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Endogenous Choice of Competition Modes in a Differentiated Duopoly with Corporate Social Responsibility

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Abstract

This paper examines how the corporate social responsibility (CSR) affects endogenous choice of competition modes. The behavior of the relevant firms and the decision policy are explored. We find that in the case of product substitution, the introduction of CSR policies by firms focusing on consumer rights will reverse the traditional quantitative competition results as the dominate strategy. Price competition becomes the dominate strategy and welfare will increase as the degree of product substitution decreases or the weight of consumer rights increases.

Keywords

Corporate Social Responsibility (CSR), Price Competition, Quantity Competition

1. Introduction

Corporate social responsibility (CSR) has achieved worldwide interest, as a paradigm of corporate self-discipline that contains ethical considerations and benefits social interests. Existing evidence suggests that consumers respond positively to the firms' efforts for social responsibility. Many researches show that consumers express a willingness to pay a premium for goods and services produced by socially responsible firms (see, Elfenbein & McManus (2010); Blanco, Ray-Maquieira, & Lozano (2009)). And, so, the final goods producers will engage in CSR activities to attract consumers and gain competitive edge.

In addition to showing concern for consumer surplus, CSR is traditionally an issue related to environmental damage, such as reducing air or water pollution problems. This paper focuses on the issue of concerning consumers welfare in corporate social responsibility, mainly to find the impact of CSR on the choice of endogenous competition in the market without discussing environmental-related issues.

In the literature of endogenous competition choices in the market, Yang and Hwang (2005), Matsumura and Ogawa (2012), Scrimitore (2013, 2014), and He and Hsu (2014), etc., examined the endogenous competitive strategy with price and quantity on different issues such as the trade policy, the private competition and the logistical channel strategy. In a purely private competition with substitution goods, regardless of whether the upstream vertical market exist, the quantity competition is always the dominant strategy; in mixed public and private firm competition setting, the price competition becomes the dominant strategy. Nakamura (2022) revisited the endogenous choice between price and quantity contracts in a duopoly composed of asymmetric firms engaged in corporate social responsibility (CSR) with possibly biased managers. Under such setting, Cournot competition can change to an equilibrium competition structure regardless of the degree of homogeneity between the goods produced by them and the degree of importance of their CSR. Furthermore, he showed that Bertrand competition, in addition to Cournot competition, can be observed in equilibrium when the degrees of importance of CSR between firm owners are sufficiently asymmetric with each other.

In this paper we consider the market competition between two firms discussing the impact of the firm's concern on consumer-oriented corporate social responsibility without delegated managers on different types of market competition mode. The main contribution of this paper is to flip the results of the past tradition. After considering the CSR consumer's welfare, the competition pattern will change even without hiring the biased manager. Our finding echoes the reversed results of Nakamura (2022) relying on the biased-manager hiring.

The rest of the paper is organized as follows. Second section provides the basic model setting. Section 3 explores the analysis of firm's strategy with CSR. Section 4 is the conclusion.

2. Basic Model

Consider an economy with two final goods producers, firms 1 and 2. These firms produce heterogeneous substitutive products. We assume that the utility function of the consumer is given by $U = a\left(q_1 + q_2\right) - \frac{1}{2}\left(q_1^2 + 2\gamma q_1 q_2 + q_2^2\right) + M$ the inverse market demand functions for the products are $p_i = a - \left(q_i + \gamma q_j\right)$, $i, j = 1, 2$, where p_i is price, γ is the paremeter of heterogeneous substitutive goods, $0 < \gamma < 1$, and q_i is the output and M denotes other composite goods. We also assume that both firms require the same cost c to produce the product.

In an economy with two final goods producers, firm 1 and firm 2 producing heterogeneous substitutive products. The firm 2 as usual maximizes its profit. The

firm 1 concerns about the consumer surplus and its profit. The policy will be called as the corporate social responsibility (CSR). Determine the equilibrium outputs of the firms when the firm i faces the cost c, $i=1,2$. Firm 1 and 2 maximise $K=\pi_1+\alpha CS$ and π_2 to determine the quantities and prices respectively. The α is the parameter of the firm 1 caring about the consumer surplus with its profit and $0<\alpha<1$, impress the CRS policy is still less important than the profit. The social welfare is $SW=CS+\sum_{i=1}^{2}\pi_i$ and the CS is the consumer surplus and $CS=U-\sum_{i=1}^{2}p_iq_i$.

Assuming that in the production process, the firm has no other costs in addition to the production cost, so the firm's profit functions will be $\pi_i=(p_i-c)q_i$, $i=1,2$.

Under the foregoing market environment settings, this section separately solves the model for three scenarios: both firms adopt quantity competition, both firms adopt price competition, and one firm adopts quantity competition while the other firm adopts price competition.

2.1. Quantity Competition

By the model setting, the market inverse demand functions for the two products are: $p_i=a-(q_i+\gamma q_j)$, $i,j=1,2$. The objective function of firm i is partially differentiated by the quantity q_i, and the first-order conditions are as follows:

$$\begin{aligned}\frac{\partial K}{\partial q_1}&=a-c-2q_1-\gamma q_2+\alpha(q_1+2\gamma q_2-\gamma q_2)=0\\ \frac{\partial \pi_2}{\partial q_2}&=a-c-\gamma q_1-2q_2=0\end{aligned}\tag{1}$$

Solving the first-order conditions simultaneouslly, the equilibrium quantities are

$$\begin{aligned}q_1&=\frac{(a-c)(2-(1-\gamma)\alpha)}{4-2\gamma+(1-\gamma)\alpha^2}\\ q_2&=\frac{(a-c)(2-\gamma-\alpha)}{4-2\gamma+(1-\gamma)\alpha^2}\end{aligned}\tag{2}$$

The equilibrium price, firms' profit, consumer surplus and social welfare level (SPNE) are listed as follows:

$$\begin{aligned}p_1&=\frac{c(2+\alpha-\alpha^2)+a(2-\alpha-\gamma(2-\alpha^2))}{4-2\gamma+(1-\gamma)\alpha^2}\\ p_2&=\frac{a(2-\gamma-\alpha)+c(2-\gamma+\alpha-(1-\gamma)\alpha^2)}{4-2\gamma+(1-\gamma)\alpha^2}\\ \pi_1&=\frac{(a-c)^2(2-(1-\gamma)\alpha)(2-\alpha-\gamma(2-\alpha^2))}{(4-2\gamma-(1-\gamma)\alpha^2)^2}\\ \pi_2&=\frac{(a-c)^2(2-\gamma-\alpha)^2}{(4-2\gamma-(1-\gamma)\alpha^2)^2}\\ K&=\frac{(a-c)^2(8-4\gamma^2+\gamma^3+2(2-\gamma)^2\alpha+(2+(2-\gamma)^2\gamma)\alpha^2)}{2(4-2\gamma-(1-\gamma)\alpha^2)^2}\end{aligned}\tag{3}$$

$$CS = \frac{(a-c)^2\left(2(2-\alpha)^2+\gamma^2(1-\alpha)-2\gamma(2-\alpha)(1-\alpha)\right)(1+\alpha)}{2\left(4-2\gamma-(1-\gamma)\alpha^2\right)^2}$$

$$SW = \frac{(a-c)^2\left(2(2-\alpha)^2(3+\alpha)+\gamma^2(1-\alpha)^2(3+2\alpha)-2\gamma(2-\alpha)\left(5-\alpha-2\alpha^2\right)\right)}{2\left(4-2\gamma-(1-\gamma)\alpha^2\right)^2}$$

2.2. Price Competition

By the model setting, the market demand functions for the two products are: $q_i = \frac{(1-\alpha)a - p_i + \alpha p_j}{1-\alpha^2}$, $i, j = 1, 2$. The objective function of firm i is partially differentiated by the price p_i, and the first-order conditions are as follows:

$$\begin{aligned} \frac{\partial K}{\partial p_1} &= \frac{c + a(1-\gamma)(1-\alpha) - (2-\gamma)p_1 + (1-\gamma)\alpha p_2}{1-\alpha^2} = 0 \\ \frac{\partial \pi_2}{\partial p_2} &= \frac{a + c - a\alpha + \alpha p_1 - 2p_2}{1-\alpha^2} = 0 \end{aligned} \tag{4}$$

Simultaneouslly solving the first-order conditions, the equilibrium prices are

$$\begin{aligned} p_1 &= \frac{c(2+\alpha-\gamma\alpha)+a(1-\gamma)\left(2-\alpha-\alpha^2\right)}{4-2\gamma-(1-\gamma)\alpha^2} \\ p_2 &= \frac{c(2-\gamma+\alpha)+a(1-\alpha)\left(2-\gamma+(1-\gamma)\alpha\right)}{4-2\gamma-(1-\gamma)\alpha^2} \end{aligned} \tag{5}$$

The equilibrium quantity, firms' profit, consumer surplus and social welfare level (SPNE) are listed as follows:

$$\begin{aligned} q_1 &= \frac{(a-c)(2+\alpha)}{(1+\alpha)\left(4-2\gamma-(1-\gamma)\alpha^2\right)} \\ q_2 &= \frac{(a-c)\left(2-\gamma+(1-\gamma)\alpha\right)}{(1+\alpha)\left(4-2\gamma-(1-\gamma)\alpha^2\right)} \\ \pi_1 &= \frac{(a-c)^2(1-\gamma)(1-\alpha)(2+\alpha)^2}{(1+\alpha)\left(4-2\gamma-(1-\gamma)\alpha^2\right)^2} \\ \pi_2 &= \frac{(a-c)^2(1-\alpha)\left(2-\gamma-(1-\gamma)\alpha\right)^2}{(1+\alpha)\left(4-2\gamma-(1-\gamma)\alpha^2\right)^2} \\ K &= \frac{(a-c)^2\left(8+\gamma^3(1+\alpha)-2\gamma^2(1+\alpha)(2+\alpha)+2\gamma\alpha(2+\alpha)^2-2\alpha^2(3+\alpha)\right)}{2(1+\alpha)\left(4-2\gamma-(1-\gamma)\alpha^2\right)^2} \\ CS &= \frac{(a-c)^2\left(\gamma^2(1+\alpha)-2\gamma(1+\alpha)(2+\alpha)+2(2+\alpha)^2\right)}{2(1+\alpha)\left(4-2\gamma-(1-\gamma)\alpha^2\right)^2} \\ SW &= \frac{(a-c)^2\left(2(2+\alpha)^2(3-2\alpha)+\gamma^2(1+\alpha)\left(3-2\alpha^2\right)-2\gamma(2+\alpha)\left(5-3\alpha^2\right)\right)}{2(1+\alpha)\left(4-2\gamma-(1-\gamma)\alpha^2\right)^2} \end{aligned} \tag{6}$$

2.3. Firm 1 Adopts Price Competition and Firm 2 Adopts Quantity Competition

By the model setting, the market (inverse) demand functions for the two products are: $q_1 = a - p_1 - \alpha q_2$ and $p_2 = a(1-\alpha) - (1-\alpha^2)q_2 + \alpha p_1$. The objective function of the firm is partially differentiated to the price or quantity, we get the first-order conditions

$$\begin{aligned} \frac{\partial K}{\partial p_1} &= a + c - a\gamma - (2-\gamma)p_1 - \alpha q_2 = 0 \\ \frac{\partial \pi_2}{\partial q_2} &= a - c - a\alpha + \alpha p_1 - 2(1-\alpha^2)q_2 = 0 \end{aligned} \tag{7}$$

By solving the first-order conditions simultaneously, the equilibrium price and quantity are

$$\begin{aligned} p_1 &= \frac{c(2+\alpha-2\alpha^2) + a(1-\alpha)(2+\alpha-2\gamma(1+\alpha))}{4-3\alpha^2-2\gamma(1-\alpha^2)} \\ q_2 &= \frac{(a-c)(2-\gamma-\alpha)}{4-3\alpha^2-2\gamma(1-\alpha^2)} \end{aligned} \tag{8}$$

The equilibrium quantity, equilibrium price, firms' profit, consumer surplus and social welfare level (SPNE) are listedas follows:

$$\begin{aligned} q_1 &= \frac{(a-c)(2-\alpha+\gamma\alpha-\alpha^2)}{4-3\alpha^2-2\gamma(1-\alpha^2)} \\ p_2 &= \frac{a(2-\gamma-\alpha)(1-\alpha^2) + c(2-\gamma(1-\alpha^2)+\alpha(1-\alpha-\alpha^2))}{4-3\alpha^2-2\gamma(1-\alpha^2)} \\ \pi_1 &= \frac{(a-c)^2(1-\alpha)(2-\alpha+\gamma\alpha-\alpha^2)(2+\alpha-2\gamma(1+\alpha))}{(4-3\alpha^2-2\gamma(1-\alpha^2))^2} \\ \pi_2 &= \frac{(a-c)^2(2-\gamma-\alpha)^2(1-\alpha^2)}{(4-3\alpha^2-2\gamma(1-\alpha^2))^2} \\ K &= \frac{(a-c)^2\left(2(2-\alpha-\alpha^2)^2 - 2\gamma^2(1-\alpha)(1+\alpha)(2+\alpha) + \gamma^3(1-\alpha^2) + \gamma\alpha(8-\alpha^2(6+\alpha))\right)}{2(4-3\alpha^2-2\gamma(1-\alpha^2))^2} \\ CS &= \frac{(a-c)^2(8-(4-\gamma)\gamma+2\gamma\alpha-(10-(4-\gamma)\gamma)\alpha^2-2\gamma\alpha^3+3\alpha^4)}{2(4-3\alpha^2-2\gamma(1-\alpha^2))^2} \\ SW &= \frac{(a-c)^2\left(\gamma^2(1-\alpha)(1+\alpha)(3-4\alpha) + (4-3\alpha^2)(6-\alpha(4+\alpha)) - 2\gamma(1-\alpha)(10+\alpha(3-2\alpha(4+\alpha)))\right)}{2(4-3\alpha^2-2\gamma(1-\alpha^2))^2} \end{aligned} \tag{9}$$

2.4. Firm 1 Adopts Quantity Competition and Firm 2 Adopts Price Competition

By the model setting, the market (inverse) demand functions for the two products

are: $p_1 = a(1-\alpha) - (1-\alpha^2)q_1 + \alpha p_2$ and $q_2 = a - p_2 - \alpha q_1$. The objective function of the firm is partially differentiated to the price or quantity, we get the first-order conditions

$$\begin{aligned} \frac{\partial K}{\partial q_1} &= a - c - a\alpha + \alpha p_2 - (2-\gamma)(1-\alpha^2)q_1 = 0 \\ \frac{\partial \pi_2}{\partial p_2} &= a + c - 2p_2 - \alpha q_1 = 0 \end{aligned} \tag{10}$$

By solving the first-order conditions simultaneously, the equilibrium price and quantity are

$$\begin{aligned} q_1 &= \frac{(a-c)(2-\alpha)}{4-3\alpha^2-2\gamma(1-\alpha^2)} \\ p_2 &= \frac{a(1-\alpha)(2-\gamma+(1-\gamma)\alpha) - c(2-\gamma+\alpha-(2-\gamma)\alpha^2)}{4-3\alpha^2-2\gamma(1-\alpha^2)} \end{aligned} \tag{11}$$

The equilibrium quantity, price, firms' profit, consumer surplus and social welfare level (SPNE) are listed as follows:

$$\begin{aligned} p_1 &= \frac{a(1-\gamma)(2-\alpha)(1-\alpha)(1+\alpha) + c(2+\alpha-\gamma\alpha-\alpha^2-(1-\gamma)\alpha^3)}{4-3\alpha^2-2\gamma(1-\alpha^2)} \\ q_2 &= \frac{(a-c)(1-\alpha)(2-\gamma+(1-\gamma)\alpha)}{4-3\alpha^2-2\gamma(1-\alpha^2)} \\ \pi_1 &= \frac{(a-c)^2(1-\gamma)(2-\alpha)^2(1-\alpha^2)}{(4-3\alpha^2-2\gamma(1-\alpha^2))^2} \\ \pi_2 &= \frac{(a-c)^2(1-\alpha)^2(2-\gamma+(1-\gamma)\alpha)^2}{(4-3\alpha^2-2\gamma(1-\alpha^2))^2} \\ K &= \frac{(a-c)^2(8-4\gamma^2+\gamma^3-2(2-\gamma)^2\alpha-2(3+\gamma(2-(4-\gamma)\gamma))\alpha^2+2(2-\gamma)^2\alpha^3-(2-\gamma)(1-\gamma)^2\alpha^4)}{2(4-3\alpha^2-2\gamma(1-\alpha^2))^2} \\ CS &= \frac{(a-c)^2(8-(4-\gamma)\gamma-2\gamma\alpha-2(5-(4-\gamma)\gamma)\alpha^2+2\gamma\alpha^3+(3-\gamma)(1-\gamma)\alpha^4)}{2(4-3\alpha^2-2\gamma(1-\alpha^2))^2} \\ SW &= \frac{(a-c)^2(3\gamma^2(1-\alpha^2)^2+(4-3\alpha^2)(6-\alpha(4+\alpha))-2\gamma(1-\alpha)(1+\alpha)(10-\alpha(5+3\alpha)))}{2(4-3\alpha^2-2\gamma(1-\alpha^2))^2} \end{aligned} \tag{12}$$

3. The Endogenous Structure of Competition Modes

The relationship between the firm's competition method and the corresponding objective function can be expressed appearing in Table 1.

Table 1. Firm's competitive strategy and the objective function.

		Firm 2	
		Price	Quantity
Firm 1	Price	(K_1^{pp}, π_2^{pp})	(K_1^{pq}, π_2^{pq})*
	Quantity	(K_1^{qp}, π_2^{qp})	(K_1^{qq}, π_2^{qq})

*The above mark *pq* is an example, which means that the firm 1 adopts price competition, and the firm 2 adopts quantity competition, and so on.

We further analyze firms' optimal market competition strategies.

Under the firm 2 with the price competitive strategy, the market competition strategies of firm 1 are:

1) **Price competition**, the objective function is:

$$K_1^{pp} = \frac{8+\gamma^3(1+\alpha)-2\gamma^2(1+\alpha)(2+\alpha)+2\gamma\alpha(2+\alpha)^2-2\alpha^2(3+\alpha)}{2(1+\alpha)\left(4-2\gamma-(1-\gamma)\alpha^2\right)^2}(a-c)^2 \quad (13)$$

2) **Quantity competition**, the objective function is:

$$K_1^{qp} = \frac{8-4\gamma^2+\gamma^3-2(2-\gamma)^2\alpha-2\left(3+\gamma\left(2-(4-\gamma)\gamma\right)\right)\alpha^2+2(2-\gamma)^2\alpha^3-(2-\gamma)(1-\gamma)^2\alpha^4}{2\left(4-3\alpha^2-2\gamma\left(1-\alpha^2\right)\right)^2}(a-c)^2 \quad (14)$$

If $K_1^{pp} > K_1^{qp}$, firm 1 will be the price competitive strategy. On the other hand, if $K_1^{pp} < K_1^{qp}$, firm 1 will be the quantity competitive strategy. By the $K_1^{pp} = K_1^{qp}$ condition, we can get the boundary of A.

Under the firm 2 with the quantity competitive strategy, the market competition strategies of firm 1 are:

1) **Price competition**, the objective function is:

$$K_1^{pq} = \frac{2\left(2-\alpha-\alpha^2\right)^2-2\gamma^2(1-\alpha)(1+\alpha)(2+\alpha)+\gamma^3\left(1-\alpha^2\right)+\gamma\alpha\left(8-\alpha^2(6+\alpha)\right)}{2\left(4-3\alpha^2-2\gamma\left(1-\alpha^2\right)\right)^2}(a-c)^2 \quad (15)$$

2) **Quantity competition**, the objective function is:

$$K_1^{qq} = \frac{8-4\gamma^2+\gamma^3+2(2-\gamma)^2\alpha+\left(2+(2-\gamma)^2\gamma\right)\alpha^2}{2\left(4-2\gamma-(1-\gamma)\alpha^2\right)^2}(a-c)^2 \quad (16)$$

If $K_1^{pq} > K_1^{qq}$, firm 1 will be the price competitive strategy. On the other hand, if $K_1^{pq} < K_1^{qq}$, firm 1 will be the quantity competitive strategy. By the $K_1^{pq} = K_1^{qq}$ condition, we can get the boundary of B.

Similarly, under the firm 1 with the price competitive strategy, the market competition strategies of firm 2 are:

1) **Price competition**, the objective function is:

$$\pi_2^{pp} = \frac{(1-\alpha)\left(2-\gamma-(1-\gamma)\alpha\right)^2}{(1+\alpha)\left(4-2\gamma-(1-\gamma)\alpha^2\right)^2}(a-c)^2 \quad (17)$$

2) **Quantity competition**, the objective function is:

$$\pi_2^{pq} = \frac{(2-\gamma-\alpha)^2(1-\alpha^2)}{\left(4-3\alpha^2-2\gamma(1-\alpha^2)\right)^2}(a-c)^2 \tag{18}$$

If $\pi_2^{pp} > \pi_2^{pq}$, firm 2 will be the price competitive strategy. On the other hand, if $\pi_2^{pp} < \pi_2^{pq}$, firm 2 will be the quantity competitive strategy. By the $\pi_2^{pp} = \pi_2^{pq}$ condition, we can get the boundary of C.

Under the firm 1 with the quantity competitive strategy, the market competition strategies of firm 2 are:

1) **Price competition**, the objective function is:

$$\pi_2^{qp} = \frac{(1-\alpha)^2(2-\gamma+(1-\gamma)\alpha)^2}{\left(4-3\alpha^2-2\gamma(1-\alpha^2)\right)^2}(a-c)^2 \tag{19}$$

2) **Quantity competition**, the objective function is:

$$\pi_2^{qq} = \frac{(2-\gamma-\alpha)^2}{\left(4-2\gamma-(1-\gamma)\alpha^2\right)^2}(a-c)^2 \tag{20}$$

If $\pi_2^{qp} > \pi_2^{qq}$, firm 2 will be the price competitive strategy. On the other hand, if $\pi_2^{qp} < \pi_2^{qq}$, firm 2 will be the quantity competitive strategy. Using $\pi_2^{qp} = \pi_2^{qq}$ condition, we can get the boundary of D.

We then use Figure 1 to portray the boundaries of A, B, C, and D and the selection of firms' competition strategies.

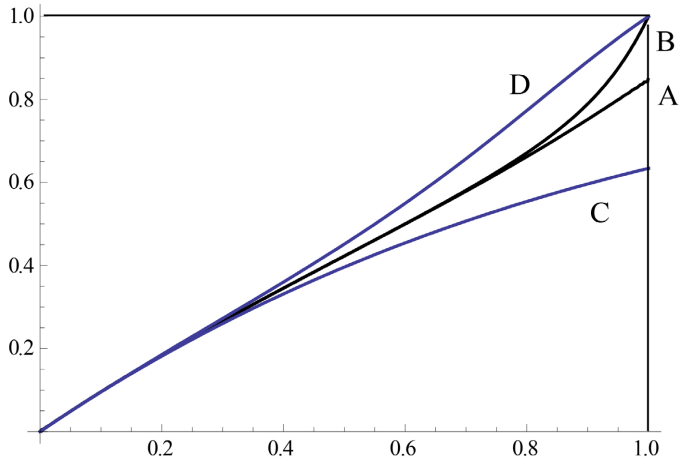

Figure 1. Firm's competition strategy selection.

In the area below the boundary of C, quantity competition is the dominant strategy for both firms, and the market equilibrium is the solution of quantity competition between the two firms. The Nash equilibrium is

$$\text{NE} = \left\{(q,q) = \left(K_1^{qq}, \pi_2^{qq}\right)\right\}$$

In the area between boundary C and boundary A, quantity competition is still

the superior strategy for firm 1, but the firm 2 change. When firm 1 competes in quantity, firm 2 competes in quantity competition; when firm 1 competes in price, firm 2 competes in price competition. The market equilibrium is still the solution for the quantity competition between the two firms because of the firm 1's decision.

$$\mathrm{NE} = \left\{ (q,q) = \left(K_1^{qq}, \pi_2^{qq} \right) \right\}$$

In the area between boundary A and boundary B, firm 1 change its strategy. When firm 2 competes in quantity, firm 1 chooses quantity competition as well; when firm 2 competes in price, firm 1 changes to price competition, but firm 2 responds stay put as in the previous stage, when firm 1 competes in quantity, firm 2 competes in quantity; when firm 1 competes in price, firm 2 competes in price, and the market equilibrium at this time is the quantity competition or price competition between the two firms just like the result of the famous "Battle of the Sexes" game.

$$\begin{aligned} \mathrm{NE} &= \left\{ (q,q) = \left(K_1^{qq}, \pi_2^{qq} \right) \right\} \\ &= \left\{ (p,p) = \left(K_1^{pp}, \pi_2^{pp} \right) \right\} \end{aligned}$$

According to the odd number theorem of the Nash equilibrium, we also know that there is an equilibrium in this conditional range where there is a mixed NE in terms of probability, that is, there is a certain probability of mixed quantity competition and price competition between firms.

In the area between boundary B and boundary D, the strategy of firm 1 change again, price competition becomes the dominant strategy, and the reaction of firm 2 is still the same as the previous two stages. When the quantity of firm 1 competes, the quantity of firm 2 competes; when the firm 1 competes in price, the firm 2 competes in price. The market equilibrium at this time is the price competition solution for both firms also because of the firm 1's decision.

$$\mathrm{NE} = \left\{ (p,p) = \left(K_1^{pp}, \pi_2^{pp} \right) \right\}$$

In the area above boundary D, the competition strategy of firm 2 has changed, price competition is the strategy of all firms' advantage, and the market equilibrium at this time is the solution of price competition between two firms.

$$\mathrm{NE} = \left\{ (p,p) = \left(K_1^{pp}, \pi_2^{pp} \right) \right\}$$

Based on the above analysis, we can get the following propositions:

Proposition 1: *When a firm introduces the CSR policy that cares about consumer propensity, the market may take price competition under the consideration of maximin the firm's objective function.*

Proof: As Figure 1's results show.

Singh and Vives (1984) proved that when the market product is a substitution relationship, the profit under quantity competition is superior to the price competition, which is the traditional result in the literature, and this paper introduces

CSR that cares about consumer tendencies, which will be reversed under the particularly parameter conditions.

Proposition 2: *The firm adopting the CSR policy will dominate the market competition result, that is, the market competition pattern is the same as that adopted by the CSR firm.*

Proof: It can be seen from the analysis in Figure 1. The strategic conditions of firm 1 weakly dominate the strategic conditions of firm 2, and the market equilibrium is determined by the market strategy of firm 1.

According to Proposition 2 result, we can clearly draw the boundaries of market competition results, as shown in Figure 2.

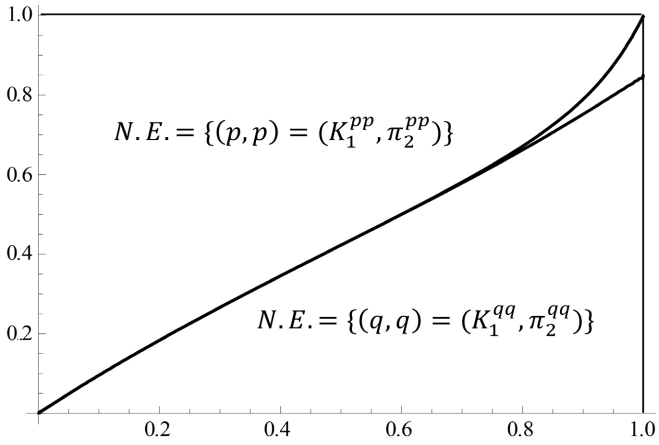

Figure 2. Market competition results.

The results in Figure 2 show that when competitive goods are substitutions, firm focus on the consumer rights and the introduction of CSR policy will reverse the traditional quantitative competition result and become the price competition, and this result will increase as the degree of substitution decreases or the weight of consumer rights increases.

4. Conclusion

We have introduced the CSR policy through the way firms care about consumer rights and based on this, we have obtained that their policies will change the competitive behavior and choices among firms. Through relevant models, we have analyzed the results, and we learned there are many differences from the traditional literatures. These results show that the diversity of firms' competitive behavior in the market and the possibility of discovering relevant decisions have further enriched the lack of literature analysis, and we hope that the society will pay more attention to the relevant impact of CSR on market behavior, which can promote market efficiency and firms' decision-making basis.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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