American Journal of Industrial and Business Management, 2023, 13, 140-153
https://www.scirp.org/journal/ajibm
ISSN Online: 2164-5175
ISSN Print: 2164-5167

Corporate Social Responsibility, Advertising Competition and Consumer Welfare: A Research on the Model of Oligopoly Competition Theory

Linmin Kan[1], **Hongjin Xiang**[2*]

[1]School of Statistics and Data Science, Nanjing Audit University, Nanjing, China
[2]School of Economics, Nanjing Audit University, Nanjing, China
Email: klinmin425@163.com, *xhjin2006@163.com

How to cite this paper: Kan, L. M., & Xiang, H. J. (2023). Corporate Social Responsibility, Advertising Competition and Consumer Welfare: A Research on the Model of Oligopoly Competition Theory. *American Journal of Industrial and Business Management, 13,* 140-153.
https://doi.org/10.4236/ajibm.2023.133010

Received: February 3, 2023
Accepted: March 25, 2023
Published: March 28, 2023

Abstract

The paper constructs an oligopoly competition model to explore the strategic choice of corporate social responsibility and advertising investment, which means to analyze the trade-off theoretically between advertising investment and the weight of social responsibility. The study found that, with the improvement of social responsibility performance, the dominant strategy of enterprises will evolve from advertising competition to production competition caused by social responsibility. Under certain restrictions, corporate social responsibility will promote advertising competition. Research shows that enterprises should pay attention to the benefits brought by advertising competition while paying attention to social responsibility and the government should also take reasonable control measures, otherwise social welfare and economic benefits of enterprises will be inhibited.

Keywords

Social Responsibility, Advertising Competition, Oligopoly, Consumer Welfare

1. Introduction

In the market competition, advertising is an important means of non-price competition. Advertising can play a role as a bridge between production enterprises and consumers. Firms spend a lot of economic resources on advertising. Its main purpose is to transmit product information to the market and form product differentiation to improve market competitiveness. An important role of advertising is to provide consumers with factual information about product attributes. Advertising that allows consumers to understand product specifications can not only stimulate new customers' product exchanges, but also promote better matching between existing customers and brands, thus benefiting the society. However, advertising is also a costly activity, and it is a social waste activity to provide consumers who already know products with rich information.

Taking the initiative to assume social responsibility is an important way to help achieve high-quality development. According to the definition of the World Business Council for Sustainable Development (WBCSD) in 2005, corporate social responsibility is the commitment of enterprises to sustainable development: it is disclosed to the society through annual reports and other forms, and it cooperates with employees and their families, local communities and the whole society to improve the overall development quality. However, there is little research on corporate social responsibility and advertising competitive investment. After years of development, corporate social responsibility (CSR) has been paid more and more attention by enterprises and has become an important part of enterprise development strategies.

More and more researchers at home and abroad have found that corporate social responsibility can not only improve the corporate social image, but also contribute to the growth of corporate financial and market performance. Luo et al. (2019) used stakeholder theory to divide multi-dimensional social responsibility indicators, and conducted empirical research on the samples through static regression analysis and dynamic lag model. The results showed that the performance of corporate social responsibility in the transportation industry has a clear positive effect on the current financial performance indicators, namely corporate image. Nan (2022) took non-financial enterprises listed in A-shares of Shanghai Stock Exchange as research samples, established multiple linear regression model and conducted hypothesis test. The research results showed that the corporate social responsibility performance to shareholders, creditors, consumers and suppliers in the early stage is significantly positively correlated with the current financial performance. Van Binh et al. (2022) used a newly developed panel data model of stochastic frontier analysis that endogenizes cost efficiency. Their results suggested that CSR can enhance cost efficiency of firms and thus improve their performance. At present, the research on social responsibility and advertising investment is not enough, especially on the specific impact mechanism.

Corporate social responsibility and advertisement level, as important decisions of enterprises, are related to the high-quality development of enterprises. This paper studies the relationship between corporate social responsibility, advertising investment competition and consumer welfare in oligopoly market. In general, if other conditions remain unchanged, the increase in the weight of CSR will increase the sales revenue of the enterprise. However, with the increase of corporate social responsibility, its marginal utility will decrease, which will affect corporate profits, indicating that corporate social responsibility cannot be increased indefinitely. Therefore, enterprises are faced with the problem of social responsibility, they need to find an optimal social responsibility to maximize the profits of enterprises, as is the case with advertising competition decisions. Enterprises should combine their social responsibility strategies with advertising competition strategies to make decisions at the same time, so as to maximize profits.

2. Literature Review

The non-cooperative game theory provides a research framework for competitive advertising decision-making. Shakun MF (1965) used a static game model to analyze the optimal advertising decision-making in the competitive market; Erickson GM (1985), Fruchter GE and Kalish S (1997) analyzed the optimal advertising decision problem by using differential game model under the premise that the advertising of enterprises in the competitive market can only attract customers and sales of competitors; In the research model in which advertising and price simultaneously act on the market under static conditions, Li and Tang (1999) established a dual oligarch advertising static game model and introduced the cost conditions for advertising to form market entry barriers; Zhang (2011), Liang and Zuo (2005) established a two-stage price and advertising game model on the premise that two competing enterprises compete first in advertising and then in price competition, and analyzed the optimal decision of the two enterprises through simulation.

In recent years, the frequent safety problems in China's food and drug industry have led to the gradual awakening of consumers' sense of social responsibility. Ma (2011) had begun to pay attention to corporate social responsibility or business ethics issues, and given them new ways of thinking and behavior. Yang et al. (2019) studied the difference in the degree of suppliers' social responsibility under the two power allocation modes of supplier led and retailer led. The study found that many consumers were willing to pay extra for the products of enterprises fulfilling social responsibility, and "responsible consumption" was becoming a trend; In this context, many enterprises are aware of the limitations of monopoly, product technology, resource endowment and other competitive means, and no longer simply regard social responsibility as an economic burden, but as a strategic management behavior of enterprises, competing to develop social responsibility practices in many fields such as society, environment, ethics, human rights, etc. From the perspective of green innovation, Fu and Liu (2013) studied the impact of corporate social responsibility based on technological innovation on corporate financial performance. The results showed that, in order to meet consumers' demands for social responsibility, enterprises strive to attach CSR attributes to their products to increase the discrimination with similar products; Shu and Li (2022) found that there is a significant "inverted U" relationship between the social responsibility in the organization and the enterprise value, and the social responsibility in the capital market, the social responsibility in the organization and the social responsibility in the product market have a significant impact on the financial flexibility in different ways. Chen et al. (2021) constructed a duopoly model considering corporate social responsibility and capacity selection, analyzed the market equilibrium results under three types of oligopoly models using sequential game theory, and analyzed the impact of corporate social responsibility on overcapacity and social welfare; Liu and Chen (2021) built an oligopoly competition model under the R&D spillover effect to explore the strategic choice of enterprises for social responsibility and technological innovation, theoretically analyze the trade-off between corporate social responsibility and R&D investment.

Corporate social responsibility will affect business operation in many ways. Through research, Li (2022) found that compensation incentives and the performance of corporate social responsibility were positively related, and corporate social responsibility played an important intermediary role in executive compensation incentives and corporate innovation. Li et al. (2022) found that the governance level of CSR stars in the same industry has a negative impact on the investment of private enterprises in technological innovation, but its negative impact is weakened with the improvement of the social status of private enterprise founders. Shu and Zou (2022) found that the high-quality performance of social responsibilities of real estate enterprises can inhibit their financialization. In addition, non-state-owned real estate enterprises' fulfilling their social responsibilities can more restrain their financialization, while the uncertainty of economic policies will weaken the main effect of social responsibilities on restraining corporate financialization. According to the objects of corporate social responsibility implementation, Ye and Ren (2023) divided it into social responsibility based on internal stakeholders and social responsibility based on external stakeholders. The results showed that CSR based on internal stakeholders is positively correlated with corporate financial performance of the year, while corporate social responsibility based on external stakeholders is negatively correlated with corporate financial performance.

It can be seen that the brand operation strategy focusing on CSR has gradually attracted the attention of enterprises. However, in the West in early years, Cornell and Shapiro (1987) developed the social impact hypothesis; Jones (1995) developed the instrumental stakeholder theory; Porter and Kramer (2006) studied the strategic social responsibility concept; These are not consistent with the current development. Based on the above scholars' research on advertising and social responsibility, this paper discusses the strategic choice between social responsibility and advertising competition investment of duopoly from the perspective of game theory, and analyzes the weight of corporate social responsibility, advertising level and consumer welfare.

3. Model

3.1. Theoretical Basis

With the development of social productivity and commodity economy, the expansion of enterprise boundaries has led to changes in its relationship with society. Enterprises are no longer just a production unit that maximizes the profits from inputs to outputs. In addition to pursuing the maximization of material benefits, they are also responsible for other social participants who establish and maintain their survival and development. They either pay a price for the enterprise's operation or share the risks for the enterprise. Therefore, enterprises need to make compensation, and the theory of corporate social responsibility develops here. However, the mainstream economic oriented enterprise theory recognizes that market failure may not ensure effective pricing or the provision of non-private goods, but emphasizes that enterprises cannot and should not expect to act voluntarily in a socially or environmentally responsible manner. Because undertaking social responsibility weakens the economic purpose of enterprises and makes them enter fields of effort unrelated to their "legitimate goals", which should be considered as "the consumption of valuable resources of enterprises". In response to the query of the mainstream enterprise theory, many scholars proposed that if social issues can be included in the enterprise strategy category, and market opportunities can be found from social issues, so as to carry out product and service innovation, and provide support for the core business of enterprises, then the "zero sum game" between social ethics and economic interests will be broken.

The two broad disciplines of mainstream corporate theory and corporate social responsibility theory have gradually merged into a subtle middle position. Most scholars have recognized the legitimacy of corporate social responsibility, and have shifted from conceptual research to emphasis on how to implement to operational measures. The focus of corporate social responsibility theory has changed from moral orientation to performance orientation, and the level of analysis has also shifted from the macro social level to the organizational level, especially the impact of corporate social responsibility on economic performance has been closely watched. On this basis, Porter and Kramer (2006) proposed strategic corporate social responsibility. When an enterprise determines its business location and scope, social responsibility behavior and competitive advantage will promote each other and form a virtuous circle. Social responsibility behavior can be used to affect the competitive environment of enterprises and meet the needs of some stakeholders, which will improve the competitiveness of enterprises. In other words, while accepting the economic goals, enterprises should adapt to the virtues of the external market, achieve collaborative value creation, and regard corporate social responsibility as a management philosophy and business strategy, which is the proper meaning of strategic corporate social responsibility.

Strategic corporate social responsibility provides a reasonable argument for corporate social responsibility initiatives from the perspective of corporate economy (finance), and effectively responds to the mainstream corporate theory on social responsibility. It allows enterprises to benefit from social responsibility opportunities and believes that enterprises participating in social responsibility activities will get market returns in economic and financial aspects. By assuming social responsibility, enterprises can gain benefits from cost and risk reduction, legitimacy and reputation benefits, enhance their competitive advantage, and establish a win-win relationship with stakeholders. Therefore, the effective promotion of corporate social responsibility depends on the formulation of appropriate corporate social responsibility strategies. This paper continues this development trend, regards social responsibility and advertising investment as the competitive strategies actively implemented by enterprises, introduces both into the objective decision-making equation of enterprises, and uses the economic analysis paradigm to investigate the strategic choices and influencing factors of enterprises under the economic rationality.

3.2. Basic Model

In the real economy, whether to fulfill the social responsibility strategy has a certain impact on the development of enterprises. We construct a mixed oligopoly competition model, assuming that there are two oligopolistic firms (firm 0 and firm 1) in the homogeneous product market, where firm 0 is a state-owned enterprise with a sense of social responsibility and firm 1 is a private enterprise pursuing profit maximization.

The enterprise profit is $\pi_i\left(i=1,2\right)$, consider two-stage competition. In the first stage, both firms choose their own advertisement level $z_i \in \left(0,+\infty\right)$. Advertisement cost is $kz_i^2/2\left(i=1,2\right)$. The advertisement level of the whole industry is $Z=z_0+z_1$; In the second stage, after observing the advertising level, the two firms independently choose their own output level $q_i \in \left[0,+\infty\right)$, The total output is $Q=q_0+q_1$. The inverse demand function is $P=a+Z-bQ$, where P is the price of homogeneous products, the marginal cost of firm 0 is c_0, and the marginal cost of firm 1 is c_1. We assume that $c_0>c_1, c_1=0$, that is, the efficiency of state-owned enterprises is lower than that of private enterprises. We also assume that a is large enough to ensure the internal solution. In the game process, the information is complete, and the model is solved by reverse induction.

In this market, state-owned enterprises are endowed with social responsibility obligations and the balance and adjustment of economic and non-economic goals. Goering (2007) proposed that the objective function of non-profit organization (NPO) is not only different from state-owned enterprises, but also different from private enterprises, and should be the weighted sum of enterprise profits and consumer surplus. This objective function has the following characteristics: 1) The stakeholder theory believes that enterprises should pay attention to the rights and interests of consumers, employees, government and other stakeholders while pursuing the maximization of shareholders' equity. This objective function considers both corporate profits and consumer interests, which is in line with the stakeholder theory. 2) Strategic corporate social responsibility refers to bringing social responsibility activities into the enterprise's strategic and operational scope, and carrying out social responsibility actions closely around the enterprise's vision. This objective function internalizes the social responsibility strategy based on the "enterprise standard". The enterprise can make the best choice according to its own interests, which is in line with the strategic corporate social responsibility theory. 3) Consumers are relatively important stakeholders of enterprises. The "corporate reputation" and "moral resources" caused by social responsibility are mostly realized through the final consumption of products, which are highly representative.

Therefore, this paper also introduces corporate social responsibility based on this framework, that is, while pursuing profit maximization, part of the goals of firm 0 should be in line with the interests of consumers:

$$U = \theta CS + (1-\theta)\pi_0 \tag{1}$$

Among them, $CS = Q^2/2$ is consumer surplus, $\pi_0 = [a+Z-bQ]q_0 - c_0 q_0 - kz_0^2/2$ is the profit function of firm 0, $\theta \in [0,1]$ gives the weight of CSR to firm 0. With the increase of θ, enterprises perform relatively positive social responsibility strategies, that is, the degree of concern for social responsibility gradually increases. Especially, when $\theta = 0$, firm 0 becomes a pure profit maximizing enterprise; when $\theta = 0.5$, firm 0 gives the same weight to its own profits and social responsibilities; when $\theta = 1$, firm 0 becomes an enterprise purely pursuing the maximization of consumer surplus.

4. Equilibrium

4.1. Enterprise Output Competition

In the second stage of the game, firm 0 maximizes U with respect to q_0 and firm 1 maximizes $\pi_1 = [a+Z-bQ]q_1 - kz_1^2/2$ with respect to q_1. The first-order conditions are respectively:

$$\theta(q_0+q_1) - (\theta-1)\left[a+Z-c_0-b(2q_0+q_1)\right] = 0 \tag{2}$$

$$a+Z-bq_0-2bq_1 = 0 \tag{3}$$

The optimal response function of two enterprises can be obtained by combining first-order conditions as follows:

$$q_0 = \frac{(a+Z)\left[b(\theta-1)-\theta\right]-2b(\theta-1)c_0}{b\left[3b(\theta-1)+\theta\right]} \tag{4}$$

$$q_1 = \frac{(a+Z)\left[b(\theta-1)+\theta\right]+b(\theta-1)c_0}{b\left[3b(\theta-1)+\theta\right]} \tag{5}$$

$$Q = \frac{(\theta-1)\left[2(a+Z)-c_0\right]}{3b(\theta-1)+\theta} \tag{6}$$

From the above equations, it can be concluded that

$$\frac{\partial q_0}{\partial \theta} = \frac{4(a+Z)-2c_0}{\left(3b(\theta-1)+\theta\right)^2} \tag{7}$$

$$\frac{\partial q_1}{\partial \theta}=\frac{-2(a+Z)+c_0}{\left(3b(\theta-1)+\theta\right)^2} \tag{8}$$

$$\frac{\partial Q}{\partial \theta}=\frac{2(a+Z)-c_0}{\left(3b(\theta-1)+\theta\right)^2} \tag{9}$$

When $2(a+Z)>c_0$, $\partial q_0/\partial\theta>0$, $\partial q_1/\partial\theta>0$. As enterprises with a sense of social responsibility gradually choose a relatively positive social responsibility strategy, they are forced to continuously increase their own output. Based on a certain market capacity, this will further occupy the market share of competitors, which to some extent indicates that enterprises undertaking social responsibility will indeed form a competitive advantage in the market; From $\partial Q/\partial\theta>0$, when a socially responsible enterprise gradually chooses a relatively positive social responsibility strategy, its own output increase effect is greater than that of its competitors' output decline effect, thus finally realizing the pulling of consumer interests.

4.2. Advertising Competition

We now consider the first stage. Substituting (4)-(6) into U and π_1, we get the expression of social responsibility function and private enterprise profit, and the equilibrium result is as follows. Let superscript "E" denote the equilibrium outcome, where $\sigma=\theta-1$. We have

$$\begin{aligned} z_0^E=&\frac{2abk\left(3b^3\sigma^3-5b^2\sigma^2\theta-5b\sigma\theta^2-\theta^3\right)}{b^2k(3b\sigma+\theta)\left[9b^2k\sigma^2+k\theta^2+2b\sigma(2+3k\theta-2\theta)\right]}\\ &+\frac{c_0\left[b\theta^2(4+k\theta-4\theta)+2b^2\sigma\theta(\theta+2k\theta-1)\right]}{b^2k(3b\sigma+\theta)\left[9b^2k\sigma^2+k\theta^2+2b\sigma(2+3k\theta-2\theta)\right]}\\ &-\frac{c_0\left[12b^4k\sigma^3+2\theta^3+b^3\sigma^2(4+k\theta-4\theta)\right]}{b^2k(3b\sigma+\theta)\left[9b^2k\sigma^2+k\theta^2+2b\sigma(2+3k\theta-2\theta)\right]} \end{aligned} \tag{10}$$

$$\begin{aligned} z_1^E=&\frac{2(b\sigma+\theta)\left[abk\left(3b^2\sigma^2+4b\sigma\theta+\theta^2\right)\right]}{b^2k(3b\sigma+\theta)\left[9b^2k\sigma^2+k\theta^2+2b\sigma(2+3k\theta-2\theta)\right]}\\ &+\frac{2c_0(b\sigma+\theta)\left[3b^3k\sigma^2+b\sigma\theta+\theta^2+b^2\sigma(2+k\theta-2\theta)\right]}{b^2k(3b\sigma+\theta)\left[9b^2k\sigma^2+k\theta^2+2b\sigma(2+3k\theta-2\theta)\right]} \end{aligned} \tag{11}$$

$$Z^E=\frac{4ab^2\sigma^2+\left(\theta^2-2b^2\sigma^2+3b\sigma\theta\right)c_0}{b\left[9b^2k\sigma^2+k\theta^2+2b\sigma(2+3k\theta-2\theta)\right]} \tag{12}$$

$$\begin{aligned} q_0^E=&\frac{abk\left(3b^2\sigma^2-2b\sigma\theta-\theta^2\right)}{b^2\left[9b^2k\sigma^2+k\theta^2+2b\sigma(2+3k\theta-2\theta)\right]}\\ &-\frac{c_0\left[6b^3k\sigma^2-b\sigma\theta+\theta^2+2b^2\sigma(1+k\theta-\theta)\right]}{b^2\left[9b^2k\sigma^2+k\theta^2+2b\sigma(2+3k\theta-2\theta)\right]} \end{aligned} \tag{13}$$

$$q_1^E = \frac{abk\left(3b^2\sigma^2 + 4b\sigma\theta + \theta^2\right)}{b^2\left[9b^2k\sigma^2 + k\theta^2 + 2b\sigma\left(2 + 3k\theta - 2\theta\right)\right]} + \frac{c_0\left[3b^3k\sigma^2 + b\sigma\theta + \theta^2 + b^2\sigma\left(2 + k\theta - 2\theta\right)\right]}{b^2\left[9b^2k\sigma^2 + k\theta^2 + 2b\sigma\left(2 + 3k\theta - 2\theta\right)\right]} \tag{14}$$

$$Q^E = \frac{\sigma\left[2abk\left(3b\sigma + \theta\right) + \left(2\theta - bk\theta - 3b^2k\sigma\right)c_0\right]}{b^2\left[9b^2k\sigma^2 + k\theta^2 + 2b\sigma\left(2 + 3k\theta - 2\theta\right)\right]} \tag{15}$$

5. Results

Assuming $k = 1, b = 1$ and considering the equilibrium outcome, we find that θ has a certain impact on the advertising competition of firms. The specific analysis is as follows.

5.1. Advertisement Level

Let $a = 5, c_0 = 1$ to analyze the relationship between weight and advertising level, the first derivative of equilibrium advertising level of state-owned firm and private firm to a is respectively

$$\frac{\partial z_0^E}{\partial \theta} = \frac{1241 - 6860\theta + 14404\theta^2 - 13600\theta^3 + 4864\theta^4}{\left(3 - 4\theta\right)^2\left(5 - 16\theta + 12\theta^2\right)^2} \tag{16}$$

$$\frac{\partial z_1^E}{\partial \theta} = -\frac{4\left(101 - 276\theta + 188\theta^2\right)}{\left(5 - 6\theta\right)^2\left(3 - 4\theta\right)^2} \tag{17}$$

Since the advertisement level in this article is positive ($z_i > 0$), the qualified value range is $\theta \in \left[0, 0.5\right]$. In this range, the advertisement level of state-owned firm increases in θ, while the advertisement level of private firm decrease in θ. From **Figure 1**, z_0 represents the advertisement level of state-owned firm, z_1 represents the advertisement level of private firm, we can see that in the advertising competition, responsible state-owned firm and private firm show a

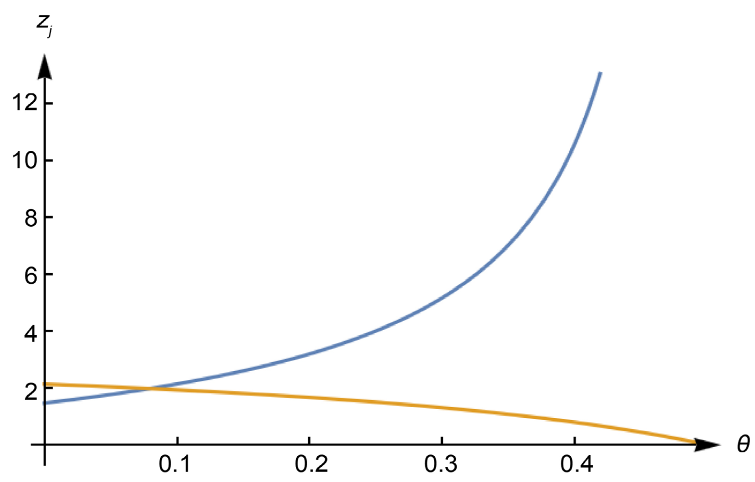

Figure 1. Relationship between advertisement and state-owned enterprise reform.

substitute relationship with each other. The intersection of the two lines in the picture is $\theta=\left(35-\sqrt{785}\right)/88\approx 0.079$, since then, the gap between state-owned firm and private firm has widened.

As shown in Figure 2, we can see that the advertisement level of the whole industry increases in the weight of CSR. According to the previous analysis, if the weight of social responsibility increases, the increasing effect on the advertisement level of state-owned firm is greater than the decreasing effect on the advertisement level of private firm. When facing the weight decision of social responsibility, enterprises should control the responsibility investment within a certain range, otherwise the advertisement level will increase excessively.

5.2. Enterprise Output

The first derivative of the two firms' output on the weight of CSR is

$$\frac{\partial q_0^E}{\partial\theta}=\frac{4a\left(7-18\theta+12\theta^2\right)+\left(36\theta-12\theta^2-19\right)c_0}{\left(5-16\theta+12\theta^2\right)^2} \tag{18}$$

$$\frac{\partial q_1^E}{\partial\theta}=-\frac{2\left(a+2c_0\right)}{\left(5-6\theta\right)^2} \tag{19}$$

$$\frac{\partial Q^E}{\partial\theta}=\frac{2a\left(13-32\theta+20\theta^2\right)+\left(52\theta-28\theta^2-23\right)c_0}{\left(5-16\theta+12\theta^2\right)^2} \tag{20}$$

As long as $\theta\neq 1/2, 5/6$ and market size a is large enough, then $\partial q_0^E/\partial\theta>0$, $\partial q_1^E/\partial\theta<0$, $\partial Q^E/\partial\theta>0$. we can draw a conclusion that with the change of θ, the two firms also show a substitution relationship in terms of output competition. When state-owned enterprises enhance their social responsibility, their output will be increased, while the output of private enterprises will be squeezed out. Moreover, the added value of the output of state-owned firm is greater than the reduced value of the output of private firm, which ultimately promotes the output of the entire industry.

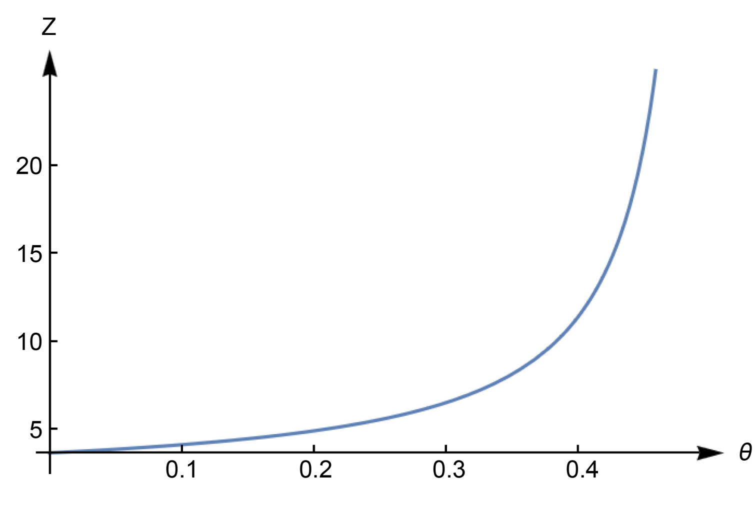

Figure 2. The advertisement and the weight of CSR.

5.3. Consumer Surplus and Corporate Profit

Take $a=5, c_0=1$ to get the relationship image between CS^E and θ in the following figure.

Under the condition that the advertisement level is positive ($\theta<0.5$), it can be seen from Figure 3. that with the increase of the weight of CSR, consumer surplus is increasing, indicating that state-owned enterprises with a sense of social responsibility are beneficial to consumers; Regardless of whether the advertisement level is positive or negative, when the weight is within a specific range ($0.5<\theta<0.831$), the consumer surplus presents an inverted U shape; However, when the weight exceeds a certain value ($0.831<\theta<1$), consumer surplus will gradually decrease to 0.

Figure 4 shows the relationship between the profits of the two firms and the weight of CSR. As can be seen from Figure 4, the profit curves of both firms are in a downward trend, and the curve of state-owned firm is falling earlier and faster. The increase in θ will lead to a decline in corporate profits, especially for state-owned firm, and the profit of state-owned firm is reduced to zero ahead

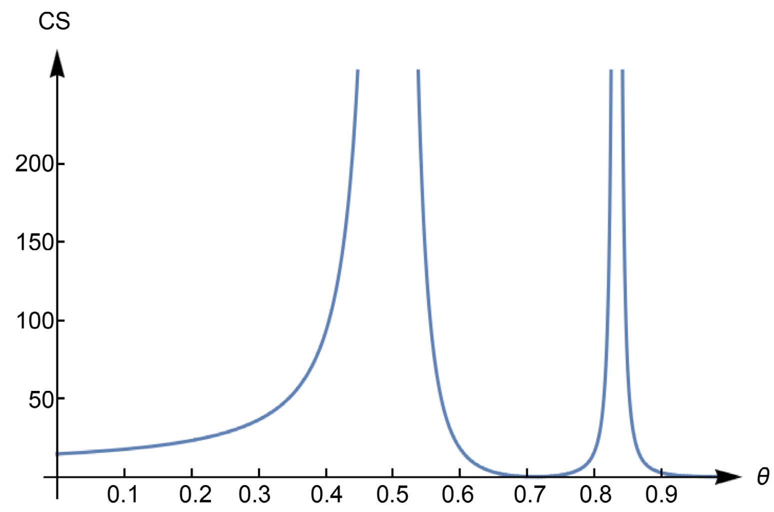

Figure 3. Consumer surplus and the weight of CSR.

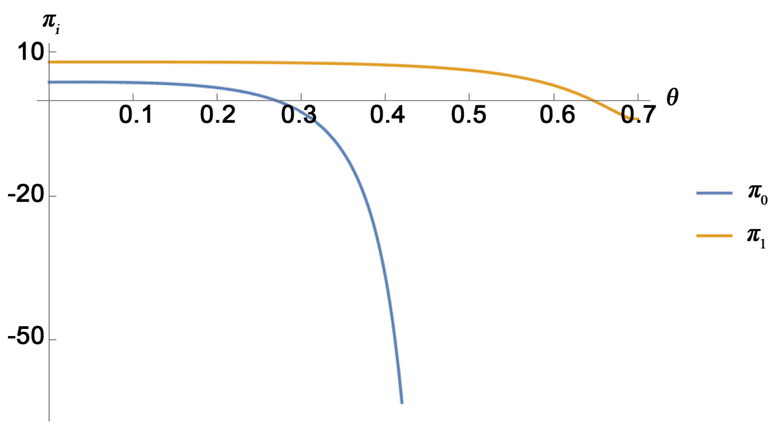

Figure 4. Two profits and the weight of CSR.

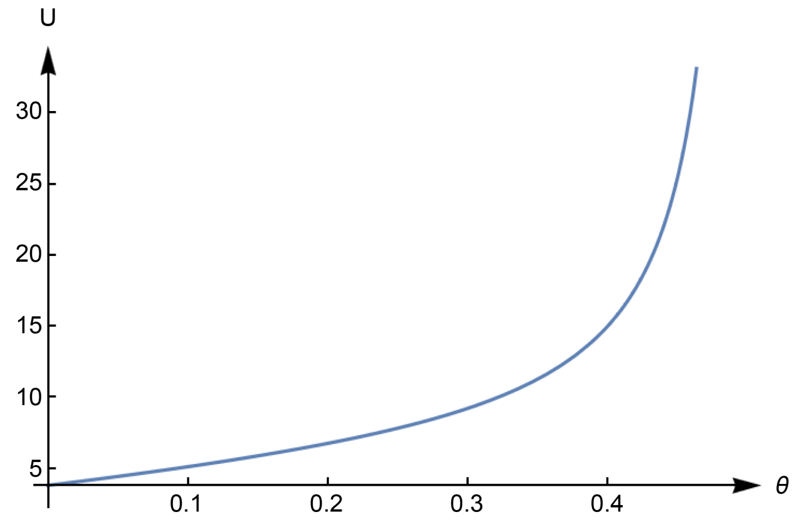

Figure 5. U and the weight of CSR.

of the profit of private firm. This is because the state-owned firm increases their sense of social responsibility, and at the same time, they invest more in advertisement than private firm, resulting in more profit reduction.

Figure 5 shows the relationship between U and θ. It means that: Compared with only considering their own profits, when state-owned enterprises incorporate social responsibility and consumer surplus into their decision-making, the profits of state-owned enterprises will show an increasing trend.

6. Conclusion

In general, the increase of social responsibility will promote the advertisement level and the output of the whole industry. When the advertisement level is positive, the increase of social responsibility of state-owned enterprises has a positive impact on consumer surplus, and consumer welfare has been improved. In order to ensure the steady increase of profits, state-owned enterprises need to take full account of consumer surplus, otherwise the increase of social responsibility will lead to the continuous decrease of profits.

Conflicts of Interest

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

References

Chen, J. L., Qin, J. C., & Sun, C. Q. (2021). Oligopolistic Competition Mode, Corporate Social Responsibility and Capacity Choice. *Industrial Organization Review, 15,* 1-19. (In Chinese)

Cornell, B., & Shapiro, A. (1987). Corporate Stakeholders and Corporate Finance. *Financial Management, 16,* 5-14.

Erickson, G. M. (1985). A Model of Advertising Competition. *Journal of Marketing Research, 22,* 297-304. https://doi.org/10.1177/002224378502200305

Fruchter, G. E., & Kalish, S. (1997). Closed-Loop Advertising Strategies in a Duopoly. *Management Science, 43,* 54-63. https://doi.org/10.1287/mnsc.43.1.54

Fu, Q., & Liu, Y. (2013). Research on the Impact of Corporate Social Responsibility on Performance Based on Technological Innovation. *Science of Science Research, 31,* 463-468. (In Chinese) https://doi.org/10.16192/j.cnki.1003-2053.2013.03.018

Goering, G. E. (2007). The Strategic Use of Managerial Incentives in a Non-Profit Firm Mixed Duopoly. *Managerial and Decision Economics, 28,* 83-91. https://doi.org/10.1002/mde.1307

Jones, T. M. (1995). Instrumental Stakeholder Theory: A Synthesis of Ethics and Economics. *Academy of Management Review, 20,* 404-437. https://doi.org/10.2307/258852

Kramer, M. R., & Porter, M. E. (2006). Strategy and Society: The Link between Competitive Advantage and Corporate Social Responsibility. *Harvard Business Review, 84,* 78-92.

Li, C., Gu, X., & Yang, X. (2022). Will Corporate Technology Innovation Be Affected by Peer Corporate Social Responsibility Stars? *Research and Development Management, 34,* 118-130. (In Chinese) https://doi.org/10.13581/j.cnki.rdm.20211104

Li, K. K., & Tang, X. W. (1999). Advertising Competition and Barriers to Market Entry. *Journal of University of Electronic Science and Technology of China, 28,* 652-654. (In Chinese)

Li, Y. C. (2022). Executive Compensation Incentive, Corporate Social Responsibility and Corporate Innovation. *Market Weekly, 35,* 14-18. (In Chinese)

Liang, Y., & Zuo, X. D. (2005). Study on the Advertisement/Price Decision Analysis of Inside and Entry Enterprises. *Journal of Jinan University (Natural Science and Medicine Edition), 26,* 612-616. (In Chinese)

Liu, Q., & Chen, L. (2021). Corporate Social Responsibility and Technological Innovation under R&D Spillover Effect. *China Soft Science, No. 7,* 120-130. (In Chinese)

Luo, J. Q., Kuang, H. B., & Shen, S. Y. (2019). Research on the Impact of Corporate Social Responsibility on Financial Performance—Taking the Transportation Industry as an Example. *Scientific Research Management, 40,* 199-208. (In Chinese) https://doi.org/10.19571/j.cnki.1000-2995.2019.02.020

Ma, L. L. (2011). Research on the Mechanism of the Impact of Corporate Social Responsibility on Consumers' Purchase Intention. *Management World, No. 5,* 120-126. (In Chinese) https://doi.org/10.19744/j.cnki.11-1235/f.2011.05.010

Nan, M. G. (2022). Empirical Study on the Relationship between Corporate Social Responsibility and Financial Performance. *Special Economic Zone, 405,* 122-128. (In Chinese)

Shakun, M. F. (1965). Advertising Expenditures in Coupled Markets—A Game-Theory Approach. *Management Science, 11,* 42-47. https://doi.org/10.1287/mnsc.11.4.B42

Shu, H., & Li, Q. L. (2022). How Corporate Social Responsibility Affects Corporate Value: Taking Listed Real Estate Companies as an Example. *Statistics and Decision, 38,* 169-173. (In Chinese) https://doi.org/10.13546/j.cnki.tjyjc.2022.24.033

Shu, H., & Zou, W. (2022). Research on the Impact Mechanism of Real Estate Corporate Social Responsibility on Corporate Financialization—The Intermediary Effect Based on Agency Costs and Financing Constraints. *Modern Economic Discussion, No. 11,* 93-105. (In Chinese) https://doi.org/10.13891/j.cnki.mer.2022.11.012

Van Binh, T., Mulatu, Abay., & Xu, B. (2022). Corporate Social Responsibility & Firm Efficiency: Evidence from Endogenous Cost Inefficiency Stochastic Frontier Analysis. *Applied Economics, 54,* 6380-6392. https://doi.org/10.1080/00036846.2022.2063790

Yang, Y., Cheng, Y. P., & Chen, S. (2019). Social Responsibility Incentives for Supply Chain Enterprises under Different Power Structures. *China Management Science, 27,* 144-156. (In Chinese) https://doi.org/10.16381/j.cnki.issn1003-207x.2019.03.015

Ye, H., & Ren, C. (2023). Research on the Relationship between Social Responsibility, Media Attention and Corporate Financial Performance—Based on Data Analysis of Listed Companies in the Pharmaceutical Manufacturing Industry. *Times Economic and Trade, 20,* 55-61. (In Chinese) https://doi.org/10.19463/j.cnki.sdjm.2023.01.015

Zhang, J. J. (2011). Game Analysis on Product Advertising Investment and Price Competition of Manufacturing Enterprises. *Statistics and Decision Making, No. 4,* 182-184. (In Chinese) https://doi.org/10.13546/j.cnki.tjyjc.2011.04.043