

Advertising Policies: Comparative versus Informative Advertising in Oligopolistic Markets.

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Abstract

The present paper investigates firms' incentives to invest in informative and/or in comparative advertising, in an oligopolistic market with horizontal and vertical product differentiation. We show that, firms' optimal endogenous choice is to invest in a combination of informative and comparative advertising, where the investment levels of comparative advertising are positively related to the degree of substitutability between products, while the investment levels of informative advertising are negatively connected to the degree of substitutability. Moreover, the comparison with the case of mere informative advertising and the case without any advertising activities reveals that the use of comparative advertising leads to lower firms' profitability and therefore, it can be characterized as "wasteful advertising". Finally, the impact of advertising on social welfare is also discussed.

Keywords: Informative Advertising, Comparative Advertising, Oligopoly, Product Differentiation.

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1. Introduction.

Undoubtedly, from 1971 where the Federal Trade Commission (FTC) began to encourage the use of comparative advertising, which is “the form of advertising that compares rivals brands on objectively measurable attributes or price, and identifies the rival brand by name, illustration or other distinctive information”¹, as a legal practice which improves market competition, this alternative way of advertising has received large publicity and has become a prevalent marketing practice². The advertising campaigns of Pepsi and Coke, Unilever and Procter & Gamble, or Dunkin’ Donuts and Starbucks are only few examples of the extended use of comparative advertising in several different industry sectors.

However, despite the large popularity of this aggressive marketing practice, its effectiveness is still under consideration. On the one hand, there are some empirical evidence that show that the comparative ads tend to be more effective than the non comparative in inducing attention to the ad, message and brand awareness, favourable brand attitudes and purchase intentions [Grewal et al.(1997), Jung and Sharon (2002)]. On the other hand, comparative advertising, apart from legal risks, can have several noxious impacts since it enhances consumers’ mistrust and may lead to misidentifications of the sponsoring brands [Etgar (1980), Wilkie and Farris (1975), Prasad (1976), Barone and Miniard (1999)].

Given the above evidence a number of questions arise about the economic analysis of comparative advertising comparing to the traditional non comparative forms of advertising that in our model are specified to informative advertising. “What are the firms’ incentives to invest in comparative and/or in informative advertising in order to promote their products?” “Which is the optimal level of investment in each type of advertising?” “How the firms’ investments in these strategic marketing practices affect the market outcomes and the social welfare?”. The present paper aims to address the above questions in a simple duopoly market with horizontally and

¹ Statement of policy regarding comparative advertising, Federal Trade Commission, Washington, D.C., August 13, 1979

² Pechmann and Stewart (1990) showed that at the United States the 60 percent of all advertising contained indirect comparative claims, 20 percent contained direct comparative claims and only 20 percent contained no comparative claims while, Muehling et al. (1990) suggested that almost 40 percent of all advertising content is comparative. The difference between direct and indirect comparative ads is based on whether the competitor is explicitly named (or precisely identified by logos and images) or not.

vertically differentiated products, where consumers do not possess any information about products.

The basic idea behind our model is that firms strategically use informative advertising in order to transmit information to consumers about the product existence, location and attributes and as consequence, to help them identify the product that covers better their needs. On the contrary, comparative advertising is strategically used by the firms in order to present their product as superior to the rivals' one. Therefore, the use of comparative advertising not only increases consumers' valuation for the advertised product but also diminishes consumers' valuation of the targeted product. However, despite the differences between these two marketing strategies they are both accompanied by a sufficiently high advertising cost.

We develop a simple theoretic model, incorporating all the above features of the two types of advertising, where firms compete by choosing their investment levels in each type of advertising and their outputs. In particular, these decisions are modelled as a two stage game where at each stage moves are simultaneous. Our main findings suggest that at the equilibrium firms have always strong incentives to invest in both informative and comparative advertising. The latter result, comes to a contradiction with the seminal work of Anderson and Renault (2006) who claim that when the products are of same quality, firms have strong incentives to advertise only their own product specification, and that there is no need for comparative advertising. Further, we show that the firms' expenditures on comparative advertising are positively related to the degree of product substitutability while, the expenditure levels on informative advertising are negatively connected to degree of substitutability between products.

Moreover, by comparing the equilibrium outcomes of our basic model, where firms invest in an combination of informative and comparative advertising, with the equilibrium outcomes of the benchmark case without advertising activities and the case of mere informative advertising, we find that the firms' investment in both types of advertising always leads to a prisoners dilemma situation and firms conclude to be worst off. Thus, we are in a position to say that comparative advertising can be characterized as "wasteful advertising" since, it enhances market competition, actuate firms to overinvest in advertising and leads them to lower profits. However, these firms' strategic marketing activities seems to be consumers' beneficial since they lead

to better informed consumers and therefore, to higher net consumers surplus. The above results also hold under Bertrand Competition.

To the best of our knowledge, in economics the aspect of comparative advertising has received little attention and the existing theoretical literature on this topic is limited. Aluf and Shy (2001) using a Hotelling type model, where the use of comparative advertising increases the transport cost to the rival's product, show that this form of advertising weakens price competition by enhancing the degree of product differentiation in consumers' eyes and thus, leads to higher prices and profits. In a different vein, Barigozzi et al.(2006) examine comparative advertising as a mean to signal quality by considering a market where an entrant decides between the use of "generic" advertising (which is a standard money burning to signal quality) and comparative advertising in order to confront an incumbent whose quality is known³. They conclude that the entrant's incentives to use comparative advertising are close related with the quality of his product and the penalty that he is going to pay if the content his advertising campaign is manipulative⁴. Further, they show that comparative advertising is seemed by consumers as a credible source of information since consumers' infer the use of comparative instead of "generic" advertising as a warranty of quality.

From an alternative perspective, Anderson and Renault (2006) investigate firms' incentives to impart product information through non comparative or comparative advertising, and show that only a firm which produce a low quality product has strong incentives to use comparative advertising (if it is legal) in order to survive in the market by targeting the firm of the high quality product. However, such comparative advertising has detrimental impact on the welfare since it leads more consumers to consume a low quality product. Although Anderson's and Renault's (2006) work is a significant first step to better understanding the firms' incentives to use comparative instead of non comparative advertising, their modelling approach is specified only to the informative "character" of comparative advertising and failures to capture its persuasive "character".

³ The signaling role of advertising is based on the idea that high advertising spending works as a device designed to signal high quality (e.g Nelson, 1974; Kihlstrom and Riordan, 1984; Milgrom and Roberts, 1986)

⁴ They assumed that when the entrant uses comparative advertising, the incumbent has the opportunity to go to court, and obtain gains if the court verdict is that the entrant's quality is low.

Thus, the present paper is novel in several dimensions. First, unlike the bulk of the literature which examines the aspect of comparative advertising only exogenously, we analyze endogenously the firms' incentives to invest in comparative or/and in informative advertising. Moreover, the present paper, contrary to the existing literature, gives answers not only about the type of advertising but also about the expenditure levels on each type of advertising that firms are willing to undertake in order to promote their products. Further, in our duopolistic model, following Häckner (2000) along with Garella and Petrakis (2006), we assume a consumers' utility function which includes both horizontal and vertical product differentiation, where the vertical differentiation can be perceived by consumers through the use of advertising, a fact that seeks to capture the persuasive role of comparative advertising.

The rest of the paper proceeds as follows. In the next section we introduce our basic model along with the benchmark case without any advertising activities. In the section 3, we adduce the equilibrium analysis and the main results of our research. In section 4, we carry out the welfare analysis. In subsection 5.1 we consider the comparison between our basic model and the case of mere informative advertising, while in the subsection 5.2 we analyze how the equilibrium results change under Bertrand competition. Finally, section 6 concludes.

2. The Basic Model.

We consider a market which consists of two firms, denoted by $i, j = 1, 2, i \neq j$, each producing one brand of differentiated good. On the demand side, we assume a unit mass population of consumers composed by individuals who have homogenous preferences. In particular, following Häckner (2000), the utility function of the representative consumer is given by:

$$U(q_i, q_j) = (\alpha + \mu_i + \kappa_i - \kappa_j)q_i + (\alpha + \mu_j + \kappa_j - \kappa_i)q_j - \frac{1}{2}[q_i^2 + q_j^2 + 2\gamma q_i q_j] + m \quad (1)$$

where, $q_i, i = 1, 2$ represents the quantity of good i , bought by the representative consumer and m is the respective quantity of the "composite good". The parameter $\gamma \in [0, 1]$ denotes the degree of product substitutability. When $\gamma = 0$ the goods are independent while, when $\gamma = 1$ the goods are perfect substitutes. Further, μ_i represents the level of investment in informative advertising while, κ_i denotes the level of investment in comparative advertising. In particular, the firms' investment in

informative advertising gives consumers the relative information to identify the product that covers better their needs. Thus, it increases consumers' valuation which shifts the demand curve outwards. On the other hand, comparative advertising has a dual effect. It has a positive impact on the advertised firm's demand since, it increases the consumers' valuation of the advertised product, while, it has a detrimental impact on the rival's firms demand since, it decreases the consumers' valuation of the targeted product.

Maximization of utility (1) with respect to q_i , q_j gives the (inverse) demand functions for the representative consumer:

$$p_i = \alpha + \mu_i + \kappa_i - \kappa_j - q_i - \gamma q_j, \quad i=1,2, ; i \neq j \quad (2)$$

where p_i , p_j are the firms' prices, while the price of the "composite good" has been normalized to unity.

We assume that both firms are endowed with identical constant returns to scale production technologies, with their marginal production cost denoted by c ($c \leq \alpha$). Further, we hypothesize a quadratic cost of advertising, given by: $b(\mu_i^2 + \kappa_i^2)$, where the parameter b represents the effectiveness of the advertising technology. The higher the parameter b is; the lower is the effectiveness of advertising. Equivalently, the higher the parameter b is, the higher are the required investment levels in advertising to obtain a given demand shift, ceteris paribus. Hence, the total cost function of firm i is given by: $C_i(.) = c q_i + b(\mu_i^2 + \kappa_i^2)$.

As it follows, the firm i 's net profits can be expressed as:

$$\Pi_i = (\alpha + \mu_i + \kappa_i - \kappa_j - q_i - \gamma q_j)q_i - c q_i - b(\mu_i^2 + \kappa_i^2) \quad i=1,2,; i \neq j \quad (3)$$

We consider a two stage game with the following timing. In the first stage, both firms decide, independently and simultaneously, upon the investment level of each type of advertising that they are going to undertake in order to promote their products. In the second stage, given the decisions of the previous stage, they compete by setting their outputs. We solve the game by applying subgame perfection.

2.1 The Benchmark Case without any investment in advertising.

Before proceeding to the equilibrium analysis of the basic model, we briefly discuss the benchmark case where firms do not undertake any advertising activities, thus μ_i

$=\mu_j=0$, $\kappa_i = \kappa_j=0$. Hence, the market outcomes can be described by the standard Cournot game with differentiated products, where each firm chooses its output, in order to maximize its profits, $\Pi_i^C = (\alpha - q_i - \gamma q_j)q_i - cq_i$. Taking the first order conditions, we evaluate the reaction function of each firm, which is given by:

$$q_i = R_i^C(q_j) = \frac{\alpha - \gamma q_j - c}{2} \quad (4)$$

Due to symmetry, the equilibrium price, output and profit are, respectively,

$$q^C = \frac{a - c}{2 + \gamma}, \quad p^C = \frac{a + (1 + \gamma)c}{2 + \gamma}, \quad \Pi^C = (q^C)^2 = \frac{(\alpha - c)^2}{(2 + \gamma)^2} \quad (5)$$

Finally, by assuming a unit mass population of consumers composed by individuals who have identical preferences, it turns out that each consumer buys a quantity $q=q^C$ from each good. Further, using eq.(1) and eq.(5), it can be checked that the net consumers surplus and the total welfare are, respectively,

$$CS_{net}^C = (1 + \gamma)q_C^2 = (1 + \gamma) \frac{(\alpha - c)^2}{(2 + \gamma)^2}, \quad TW^C = (3 + \gamma) \frac{(\alpha - c)^2}{(2 + \gamma)^2} \quad (6)$$

3. Equilibrium Analysis.

In the last stage of the game each firm chooses its output q_i , taking as given the rival's output q_j along with the expenses on each type of advertizing $(\mu_{i,j}, \kappa_{i,j})$, decided in the first stage of the game, in order to maximize its profits given by eq.(3).

Taking the first order conditions (foc) of eq.(3), we evaluate firm's i reaction function which is given by:

$$q_i = R_i^{CI}(q_j) = \frac{\alpha - c - \gamma q_j + \mu_i + \kappa_i - \kappa_j}{2} \quad (7)$$

Clearly from the above expression an increase in firm's i informative and/or comparative advertising investment levels tends to increase its level of production and thus, the equilibrium output. On the other hand, equilibrium output tends to decrease when the rival's investment in comparative advertising increases.

By solving the system of reaction functions eq. (7), we obtain the equilibrium output of the second stage,

$$q_i^{CI}(\cdot) = \frac{(2-\gamma)(\alpha-c) + 2(\mu_i + \kappa_i - \kappa_j) - \gamma(\mu_j + \kappa_j - \kappa_i)}{4-\gamma^2} \quad (8)$$

In the first stage of the game, firm i chooses the expenditure level of each type of advertising (μ_i, κ_i) in order to maximize its profits. Thus, firm's i maximization problem is:

$$\max_{\mu_i, \kappa_i} \Pi_i^*(\cdot) = \frac{[(2-\gamma)(\alpha-c) + 2(\mu_i + \kappa_i - \kappa_j) - \gamma(\mu_j + \kappa_j - \kappa_i)]^2}{(4-\gamma^2)^2} - b(\kappa_i^2 + \mu_i^2) \quad (9)$$

Applying first order conditions, we get the best reply functions for both informative and comparative advertising given by:

$$\mu_i(\mu_j) = \frac{2[(2-\gamma)(\alpha-c) + (2+\gamma)(\kappa_i - \kappa_j) - \gamma\mu_j]}{b(\gamma^2 - 4)^2 - 4} \quad (10)$$

$$\kappa_i(\kappa_j) = \frac{(2-\gamma)(\alpha-c) - (\gamma+2)\kappa_j - \gamma\mu_j + 2\mu_i}{[b(\gamma-2)^2 - 1](\gamma+2)} \quad (11)$$

From the above equations it is clear that both informative and comparative advertising effort that firm i is willing to undertake, decrease as the effectiveness of advertising technology decrease (for the higher values of b), ceteris paribus. In addition, we observe strategic substitutability between informative and comparative advertising since the investment level of both informative and comparative advertising tend to decrease as the corresponding rival's advertising levels tend to decrease.

By imposing symmetry and solving the first order conditions system, we obtain firm i's equilibrium investment level for both informative and comparative advertising,

$$\mu_i^* = \frac{2(\alpha-c)}{b(2-\gamma)(\gamma+2)^2 - 2} > 0 \quad (12)$$

$$\kappa_i^* = \frac{2(\alpha-c)(\gamma+2)}{b(2-\gamma)(\gamma+2)^2 - 2} > 0 \quad (13)$$

From eq.(12) and eq.(13) one can easily observe that at the equilibrium there always exist strong incentives for the competing firms to invest both in informative and in comparative advertising. The intuition behind this result is that firms are willing to undertake both types of advertising in order to increase their demand not only by attracting consumers through the use of informative advertising but also by decreasing the rival's demand through the comparison. Hence, the following proposition can be stated:

Proposition 1. *In equilibrium, firms' optimal endogenous choice is to invest in a combination of informative and comparative advertising, given that the parameter of advertising technology effectiveness (b) is sufficiently high.*

Further, by eq. (12) and eq.(13) it is clear that as the substitutability between products increases, i.e, as the parameter $\gamma \rightarrow 1$, firms' investment levels in informative advertising decrease while, the investment levels in comparative advertising increase. The intuition is as follows. It is well known that when the products tend to be close substitutes the market competition augments. Thus, each firm has a strong incentive to invest more in comparative advertising than in informative in order to increase its demand and decrease the demand of its rival by convincing consumers that its product is superior than the rival's one. Moreover, it can be easily testified by the eq.(12) and eq.(13) that the more effective the advertising technology is, i.e, the lower values of b , the higher is the investment in advertising, ceteris paribus. The following lemma summarizes:

Lemma 1.

a) The equilibrium investment level of informative advertising is decreasing in the degree of substitutability between products (γ) and in the effectiveness degree of advertising technology (b). Therefore, it is higher when goods tend to be independent and advertising technology is efficient.

b) The equilibrium investment level of comparative advertising is increasing in the degree of substitutability between products and is therefore highest when the goods are perfect substitutes while, it is decreasing in the effectiveness degree of advertising technology (b).

Plugging eq.(12) and (13) into (6) and (3), firm's equilibrium output and profits are given,

$$q_i^{CI} = \frac{b(\alpha - c)(\gamma^2 - 4)}{b(\gamma - 2)(\gamma + 2)^2 + 2} > 0 \quad (14)$$

$$\Pi_i^{CI} = \frac{(\alpha - c)^2 \{b[b(\gamma^2 - 4)^2 - \gamma(\gamma + 4) - 8]\}}{[b(\gamma - 2)(\gamma + 2)^2 + 2]^2} > 0, \text{ for } b > \frac{3}{2} \quad (15)$$

Note that the necessary stability condition at the equilibrium, that is a condition in order the firms' profits to be positive, is $b > 3/2$.

Given the eq.(15) it can be testified after some manipulations, that firms' equilibrium profits tend to increase as the effectiveness of the advertising technology decreases, ceteris paribus. The intuition behind this result is based on two alternatives aspects. Firstly, as we have previously shown, each firm's expenditures on comparative advertising tend to decrease when the advertising technology tends to be ineffective. Therefore, the lower firms' investment in comparative advertising declines the diminishing effect on each firm's demand due to rival's comparative advertising and thus, it acts beneficially to profits. On the contrary, an ineffective advertising technology leads also to lower firms' investment in informative advertising which in turn, it tends to decrease the beneficial effect of informative advertising on each firm's demand and thus, to decrease profits. However, our equilibrium results reveal that the beneficial effect of the low effectiveness of advertising technology dominates since it prevent firms from overinvestment in advertising. In other words, a reduction in b enhances market competition and as a consequence the firms' equilibrium profits are reduced. The latter result is in the same spirit as Bester and Petrakis (1995) and Peters (1984) who claim that firms are better off under advertising restrictions. The following proposition summarizes:

Proposition 2. *Equilibrium output is decreasing both in the degree of substitutability between products γ and in the advertising effectiveness parameter b , while equilibrium profits are decreasing in γ but increasing in b .*

3.1 A Comparison

We turn out now to the comparison of the equilibrium outcomes of our basic model and the benchmark case without advertising activities. It is obvious that eq.(7) can also be written as:

$$q_i = R_i^{CI}(q_j) = \frac{\alpha - c - \gamma q_j}{2} + \frac{\mu_i + \kappa_i - \kappa_j}{2} \quad (16)$$

Comparing $R_i^{CI}(q_j)$ with the reaction function of the no advertising case $R_i^C(q_j)$, in which only the left term of eq.(16) appears, we observe the dual effect that the use of advertising has over the output. On the one hand, firm's i expenditures on informative and comparative advertising (μ_i, κ_i) tend to augment its demand and thus, its production and equilibrium output. On the contrary, the rival's firm investment in comparative advertising (κ_j) tends to decrease equilibrium output. However, at the equilibrium due to the symmetry of the game we have that the optimal expenditure on comparative advertising is equal for both firms, $\kappa_i^* = \kappa_j^* = \kappa^*$, thus, the effect of each firm's investment in comparative advertising tends to neutralize one another and as a consequence, $q^{CI} > q^C$ always holds.

Further, by evaluating the difference between the equilibrium profits of the case where firms invest both in comparative and informative advertising given by eq.(15) and the profits of the benchmark case given in eq.(5) we have that,

$$\Pi^{CI} - \Pi^C = -\frac{(\alpha - c)^2 [b\gamma(\gamma + 2)^2(8 + \gamma) + 4]}{(\gamma + 2)^2 [b(\gamma - 2)(\gamma + 2)^2 + 2]^2} < 0 \quad (17)$$

Clearly from the above equation, since both the nominator and the denominator are positive for all the given values of the parameters b and γ , $\Pi^C > \Pi^{CI}$ always holds. Thus, it is obvious that firms conclude in a prisoners' dilemma situation since, the investment in both informative and comparative advertising increases market competition and leads firms to be worst off. As a consequence, the optimal decision of firms to invest in a combination of comparative and informative advertising can be characterized as the case of "wasteful advertising"⁵. The following lemma summarizes:

⁵ The term was first introduced by Pigou 1924, in order to describe the Prisoner's Dilemma which arises when competing firms in a market invest equal efforts in advertising in order to attract the favor

Lemma 2.

a) *The equilibrium output when firms invest both in informative and comparative advertising is always higher than that of the case without any advertising activities.*

b) *Firms' equilibrium profits when they do not undertake any advertising activities always exceed the equilibrium profits when firms invest both in informative and comparative advertising.*

4. Welfare Analysis.

In this section we discuss the impact of the firms' decision to investment in both informative and comparative advertising on the social welfare. Total welfare is defined as the sum of consumers and producers surplus:

$$TW = CS_{net} + 2\Pi_i^* \quad (18)$$

with CS_{net} and $2\Pi_i^*$ corresponding to the net consumers surplus and the overall market profits respectively. In particular, the net consumer surplus for the representative consumer is given by the following expression:

$$CS_{net}^{CI} = (\alpha + \mu_i + \kappa_i - \kappa_j)q_i + (a + \mu_j + \kappa_j - \kappa_i)q_j - \frac{1}{2}(q_i^2 + q_j^2 + 2\gamma q_i q_j) - p_i q_i - p_j q_j \quad (19)$$

In equilibrium, due to symmetry, we have that $q_i^{CI} = q_j^{CI} = q^{CI}$, $\mu_i^* = \mu_j^* = \mu^*$, $\kappa_i^* = \kappa_j^* = \kappa^*$ and $p_i^{CI} = p_j^{CI} = p^{CI}$. Thus, after some manipulations eq.(19) can be written as:

$$CS_{net}^{CI} = (1 + \gamma)[q^{CI}]^2 \quad (20)$$

From the eq. (20) we observe that since CS_{net}^{CI} is positively connected to the equilibrium output, it tends to decrease as the parameters γ and b increase. The intuition behind this is based on two different aspects. First, for a given effectiveness of advertising, as the products tend to be homogeneous firms tend to invest more in comparative and less in informative advertising while, the overall expenditure on

of the public from the others. As Pigou first showed this concludes in a Prisoner's Dilemma where none of the firms gains anything at all.

advertising tend to decrease. Hence, since the use of comparative advertising aims mainly to alter the consumers' valuation about the rival's firm product than to transmit information, along with the reduction on the investment in advertising, we conclude in less informed consumers which has a detrimental impact on the net consumers' surplus. Second, as the products tend to be perfect substitutes, the equilibrium output of each firm decreases which tends to diminish the net consumers' surplus.

Further, with respect to eq. (18), (20) and (14), the total welfare can be written as:

$$TW^{CI} = \frac{(\alpha - c)^2 b \{ [b(\gamma + 3)(\gamma^2 - 4) - 16 + 2\gamma(\gamma + 4)] \}}{[b(\gamma - 2)(\gamma + 2)^2 + 2]^2} \quad (21)$$

As it can be easily testified by eq.(21) the total welfare, when firms invest both in informative and comparative advertising, is decreasing as goods tend to be homogenous and as effectiveness of advertising technology decrease, i.e., for higher values of b. We summarize our findings in the follow proposition:

Proposition 3. In equilibrium, both the social welfare and the net consumers' surplus are decreasing in the degree of substitutability between products γ and in the advertising effectiveness parameter b.

Let us now compare our results regarding social welfare to the benchmark case without advertising activities. The following lemma summarizes our findings:

Lemma 3.

- a) *The net consumers' surplus when firms invest in advertising (informative and comparative) always exceeds the net consumers' surplus when firms do not undertake any advertising activities.*
- b) *The social welfare when firms invest in advertising and products are not close substitutes is higher than that of the no advertising case while, it is lower when the products tend to be close substitutes.*

We turn now to discuss the main arguments that drive our results. By using the eq.(6) and the eq. (20), and since $q^{CI} > q^C$ always holds, it can be easily checked that

$CS_{net}^{CI} > CS_{net}^C$ for all the given values of the parameters γ and b . The rationale behind this result is based on the dual beneficially effect of advertising. Firstly, firms' investment in advertising leads to better informed consumers which acts beneficially to the net consumers' surplus. Secondly, the increased competition among the firms, leads to higher total production, that make consumers better off.

Further, by taking the difference between TW^{CI} given by eq. (21) and TW^C given by eq. (6), we have that:

$$TW^{CI} - TW^C = -\frac{4(3 + \gamma) + 2b(\gamma + 2)^2(3\gamma^2 + 6\gamma - 4)}{(\gamma + 2)^2[b(\gamma - 2)(\gamma + 2)^2 + 2]^2} \quad (22)$$

From the above equation it can be easily testified, after some manipulations, that $TW^{CI} > TW^C$ when the products are not close substitutes while, $TW^C > TW^{CI}$ when the products tend to be close substitutes. Clearly, when the products are not close substitutes the beneficially effect of the higher net consumers' surplus when firms invest in advertising dominates the diminishing effect of the lower firms' profitability. On the contrary, as the substitutability between products increases the diminishing effect of the lower profits dominates the beneficially effect of the higher net consumers' surplus.

5. Extensions

5.1 The case of mere informative advertising.

In this section we consider the case where firms invest only in informative advertising. In other words, $\kappa_i = \kappa_j = 0$ ⁶. Hence, keeping all the other modeling specifications fixed, firm's i inverse demand is given now by: $p_i^{IN} = \alpha + \mu_i - q_i - \gamma q_j$. Thus, in the final market competition stage, where firms compete by setting their outputs, firm i solves the maximization program,

$$\max_{q_i} \Pi_i^{IN} = (\alpha + \mu_i - q_i - \gamma q_j)q_i - cq_i - \mu_i^2 \quad (23)$$

⁶ This configuration also reflects the case where consumers perceive comparative advertising as a manipulating firms' marketing practice which does not capture any trustworthy information. In this case the results coincide with the ones obtained in this subsection.

where μ_1 and μ_2 are given as first stage choices. The best reply function of firm i as function of the rival's output q_j is $q_i = R_i^{IN}(q_j) = \frac{(\alpha - c - \gamma q_j + \mu_i)}{2}$. Therefore by solving the first order conditions system, we evaluate equilibrium output,

$$q_i^{IN} = \frac{(2 - \gamma)(\alpha - c) + 2\mu_i - \gamma\mu_j}{4 - \gamma^2} \quad (24)$$

Note that equilibrium output in the case where firms invest only in informative advertising is decreasing as the rival's investment in advertising increases and products tend to be close substitutes. Further in the first stage of the game, the maximization program of the firm i is given by:

$$\max_{\mu_i} \Pi_i^{IN} = \frac{[(2 - \gamma)(\alpha - c) + 2\mu_i - \gamma\mu_j]^2}{(4 - \gamma^2)^2} - b\mu_i^2 \quad (25)$$

Applying first order conditions we have that the best reply function in informative advertising is given by:

$$\mu_i^{IN}(\mu_j^{IN}) = \frac{2[(2 - \gamma)(\alpha - c) - \gamma\mu_j]}{b(\gamma^2 - 4)^2 - 4} \quad (26)$$

Exploiting symmetry we have that equilibrium level of investment in informative advertising, output and profits are respectively,

$$\mu_i^{IN*} = \frac{(\alpha - c)}{b(\gamma + 2)^2 - 1}, \quad q_i^{IN*} = \frac{b(\alpha - c)(\gamma + 2)}{b(\gamma + 2)^2 - 1}, \quad \Pi_i^{IN*} = \frac{b(\alpha - c)^2}{b(\gamma + 2)^2 - 1} \quad (27)$$

Further, the net consumers' surplus and total welfare are given respectively by:

$$CS_{net}^{IN} = \frac{b^2(1 + \gamma)(\alpha - c)^2(\gamma + 2)^2}{[b(\gamma + 2)^2 - 1]^2}, \quad TW^{IN} = \frac{b[b(2 + \gamma)^2(3 + \gamma) - 2](\alpha - c)^2}{[b(\gamma + 2)^2 - 1]^2} \quad (28)$$

Note that the equilibrium profits, output, net consumers' surplus and total welfare when firms invest only in informative advertising always exceed the equilibrium profits, output, net consumers' surplus and total welfare of the benchmark case where firms do not undertake any advertising activities. As a consequence, we observe that firms always have strong incentives to invest in informative advertising.

5.1.2 A Comparison.

We turn now to the comparison between the equilibrium outcomes when firms invest both in informative and comparative advertising and when they invest only in informative advertising. Using eq.(14) and eq.(27) it can be easily checked that the equilibrium output when firms invest in an combination of informative and comparative advertising always exceeds the equilibrium output of the single informative advertising case, $q^{CI} > q^{IN}$ always holds. Further, considering the equilibrium profits in these two cases, we have that,

$$\Pi_i^{IN} - \Pi_i^{CI} = \frac{b\{(2 + \gamma)^2[2b(\gamma^2 + 2\gamma + 2) - 2]\}(\alpha - c)^2}{[b(\gamma + 2)^2 - 1][b(\gamma - 2)(\gamma + 2)^2 + 2]^2} \quad (30)$$

From the above equation it is obvious that $\Pi^{IN} > \Pi^{CI}$ holds for all the given values of parameters γ and b . Moreover the difference between equilibrium profits is increasing in γ while it is decreasing in b . Therefore it is highest when goods are perfect substitutes, ceteris paribus. The rationale behind this result is straightforward. The use of comparative advertising is considered as a quite aggressive marketing practice; as a consequence, it leads to fiercer market competition and lower firms' profitability. Clearly, we observe that a prisoners' dilemma exists since, $\Pi^{IN} > \Pi^{CI}$ always holds.

Considering now the societal effects of comparative advertising we have that, since the equilibrium net consumers' surplus can be expressed as $CS_{net} = (1 + \gamma)[q^*]^2$ and $q^{CI} > q^{IN}$ always holds, $CS_{net}^{CI} > CS_{net}^{IN}$ for all the given values of γ and b . Therefore, the increased market competition, due to the use of comparative advertising, turns out to be consumers' beneficial. Finally, by taking the difference between eq.(28) and eq.(21) and after some manipulations it can be checked that the total welfare in the case of mere informative advertising always exceeds the total welfare when firms invest both in informative and comparative advertising, $TW^{IN} > TW^{CI}$. Hence, it is obvious that the effect of the higher firms' profitability when firms invest only in informative advertising dominates the effect of the higher net consumers' surplus when firms invest in a combination of informative and comparative advertising.

From all the above, one can realize that the use of this aggressive marketing practice enhances market competition and leads to lower firms' profitability and

lower social welfare. Therefore, comparative advertising can be characterized as “wasteful advertising”. The above discussion is summarized in the following lemma:

Lemma 4.

a) The equilibrium output and the net consumers’ surplus of the case where firms invest in a combination of informative and comparative advertising are always higher than those of the case where firms invest only in informative advertising.

b) The equilibrium profits and the total welfare when firms invest only in informative advertising always exceed the equilibrium profits and the total welfare of the case where firms invest both in informative and comparative advertising.

5.3 Bertrand Competition.

In this section we consider the case where firms compete by choosing their prices. In this case each firm i faces the linear demand function $q_i = (1-\gamma)a + \mu_i - \gamma\mu_j + (1+\gamma)(\kappa_i - \kappa_j) - p_i - \gamma p_j / (1-\gamma^2)$, $0 \leq \gamma < 1$. Keeping all the other modeling specifications fixed, we observe that all of our main results still hold under Bertrand market competition and the intuitive arguments are in line with the respective ones in the Cournot case. In particular, we show that firms in the equilibrium have always strong incentives to invest both in informative and comparative advertising for all the given values of the substitutability parameter γ . However, we observe that the necessary stability condition at the equilibrium, changes from $b > \frac{3}{2}$ under Cournot competition to $b > 30$ under Bertrand competition. Thus, our model possesses a price setting equilibrium only if the cost of advertising is significantly high. The intuition behind this result is derived directly by the fact that the Bertrand competition is “harder” than Cournot. Thus, as the advertising tends to be ineffective firms tend to invest less in advertising which protect them by the impacts of the existing prisoners’ dilemma.

6. Concluding Remarks.

In the present paper, we have analyzed endogenously the firms' incentives to invest in informative and/or in comparative advertising in an oligopolistic market with horizontal and vertical product differentiation, taking as basic premise, that informative advertising is used by firms as a mean to transmit information to consumers while, comparative advertising is mainly used in order to alter consumers' preferences by presenting the advertised product as superior to the rival's one.

Our main findings suggest that, at the equilibrium firms' optimal decision is to invest in a combination of informative and comparative advertising, where, when the products are independent the firms' expenditures on informative advertising are equal to that of comparative advertising while, when the products tend to be close substitutes firms tend to invest more in comparative advertising than in informative. This result comes to a contradiction with the existing literature that states that when the products are of same quality firms have no incentive to invest in comparative advertising.

Moreover, by comparing the equilibrium outcomes when firms invest in a combination of informative and comparative advertising with those of the no advertising case and the case of mere informative advertising, we show that firms' endogenous optimal decision to invest in both informative and comparative advertising always leads them to lower profitability. Thus, firms find themselves in a prisoner's dilemma situation, and they conclude to be worst off. Hence, comparative advertising can be characterized as "wasteful advertising" since both of the firms would be better off, if comparative advertising was prohibited. On the contrary, our analysis reveals that the use of comparative advertising is beneficial to consumers, since it leads to higher net consumers' surplus due to the improved information that consumers possess through the use of advertising.

Although, our analysis was carried out for a duopolistic market, we strongly believe that it provides all the essential insights about the firms' incentives to invest in informative and/or comparative advertising. We are also aware that the undertaken analysis has several limitations that emerge from the functional forms we have used, but we strongly believe that the use of more general modeling forms would jeopardize the clarity of our findings without significantly changing their qualitative character. Further, given the large publicity of comparative advertising, we believe that our

analysis provide a first theoretical step in the better understanding of the strategic use of comparative advertising. However, there are several open directions for future work. For instance, an interesting enough question that arises is, how the firms' incentives to use informative and/or comparative advertising change, if we assume that a portion of consumers are already informed about the existing products in the market. Since this scenario is not an easy task, its analysis awaits for further work.

7. References.

- Aluf, Y., and Shy, O., 2001, “Comparison – Advertising and Competition”, mimeo, University of Haifa.
- Anderson, S.P., and Renault R., (2004), “Negative Advertising a New Product!”, mimeo, University of Virginia.
- Anderson, S.P., and Renault R., (2006a), “Comparative Advertising”, mimeo, University of Virginia.
- Anderson, S.P., and Renault R., (2006b), “Advertising Content”, *American Economic Review*, Vol. 96, 93-113.
- Bagwell, K., (2003), “The Economic Analysis of Advertising”, *The Handbook of Industrial Organization*, Vol.3.
- Barigozzi, F., Garella, P.G., and Peitz, M., (2007), “With a Little Help from my Enemy: Comparative Advertising”, University of Bologna discussion paper.
- Barigozzi, F., Garella, P.G., and Peitz M., (2006), “Advertising and Prices as Signals of Quality: Competing Against a Renowned Brand”.
- Barigozzi, F., and Peitz M., (2006), “Comparative Advertising and Competition Policy”, in: Choi, J.P.(ed.), *Recent Trends in Antitrust: Theory and Evidence*, MIT Press, 215-263.
- Barone, M.J., and Miniard, P.W., (1999), “How and When Factual Ad Claims Mislead Consumers: Examining the Deceptive Consequences of Copy X Copy Interactions for Partial Comparative Advertisements”, *Journal of Marketing Research*, Vol. 36(1), 58-74.

- Bester, H., and Petrakis, E., (1995), “Price Competition and Advertising in Oligopoly”, *European Economic Review*, Vol.39, 1075-88.
- Garella, P.G., Petrakis, E., (2006), “Minimum quality standards and consumers information”, *Economic Theory*, Vol. 36(2)., 283-302.
- Grewal, D.S. Kavanoor, E. Fern, C. Costley and J. Barnes, (1997), “Comparative Versus Non-comparative Advertising: A Meta- Analysis”, *Journal of Marketing*”, Vol.61(4), 517-32.
- Grossman and Sharipo, (1984), “Informative Advertising with Differentiated Products”, *The Review of Economics Studies*, Vol.51.
- Häckner, J., (2000), “A note on price and quantity competition in differentiated oligopolies”, *Journal of Economic Theory*, Vol. 93, 233-239.
- Haller Hans and Chakrabarti Subhadip, (2002) “An Analysis of Advertising Wars”, mimeo.
- Muehling D., Stoltman J., Grossbart S., (1990), “The Impact of Comparative Advertising on Levels of Message Involvement”, *Journal of Advertising*, Vol. 19, 41-50.
- Nelson, P., (1974), “Advertising as Information”, *Journal of Political Economy*, Vol.84, 729-754.
- Pechmann, C. and D.W. Steward, (1990), “The Effect of Comparative Advertising on Attention, Memory and Purchase Intention”, *Journal of Consumer Research*, Vol.17, 180-191.
- Pechmann, C. and S. Ratneshwar, (1991), “The Use of Comparative Advertising for Brand Positioning: Association versus Differentiation”, *Journal of Consumer Research*, Vol. 18, 145-160.

- Peters, M, (1984), “Restrictions on price advertising”, *Journal of Political Economy*, Vol. 92, 472-485

- Pigou, A.C, (1924), “The Economics of Welfare”, London: Micmillan and Co., Limited. Second Edition.

- Wilkie, W.L. and P.W. Farris, (1975), “Comparative Advertising: Problems and Potential”, *Journal of Marketing*, Vol.39, 7-15.