Building Sustainable Competitive Advantage: Matching IT Capabilities by Network Externalities

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Abstract: IT capability based on RBV cannot provide firms with sustainable competitive advantage. IT capability consists of standardized IT capability and non-standardized IT capability. This paper applied Stackelberg model to research match of IT capabilities factors based on network externalities. Network externalities from IT technology standards can bring about sustainable competitive advantage for the incumbent firms. When difference of non-standardized IT capability between two types of firms is significant, the incumbent firms should control compatibility of standardized IT capability, which enable him to achieve differentiation competitive advantage; when difference of non-standardized IT capability between firms is insignificant, incumbent firm should release IT standards absolutely, which can increase consumers' anticipation to achieve installed-base for technological innovation.

Keywords: standardized IT capabilities; non-standardized IT capabilities; network externalities; Competitive Advantage

1 Introduction

Over long periods, people have gradually realized the importance of IT to employ information technology Within the firms, such as ERP、MRPII etc. Excellent IT capability can promote firms to digitalize, thus improving operating efficiency, expanding market space, and providing personalization. In 2023, the scale of digital economy in China has reached 54.6 trillion yuan. However, when one firm achieve more profits, the others will snatch benefits by imitating technology. So how to maintain sustainable competitive advantage, which is solved by all firms. Firms' IT capabilities belong to the technical capabilities, this concept about IT capabilities was firstly proposed by ROSS who considered that firm IT capabilities are the abilities of controlling the costs associated with IT and influencing on the organizational goals by implementing IT. For excapml, ShaiHai's firms applied new generation information technologies such as cloud computing, big data, Internet of Things, artificial intelligence, blockchain, etc to improve average quality by 7.7%, and reduce cost by 15.1% since 2021.

According to dynamic capabilities theory, IT capabilities belongs to combinatorial capabilities, which include core IT capability and dynamic IT capability similarly. Dynamic IT capability can dynamically reorganize the firm's IT resources and organizational resources according to the external environment, and this IT capability will evolve into the new core IT capability [1][5]. Dynamic IT capability depend on core IT capability, and dynamic IT capability must have positive feedback effect on core IT capability, but level of the former one is higher than latter

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one[2]. They evolve alternately by socializing and internalizing the knowledge. In fact, the dynamic IT capability is a process of socialization and internalization of knowledge. According to the RBV theory and dynamic capability theory, core IT capability and dynamic IT capability must constitute firm's IT capabilities, which can generate sustainable competitive advantage for the firm by evolving alternately. In 2022, Shanghai electric group adopted IT technolgy based on consumer demand to incerase customer satisfaction rate by 4%, response speed by 4%, and improved the production efficiency and quality of the firm significantly.

In conclusion, this paper applied two-stage game and Stackelberg price competition methods to quantitative research the influence of the network externalities from IT technology standards based on competitive advantage and strategic benefit of firms, and discussed the positive influence as well as negative influence of modular enterprise cooperation. The outline of this paper is as follows. Section 2 presents the theoretical research and hypothesis. Section 3 researches the matching of horizontal firms' IT capabilities based on network externalities. And section 4 concludes the paper.

2 Theoretical research and hypothesis

This paper considers that IT capability includes standardized IT capability and non-standardized IT capability based on existing digital technology standards. Standardized IT capability belongs to dynamic IT capability, that is produced by the IT standardized services and the IT application standards in the market acting on the firm, it is an equivalent IT capability with obvious characteristics of explicit knowledge and coding and spreading easily; But non-standardized IT capability belongs to the core capability, it is formed by IT resources and other unique resources in the firm. It has obvious heterogeneity and characteristics of recessive knowledge, it is rooted in the firm, and it has great viscosity and it is difficult to be coded and spread.

The standardized IT capability coming from the firms outside is promoted by the standardized information service and IT application standards of the industry. Because the diffusion IT technology standards will spread more widely, their industry's value will be higher than ever, and firms can provide higher value of products and services for consumers also. The consumers' utility will increase and the positive network effect will be more significant by the scale of consumers becoming larger, then the value of products and services provided by firms will be higher. IT standards will bring about the network externalities, and the network externalities root in standardized IT capabilities. The strength of network externalities represents scale of consumers depending on firm's IT applications, and this dependence is especially reflected in the consumer internet industry[3]. The firm's high-quality IT applications will bring high-quality feelings of consumption to consumers. The degree of consumers' dependence on IT applications is decided by its popularity in the industry. If there are more firms adopt mainstream technology standards, consumers' habits will be changed more easily, then it will generate adaptability and dependence on IT applications. For example, when using online shopping, mobile client shopping and other consumption modes, if there are more consumers adapt to the new mode, then the new model will be applied more easily and generate more value for firms. If consumers recognize the IT application network at a greater extent, the network externalities intensity of standardized IT capability will be more significant, the network value will be higher, the network externalities will be more significant in the whole industry, then it will generate greater

attraction to consumers, which increases consumers' confidence and psychological expectations for firm's IT application network.

The impact of non-standardized IT capabilities on firms originated the classical theory—Resource-Based View (RBV), which mainly uses the organizational capabilities of firms to integrate and allocate IT resources, thus, these rare IT resources can generate the IT core capabilities which are valuable, rare and difficult to imitate or replace. Non-standardized IT capabilities are mainly oriented to the fields of IT management, IT human resources and IT organization learning in firms, they can directly affect the design, production, manufacturing and other fields of products, thus produce a positive feedback effect on product, service and other aspects, and this effect is unique.

When these firms get the competitive advantages through non-standard IT capabilities, there will be a large gap among firms, it means difference in the quality of products and services. At this time, different products and services will correspond to different price, which could distinguish different consumer groups. High quality products and services can improve the utility of consumers and largen horizontal gaps. Standardized IT capabilities could create positive network effects to the consumers' effects inevitably; Simultaneously the consumers will pay more expenditure for the utility increasing when the level of non-standard IT capability is increased.

Now the problem is that the core IT capability will increase the consumers' expenditure and reduce the consumer s' utility although it will improve the quality of products and services. But the firm must have scarce resources to obtain competitive advantage, this is a paradox.

It is supposed that the leading firm makes and publishes technology standards, obtains large consumer base, and creates network externalities in the competitive market by using the leading advantages in the industry, the firms are likely to give up technology innovation and dedicated to promoting technology standards if the benefits brought by network externalities are enough to offset the benefits gained by firm innovation[4]. It is emphasized here that technology standards do not represent the latest technology. The question is that the firms choose one of which or both? The firms must choose a balanced combination between technology research and technical standards promotion to achieve the competitive advantage if they are both not willing to give up researching the technology and promoting the standards of technology.

In order to research the equilibrium relationship between the technology R&D and technology standard's popularization, the paper puts forward the following hypothesizes:

Hypothesis 1: There are only incumbent firms and competitive firms in the market. Incumbent firms have advantages of information technology and can provide standardized information technology services to consumers. They are more mature than competitors in IT application, and they have core advantages of competence. The incumbent firms as leaders are different in non-standardized IT capabilities from competitive firms.

Hypothesis 2: There is perfect information between incumbent firms and competitive firms, and they can observe the pricing and adjustment behavior of different IT capabilities sufficiently each other. The incumbent firms as leader are first movers; the competitive firms as followers can only adopt unidirectional compatible strategy for the information technology of the incumbent firm.

Hypothesis 3: There are digital technology standards which can generate network externalities in the markets. Both incumbent firms and competitive firms provide products and services to consumers by compatible information technologies. So, there are compatibilities between the two firms' products and services.

3 A model with IT capabilities based on network externalities

Baake & Boom regarded that consumers have different willingness to pay due to the differences of products' inherent quality. According to the Hotelling model, consumers also have different willingness to pay for favorite commodity because of the horizontal differences between products. So, firms' non-standardized IT capabilities and standardized IT capabilities can provide products with vertical and horizontal differences to the consumers. Now we assume that the consumer utility provided equations by the incumbent firm is:

$$U_b = \theta M_b - p_b + \tau q_b + \tau\gamma q_m \tag{1}$$

The Parameters: q_b is the incumbent products' market demand, and q_m is the competitive products' market demand, the total demand $q_b + q_m = 1$. In the competitive market, information technology services also tend to be standardized and have a certain degree of similarity and universality in content, so that the standardized IT capabilities between firms are equivalent. compatibility $\gamma \in [0,1]$ reflects the similarity of standardized IT capabilities. M_b reflects the level of non-standardized IT capability of the incumbent firm, which is a continuity variable. Non-standardized IT capabilities' elements are formed by the combination of organizational capability and IT resources. They have certain heterogeneity and can affect the firms' organizational capability, exploration capability or development capability, then affecting the quality of products or services. $\theta \in [\theta_1, \theta_2]$ determines the consumers' sensitivity coefficient of non-standardized IT capabilities, and it is uniform distribution. When the sensitivity coefficient chooses θ_2, it represents that all consumers are very sensitive to product quality and they will choose the incumbent products. When the sensitivity coefficient is θ_1, it represents that consumers are not sensitive to product quality and all consumers will choose the competitive products instead. While the sensitivity coefficient range is between $[\theta_1, \theta_2]$, the two types of consumers coexist. θM_b determines the consumers' willingness to pay for high-quality products, consumers' utility from non-standardized IT capabilities; p_b represents the incumbent products' price. It is assumed that firms are willing to expose the mature IT standards to the outside world, Now, we assume that $\tau > 0$ is the network externalities intensity of standardized IT capabilities, it represents the degree of the consumers' recognition in standardized information technology, that is the degree of consumers' dependence on standardized information technology services; τq_b represents the network externalities generated by the standardized IT capabilities of incumbent firms. The consumer will obtain more utility if there are more consumers accept the standardized information technology services, $\tau\gamma q_m$ represents the compatible network externalities generated by the competitive firms' standardized IT capabilities, it can also generate positive feedback effect on the consumer utility of the incumbent products[6].

Similarly, the consumers' utilities of competitive products are:

$$U_m = \theta M_m - p_m + \tau q_m + \tau\gamma q_b - \delta(1-\gamma) \tag{2}$$

According to function above, M_m is the level of competitive firms' non-standardized IT capabilities, and θM_m represents the utility generated by competitive firms' non-standardized IT capabilities effecting on the consumers of competitive products; the price of competitor's product is p_m ; τq_m represents the network externalities generated by the competitor's standardized IT capabilities. $\tau\gamma q_b$ represents the compatible network externalities generated by the incumbent firms' standardized IT capabilities to the consumers of competitive products; $\delta(1-\gamma)$represents the transfer cost or learning cost when consumers give up incumbent products and switch to select competitive products, $\delta > 0$ represents the compatible sensitive coefficient of transfer cost.

When $U_b = U_m$, we consider that the consumers have the same preference for choosing incumbent products and competitive products. Then we have the critical sensitivity coefficient of consumers for non-standardized IT capabilities:

$$\theta^* = \frac{p_b - p_m - \tau(q_b - q_m) + \tau\gamma(q_b - q_m) - \delta(1-\gamma)}{\Delta M} \tag{3}$$

In equation (3), $\Delta M = M_b - M_m > 0$ represents the differences between the two kinds of firms' non-standardized IT capabilities. Now we assume that the market demand function of the incumbent products is[1][7]:

$q_b = \frac{1}{\Delta\theta}(\theta_2 - \theta^*)$, $\Delta\theta = \theta_2 - \theta_1$

Equation (3) is plugged into the above formula, as follow:

$$q_b(p_b, p_m) = \frac{\theta_2\Delta M - p_b + p_m + (\delta - \tau)(1-\gamma)}{\Delta M\Delta\theta - 2\tau(1-\gamma)} \tag{4}$$

Similarly, the market demand function of competitive products is:

$$q_m = \frac{1}{\Delta\theta}(\theta^* - \theta_1), \quad \Delta\theta = \theta_2 - \theta_1$$

Equation (3) is plugged into the market demand function of competitive products also, as follow:

$$q_m(p_b, p_m) = \frac{-\theta_1\Delta M + p_b - p_m - (\delta + \tau)(1-\gamma)}{\Delta M\Delta\theta - 2\tau(1-\gamma)} \tag{5}$$

In the horizontal market, two kinds of products' competition are divided into two stage games. In the first stage, the two types of firms firstly choose the differences of the optimal non-standardized IT capabilities and the compatibility of the optimal standardized IT capabilities to determine the optimal IT capabilities match between the two types of firms. In the second stage, the incumbent firms and competitive firms play Stackelberg price game to determine their equilibrium prices and equilibrium market output[6].

3.1 Price competition based on Stackelberg game-theoretic model

This paper adopted the Backward-Induction method. Firstly, the two types of firms compete each other in Stackelberg price competition to determine their equilibrium prices respectively.

Now we assume that the profit function of the competitive firms is:

$$\pi_m(p_m) = q_m(p_m - c_m)$$

From above function, $c_m > 0$ represents the marginal cost of competitive products, putting (5) into the above function, as follow:

$$\pi_m(p_m) = \left[\frac{-\theta_1\Delta M + p_b - p_m - (\delta + \tau)(1-\gamma)}{\Delta M\Delta\theta - 2\tau(1-\gamma)}\right](p_m - c_m) \tag{6}$$

The first-order conditions (FOC) and second-order conditions (SOC) are obtained by taking the derivative of function (6) respectively:

$$\frac{\partial\pi_m}{\partial p_m} = \frac{-\Delta M\theta_1 + p_b - 2p_m - (\delta + \tau)(1-\gamma) + c_m}{\Delta M\Delta\theta - 2\tau(1-\gamma)}$$

$$\frac{\partial^2\pi_m}{\partial p_m^2} = -\frac{2}{\Delta M\Delta\theta - 2\tau(1-\gamma)}$$

When $\tau < \frac{\Delta M\Delta\theta}{2(1-\gamma)}$, there must exists $\frac{\partial^2\pi_m}{\partial p_m^2} < 0$,and the profit function of the competitive firms is strict concave function. the competitive firms get max profits, Therefore, there is a unique equilibrium price for the competitive firms $p_m^*(\tau)$:

$$p_m^*(\tau) = \frac{-\Delta M\theta_1 + p_b - (\delta + \tau)(1-\gamma) + c_m}{2} \tag{7}$$

Secondly, we assume that the incumbent firms' reaction profit function is:

$$\pi_b(p_b) = q_b(p_b - c_b)$$

In above function, $c_b > 0$ represents the marginal cost of the incumbent products. It is emphasized that, there are differences between the two types of firms in raw material procurement, production process and logistics distribution because there are vertical and horizontal differences between them in non-standardized IT capabilities and standardized IT capabilities, which makes the marginal cost of the two types of products to be unequal, and $c_b < c_m$, It does not mean the raw materials' cost of the products, that is comprehensive cost. The incumbent firms will readjust its equilibrium price according to the competitive firms' equilibrium price by means of observing the competitive their pricing behavior. Putting(4)、(7) into the above function:

$$\pi_b(p_b) = \left[\frac{2\theta_2\Delta M - p_b + (\delta - 3\tau)(1-\gamma) - \Delta M\theta_1 + c_m}{2[\Delta\theta\Delta M - 2\tau(1-\gamma)]}\right](p_b - c_b) \tag{8}$$

Now taking the first and second partial derivative of incumbent firms' reaction profit function $\pi_b(p_b)$ respectively:

$$\frac{\partial \pi_b(p_b)}{\partial p_b} = \frac{2\Delta M\theta_2 - 2p_b + (\delta - 3\tau)(1-\gamma) - \Delta M\theta_1 + c_m + c_b}{2[\Delta M\Delta\theta - 2\tau(1-\gamma)]}$$

$$\frac{\partial^2 \pi_b(p_b)}{\partial p_b^2} = -\frac{1}{\Delta M\Delta\theta - 2\tau(1-\gamma)}$$

When $\frac{\partial^2 \pi_b(p_b)}{\partial p_b^2} < 0$, there must be $\frac{\partial^2 \pi_b(p_b)}{\partial p_b^2} < 0$, therefore, there must be a unique equilibrium price $p_b^*(\tau)$ in incumbent firms:

$$p_b^*(\tau) = \frac{\Delta M\theta_2 + p_m + (\delta - \tau)(1-\gamma) + c_b}{2} \quad \backslash \tag{9}$$

According to function (7) and function (9), we obtain the following:

$$p_b^{**}(\tau) = \frac{2\Delta M\theta_2 + (\delta - 3\tau)(1-\gamma) - \Delta M\theta_1 + c_m + c_b}{2} \quad \backslash \tag{10}$$

$$p_m^{**}(\tau) = \frac{-3\Delta M\theta_1 - (\delta + 5\tau)(1-\gamma) + 3c_m + 2\Delta M\theta_2 + c_b}{4} \quad \backslash \tag{11}$$

Now putting the first partial derivative of function (10) and function (11) respectively:

$$\frac{\partial p_b^{**}(\tau)}{\partial \tau} = -\frac{3(1-\gamma)}{2};\ \frac{\partial p_m^{**}(\tau)}{\partial \tau} = -\frac{5(1-\gamma)}{4}$$

From above two equations, we consider that the equilibrium price of incumbent products declines faster than that of the competitive products, and the price dispersion between the two types of products will enlarge, as the network externalities τ of standardized information technology services increasing, that is $\left|\frac{\partial p_b^{**}(\tau)}{\partial \tau}\right| > \left|\frac{\partial p_m^{**}(\tau)}{\partial \tau}\right|$. Thus, it implies that the standardized IT services are more easily accepted by consumers, when the network externalities' intensity τ of standardized IT services increasing, hence, incumbent products will achieve more price advantages than competitive products.

From function (10), (11) and function (4), we obtain the equilibrium market output $q_b^*(\tau)$ and first partial derivative of incumbent products about τ :

$$q_b^*(\tau) = \frac{2\Delta M\theta_2 + (\delta - 3\tau)(1-\gamma) + c_m - c_b - \Delta M\theta_1}{4[\Delta\theta\Delta M - 2\tau(1-\gamma)]} \tag{12}$$

$$q_m^*(\tau) = \frac{-3\Delta M\theta_1 - (\delta + 5\tau)(1-\gamma) + 2\Delta M\theta_2 - c_m + c_b}{4[\Delta\theta\Delta M - 2\tau(1-\gamma)]} \tag{13}$$

$$\frac{\partial q_b^*(\tau)}{\partial \tau} = \frac{(1-\gamma)[\Delta M\theta_1 + \Delta M\theta_2 + 2c_m - 2c_b + 2\delta(1-\gamma)]}{4[\Delta M\Delta\theta - 2\tau(1-\gamma)]^2} \tag{14}$$

Now taking the second partial derivative of the incumbent firms' equilibrium market output based on function (14):

$$q_b^*(\tau)'' = \frac{-(1-\gamma)^2\left[\Delta M\theta_1 + \Delta M\theta_2 + 2c_m - 2c_b + 2\delta(1-\gamma)\right]}{\left[\Delta M\Delta\theta - 2\tau(1-\gamma)\right]^2} \tag{15}$$

Function (12) and (13) implies the equilibrium market output of incumbents and competitors can also be regarded as the market coverage rate of the two firms (the total market capacity is 1). $c_b < c_m$ and $\Delta M > 0$ confirmed $q_b^*(\tau) - q_m^*(\tau) > 0$, which indicated sufficiently that incumbent firms occupy obvious first-mover advantage because their non-standardized IT capabilities are superior to that of competitors. Therefore, the actual market coverage rate of incumbent firms is higher than that of competitive firms. Through IT application, firms can achieve the first-mover competitive advantage as long as they have the advantage of non-standardized IT capabilities.

Because $\Delta M > 0$, incumbent firms have the advantage of non-standardized IT capabilities and they are able to promote the production process's innovation than competitive firms further. Hence $c_m > c_b$, we could obtain:

$-\Delta M\Delta\theta + 2\Delta M\theta_2 + 2c_m - 2c_b + 2\delta(1-\gamma) > 0$, Necessarily $\frac{\partial q_b^*(\tau)}{\partial\tau} > 0$, and $\frac{\partial q_m^*(\tau)}{\partial\tau} < 0$

Therefore, there must be $\frac{\partial q_b^*(\tau)}{\partial\tau} > 0$ and $\frac{\partial q_m^*(\tau)}{\partial\tau} < 0$

the standardized IT services become more valuable for consumers when the standardized IT services' intensity of network externalities τ tends to be significant, the supporting capabilities of incumbent firms have been improved, such as raw material procurement, logistics distribution, online payment, order processing, warehouse management, etc. They can improve consumer expectations effectively and promote the increase of incumbent firms' consumer demands, then achieve economies of scale, reduce marginal costs, obtain cost advantages, transform industrial advantages to the firms' internal advantages, and improve the market coverage of incumbent firms. Importantly, when the competitive strategy of incumbent firms is transformed into standardized competitive strategy, the competitive firms cannot implement the economies of scale. under the background of standardized information technology services, incumbent firms must give priority to standardized competitive strategy, but competitive firms cannot choose standardized competitive strategy, they can only choose price competitive strategy to reduce their products price and expand their market demand.

3.2 The influence of standardized IT' network externalities intensity on firms' equilibrium profits

After discussing the influence of τ on market demand and equilibrium price of two kinds of firms in competitive market, we continue to discuss respectively the influence of τ on firms' effect of equilibrium profits:

Case 1: The influence of standardized IT services' network externalities intensity τ on the profits of competitive firms

Now taking the first partial derivative of competitive firms' equilibrium profits:

$$\frac{\partial \pi_m^*(\tau)}{\partial \tau} = \frac{\partial q_m^*}{\partial \tau}\left(p_m^{**} - c_m\right) + \frac{\partial p_m^{**}}{\partial \tau} q_m^* \tag{16}$$

the influence of τ on competitive firms' equilibrium profits is composed of price effect and market output effect. Because of price effect $\frac{\partial p_m^{**}(\tau)}{\partial \tau} q_m^* < 0$ and market output effect $\frac{\partial q_m^*(\tau)}{\partial \tau}\left(p_m^{**} - c_m\right) < 0$, so $\frac{\partial \pi_m^*(\tau)}{\partial \tau} < 0$. According to functions (11) and (14), the entire standardized IT service network has been controlled by incumbent firms because of his initial endowment of non-standardized IT capabilities advantages, the equilibrium market output of competitive firms will shrink gradually with the increase of τ, They could not achieve economies of scale, nor could shift to differentiation strategy, so they can only implement the price competition strategy. At last, the competitive firms' equilibrium profits will inevitably decrease with the increase of τ.

Case 2: The influence of standardized information technology services' network externalities intensity on the incumbent firms' profits

Now take the first partial derivative of incumbent firms' equilibrium profits:

$$\frac{\partial \pi_b^*(\tau)}{\partial \tau} = \frac{\partial q_b^*(\tau)}{\partial \tau}\left(p_b^{**} - c_b\right) + \frac{\partial p_b^{**}(\tau)}{\partial \tau} q_b^* \tag{17}$$

whether the incumbent firms' marginal profit $\frac{\partial \pi_b^*(\tau)}{\partial \tau}$ will be increasing, mainly depends on their market output effect $\frac{\partial q_b^*(\tau)}{\partial \tau}\left(p_b^{**} - c_b\right)$ is greater than $\left|\frac{\partial p_b^{**}(\tau)}{\partial \tau} q_b^*\right|$:

$$\frac{\partial q_b^*(\tau)}{\partial \tau}\left(p_b^{**} - c_b\right) = \frac{(1-\gamma)\left[-\Delta M\Delta\theta + 2\Delta M\theta_2 + 2c_m - 2c_b + 2\delta(1-\gamma)\right]\left[2\Delta M\theta_2 + (\delta - 3\tau)(1-\gamma) - \Delta M\theta_1 + c_m - c_b\right]}{8\left[\Delta M\Delta\theta - 2\tau(1-\gamma)\right]^2} \tag{18}$$

Because $\frac{\partial p_b^{**}(\tau)}{\partial \tau} q_b^* < 0$, so the incumbent firms' price effect's absolute value is:

$$\left|\frac{\partial p_b^{**}(\tau)}{\partial \tau} q_b^*\right| = \frac{3(1-\gamma)\left[\Delta M\Delta\theta - 2\tau(1-\gamma)\right]\left[2\Delta M\theta_2 + (\delta - 3\tau)(1-\gamma) - \Delta M\theta_1 + c_m - c_b\right]}{8\left[\Delta M\Delta\theta - 2\tau(1-\gamma)\right]^2} \tag{19}$$

if $\frac{\partial \pi_b^*(\tau)}{\partial \tau} > 0$, there must be $\left|\frac{\partial p_b^{**}(\tau)}{\partial \tau} q_b^*\right| < \frac{\partial q_b^*(\tau)}{\partial \tau}\left(p_b^{**} - c_b\right)$. That is, the incumbent firms' output effect is greater than his price effect, thus, we can derive the non-standardized IT capabilities difference between the two types of firms:

$$\Delta M < \frac{c_m - c_b + (\delta + 3\tau)(1-\gamma)}{\theta_2 - 2\theta_1}\left(\theta_2 > 2\theta_1\right) \tag{20}$$

ΔM will influence effect of τ, and $\theta_2 > 2\theta_1$ represents that the market capacity must be very large, and different consumers have obviously different preferences for non-standardized IT capabilities. Because the denominator part is higher order than the numerator part of function

(15), Therefore, if ΔM is larger, the positive feedback from the τ to the incumbent firms' equilibrium market output is smaller. When $\Delta M < \frac{c_m - c_b + (\delta + 3\tau)(1-\gamma)}{\theta_2 - 2\theta_1}(\theta_2 > 2\theta_1)$, for random $\gamma < 1$,The equilibrium profits of incumbent firms will increase with increasing of τ from standardized IT capabilities.

4 Conclusion

This conclusion represents that the incumbent firms have the advantages of non-standardized IT capabilities to control over the network of standardized IT capabilities. Non-standardized IT capabilities will weaken the network externalities of standardized IT capabilities. When difference of non-standardized IT capabilities is obvious, the network externality intensity of standardized IT capabilities brings about little positive feedback effect to the market demand of incumbent firms. therefore, the equilibrium profits of incumbent firms will cut down. On the contrary, when the difference between two non-standardized IT capabilities is small, the incumbent firms' equilibrium profits will increase with the increasing of standardized IT services' network externalities intensity. For exemple, Huawei has achieved fruitful results in the research and deployment of 5G networks, and he is promoting the implementation of 5G standards. Now Huawei continuously is promoting chinese technology to the global market and has established long-term and stable relationships with numerous international brands and partners.

Generally speaking, the network externalities intensity of standardized IT capabilities has a negative feedback effect on the equilibrium price of both incumbent and competitive products, and the equilibrium price of incumbent products declines faster than that of competitive products. At the same time, the network externalities intensity of standardized IT capabilities has the positive feedback effect on the equilibrium market output of incumbent products. However, the differences between the two types of firms' non-standardized IT capabilities are more obvious, so the positive feedback effect is weaker, therefore, the price output elasticity of incumbent products will be greater than 1 only when the non-standardized IT differences between two types of firms is insignificant, then achieve demand economies of scale actually. However, the increase of network externalities intensity of standardize IT capabilities is not good for the competitive firm, which will be trapped in price competition.

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