependent and complementary with two types of consumer groups. It is the mutual dependence and complementarity between users in the two-sided market that leads to the difference between the competition behaviors of platform enterprises in the two-sided market from those in the one-sided market. Only when buyers and sellers have the demand for products or services provided on the platform at the same time, can the transaction be generated and the platform has the significance of existence.^[4]

Third, the price set by the two-sided market platform enterprise is asymmetric for the seller and the buyer, but this asymmetric price structure does not mean that it has monopoly power or predatory pricing. The main reason for asymmetric pricing is the existence of network externalities in the two-sided market. The platform only needs to set a relatively low price for one user in the platform to expand the scale of this user, and then use the network externalities to expand the scale of the other user without setting a relatively low price, so as to maximize profits. Chunhui Gan and Xingyu Run (2004) analyzed the difference between two-sided market and one-sided market and considered that the pricing structure of two-sided market is $P = P^B + P^S$, but the price required in non one-sided market is equal to the marginal cost. Therefore, the allocation between users of both sides should be taken into consideration when pricing for buyers and sellers, so as to guarantee the profit of the enterprise as well as the social welfare level.

3. Definition and Development of Cross Border e-Commerce

3.1 Definition of Cross Border e-Commerce

E-commerce platform is a typical two-sided market, which relies on the rapid development of network information technology. It tries to help sellers and buyers to realize the efficient and flexible transaction, which greatly conforms to the development trend of the current industrial organization, and develops rapidly in recent years.^[5]

Cross border trade e-commerce can be understood as e-commerce for foreign trade, which refers to an international business activity that belongs to different trading subjects in different customs areas. Through the means of e-commerce, the links of commodity display, communication, negotiation and final transaction in offline import and export trade are networked; finally, the commodities are delivered and the transaction is completed through cross-border logistics. It includes e-trade of goods, online data transmission, cross-border e-fund payment, e-freight documents and cross-border logistics.^[6] Cross border e-commerce platforms mainly include tmall global, KJT, Suning global shopping, xiu.com, Amazon, and YHD. These platforms are typical two-sided markets. The platform improves the transaction volume by improving the search efficiency and matching degree of two-sided users.

3.2 Development of Cross-Border e-Commerce

The proposal of building the Silk Road Economic Belt and the Twenty-first Century Maritime Silk Road (The Belt and Road Initiatives) was put forward by general secretary Jinping Xi during his visit to Central Asia and Southeast Asia in September and October, 2013. "The Belt and Road Initiative" links the Central Asia, the South Asia, the Southeast Asia, and the West Asia. It links up the two major economic circles of Asia Pacific and Europe. It is the largest and most potential economic cooperation zone in the world. On March 28, 2015, the National Development and Reform Commission, the Ministry of Foreign Affairs and the Ministry of Commerce jointly issued the *Vision and Proposed Actions Outlined on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road*. It mentioned the "innovation of trade mode, the development of cross-border e-commerce and other new business forms", which clearly showed that the state attached much importance to the development of cross-border e-commerce. The Belt and Road Initiative is

clearly laid out; cross-border e-commerce attracts much attention and has great potentials for development. [7-8]

The structure of cross-border e-commerce market is relatively concentrated in China. The main trading modes are export markets and B2B markets. The commodity mainly includes clothing products, electronic products and outdoor sports products. From the perspective of annual transaction scale, the proportion of import e-commerce is relatively low. With the improvement of cross-border online shopping environment, the opening of cross-border online shopping market and the formation of consumers' cross-border online shopping habits, the proportion of import ecommerce will increase in the future. With the development of cross-border e-commerce industry, China's manufacturing industry accelerates the reform process to improve the quality of products and services, so as to better adapt the international market. The cross-border e-commerce has four operation modes in China: the third-party service platform, the small scale B2B or C2C mode, the large scale B2B mode and the independent B2C mode.^[9] With the improvement of cross-border ecommerce policies as well as the establishment of the e-commerce export supervision mode and credit system, the cross-border e-commerce mode will change from the traditional mode of providing information to providing comprehensive services of transaction, marketing, payment and logistics. It is believed that the change of operation mode will drive the growth of cross-border ecommerce transaction and promote the stable and continuous development of import and export trade in China.^[10-11]

Despite the rapid development of cross-border e-commerce in China, credit problems, payment problems, logistics problems and defects in national policies still exist, affecting the smooth development of cross-border e-commerce.

4. Analysis on Cross-Border e-Commerce Platforms' Pricing Based on the Two-Sided Market Theory

The Hotelling model is a classic model in industrial organization theory. According to Hotelling (1929), when the profit maximization second-order condition is satisfied, there is equilibrium in the model. The equilibrium point of the model lies in the same point where two enterprises locate in the market, which is the so-called "minimum product differentiation principle". The Hotelling spatial competition model, as a classic model of horizontal differentiation research, has been gradually improved after more than 30 years of development. There are many researches on the expansion of the model. This paper will expand the classic model to research the equilibrium pricing of crossborder e-commerce platforms.

4.1 Model Analysis

This paper assumes that the platform enterprise adopts the same registration fee standard for the buyers. It expands the basic Hotelling model, and adopts the price competition model of linear city, which includes three main bodies: platform enterprises, buyers and sellers. The assumptions for the three entities in the platform are as follows.

Network platform enterprise: in a straight line with the length of 1, there are two platform enterprises i located at both ends of the straight line, which are recorded as platform i = 1, 2. The platform enterprise 1 locates at x = 0, and platform 2 locates at x = 1. The two platform enterprises provide the same kind of services but with quality differences. Here, we use the locations of the two platform enterprises to represent the service level differences that affect users' decision beyond the network utility. The fixed cost of the platform is standardized to 0.

The buyers are evenly distributed in a linear city which has the length of 1 with the density of 1. The sellers are evenly distributed in a linear city which has the length of 1 with the density of 1.

 U_i^B and U_i^S respectively represent the utility of the buyer and the seller in the platform i (i = 1,2).

If the buyer user is located at a distance of x from platform 1, the effect obtained when the buyer only belongs to platform 1 is $U_1^B = U_0^B + \alpha^B n_1^S + \beta^B n_1^B - F_1^B - t_B x$; the effect the buyer only belongs to platform 2 is : $U_2^B = U_0^B + \alpha^B n_2^S + \beta^B n_2^B - F_2^B - t_B(1-x)$.

If the seller user is located at a distance of y from platform 1, the effect obtained when the seller only belongs to platform 1 is $U_1^s = U_0^s + \alpha^s n_1^B + \beta^s n_1^s - F_1^s - t_s y$; the effect the buyer only belongs to platform 2 is : $U_2^s = U_0^s + \alpha^s n_2^B + \beta^s n_2^s - F_2^s - t_s (1 - y)$.

The profit function of the platform is: $\pi_1 = n_1^B F_1^B + n_1^S F_1^S$, $\pi_2 = n_2^B F_2^B + n_2^S F_2^S$

Among them, U_0^B represents the basic utility of user to access to the platform; n_i^B and n_i^S represent the user scales of buyers and sellers in platform i respectively; α^B represents the indirect network utility intensity of the buyers to the sellers; β^B is the direct network utility parameter of the buyers to other buyers. t^B and t^S represent the unit traffic cost of buyers and sellers respectively, which is usually a horizontal difference parameter and can reflect the degree of differentiation of network platform enterprise to user service. $F_1^B, F_2^B, F_1^S, F_2^S$ indicate the registration fee charged by platform 1 to buyers and sellers, as well as the registration fee charged by platform 2 to buyers and sellers.

According to the Hotelling model analysis, it is assumed that $\overline{x} \in [0,1]$, the effect of consumer B's choice of accessing platform 1 for transaction is the same as accessing platform 2, which is expressed as follows:

$$U_{1}^{B} = U_{2}^{B}.$$

Solve the equation, $\overline{x} = \frac{1}{2} + \frac{\alpha^{B}(n_{1}^{S} - n_{2}^{S}) + \beta^{B}(n_{1}^{B} - n_{2}^{B}) - (F_{1}^{B} - F_{2}^{B})}{2t_{B}},$
then $n_{1}^{B} = \Pr(x < \overline{x}) = \overline{x} = \frac{1}{2} + \frac{\alpha^{B}(n_{1}^{S} - n_{2}^{S}) + \beta^{B}(n_{1}^{B} - n_{2}^{B}) - (F_{1}^{B} - F_{2}^{B})}{2t_{B}}$

It is assumed that the user belongs to a single platform. Therefore, $n_2^B = 1 - n_1^B$, $n_2^S = 1 - n_1^S$. By substituting this into the above formula, we can get the user scale of the buyers on platform 1 is as follows:

$$n_1^B = \frac{1}{2} + \frac{\alpha^B (2n_1^S - 1) - (F_1^B - F_2^B)}{2(t_B - \beta^B)}$$
(1)

The user scale of the buyers on platform 2 is as follows.

$$n_2^B = \frac{1}{2} - \frac{\alpha^B (2n_2^S - 1) - (F_1^B - F_2^B)}{2(t_B - \beta^B)}$$
(2)

Similarly, the user scale of sellers on platform 1 is as follows.

$$n_1^s = \frac{1}{2} + \frac{\alpha^s (2n_1^B - 1) - (F_1^s - F_2^s)}{2(t_s - \beta^s)}$$
(3)

The user scale of sellers on platform 2 is as follows.

$$n_2^{s} = \frac{1}{2} - \frac{\alpha^{s} (2n_2^{B} - 1) - (F_1^{s} - F_2^{s})}{2(t_s - \beta^{s})}$$
(4)

To solve the equation set composed of (1) and (2), the number of buyers and sellers trading on platform 1 can be obtained as follows.

$$n_1^B = \frac{1}{2} + \frac{1}{2} \frac{\alpha^B (F_2^S - F_1^S) + (t_s - \beta^S) (F_2^B - F_1^B)}{(t_B - \beta^B) (t_s - \beta^S) - \alpha^B \alpha^S}$$

$$n_1^{S} = \frac{1}{2} + \frac{1}{2} \frac{\alpha^{S} (F_2^{B} - F_1^{B}) + (t_B - \beta^{B}) (F_2^{S} - F_1^{S})}{(t_B - \beta^{B}) (t_S - \beta^{S}) - \alpha^{B} \alpha^{S}}$$

To solve the equation set composed of (3) and (4), the number of buyers and sellers trading on platform 2 can be obtained as follows.

$$n_{2}^{B} = \frac{1}{2} - \frac{1}{2} \frac{\alpha^{B} (F_{2}^{S} - F_{1}^{S}) + (t_{S} - \beta^{S}) (F_{2}^{B} - F_{1}^{B})}{(t_{B} - \beta^{B}) (t_{S} - \beta^{S}) - \alpha^{B} \alpha^{S}}$$
$$n_{2}^{S} = \frac{1}{2} - \frac{1}{2} \frac{\alpha^{S} (F_{2}^{B} - F_{1}^{B}) + (t_{B} - \beta^{B}) (F_{2}^{S} - F_{1}^{S})}{(t_{B} - \beta^{B}) (t_{S} - \beta^{S}) - \alpha^{B} \alpha^{S}}$$

From the above analysis, it can be seen that the equilibrium quantity of bilateral users exists when the platform enterprise adopts the product bundling strategy, and there is a unique equilibrium solution. The user scale of the platform enterprise is affected by fees charged by the two platforms and network externality parameters, but the additional effect factors only affect the user scale of platform 1.

4.2 Game Analysis

In the above analysis model, we divide the game into two stages for analysis. In the first stage, the platform enterprise sets prices to users of both sides respectively; in the second stage, buyers and sellers conduct transactions. In this paper, we use the backward induction method to analyze the game process of the competition model and find the equilibrium solution of the game.

In the second stage of the game, the buyer user and the seller conduct the transaction.

In the first stage of the game, the two platform enterprises set prices to the buyer and the seller respectively. In this paper, it is assumed that the platform enterprise only charges the registration fee, and the marginal cost of the services provided by the two-sided market platform is zero for both sellers and buyers.

Therefore, the profit of the platform is: $\pi_1 = n_1^B F_1^B + n_1^S F_1^S$, $\pi_2 = n_2^B F_2^B + n_2^S F_2^S$ The profit of platform 1 is as follows.

 $\pi_1 = n_1^B F_1^B + n_1^S F_1^S$

$$= \left[\frac{\frac{1}{2} + \frac{1}{2}\frac{\alpha^{B}(F_{2}^{S} - F_{1}^{S}) + (t_{S} - \beta^{S})(F_{2}^{B} - F_{1}^{B} + \Delta v)}{(t_{B} - \beta^{B})(t_{S} - \beta^{S}) - \alpha^{B}\alpha^{S}}\right]F_{1}^{B}}$$

$$+ \frac{\left[\frac{1}{2} + \frac{1}{2}\frac{\alpha^{S}(F_{2}^{B} - F_{1}^{B} + \Delta v) + (t_{B} - \beta^{B})(F_{2}^{S} - F_{1}^{S})}{(t_{B} - \beta^{B})(t_{S} - \beta^{S}) - \alpha^{B}\alpha^{S}}\right]F_{1}^{S}}{F_{1}^{S}}$$

The goal of the enterprise is to maximize the profit, so we need to take the derivative of the above equation to calculate the maximum profit.

From the first order conditions $\frac{\partial \pi_1}{\partial F_1^B} = 0$, $\frac{\partial \pi_1}{\partial F_1^S} = 0$, it is known that

$$\frac{\partial \pi_{1}}{\partial F_{1}^{B}} = \frac{1}{2} + \frac{1}{2} \frac{\alpha^{B} (F_{2}^{S} - F_{1}^{S}) + (t_{S} - \beta^{S}) (F_{2}^{B} - F_{1}^{B})}{(t_{B} - \beta^{B}) (t_{S} - \beta^{S}) - \alpha^{B} \alpha^{S}}$$
$$-\frac{1}{2} \frac{(t_{S} - \beta^{S}) F_{1}^{B}}{(t_{B} - \beta^{B}) (t_{S} - \beta^{S}) - \alpha^{B} \alpha^{S}} - \frac{1}{2} \frac{\alpha^{S} F_{1}^{S}}{(t_{B} - \beta^{B}) (t_{S} - \beta^{S}) - \alpha^{B} \alpha^{S}} = 0$$

$$\frac{\partial \pi}{\partial F_{1}^{S}} = -\frac{1}{2} \frac{\alpha^{B} F_{1}^{B}}{(t_{B} - \beta^{B})(t_{S} - \beta^{S}) - \alpha^{B} \alpha^{S}} + \frac{1}{2}$$
$$+ \frac{1}{2} \frac{(t_{B} - \beta^{B})(F_{2}^{S} - F_{1}^{S})}{(t_{B} - \beta^{B})(t_{S} - \beta^{S}) - \alpha^{B} \alpha^{S}} - \frac{1}{2} \frac{(t_{B} - \beta^{B})F_{1}^{S}}{(t_{B} - \beta^{B})(t_{S} - \beta^{S}) - \alpha^{B} \alpha^{S}} = 0$$

Similarly, the above analysis for platform 2 can also obtain the first-order conditions of platform 2:

$$\frac{\partial \pi_2}{\partial F_2^B} = \frac{1}{2} - \frac{1}{2} \frac{\alpha^B (F_2^S - F_1^S) + (t_s - \beta^S) (F_2^B - F_1^B)}{(t_B - \beta^B) (t_s - \beta^S) - \alpha^B \alpha^S} + \frac{1}{2} \frac{\alpha^S F_2^S}{(t_B - \beta^B) (t_s - \beta^S) - \alpha^B \alpha^S} = 0$$
$$\frac{\partial \pi_2}{\partial F_2^S} = \frac{1}{2} \frac{\alpha^B F_2^B}{(t_B - \beta^B) (t_s - \beta^S) - \alpha^B \alpha^S} + \frac{1}{2} \frac{\alpha^B F_2^B}{(t_B - \beta^B) (t_s - \beta^S) - \alpha^B \alpha^S} = 0$$

From the above four first-order conditions, the equilibrium price of platform 1 when two platforms are competitive equilibrium is:

$$F_{1}^{B^{*}} = t_{B} - \beta^{B} - \alpha^{S} + \frac{[3(t_{B} - \beta^{S})(t_{S} - \beta^{S}) - 2\alpha^{B}\alpha^{S} - \alpha^{B^{2}}]}{9(t_{B} - \beta^{S})(t_{S} - \beta^{S}) - \alpha^{B}\alpha^{S} - 2(\alpha^{B} + \alpha^{S})^{2}}$$
$$F_{1}^{S^{*}} = t_{S} - \beta^{S} - \alpha^{B} + \frac{(t_{B} - \beta^{S})(\alpha^{S} - \alpha^{B})}{9(t_{B} - \beta^{S})(t_{S} - \beta^{S}) - \alpha^{B}\alpha^{S} - 2(\alpha^{B} + \alpha^{S})^{2}}$$

Similarly, the equilibrium price of platform 2 is:

$$F_{2}^{B^{*}} = t_{B} - \beta^{B} - \alpha^{S} - \frac{[3(t_{B} - \beta^{S})(t_{S} - \beta^{S}) - 2\alpha^{B}\alpha^{S} - \alpha^{B^{2}}]}{9(t_{B} - \beta^{S})(t_{S} - \beta^{S}) - \alpha^{B}\alpha^{S} - 2(\alpha^{B} + \alpha^{S})^{2}}$$

$$F_{2}^{S^{*}} = t_{S} - \beta^{S} - \alpha^{B} - \frac{(t_{B} - \beta^{S})(\alpha^{S} - \alpha^{B})}{9(t_{B} - \beta^{S})(t_{S} - \beta^{S}) - \alpha^{B}\alpha^{S} - 2(\alpha^{B} + \alpha^{S})^{2}}$$

From the above analysis, it can be seen that there are equilibrium prices charged by platform enterprises for two-sided users, and there is also an interaction between the prices charged by platform enterprises for two-sided users. The influence of two kinds of network externalities and extra effect parameters on equilibrium price can not be ignored. This chapter will analyze it in detail in the part of summary.

4.3 Summary

This paper discusses the price should be charged by the platform to buyers and sellers in order to obtain the maximum profit under the condition that two-sided users completely belong to one platform in the two-sided market. From the above analysis, we can draw some conclusions.

First, the equilibrium solution of the price charged to buyers and sellers when the platform obtains the maximum profit exists, and there is a unique equilibrium solution.

Second, when a platform enterprise adopts the strategy of product bundling, both the equilibrium price and quantity charged by the platform enterprise to users and the indirect network externality

 $\alpha^{B}\alpha^{S}, \alpha^{B}, \alpha^{S}, (\alpha^{B} + \alpha^{S})$ of both sides have an impact on the maximization of profits. However, the impact of each indirect network externality on the price setting is different, which needs further analysis.

Thirdly, when a platform enterprise adopts the strategy of product bundling, the equilibrium price and the quantity of two platforms are related to β^B , β^S , $(t_B - \beta^B)$, $(t_S - \beta^S)$. The equilibrium price is negatively related to above factors. It indicates that the direct network externalities of users on both sides of the platform are negatively related to the equilibrium price.

Fourthly, the degree of service quality difference t between platform enterprises and users of both sides will also affect the pricing of platform. Moreover, the size of equilibrium price is positively related to t, which means that the difference of service quality between platform and users of both sides is positively related to the equilibrium price.^[12]

5. Conclusion

In the two-sided market, the pricing of users on both sides of the platform is affected by a variety of factors. Therefore, cross-border e-commerce platforms should consider a variety of factors in the pricing process.

Firstly, cross border e-commerce platforms should make use of the pricing asymmetry of twosided market platforms and set different prices according to different characteristics of users in order to maximize profits.

Secondly, cross border e-commerce platforms should fully consider the characteristics of network externalities in pricing. In that process, they should distinguish direct network externalities from indirect network externalities, and analyze the influence of two network externalities on platform pricing. The platform should also consider the direct and indirect network externalities of the other user when setting the price for one user, because the price set by the platform for the other user is also related to the direct and indirect network externalities of this user.

Thirdly, both the platform's service quality and the quality difference for users of both sides have impacts on platform pricing; this impact is positive. It means that the greater the difference between the platform's service quality for users of both sides and that of other platforms, the greater the platform's service quality difference is. Under that situation, the platform can set a high price for users so as to obtain greater profits. This requires cross-border e-commerce platforms to pay more attention to the improvement of service quality when providing special services to two-sided users, so that users can get better experience and maximize profits from service quality.

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