Burger Thy Neighbour

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Abstract:

Labels such as "hormone-free" and "antibiotics-free" are being advertised more often than ever. One cannot help but wonder about the underlying negative perception that such labels might create about products that may contain hormones and antibiotics in the consumers' mind. This paper develops a theoretical model that helps provide a better understanding of the effect of such hostile marketing and advertisement strategies on competition. We show that marketing campaigns that negatively impact consumers' perception of their rivals' products can change the nature of competition by impacting the distribution of consumers' preferences and subsequently elasticity of demand for own and rival products. We show that negatively influencing consumers' perception of rivals' products may be a more effective marketing tool than the "beggar-thy-neighbor" advertising where one firm steals some market share from its rivals by means of positive promotion of its own product. This may explain the increasing popularity of such strategies in the food industry in the last few years.

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Abstract

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Introduction

It is conventional among economists to assume that advertising increases demand through an outward shift in the demand curve (Piggot et al. 1998; Alston et al. 2001). Some marketing campaigns such as A&W's recent hormone-free beef advertisement, however, seem to negatively impact consumers' perception of their rivals' products, causing a reduction is at least some consumers' willingness to pay (WTP) for the rivals' products. This can change the nature of competition by impacting the distribution of consumers' preferences, degree of substitutability, and subsequently elasticity. As a result, the impact of such actions may be more aggressive than the "beggar-thy-neighbor" advertising where one firm steals some market share from its rivals by means of positive promotion of its own product.

This study seeks to investigate the impact of hostile advertisement strategies that create a negative perception of rivals' products on the nature of competition in an industry. We employ a simple graphical model to show that a firm can make the demand for its rivals' products more elastic by lowering the lower bound of the distribution of preferences for the rivals' products through hostile advertisement.

Model

In this section we build upon a model developed in Torshizi et al. (2018) to analyze the effect of hostile advertisement on competition. This two-product analysis is based on a multiproduct model originally developed by Perloff and Salop (1985). Torshizi et al. (2018) provide a graphical representation of Perloff and Salop's model. We assume that there are two products in the market, each differentiated from its rival with respect to only one unique characteristic. Specifically, product 1 is hormone-free meat while product 2 is meat that contains hormones. There are L consumers with no bargaining power, each purchasing one unit of either product 1 or 2 to maximize their individual net surplus, or

$$(1) \qquad s_i = \hat{\theta}_i - p_i, \qquad i=1,2$$

where i represents products, s_i surplus from product i, p_i its price, and $\hat{\theta}_i$ is the relative value that a consumer assigns to i. A consumer would purchase product 1 if and only if $s_1 \geq s_2$, and *vice versa*. Following Bester (1992), each consumer needs and buys only one unit of either product so that there is no need for an “outside” alternative.

Preferences are summarized by the density functions

(2) $$g(\theta) = g_i(\theta_i).$$

As it is conventional in the literature (see for example Perloff and Salop (1985)) we first assume independent and identically distributed (i.i.d.) aggregate preferences for i. For comparison purposes, however, we also investigate the case of perfectly negatively correlated preferences. As demonstrated in Torshizi et al. (2018) these two cases best fit products with unrelated and related differentiating characteristics, respectively, and therefore imply different substitutability levels. Comparison of the two cases allows us to explore the relationship between degree of substitutability and the effect of hostile advertisement strategies on competition.

I. i.i.d Preferences

Panels a and b of Figure 1 present the distributions of preferences for two products with i.i.d. before and after hostile advertisement performed by Firm 1, respectively. We first derive the demand curve for product 1 before advertisement based on the graphical representation in Panel a and then discuss the effect of hostile advertisement in Panel b. The position of each black dot in the rectangular preference boxes with respect to $\hat{\theta}_1$ and $\hat{\theta}_2$ axes reflects one consumer’s preferences for products 1 and 2. It is assumed that preferences have the following uniform distribution:

(3) $$\theta_i \sim u(a_i, b_i)$$

where $a_i > b_i$. To keep the model analytically tractable, we also assume that $b_1 > b_2$ Given Equations 1 and 3 it is easy to see that a consumer’s net surplus s_i from product i cannot be higher than $a_i - p_i$ or lower than $b_i - p_i$. This is reflected in height and width of the preference boxes.

Preferences are uniformly spread over the area in between the axes with no correlation between $\hat{\theta}_1$ and $\hat{\theta}_2$. The thick diagonal lines distinguish consumers with $s_1 \geq s_2$ from those with $s_1 \leq s_2$. These lines represent the line of indifference and can be summarized as:

$$s_1 = s_2 \text{ or } \hat{\theta}_1 = (p_1 - p_2) + \hat{\theta}_2.$$

All consumers above (below) the line of indifference purchase product 1(2). Slope of the line depends on the height and the width of the preferences boxes and is 45°. Intercept of the line of indifference is equal to $p_1 - p_2$.

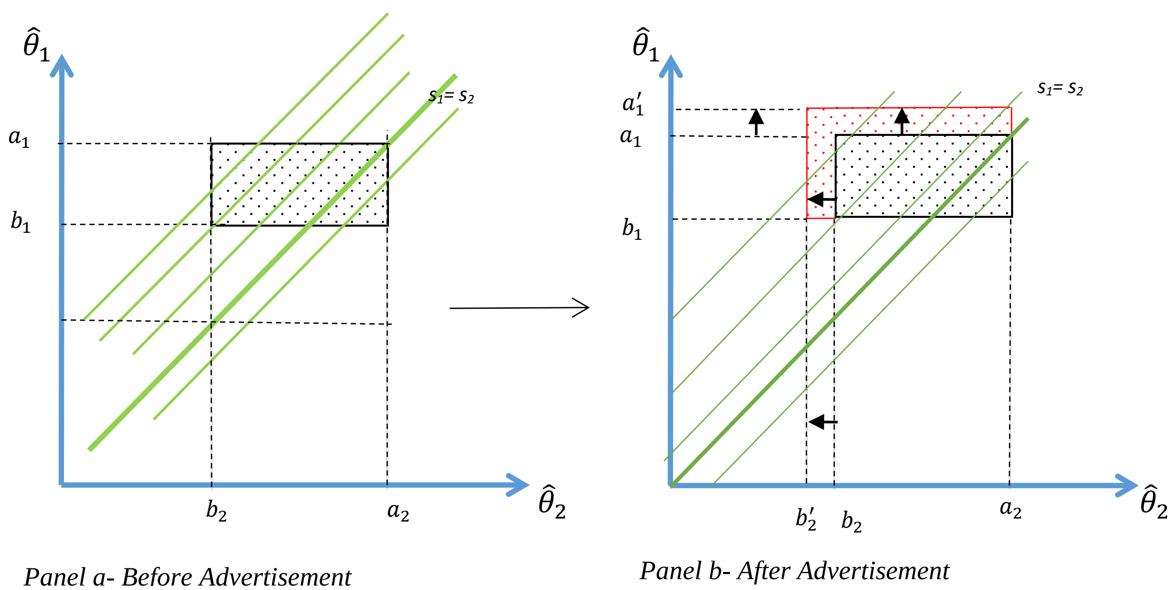

Figure 1. Allocation of Consumers to Two Products with i.i.d. Preferences

Perloff and Salop (1985) express expected demand for product 1 as

(4) $$Q_1(p_1, p_2) = \Pr(s_1 \geq s_2)L.$$

Given θ_2, the above probability is found as:

(5) $\Pr(s_1 \geq s_2) = G(p_2 - p_1 + \theta_1)$

where $G(.)$ is the cumulative density function (CDF) of $g(.)$. Demand for product 2 can be found in a similar fashion.

Perloff and Salop (1985) find $\Pr(s_1 \geq s_2)$ in a multiproduct case. Because their solution is general (i.e. it works for any i.i.d. distribution and any number of firms) the CDF does not take a specific functional form. Having only two products and only uniform distributions, we are able to use our graphical analysis to find the functional form of $G(.)$.

As shown in Figure 1, starting from $p_1 = p_2$ as p_1 increases the line of indifference shifts up (represented by dashed diagonal lines) and some consumers switch from product 1 to product 2. When p_1 increases above a certain point, each time the line of indifference shifts higher, fewer consumers switch to product 2. Similarly, when p_1 falls below a certain point, each time the line of indifference shifts lower, fewer consumers switch to product 1. Consequently, the resulting CDF, which represents the cumulative probability of switching from product 2 to product 1 as p_1 decreases, is non-linear for i.i.d (see Figure 2).

The CDF in Figure 2 presents the price range for which demand is defined. Following Equation 4, we multiply $\Pr(s_1 \geq s_2)$ presented in Figure 2 by number of consumers L to find $Q_1(p_1, p_2)$. Figure 3 present the expected demand curves for product 1.

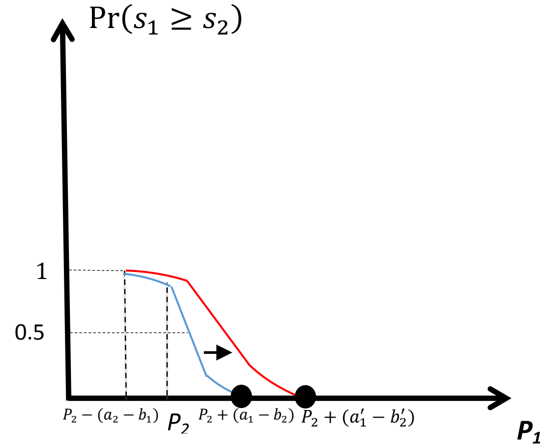

Figure 2. CDFs of Buying Product 1 (i.i.d. Preferences)

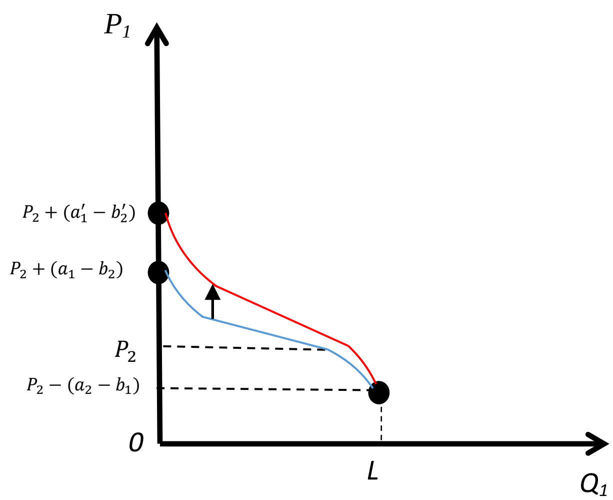

Figure 3. Demand for Product 1 (i.i.d. Preferences)

The resulting non-linearity of demand curve in Panel *a* of Figure 3 is pointed out by Nevo (2000) and Torshizi et al. (2018). Nevo (2000) attributes this non-linearity to consumer heterogeneity, which is reflected in the distribution of preferences in this study. Algebraically, expected demand curve can be found from Panel *a* of Figure 1. Given the uniform density of the preference box, $Q_1(p_1, p_2)$ can be obtained by dividing market share of product 1 by the total area of the preference box as follows:

(6)

$$\begin{cases} Q_1 = 0 & for\ a_1 - b_2 < P_1 - P_2 \\ Q_1 = \left(\frac{(a_1-b_2-(P_1-P_2))^2}{(a_1-b_1)(a_2-b_2)}\right) L & for\ (b_1 - b_2) \leq (P_1 - P_2) \leq (a_1 - b_2) \\ Q_1 = \left(1 - \frac{2((P_1-P_2)-(a_1-a_2))+(a_2-b_1)}{2(a_2-b_2)}\right) L & for\ \ (a_1 - a_2) \leq (P_1 - P_2) \leq (b_1 - b_2) \\ Q_1 = \left(1 - \frac{(a_2-b_1+(P_1-P_2))^2}{(a_1-b_1)(a_2-b_2)}\right) L & for\ (b_1 - a_2) \leq (P_1 - P_2) \leq (a_1 - a_2) \\ Q_1 = 1 & for\ (P_1 - P_2) \leq (b_1 - a_2)\,. \end{cases}$$

Effect of Hostile Advertisement

Now assume that firm 1's hostile advertisement campaign results in an increase in at least some consumers' WTP for product 1 and a reduction in at least some consumers' WTP for product 2. As a result, upper bound of distribution of preferences for product 1 (θ_1) increases from a_1 to a_1'. Similarly, lower bound of distribution of preferences for product 2 (θ_2) decreases from b_2 to b_2'. To keep the model tractable it is assumed that after advertisement the joint distribution of preferences is still uniform (i.e. the joint distribution has the same density across its domain). The effect of such changes in distributions of preferences for the two products on the joint distribution is depicted in Panel *b* of Figure 1. As well, figures 2 and 3 present the effect of such changes on the CDF and the demand curve.

As presented in Figure 3, both increase in the upper bound of distribution of preferences for product 1 and decrease in the lower bound of distribution of preferences for product 2 result in a more inelastic demand for product 1. Effect of decrease in the lower bound of distribution of preferences for product 2, however, may be more substantial. Slope of the mid (flat) part of the demand curve in Figure 3 can be found by taking the derivative of the corresponding part of the equation 6 as follows:

(7)

$$\frac{\partial Q_1}{\partial P_1} = -\frac{1}{(a_2-b_2)}.$$

Effect of a change in the lower bound of the distribution of preferences for product 2 on the slope of demand curve for product 1 can be found as follows:

(8) $$\frac{\partial(\frac{\partial Q}{\partial P_1})}{\partial b_2} = -\frac{1}{(a_2-b_2)^2} < 0.$$

As indicated in Equation 8, a reduction in the lower bound of the distribution for the rivals' product results in a more inelastic demand for one's own product. Similarly, one could easily show that this also results in a more elastic demand for the rival's product. That means, hostile advertisement approaches that create a negative perception about rivals' products do more than simply stealing some market share (i.e. beggar-thy-neighbour). Such advertisement campaigns can change the nature of competition by changing the elasticity of demand for own and rivals' products.

It is easy to see the effect of a beggar-thy-neighbour advertisement strategy on the demand curve presented in Figure 3. If advertisement for product 1 increases all consumers WTP for product 1 by the same amount without influencing their perception of product 2 in any way, then a_1 and b_1 increase by the same amount resulting in an upward shift in the demand curve. That is, a non-hostile advertisement strategy does not affect the demand elasticities.

II. Perfectly Negatively Correlated Preferences

Panels *a* and *b* of Figure 4 present the distributions of preferences for two products with perfectly negatively correlated preferences before and after hostile advertisement performed by Firm 1, respectively. We first derive the demand curve for product 1 before advertisement based on the graphical representation in Panel *a* and then discuss the effect of hostile advertisement in Panel *b*. The position of each black dot in the rectangular preference boxes with respect to $\hat{\theta}_1$ and $\hat{\theta}_2$ axes reflects one consumer's preferences for products 1 and 2. It is assumed that preferences have the uniform distribution presented in Equation 3. Expected demand is derived using

Equation 4 in a fashion similar to the case of i.i.d. preferences. Figures 5 and 6 present the CDF and demand curves before and after advertisement.

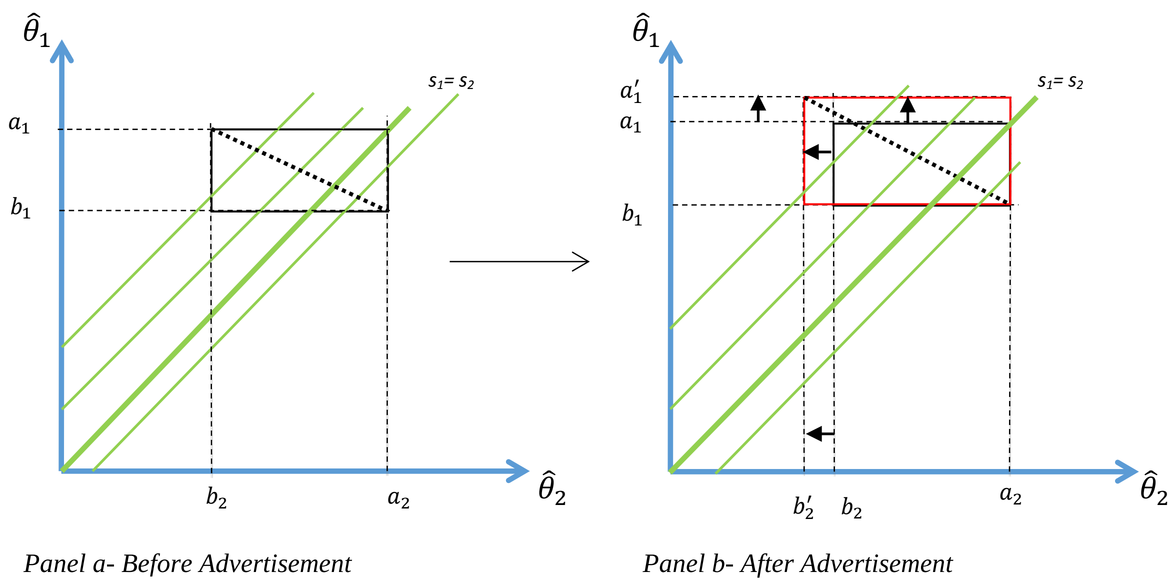

Figure 4. Allocation of Consumers to Two Products with Perfectly Negatively Correlated Preferences

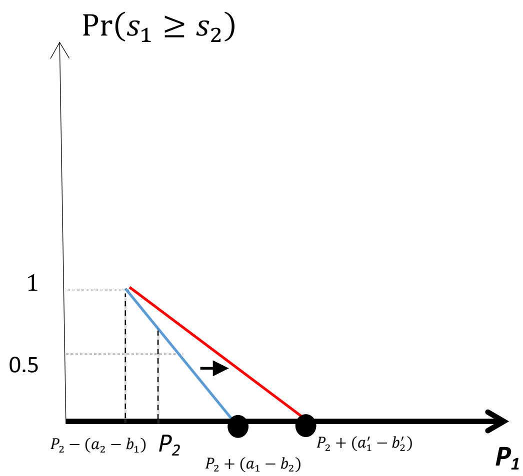

Figure 5. CDFs of Buying Product 1 (Perfectly Negatively Correlated Preferences)

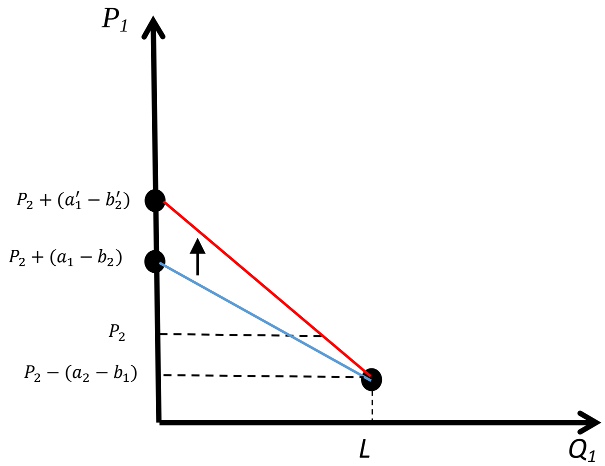

Figure 6. Demand for Product 1 (Perfectly Negatively Correlated Preferences)

Demand for product 1 before the advertisement presented in Figure 6 can be easily found based on its intercept and slope:

(9) $$Q_1 = \left(\frac{P_2 - P_1 + (a_1 - b_2)}{(a_1 - b_2) + (a_2 - b_1)}\right) L.$$

Slope of the demand curve can be found by taking the derivative of Equation 9 as follows:

(10) $$\frac{\partial Q_1}{\partial P_1} = -\frac{1}{(a_1 - b_2) + (a_2 - b_1)}.$$

Effect of Hostile Advertisement

Panel b of Figure 4 depicts the effect of hostile advertising when preferences for the two products are perfectly negatively correlated. Similar to the previous case, firm 1's hostile advertisement campaign results in an increase in at least some consumers' WTP for product 1 and a reduction in at least some consumers' WTP for product 2. As a result, upper bound of distribution of preferences for product 1 (θ_1) increases from a_1 to a_1' and lower bound of distribution of preferences for product 2 (θ_2) decreases from b_2 to b_2'. Again, it is assumed that the joint distribution of preferences remains uniform after advertisement. The effect of such changes in distributions of preferences for the two products on the joint distribution is depicted in Panel b of Figure 4. As well, figures 5 and 6 present the corresponding CDF and demand curves.

Effect of a change in the lower bound of the distribution of preferences for product 2 on the slope of the demand curve for product 1 can be found as follows:

(11) $$\frac{\partial(\frac{\partial Q_1}{\partial P_1})}{\partial b_2} = -\frac{1}{[(a_1-b_2)+(a_2-b_1)]^2} < 0.$$

Similar to the previous case, a reduction in the lower bound of the distribution for the rivals' product results in a more inelastic demand for one's own product, although the effect in the case of perfectly negatively correlated preferences is smaller than the case of independent preferences. This is plausible as perfectly negatively correlated preferences imply a lower degree of substitution than independent preferences (Torshizi et al., 2018). Nevertheless, even in the case of perfectly negatively correlated preferences, creating a negative perception about rivals' products seems to change the nature of competition by changing the elasticity of demand for own and rivals' products.

Equilibrium conditions for firm 1 can be easily found by solving the following profit-maximization problem:

(12) $$Max_{p_1}\pi_1 = (P_1 - c_1)\left(\frac{P_2-P_1+(a_1-b_2)}{(a_1-b_2)+(a_2-b_1)}\right)L - FC_1$$

where c_1 and FC_1 are firm 1's marginal and fixed cost of production. Solving the above problem results in the following best response function:

(13) $$P_1 = \frac{P_2+(a_1-b_2)+c_1}{2}.$$

Firm 2's best response function is found by following the same steps:

(14) $$P_2 = \frac{P_1 + (a_2 - b_1) + c_2}{2}.$$

Equilibrium prices are found by substituting 14 into 13:

(15) $$P_1 = \frac{2(a_1 - b_2) + (a_2 - b_1) + (2c_1 + c_2)}{3},\ P_2 = \frac{(a_1 - b_2) + 2(a_2 - b_1) + (c_1 + 2c_2)}{3}.$$

Equations 15 imply that a reduction in the lower bound of the distribution for the rivals' product results in higher equilibrium prices for one's own and rival product. This is due to the fact that the two products are substitutes. Nevertheless, the increase in own price is (twice) larger than rival's price. More importantly, equation 15 implies that the price effect of an advertisement strategy that negatively influences consumers' perception of rival's products can be more substantial than a strategy that merely promotes one's own product. Assume a non-hostile advertisement strategy increases all consumers WTP for product 1 by ε without influencing their perception of product 2 in any way. As a result, both a_1 and b_1 increase by ε causing P_1 to increase by $\frac{\varepsilon}{3}$. However, a hostile advertisement approach that results in $\frac{\varepsilon}{2}$ increase in a_1 and $\frac{\varepsilon}{2}$ decrease in b_2 (or ε decrease in b_2 and no increase in a_1) will result in $\frac{2\varepsilon}{3}$ increase in P_1.

Concluding Remarks

Labels such as "hormone-free", "antibiotics-free", "GMO-free", "free run", "natural", regardless of whether there is scientific evidence that they are indeed better for consumers' health, are being advertised more often than ever. One cannot help but wonder about the underlying negative perception that such labels might create about their rivals' products in the consumers' mind. In this paper we show that marketing campaigns that negatively impact consumers' perception of their rivals' products can change the nature of competition by impacting the distribution of consumers' preferences and subsequently elasticity of demand. The impact of such actions may be more aggressive than the "beggar-thy-neighbor" advertising where one firm steals some market share from its rivals by means of positive promotion of its own product. We show that negatively influencing consumers' perception of rivals' products may be a more effective marketing tool than promoting one's own product. This may explain why such strategies have become so popular among some food businesses in the last few years.

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