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Advertising Policies:

Comparative Versus Informative Advertising

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Αφιερώνω αυτή μου την εργασία στους γονείς μου, Πέτρο και Ελένη Αλιπράντη και στον αδελφό μου Ζαχαρία γιατί στήριξαν κάθε επιλογή μου και μου έμαθαν ότι η ουσία των πραγμάτων κρύβεται στην δυσκολία τους. Στους φίλους και συμφοιτητές μου και ιδιαίτερα στις: Βαρβατάκη Μαρία και Αναγνωστοπούλου Φωτεινή γιατί ήταν συνοδοιπόροι στην τρελά, στο άγχος, στο διάβασμα, αλλά και στο γέλιο. Στους παιδικούς μου φίλους Μαυραγάνη Αμαρυλλίς και Μαλαματένιο Κωνσταντίνο γιατί όταν μοιράζεσαι την χαρά είναι διπλή χαρά και όταν μοιράζεσαι τη λύπη είναι μίση λύπη. Στους καθηγητές μου που απλόχερα προσφέρουν την γνώση και την παιδεία τους για να μας κάνουν όχι μόνο καλύτερους οικονομολόγους, αλλά και σκεπτόμενους ανθρώπους.

Ιδιαίτερα ευχαριστώ τον επιβλέποντα καθηγητή μου κύριο Πετράκη Μανόλη που μου έδωσε την δυνατότητα να δοκιμάσω τις δυνάμεις μου στην ερευνά. Ακόμα, ευχαριστώ τους Γαλανάκη Κωνσταντίνο και Κουργιαντάκη Μάρκο για τις πολύτιμες συμβουλές τους. Τέλος, ένα ιδιαίτερα μεγάλο ευχαριστώ στον Μητροκώστα Βαγγέλη όχι μόνο για την πολύτιμη βοήθεια και στήριξη του σε όλη αυτή την προσπάθεια, αλλά και γιατί πίστεψε σε μένα και μου έδειξε το δρόμο για να γίνουν τα δύσκολα εύκολα και δυνατά τα αδύνατα.

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1.Introduction

The role of advertising in competition among firms in oligopolistic markets has been for many decades an interesting issue for study among scientists, since advertising by its nature is a prominent feature of economic life, and constitutes a main strategic tool in addition to prices and quantities. Advertising reaches consumers everyday through a wide variety of media, such as newspapers, magazines, television and more recently Internet. However, it was only at the beginning of the 20th century that began to focus a great interest among the scientific community, and started to be advanced at a furious pace.

According to the Marketing perspective, advertising can take a number of alternative forms including advocacy, cooperative, comparative, informational, persuasive, institutional, reminder, point-of-purchase, and specialty advertising. Each of these forms is designed to cover different needs of the advertisers, is used by different types of markets, and is applied to different target groups. In the present thesis, we will focalize in the economic aspects of two specific forms of advertising, Comparative and Informative Advertising, and less in the details of the craft which are the subject of marketing research.

More precisely, Informative advertising is the simplest and most common form of advertising, which according to Bagwell (2005) it is used by firms as a mean through which, direct information such as price, location, attributes, or/and indirect information such as quality¹, can be transmitted to consumers. Thus, advertising can effectively diminish market search costs, since it conveys information to consumers (Stigler 1960, Ozga 1960, Telser 1964, Nelson 1976). Moreover, as the majority of the economic writings suggest, informative advertising enhances market performance: encourages entry, efficient production, lower prices and higher-quality products. In particular, the use of informative advertising, when consumers are imperfectly informed about product existence, characteristics and prices, reduces product differentiation, decreases market concentration and as a consequence diminishes

¹ The fact that advertising can transmit information about the quality of a product was first introduced by Nelson (1976), who has predicted a positive relationship between advertising and product quality, especially for experience goods. His well known explanation of advertising as information, is based on the idea that the high cost of an advertising campaign works as a device to signal high quality of a brand.

prices and profits (Grossman and Sharipo 1984, Robert and Stahl 1993, Bester and Petrakis 1995).

On the other hand, Comparative advertising is a very common phenomenon, which plays a significant role in today's advertising world, but surprisingly enough, has focused little attention in the Economic literature. To be more precise, it is important to give the definition of the term "comparative advertising" as it is stated by the F.T.C. and the E.U. According to the Federal Trade Commission (F.T.C), "Comparative advertising is defined as the form of advertising which compares rivals brands on objectively measurable attributes or price, and identifies the rival brand by name, illustration or the other distinctive information"(Statement of policy Regarding Comparative Advertising, Federal Trade Commission, Washington, D.C., August 13, 1979). While, in the European Union; where until very recently comparative advertising was of little use, is defined as: "Comparative Advertising means any advertising which explicitly or by implication identifies a competitor, or goods and services, offered by a competitor".

Moreover, comparative advertising can be further classified according to whether its message is direct or indirect. Direct comparative ads present the advertised product as superior on specific attributes, benefits or prices, to explicit named or precisely identified (by photos, logos, images) competitors' products. For example, in 1991 MasterCard launched "a campaign that used funny thirty second commercials to depict frenzies American Express Card holders rushing madly around unsuccessfully trying to find a ATM that would take their card" (Leighton 2004). On the contrary, indirect comparative ads, which are more common, do not directly name the competing brand. (competitors are not explicitly named, but the advertised brand is reported as being superior on specific attributes or benefits).The most famous example of indirect comparative ads is the Avis campaign with the logo "We try harder".² However, both direct and indirect comparative messages are considered as aggressive marketing policies.

² In 1962 Hertz was undoubtedly the leader in the car rental business, while Avis was one of the followers. The advertising campaign of Avis " We try harder" makes the company right choice in the mind of consumers and as a consequence the market dominance pass from Hertz to Avis. This campaign is famous as the first "modern" use of comparative advertising in the history of advertising. (Bixby and Lincoln 1989)

Obviously, from 1971, where the Federal Trade Commission (FTC) began to encourage the use of that form of advertising since today, comparative advertising has received large publicity and has become the prevalent marketing practice. As Pechmann and Stewart (1990) shown, the 60 percent of the advertising contained indirect comparative claims, 20 percent contained direct comparative claims and only 20 percent contained no comparative claims. While, Muehling et al.(1990) find that almost 40 percent of all advertising content is comparative.

However, despite the sudden increase of the use of comparative advertising, the legal framework between E.U and U.S until very recently, was quite different due to the lack of a harmonized legislation for this type of advertising within Europe. For example, until April 2000, were laws on comparative advertising were harmonized, the majority of European countries have prohibit the use of explicit comparative ads as unfair, misleading and manipulative. In particular, as Petty and Spink 1995 stated “the explicit identification of a rival or its product constitute an unauthorized use of the rival’s trademark or unfair denigration”. Nevertheless, according to the current European and American legislation³ the use of comparative advertising is allowed only if it is not misleading, compares like with like, does not create confusion to consumers, does not discredit or take unfair advantage of a rival’s trademark and does not manipulate consumers. Thus, nowadays we can observe a relaxed attitude towards comparative advertising, since it is generally believed that truthful and objective advertising helps consumers to make more informed purchasing decisions.

³ For further analysis about the legislation of Comparative Advertising in the E.U and U. S see appendix.

1. 2. Relative Literature

1. 2. 1. The marketing approach of Comparative Advertising

Even since comparative advertising has begun to be used as a marketing practice, academicians and practitioners have started to explore its effectiveness. However, according to the Marketing literature, the effectiveness of comparative advertising is still under consideration due to the fact that several studies using different data sets and methodologies, conclude in controversial results⁴.

On the one hand, a number of practitioners suggest that comparative ads tends to be more effective than non comparative ads. In particular, Grewal et al.(1997) examining the relative effectiveness of comparative advertising, showed that comparative ads tend to be more effective than non comparative, in induces attention to the ad, message and brand awareness, favourable brand attitudes and purchase intentions. In addition, Jung and Sharon (2002) examining the effectiveness of that type of advertising on two different groups of consumers (familiar and unfamiliar with comparative advertising), showed that comparative ads seem to be more effective, whether or not the consumers are familiar with it. Moreover, studying the relative effectiveness of the two classifications of comparative advertising (direct, indirect), they conclude that direct comparative ads are more persuasive effective on consumers that have never been exposed to direct comparative messages, while indirect comparative ads are more effective in inducing favourable brand attitudes and purchase intention to consumers who are familiar with the use of comparative advertising and especially, on consumers which are familiar with direct comparative messages.

On the contrary, according to many empirical surveys comparative advertising is not only less effective than non comparative, but also has several nocuous impacts on the advertising firm. Apart from legal risks, there exist long- term consequences that may turn up to be seriously detrimental. In particular, according to Goodwin and

⁴ For further analysis, see Prasad 1976, Perchmann and Ratneshwar 1991, Barone and Miniard 1999

Etgar (1980), comparative advertising can lead to misidentifications of the sponsoring brands. As they stated, “The less explicit the comparison, the less likely are consumers to identify correctly and with confidence the comparison brand”. In addition, a second serious negative effect of comparative advertising is about credibility. In many cases, comparative ads are not being viewed by consumers as a good and credible sources of information, but as an attempt from the advertising firms to manipulate them. Thus, comparative advertising may enhance consumers mistrust which leads to the exactly opposite results than that, which comparative advertising was designed to achieve (Wilkie and Farris, 1975; Prasad 1976).

However, a common agreement according to the marketing literature is that comparative ads are more effective for new, less established brands, since they can enhance consumers purchase intention by comparing themselves with the leading brands of the market (e.g. Pechmann and Stewart 1990; Muehling et al.1990; Gnepa 1993; Grewal et al.1997)

1. 2. 2. The Economic approach of Comparative Advertising

Although in marketing there exist a lot of documentation and discussion about the phenomenon of comparative advertising, in economics there is curiously little literature on this topic. A first step to modelling comparative advertising was done by Shy (1992), where he assumes a duopoly market with the two firms competing on markets shares by choosing their type of advertising (non-comparative or comparative advertising). In particular, he assumes that non-comparative ads are persuasive since, there are used to enlarge the target group that firms possess, while comparative ads is only informative and targeted on consumers that have in past purchase the product. His results are mainly focused on the matching of heterogeneous consumers to differentiated brands.

More recently, Aluf and Shy (2001) using a Hotelling type duopoly market, and assuming that comparison advertising is persuasive, and decreases the consumers’ willingness-to-pay for competitors’ products, examine, whether comparative advertising has or not anti-competition effects. They suggest, that comparison advertising is a fruitful product differentiation strategy, since it enhance the degree of product differentiation in consumers eyes. As a consequence, according to their

analysis, the use of comparison advertising weakens price competition, increases the local monopoly power of each brand-producing firm, and leads to higher prices and profits. Furthermore, they examine if there are any semi-collusion⁵ incentives and showed that, there exist such incentives, since equilibrium prices and profits when firms collude increases. Thus, comparison advertising has strong anti-competition effects. Interestingly enough, they also found that in contrast to a large number of conventional advertising models, in which collusion leads to lower investment in advertising in order to avoid high advertising costs, in their model the investment in advertising enhanced under collusion since, as the investment in comparison advertising increases the competition among firms decreases.

However, Aluf's and Shy's modeling of comparison advertising, has been widely criticized, as a model which failure to capture the informative role of comparison advertising, which is not micro-founded in information revelation and which actually model the "negative" persuasive advertising instead of comparative advertising.(Anderson and Renault (2006), Barigozzi and Peitz (2005)).

On the contrary, Haller and Chakrabarti (2002) performed a theoretical model⁶ where firms engage in comparative advertising against each other, and compete in advertising levels and quantities. In particular, they develop two different versions of their model. In the perfectly symmetric version, where only two firms exist in the market and each firm advertise against the other, they obtained that equilibrium advertising levels are positive, while equilibrium quantities and prices are exactly the same as it would have been if none of the firms had invest in comparative advertising. However, each individual firm has an incentive to advertise up to a certain level. Hence, it is obvious that firms conclude in a Prisoner's Dilemma which has been described verbally by Pigou (1924) as the case of wasteful advertising. Moreover, taking the social welfare perspective they stated that advertising expenditures constitute a clear welfare loss since, neither consumers nor producers are ultimately affected by the comparative advertising, except from the impact of the advertising costs.

⁵ A semi-collusion market structure is a two-stage game where, in second stage both firms compete noncooperatively on prices given the level of advertising decided in the first stage. In the first stage, both firms maximize their joint profit given the price functions calculated in the second stage.

⁶ In particular, they use a generalized Cournot model with horizontal and vertical differentiated products.

In the asymmetric version, where finitely many firms are competing in quantities (Cournot Competition) and only one of them use Comparative advertising against a specific rival, Haller and Chakrabarti prove that, as long as the cost of advertising is sufficiently small, the advertised firm will always gain from advertising⁷. Furthermore, they explore the side-effects of comparative advertising on third parties of the market (non-targeted firms), and showed that third parties stand to gain if the loss incurred by the targeted firm is greater than the gain of the advertising firm and vice versa.

In a revised form of the paper, Haller and Chakrabarti further examine the link between the relative effectiveness of comparative advertising and the degree of product differentiation. Considering a three-stage Hotelling model, where firms choose first locations (in an unit interval product space), next advertising levels and finally set their quantities, they showed that in equilibrium one firm locates at the one endpoint of the linear city and the other firm locates at the opposite endpoint. This result identifies the dual effect that each firm experience as it comes closer to the rival. In particular, when a firm moves closer to its competitor, its' advertising becomes more effective but on the other hand, also competitor's advertising becomes more effective. Thus, the losses from moving closer to one's competitor outweigh the gains, and as a result, the ensuing advertising war intensifies to the detriment of both firms' profits. Finally, examining comparative advertising as perceived product differentiation, they observe that comparative advertising leads to maximum horizontal product differentiation and minimum vertical differentiation.

From an alternative perspective, Shaffer and Zettlmeyer (2004) use a standard Hotelling type model, where, there exist finitely many manufacturers and one retailer, and investigate the retailer's incentives to expose consumers to a manufacturer's comparative advertising campaign and the effects of that decision on the retailer's profits. Their basic premise is that manufacturers have always incentive to use comparative advertising messages since, such types of messages induce consumers to buy their products instead of the rival's product. While, the incentives for a retailer who carries both products in his product line, to support a manufacturer's comparative

⁷ The above is based on the fact that strategic comparative advertising has two sources of gain, first, advertising firm's demand increases, while targeted firm's decreases.

message and to “play favorites”⁸ are not clear; due to the dual effect of such an action: an increase in retailer’s sales of the favored product is accompanied by a decrease on his sales of the comparison product. They conclude that, a retailer would expose consumers to the manufacturer’s advertising campaign, when the increase in consumers’ valuation for the advertised product is larger than the decrease in consumers’ valuation of the compared product. They also stated, that the impact on the retailer’s profits by the comparative advertising message depends on the market share, which the manufacturer whose product is favored, possess. In particular, they showed that a retailer has stronger incentives to expose consumers to a comparative ad when the market share of that manufacturer’s product is quite large.

In addition, Shaffer and Zetlmeyer also examined the effectiveness of comparative advertising campaign in two different types of consumers, “core” and “non- core”⁹, since, the type of the target group which comparative advertising campaign focus on, plays a crucial role in determining whether or not, a retailer gains from the manufacturer’s campaign. They showed that the retailer will always gain from manufacturer’s comparative advertising campaign which is targeted directly to the non-core consumers, while he will always loses when it is targeted to core consumers. Moreover they claimed that untargeted comparative ads, are most likely to benefit the retailer if they are “positive”¹⁰ and initiated by small market-share manufacturers.

In an different vein, Barigozzi, Garella and Peitz (2006) examine comparative advertising as a mean to signal quality. They use a model where an entrant with uncertain quality can choose among “generic” advertising, which is a standard money burning to signal quality¹¹, comparative advertising, or no advertising (signaling quality with price) in order to confront an incumbent¹² whose quality is known.

⁸ The term “play favorites” means that the retailer chooses to expose consumers to a manufacturer’s comparative advertising message. In other words, the retailer chooses to promote better the advertised product instead of the non advertised.

⁹ By the term “core” consumers the authors mean those consumers which are located in preference space close to manufacturer’s product. While by the term “non-core” they mean those consumers which are located in preferences space far from the manufacturer’s product.

¹⁰ The term “positive comparative advertising” is related to the emphasis of the advertising message. A positive advertising message is a message which focus on the superiority of the advertised product against the targeted product in a non-derogatory manner.

¹¹ 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)

¹² The incumbent may have favorable or unfavorable information about the entrant’s quality but he is not in a position to observe it perfectly.

Furthermore, they assume that in the case where the entrant chooses to use comparative advertising, which means that he claims that his product has at least the same quality as the incumbent's product, the incumbent has the opportunity to go to court, and obtain gains if the court verdict is that the entrant's quality is low. In any other case incumbent can not appeal to the court¹³. Thus as they stated, it is clear that the incumbent has incentive to go to the court only if he believes that the entrant's quality is low and if that can be verified, while entrant's incentives to choose comparative advertising, changes with the quality that he possess and with the level of the damage that his is going to pay if his advertising is manipulative.

In more details, they focus on two alternative types of equilibria: unconditional contested and conditional contested, where, in the unconditional contested equilibria the incumbent ignores any information that possess about entrant's quality and always go to the court. While, in the conditional contested equilibria, the incumbent goes to the court only when he has a strong belief that the entrant's quality is low. They proved, that there not exist either a separating equilibrium in which the entrant can signal his quality without advertising (signal quality with price) or an equilibrium which the entrant can signal quality with generic advertising. However, they showed that where price and "generic" advertising fail as a signal of quality, comparative advertising succeed in that role. Thus, they conclude that comparative advertising has higher signaling power than price and "generic" advertising together, as long as, there exist; a sufficient high level of damage payment that the entrant oblige to pay if his advertisement is manipulative.

Another very important research was that of Anderson and Renault (2006) which investigates firm's decisions to impart product information through advertising. They use a duopoly Bertrand model where firms with horizontally differentiated products, which are valued differently by different consumers, can choose to transmit information using partial¹⁴ or comparative advertising, or they can choose to not advertise at all. More precisely, they examine two different scenarios, where, in the first scenario, firms have exactly the same quality and thus, the same market shares, while in the second; there exist a high quality firm with high market share and a low

¹³ They assume that the court is capable to trustworthy check the entrants real quality. So the real entrant quality is perfectly revealed to the court.

¹⁴ Partial advertising is defined by the authors, as the form of advertising which reveals information only for the advertised product. Thus such "positive" advertising allows consumers to establish their realization about each specific product.

quality firm with low market share. In addition, they assume that advertising reaches consumers costlessly. They found that when firms have exactly the same quality and market shares, then, they choose to provide only partial information to consumers. On the other hand, if qualities, market shares or marginal production costs are sufficiently different and comparative advertising is illegal, the dominant product will serve the whole market without needing to be advertised, and the minor product will be overwhelmed. On the contrary, if comparative advertising is legal, the minor product can impose its consumer base and survive by targeting the dominant product. Thus, comparative advertising enables the weaker firms to survive. Nevertheless, as Anderson and Renault stated, such comparative advertising has detrimental impact on the welfare by leading more consumers to consume the low quality product: this effect dominates the benefits from improved consumers information and reduces social welfare. Finally the authors underline the fact that they assume zero cost of advertising, and conclude that the above results may change if such a cost be introduced in the model.

1. 3. Purpose and Structure of the Thesis

Although in the last few years have been done some important steps in order to investigate the economic approach of comparative advertising, there still several aspects on this topic that have not yet been met by the economists, and need further investigation. For example, none of the aforementioned studies has investigate the economic differences that may emerge between the two classifications of comparative advertising (direct and indirect), or, if comparative advertising can be used by an incumbent as a trustworthy menace in order deter an entrant to entry in a market.

In addition, an important question that arise, and has not been yet deeply examined by the existing literature is which type of advertising, among the several forms that advertising can take (informative, persuasive, comparative, “negative”...), firms’ has incentive to use in order to promote their products. A first try to answer to that question was made, as we have in length analyze in the previous section, by Anderson and Renault (2006). However, Anderson and Renault have examined only exogenously the incentives that a firm has, to use partial or comparative advertising,

by doing the comparative static of the effects that the use of each form of advertising has in the equilibrium. Moreover, they made the simplifying assumption that advertising costs is zero, which far exceed from real world, where advertising costs not only exist but there are also sufficiently high.

Hence, the question about which is the optimal endogenous choice of advertising type that firms are willing to undertake in order to promote their products, still holds. In the present thesis we will focalize in two specific forms of advertising (Comparative and Informative Advertising) and we will try to address this question in an oligopolistic market where firms compete in an ala Cournot framework and advertising cost is increasing with an increasing rate. Thus, the present master thesis is novel in several dimensions. Unlike the vast majority of the literature which examine the aspect of comparative advertising only exogenously, we endogenize the strategic decision about the type and the level of investment in advertising, in order to investigate firms' incentives to use Comparative instead Informative advertising and vice versa. In addition, contrary to Anderson and Renault (2006) who assumed maximum vertical product differentiation which is observable by consumers and zero advertising cost, 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.

More precisely, the objectives of the present master thesis are: First, to endogenize firms' advertising strategic behaviour and investigate, firms' incentives to use Informative instead of Comparative Advertising and vice versa. Second, to evaluate the optimal level of investment in advertising that firms are willing to undertake in order to maximize their profits. And finally, to indicate how firms' advertising decisions affect the Consumers' Surplus and the Social Welfare in general.

The rest of the thesis proceeds as follows. In the next section we make a briefly discussion about the methodology that we are going to use in order to accomplish the objectives of this thesis and derive some trustworthy conclusions. In section 3 we introduce the model, while in the section 4 we adduce the equilibrium analysis along with the main results of our research. In section 5 we carry out the welfare analysis. In section 6 we consider the comparison between our model and the case of no advertising and finally, section 7 concludes.

2. Methodology

Having notice the specific questions that this master thesis is trying to answer, we continue, presenting the methodology that we are going to use in order to achieve ours goals. Among several alternative modelling tactics that can be used in Economic Theory such as Game Theory, Econometrics and Competitive Equilibrium Theory we strongly prefer Game Theory approach, as the most appropriate method which enables us to model all the specific parameters of our problem.

Although Econometrics is a widely used method in many fields of Economics, since it enables scientists to quantify economical relationships on the basis of available data, and by using statistical techniques to estimate, get forecasts for future values, and interpret the correlation between different variables, it fails to been used in the area of the Economic Theory that we are trying to investigate, since, our model does not has as an objective to estimate parameters using data panels but we are trying to construct a theory that captures the economic approach of advertising.

On the other hand, Competitive Equilibrium Theory (C.E.T) which is commonly used in neoclassical economics when we are trying to investigate how firms and consumers respond in the market in order to reach the equilibrium, is consider to be useless in our case since, it is not able to capture the strategic decisions and interactions among the individuals in a marketplace.

As a consequence, we choose Game Theory as the most applicable method to use, since it provides a formal modelling approach to situations, where decision makers interact with other agents, and studies the optimal behavior of each individual when costs and benefits of each option depend upon the choices of the other individuals. In particular, in our case we use Game Theory, since we are trying to investigate the optimal decision about the type (informative or comparative) and the advertising expenditure that a firm has incentive to undertake, given that these decisions interact with the decisions of the other firms in the market. Moreover we find Game Theory approach more useful, since we analyze a situation where the number of firms in the market is small and each firm's decision is likely to have a large impact on the other firms' decisions.

3. The Model

In a market with horizontally and vertically differentiated goods two firms compete by choosing their type of advertising, their level of investment in advertising, and their quantities. These decisions are modelled as a tree stage game where in each stage, firms decide independently and simultaneously.

More precisely, 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 identical preferences. In particular, following Häckner (2000), we assume a utility form which is quadratic in the consumption of the q_i -goods and linear in the consumption of the other goods (m)¹⁵. Thus, the utility function is given by:

$$U(q_i, q_j) = (A + S_i + F_i(S_i - S_j))q_i + (A + S_j + F_j(S_j - S_i))q_j - \frac{1}{2}[q_i^2 + q_j^2 + 2\gamma q_i q_j] + m \quad (1)$$

where, q_i , $i = 1, 2$ is the quantity of good i , which is bought by the representative consumer and m represents the respective quantity of the “composite good”. The parameter $\gamma \in [0, 1]$ is a measure of the degree of substitutability among goods. When $\gamma = 0$ the goods are independent and thus, each firm has monopolistic power, while, when $\gamma = 1$ the goods are perfect substitutes. Further, the parameter S_i denotes the level of investment in advertising that each firm undertakes which, in turn, when it is positive ($S_i > 0$), increases consumers’ valuation for good i , and shifts the advertised firm’s demand curve outwards. Finally, the parameter $F_i \geq 0$ denotes the type of advertising, where, when $F_i = 0$ we have the case of Informative advertising, while when $F_i > 0$ we have the case of Comparative advertising.

We note that in the case of comparative advertising we observe a dual effect of investment in advertising. On the one hand, it has a positive impact on the advertised firm’s demand, while it has a detrimental impact on the rival’s firm demand. We further assume that in the case of comparative advertising consumers receive direct information for the advertised product and indirect information for the rival’s product through the comparison. Thus, in the case of comparative advertising we observe that

¹⁵ m : represents the quantity of the composite good and we normalize its price to unit.

firm's i investment in advertising, increases consumers' valuation about her product and as a consequence shifts her demand curve outwards per $(1 + F_i) * S_i$, while the impact of the rival's investment in advertising decreases consumers' valuation about firm i 's product which tend to shift her demand curve inward per $(F_i * S_j)$. Hence, if the advertised firm's demand, ultimately increases or decreases depends upon the relevant difference between the level of investment in advertising that the two firms undertake. More precisely, when $S_i + F_i(S_i - S_j) > 0$ then firm's i demand increases, while it decreases when $S_i + F_i(S_i - S_j) < 0$. However, as we have define S_i and F_i are always positive or at least zero ($S_i \geq 0, F_i \geq 0$), thus as it can easily be observed if firm's i demand, ultimately increases or decreases, depends on the difference $(S_i - S_j)$.

Given now, the utility function (1) consumers solve the following maximization problem:

$$\begin{aligned} \underset{q_i, q_j}{Max} U &\Leftrightarrow \underset{q_i, q_j}{Max} (A + S_i + F_i(S_i - S_j))q_i + (A + S_j + F_j(S_j - S_i))q_j - \frac{1}{2}[q_i^2 + q_j^2 + 2\gamma q_i q_j] + m \\ &\text{s.t. } p_i q_i + p_j q_j + p_m m \leq W \quad \xRightarrow{p_m=1} \quad p_i q_i + p_j q_j + m \leq W \end{aligned}$$

where, W denotes the consumer's income and the price of the "composite good"¹⁶ is normalized to unit.

Applying the first order conditions of the utility (1) with respect to q_i, q_j we determine the optimal consumption of goods i, j which are given by:

$$\frac{\partial U}{\partial q_i} = A + S_i + F_i(S_i - S_j) - q_i - \gamma q_j - p_i = 0 \quad (2)$$

$$\frac{\partial U}{\partial q_j} = A + S_j + F_j(S_j - S_i) - q_j - \gamma q_i - p_j = 0 \quad (3)$$

It is obvious that each firm's inverse demand function can be solved directly from the expressions (2) and (3).

¹⁶ With the term "composite good" we mean the representative consumer's expenses for all the other goods. For the sake of simplicity we normalize its price to unit.

Thus, the inverse demand function of each firm is given by:

$$P_i = A + S_i + F_i(S_i - S_j) - q_i - \gamma q_j \quad , i=1,2, ; i \neq j \quad (4)$$

where P_i , P_j are the firms' prices. Clearly, from the above expressions we have that, when firms use Informative Advertising their demand increased by their advertising investment, while when they use Comparative Advertising we observe two alternative effects: First, the investment in advertising has a positive impact on the demand of the advertised firm while, it has a negative impact on the demand of the targeted firm.

On the firms' side, we have that firms decide upon the type, the investment level of advertising and their quantities, in order to maximize their profits. We assume that firms are facing the same constant marginal cost C and a quadratic advertising cost denoted by S_i^2 . This implies that, as the level of advertising which a firm undertakes increases, the cost of the advertising increases at an increasing rate. Hence, firm i 's total cost is given by :

$$TC_i(q_i, S_i) = Cq_i + S_i^2 \quad (6)$$

where it is can be easily noticed that, variables costs are independent of advertising, while, total costs are increasing, at an increasing rate, in advertising.

Thus, given the inverse demand curve (4) and the cost function (6), we can express firm i 's profit function as:

$$PR_i = [A + S_i + F_i(S_i - S_j) - q_i - \gamma q_j]q_i - Cq_i - S_i^2 \quad i=1,2, ; i \neq j \quad (7)$$

Therefore, according to what type of advertising the firm i is willing to undertake, in order to promote her product, we observe different effects on profits. In particular, in the case of Informative Advertising ($F_i=0$) firm's i investment in advertising, makes her product more attractive in the eyes of consumers, which leads to higher demand for the firm, which as a consequence, tends to increase firm's profits. While, in the case of Comparative Advertising ($F_i>0$) the investment in advertising; not only makes

the advertised product more attractive in consumers' eyes which increases the demand for the advertised firm, but also decreases the consumers' valuation for the rival's product which leads to lower demand for the targeted firm and as a consequence to further augmentation of the advertised firm's demand. From all this mechanism firm's profits tend to increase. But, on the other hand, the rival's investment in comparative advertising, since the game is symmetrical, leads to the exactly opposite results on firm's demand, rival's advertising effort makes the firm's product less attractive in the consumers' eyes which decreases her demand and leads to lower profits. Thus, the effect of the use of Comparative advertising in firms profit is until that point of analysis ambiguous. However, the use of advertising whether it is Informative or Comparative, increases total costs which has a decreasing impact on the firm's profits.

3.1.1 The Model Timing

We consider a simple tree-stage game where the sequence of strategic decisions is as follows:

Stage 1: Firms take the strategic decision about the type of advertising (Informative or Comparative) that they are going to use in order to promote their products.

Stage 2: Firms choose the level of the investment in advertising, that their willing to undertake.

Stage 3: Firms compete by setting their outputs simultaneously and independently. (Cournot Competition)

We will solve the above game using backwards induction which is the standard method of solving finite extensive-form games with perfect information. Thus, we will start from the final stage and we will move on until the first stage, in a manner that accomplish the perfect subgame Nash equilibrium.

4. Analysis

4.1 Firms' Strategic decisions

The aim of this section is to investigate endogenously, which are the optimal firms' decisions about the level and type of advertising, that each firm has incentive to undertake in order to promote their product, along with the consequences of that decisions in the equilibrium profits and quantities. In order to obtain the subgame perfect Nash equilibrium (S.P.N.E), we use backwards induction beginning from the last stage.

Hence, in the last stage of the game, each firm taking as given the output of her rival (q_j), the level of investment in advertising (S_i, S_j), which are chosen in the second stage of the game and the type of advertising (F_i, F_j), which are chosen in the first stage, sets her output (q_i) in order to maximize its profits given in eq (7).

Therefore, firm i solves the following maximization problem:

$$\begin{aligned} \underset{q_i}{\text{Max}} PR_i &= \underset{q_i}{\text{Max}} [P_i q_i - TC_i] \Leftrightarrow \\ \underset{q_i}{\text{Max}} [(A + S_i + F_i(S_i - S_j) - q_i - \gamma q_j) q_i - c q_i - S_i^2] \end{aligned} \quad (8)$$

Taking the first order condition of (8), we evaluate firm's i reaction (best-response) function which is given as follow :

$$\frac{\partial PR_i}{\partial q_i} = 0 \Rightarrow q_i(q_j) = \frac{A - C - \gamma q_j + S_i + F_i(S_i - S_j)}{2} \quad i=1,2,; i \neq j \quad (9)$$

From the above expression it is clear, that the investment in advertising tends to increase the equilibrium output. In particular, in the case of Informative Advertising ($F_i=0$), the equilibrium output tends to increase as the level of advertising (S_i) increases. On the contrary, in the case of Comparative Advertising ($F_i>0$) we observe two controversial effects. On the one hand, the equilibrium output tends to increase as the firm's investment in advertising increases, while, it tends to decrease when the rival's investment in advertising increases.

By solving the first order conditions system given by eq.(9) where $i = 1, 2, ; i \neq j$, we obtain the Nash equilibrium output of the third stage which is given by:

$$q_i(A, C, S_i, S_j, F_i, F_j, \gamma) = \frac{(2 - \gamma)(A - C) + 2[S_i + F_i(S_i - S_j)] - \gamma[S_j + F_j(S_j - S_i)]}{4 - \gamma^2}$$

(10)

From the above expression, it is obvious that the equilibrium output of firm i embraces two controversial effects. On the one hand, it tends to increase as firm's i advertising expenditure increases. On the other hand, it tends to decrease, as the products tend to be perfect substitutes ($\gamma \rightarrow 1$) and the rival's advertising expenditure increases.

Substituting the equilibrium output of the third stage eq.(10) into eq.(7) we obtain the firm's i profit function which is an equation of $(A, C, S_i, S_j, Z, F_i, F_j)$. Thus, $PR_i[A, C, S_i, S_j, \gamma, F_i, F_j]$ in the third-stage are given:

$$PR_i = \frac{\langle 2[C + S_i - F_i(S_i + S_j)] + A(\gamma - 2) - \{\gamma[C + F_j(S_i - S_j) - S_j + \gamma S_i]\} \rangle}{(\gamma^2 - 4)^2},$$

$$i = 1, 2, ; i \neq j \quad (11)$$

In the second stage of the game, taken as given the advertising decision of the previous stage, firms decide independently and simultaneously, their level of investment in advertising. Therefore, each firm chooses her advertising level in order to maximize its' profit function given by eq.(11). Thus, the optimization problem which each firm solves in that stage is as follows:

$$MAX_{S_i} PR_i(A, C, S_i, S_j, \gamma, F_i, F_j) \quad i = 1, 2, ; i \neq j \quad (12)$$

Applying first order conditions in order to solve the above maximization problem, we have :

$$\frac{\partial PR_i[A, C, S_i, S_j, \gamma, F_i, F_j]}{\partial S_i} = 0, \quad \frac{\partial PR_j[A, C, S_i, S_j, \gamma, F_i, F_j]}{\partial S_j} = 0 \quad (13)$$

By solving the above first order conditions system with respect to S_i, S_j we evaluate the best reply functions of the investment in advertising which are given by:

$$S_i(S_j) = \frac{(2 + 2F_i + \gamma F_j)[(A - C)(\gamma - 2) + S_j(2F_i + \gamma + \gamma F_j)]}{(6 + 2F_i + \gamma F_j - \gamma^2)(-2 + 2F_i + \gamma F_j + \gamma^2)}, \quad i=1,2,; i \neq j \quad (14)$$

From the above expression it is easy to notice that the advertising effort that a firm chooses, is increasing as the rival's advertising effort increase. So, as the rival augments his investment in advertising each firm tends to increase her own investment in advertising in order to outweigh the impact of the higher advertising effort of the rival.

Solving the system of the best respond functions eq.(14) we evaluate the optimal advertising expenditure S_i^* , $i=1,2$ that each firm is willing to undertake, as a function of $[A, C, \gamma, F_i, F_j]$. In particular¹⁷:

$$S_i^* = S_i(A, C, \gamma, F_i, F_j) \quad (15)$$

Substituting the optimal advertising expenditure eq.(15) into the firm's i equilibrium output eq.(10) and profits function eq.(11), of the third stage, we obtain the firm's i production and profit function of the second stage which are equations depended on $[A, C, \gamma, F_i, F_j]$. Thus, firm's i optimal production and profits of the second stage, are:

$$q_i[A, C, \gamma, F_i, F_j] \quad i=1,2,; i \neq j \quad (16)$$

$$PR_i[A, C, \gamma, F_i, F_j] \quad i=1,2,; i \neq j \quad (18)$$

¹⁷ The extensive form of the equations in the second stage, (S_i, Q_i, PR_i) are presenting in the Appendix.

In the first and final stage of the game, firms choose independently and simultaneously the type of advertising, representing by F_i, F_j , that they are going to use in order to promote their products and maximize their profits. Therefore firm i solves the above optimization problem:

$$\underset{F_i}{MAX} PR_i(A, C, \gamma, F_i, F_j), \quad i=1,2,; i \neq j \quad (19)$$

In order to evaluate the optimal decision about the advertising type (Informative or Comparative) that each firm wants to undertake we take the first order conditions which are given as:

$$\frac{\partial PR_i(A, C, \gamma, F_i, F_j)}{\partial F_i} = 0 \quad i=1,2,; i \neq j \quad (20)$$

Exploiting symmetry, the first order conditions can be expressed as :

$$\frac{\partial PR(A, C, \gamma, F)}{\partial F} = \frac{2(A-C)^2(\gamma^2-4)(\gamma+F(2+Z))(F^2(2+\gamma)^3+2F(2+\gamma)(2+3\gamma)-\gamma(8-8\gamma^2+\gamma^4))}{[-6+F(2F(2+\gamma)+(6+\gamma))+\gamma(4+2\gamma-\gamma^2)][-6-4\gamma+(2+\gamma)(F+\gamma^2)]^3} \quad (21)$$

Solving the above expression with respect to F we obtain that :

$$\frac{\partial PR(A, C, \gamma, F)}{\partial F} = 0 \Rightarrow$$

$$\frac{2(A-C)^2(\gamma^2-4)(\gamma+F(2+Z))(F^2(2+\gamma)^3+2F(2+\gamma)(2+3\gamma)-\gamma(8-8\gamma^2+\gamma^4))}{[-6+F(2F(2+\gamma)+(6+\gamma))+\gamma(4+2\gamma-\gamma^2)][-6-4\gamma+(2+\gamma)(F+\gamma^2)]^3} = 0 \Rightarrow$$

$$2(A-C)^2(\gamma^2-4)(\gamma+F(2+Z))(F^2(2+\gamma)^3+2F(2+\gamma)(2+3\gamma)-\gamma(8-8\gamma^2+\gamma^4))=0$$

$$\Rightarrow F_j = F_i = F^* = \frac{(2-\gamma)\sqrt{(1+\gamma)(1+\gamma(7+\gamma(5+\gamma)))}-3\gamma-2}{(2+\gamma)^2} \quad (22)$$

Given the above expression, we can state the following lemmas.

Lemma 1 :

- a) In the case of independent goods, firms' optimal endogenous choice is to use Informative instead of Comparative Advertising.
- b) In the case where products are not close substitutes (for intermediate values of the substitutability parameter γ), firms' optimal decision is to use Comparative Advertising
- c) In the case of homogenous goods, firms tend to use Informative Advertising in order to promote their product.

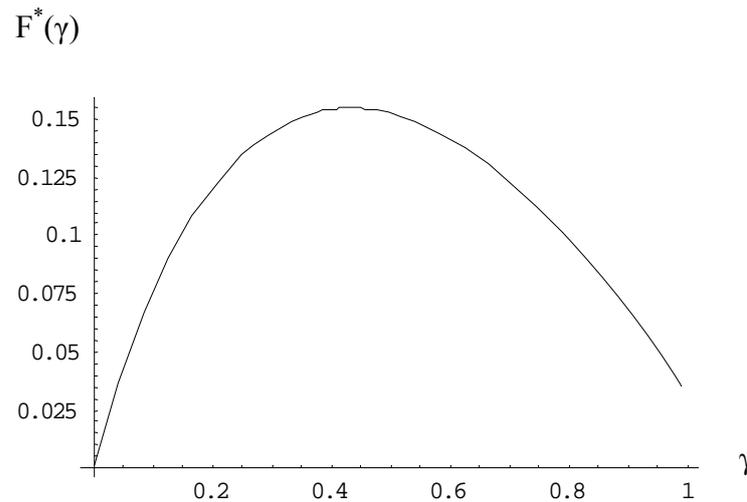
Proof. Using equation (22) when the products are independent, which means that $\gamma=0$, we evaluate that the optimal F is zero, ($F^*=0$), which can be interpreted as, that each firm has a strong incentive to use Informative Advertising instead of Comparative Advertising. On the contrary, when γ takes values in the (0,1) interval by eq.(22) we obtain that the optimal F is positive ($F^*>0$), which means that the optimal endogenous choice for both firms is Comparative Advertising. In addition, when the substitutability among products increases and takes its highest value ($\gamma=1$), we observe that the optimal F tends to zero, ($F^* \rightarrow 0$), which means that firms choose to use a very "light" comparative advertising message which mainly informs rather than compares the two rivals' products. Hence, when products tend to be perfect substitutes, firms tend to prefer the use of Informative advertising in order to promote their products.

From all the above it is clear that, when the products are absolutely dissimilar there is no role of comparative advertising¹⁸, since firms have a strong incentive to advertise their own product specification, in order to transmit to the consumers all the available information about their products and help them to identify the product which better covers their needs. On the other hand, when the products are not close substitutes,

¹⁸ In the case where products are independent, firms have monopolistic power, thus Informative advertising is the ideal solution due to the fact that the use of a comparative advertising message in that case it will be proved to be useless.

each firm wants to increase her demand by convincing consumers that her product is better than the rivals' one. Thus, firms have a strong incentive to invest in Comparative Advertising in order to convince consumers that the rival's product differs from their "ideal and superior" product. In other words, each firm use comparative advertising in order to increase her demand by making the rival's product less valuable in the eyes of consumers. Finally when products are close substitutes firms tend to use Informative Advertising, since the use of Comparative Advertising, in order to reveal some "negative" information about the rival's product and due to the fact that products are identical, acts harmful not only to the rival's demand but also to her own demand. For example, as we all know Pepsi and Coca-Cola are exactly the same products. If Coca-Cola create an advertising campaign that claims, that her product is superior to Pepsi because it is healthier, since consumers know that the products are perfect substitutes they will establish the opinion that not only Pepsi but also Coca is an unhealthy product, thus the advertising campaign will come against not only to the targeted product but also against to its own firm's product. All the above analysis can be easily observed by the diagrammatical presentation of F^* with the substitutability parameter γ .

Equilibrium optimal choice of advertising type.



Given the optimal choice of advertising type, we continue our analysis by evaluating the equilibrium advertising expenditure, output and profits for each firm. To begin with, we evaluate the level of advertising investment; in the equilibrium.

By substituting F^* , eq.(22), into the eq.(15) we obtain the optimal advertising effort that, due to symmetry is:

$$S_i^* = S_j^* = S^* = \frac{(A - C)(1 + \gamma + \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))})}{(1 + \gamma)(2 + \gamma)(3 + \gamma)} \quad (23)$$

Using the above equation we conclude in the following proposition and lemma.

Proposition 1: Firms' equilibrium investment in advertising is always positive for all the given values of γ .

Proof. Clearly, the above equation is positive for all the given values of the substitutability parameter γ , since $A > C$ always holds and all the other factors of the fraction is positive due to the fact that $\gamma \in [0, 1]$.

Further, using the eq.(23) we conclude in the following lemma.

Lemma 2: In the case where goods are not close substitutes, the investment in advertising that firms are willing to undertake, is increasing, while it is decreasing as the products tend to be homogenous.

Proof: In order to obtain how the equilibrium level of investment in advertising changes, as the parameter γ changes, we evaluate the first derivative of S^* eq.(23) with respect to γ . Thus we have that:

$$\frac{\partial S^*}{\partial \gamma} = \frac{13 + \gamma(3 - 7\Psi) - 2\gamma^2(12 + \Psi) - 5\Psi - 23\gamma^2 - 8\gamma^4 - \gamma^5}{(1 + \gamma)(2 + \gamma)^2(3 + \gamma)^2 \Psi}$$

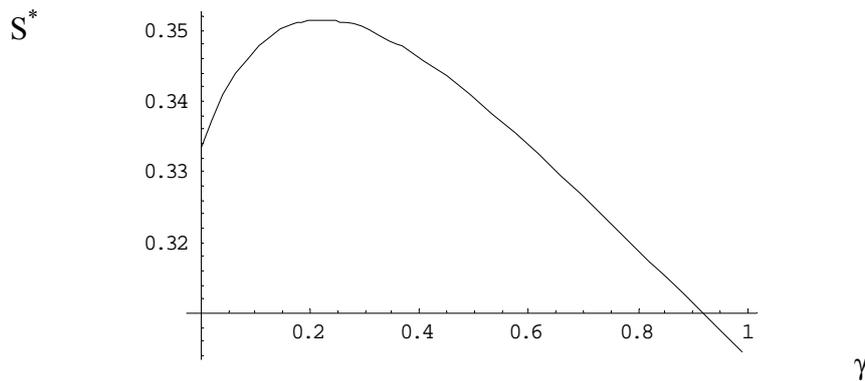
where, $\Psi = \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}$.

It is clear that the denominator is positive for all the given values of γ . Therefore, the effect of γ on the equilibrium investment in advertising, is dependent on the sign of the numerator. It is easy to observe that the numerator is positive for $\gamma \in [0, 0.3)$ interval while it is negative when $\gamma \in [0.3, 1]$. Consequently, the level of investment in

advertising tends to increase when the goods are not close substitutes, while it is decreasing when the goods are tend to be perfect substitutes.

All the above can be clearly observed with the use of the following diagrammatical presentation of the advertising expenditure with respect to γ .

Equilibrium level of investment in advertising.



More precisely, when the products are independent each firm has an incentive to undertake a positive advertising effort in order to inform consumers about its' product specifications. Moreover, in the case where products are not close substitutes each firm has a strong incentive to increase its advertising effort as an attempt to attract more consumers through the use of Comparative Advertising and as a consequence to augments its demand.

On the contrary, when goods tend to be homogenous we realize a reduction on the advertising expenditure that each firm is willing to undertake. The intuition behind this result is based on the dual effect of the advertising effort S^* (it increases the advertised firm's demand, while it decreases the demand of the targeted firm). It easy to understand, that, due to the symmetry of the game each firm knows that the rival's best response on the advertising expenditure, is to undertake the same advertising effort. Furthermore, it is well known that as the substitution ability among goods increases the competition among firms increases which leads them to lower profits. Thus, both firms know that if they use a high advertising effort they will further augment the competition between them which will have a negative impact to their

profits. Hence, their optimal choice is to use a positive but lower advertising effort in order to avoid the detrimental impact on their profits, that the investment in a higher level of advertising will cause. So, we observe a “collusive” behavior between firms in order to escape from the Prisoner’s Dilemma that will arise.

Continuing our analysis we evaluate the equilibrium output for the firms. By substituting the eq.(22) into the eq.(16) and due to symmetry of the game we have at the solution that:

$$Q^*(\gamma) = \frac{(2 + \gamma)^2 (A - C)}{7 + 12\gamma + 6\gamma^2 + \gamma^3 - \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}} \quad (24)$$

Given that $A > C$ always holds, we normalize $A - C = 1$, so the eq.(26) can be written:

$$Q^*(\gamma) = \frac{(2 + \gamma)^2}{7 + 12\gamma + 6\gamma^2 + \gamma^3 - \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}} \quad (25)$$

From the above we conclude in the following lemma:

Lemma 3: The equilibrium output, when firms are competing in the type and level of advertising is decreasing in γ and is as a consequence, highest when the goods are independent.

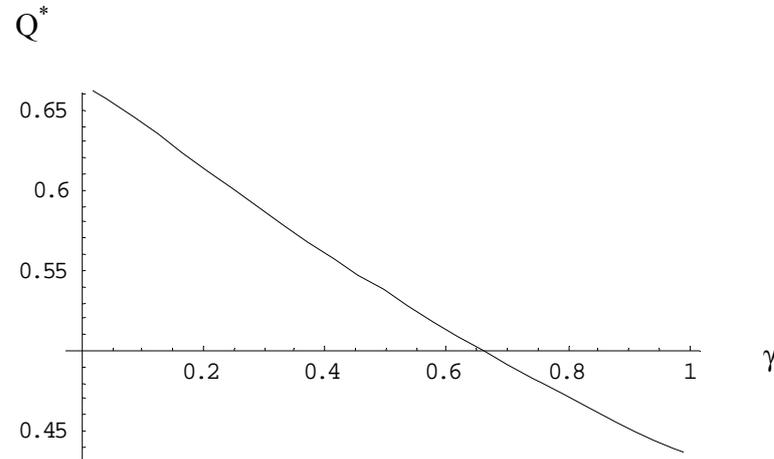
Proof. In order to obtain how the equilibrium output changes as the parameter γ changes, we evaluate the first derivative of Q^* , eq.(25), with respect to γ . Thus we have that:

$$\frac{\partial Q^*}{\partial \gamma} = \frac{12 + 30\gamma + 24\gamma^2 + 8\gamma^3 + \gamma^4 - (2 + \gamma)\Psi[10 + \gamma(12 + \gamma(6 + \gamma))]}{\Psi[7 + \gamma(12 + \gamma(6 + \gamma)) - \Psi]^2} < 0$$

where, $\Psi = \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}$. It is obvious that the denominator is positive for all the given values of γ . Therefore the effect of γ on the equilibrium quantity is signed as negative if the numerator is negative, which is true for all values of γ in the $[0, 1]$ interval.

As a attempt to be our results more clear we construct the diagrammatical presentation of the equilibrium output with respect to the substitutability parameter γ .

Firms' equilibrium output .



Given the optimal choice of advertising type, level of investment in equilibrium and output, we continue our analysis by evaluating the equilibrium profits for each firm. Therefore, exploiting symmetry the profits of the equation (18) can be rewritten as :

$$PR_i[A, C, \gamma, F] = PR[A, C, \gamma, F] , i = 1, 2, ; i \neq j \tag{26}$$

Substituting the optimal decision of the type of advertising eq(22), that firm i chooses in order to maximize its profits, we evaluate the equilibrium profits of each firm which are functions depended on $[A, C, \gamma]$. Thus profits in the solution of the game are given by:

$$PR^*[A, C, \gamma] = \frac{2(A - C)^2}{7 + 12\gamma + 6\gamma^2 + \gamma^3 - \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}} \tag{27}$$

where: A is the constant variable that represents the amount of demand when the production is zero, C represents the firm's marginal cost which is constant and same for both firms and $A > C$ always holds. For simplicity we normalize $A - C = 1$.

Thus, the equation (27) can be written as :

$$PR^*[\gamma] = \frac{2}{7 + 12\gamma + 6\gamma^2 + \gamma^3 - \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}} \quad (28)$$

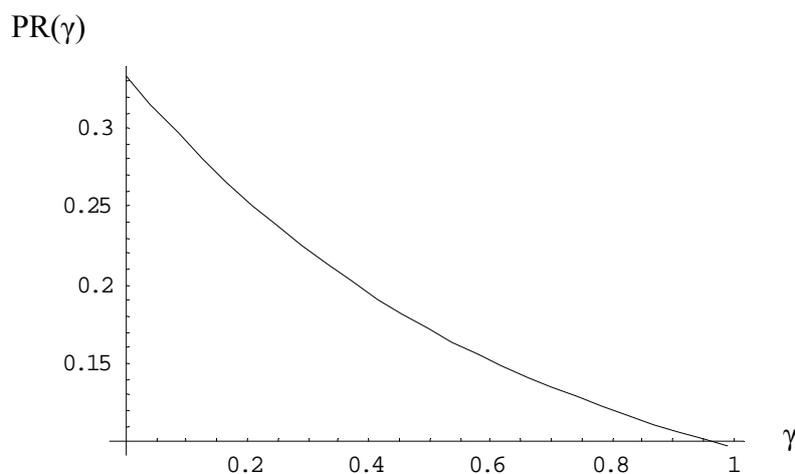
Given the above equation we can conclude in the following lemma:

Lemma 4: Firms equilibrium advertising profits are always positive and decreasing for all the given values of the substitution ability parameter γ .

Proof. It can be easily noticed, that the denominator of the equation (28) increases as the parameter γ increases. As a consequence, the whole fraction is decreasing as the substitution ability between the two goods increases. This means, that profits take their highest value when goods are independent, while they take their lowest value when goods are perfect substitutes.

The diagrammatical presentation of equilibrium profits with respect to γ will be helpful in order to understand the following discussion.

Firms' equilibrium profits:



The result described by lemma 4, is based mainly on two alternative effects which act on profits. First, it is well known that as the ability of substitution among goods in the market increases, the competition among the firms increases which as a result diminishes profits. In addition, as we will prove in the section 5, when products tend to be homogenous and firms invest in advertising, then firms conclude in the Prisoners Dilemma. Thus, the decreasing root of profits can be easily explained as a combination result of the two aforementioned effects. In more details, when the products are homogeneous and game is symmetrical, the investment in advertising of each competing firm, tend to neutralize one another. This, leads the competing brands to lower profits since they undertake the cost of advertising without to be benefit from that investment. More precisely, when both firms make equals efforts on advertising to attract consumers closer to their own good and to prevent consumers by consumption of the rival's good, then the total result in the symmetric case will be equal if neither of them had made any advertising at all.

5. Welfare Analysis

In this section of the present thesis we are trying to investigate the social effects of Advertising. In order to obtain the total welfare, we first evaluate its' components, consumers' surplus and producers' surplus.

5.1. Consumers' Surplus

The consumers surplus is defined as the utility that consumers enjoy from the consumption of the good or service. So, the net consumer's surplus is defined as the consumer's benefit minus the consumer's expenditure. In particular:

$$CS_{net}^{Ad} = CB^{Ad} - CE^{Ad} \quad (29)$$

where CB^{Ad} is the consumer benefit by the consumption of the good or service and CE^{Ad} is the consumer expenditure. Furthermore, the net consumer surplus can be expressed as follows:

$$CS_{net} = u^c - p_i q_i - p_j q_j - p_m m \xrightarrow{p_m=1} {}^{19}$$

$$CS_{net} = (A + S_i + F_i(S_i - S_j))q_i + (A + S_j + F_j(S_j - S_i))q_j - \frac{1}{2}(q_i^2 + q_j^2 + 2\gamma q_i q_j) + m - p_i q_i - p_j q_j - m \Rightarrow$$

$$CS_{net} = (A + S_i + F_i(S_i - S_j))q_i + (A + S_j + F_j(S_j - S_i))q_j - \frac{1}{2}(q_i^2 + q_j^2 + 2\gamma q_i q_j) - p_i q_i - p_j q_j \quad (30)$$

In equilibrium, due to the symmetry of the game we have :

$$\left. \begin{aligned} q_i^* &= q_j^* = q^* \\ S_i^* &= S_j^* = S^* \\ p_i^* &= p_j^* = p^* \\ F_i^* &= F_j^* = F^* \end{aligned} \right\} (31)$$

¹⁹ For simplicity we normalize the price of the composite good to unit . So $p^m=1$

In addition, from the inverse demand function that firms face, we have:

$$p_i = A - q_i - \gamma q_j + S_i + F_i(S_i - S_j) \Rightarrow$$

$$p = A - q - \gamma q + S \Rightarrow p = A - (1 + \gamma)q + S \quad (32)$$

By substituting (32) into the eq(30) and due to the symmetry given by (31) we have :

$$CS_{net} = (A + S)q + (A + S)q - \frac{1}{2}(q^2 + q^2 + 2\gamma qq) - pq - pq \Rightarrow$$

$$CS_{net} = 2(A + S)q - \frac{1}{2}(2q^2 + 2\gamma q^2) - 2(A - (1 + \gamma)q + S)q \Rightarrow$$

$$CS_{net} = 2(1 + \gamma)q^2 - (1 + \gamma)q^2 \Rightarrow CS_{net} = (1 + \gamma)q^2$$

Hence, net consumers' surplus is given by:

$$CS_{net} = (1 + \gamma)[q^*]^2 \quad (33)$$

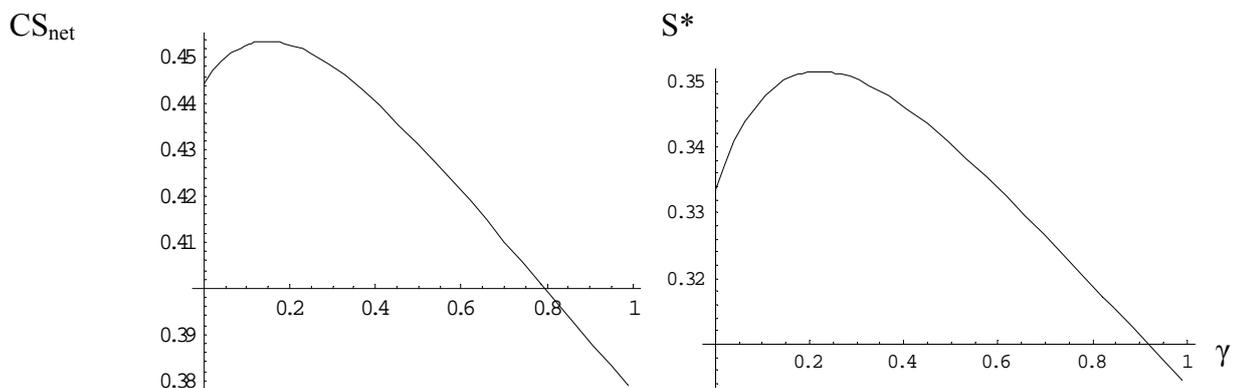
By substituting the firm's equilibrium output, eq. (26), into the eq (33) we evaluate the consumers' surplus given by :

$$CS_{net} = \frac{(A - C)^2 (1 + \gamma)(2 + \gamma)^4}{[7 + \gamma(12 + \gamma(6 + \gamma)) - \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}]^2} \quad (34)$$

For the sake of simplicity we normalize (A-C)=1. Thus the eq.(34) can be written as :

$$CS_{net} = \frac{(1 + \gamma)(2 + \gamma)^4}{[7 + \gamma(12 + \gamma(6 + \gamma)) - \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}]^2} \quad (35)$$

Comparing the diagrammatic approach of the net consumers' surplus and the advertising effort in the equilibrium, it easy to observe that a positive relationship between the S^* and the CS_{net} exists.



More precisely, we observe that when the products are not close substitutes, the net consumers' surplus tends to increase as the firms' level of investment in advertising increases. The intuition behind this result, is that, as the investment in advertising increases, the information that consumers receive about the products increases, which helps them to identify better the product that covers their needs. Thus, the use of Comparative Advertising when the products are not close substitutes, is consumer beneficial since, the improved consumers' information allows them to have a whole view about the pros and cons of each product. Furthermore, the use of Comparative Advertising as we show in previous section increases competition among firms which as a consequence has a positive impact on the consumers' surplus.

On the contrary, when the products tend to be homogeneous, as we have shown in previous section: firms tend to use Informative Advertising, the level of investment in advertising decreases as well as consumers' surplus decreases. This result is based mainly on two different aspects. First, the use of Informative Advertising does not transmit as much information as Comparative Advertising does, due to the fact that the Informative Advertising does not reveal any information about the rival's product. Thus, the reduction of investment in advertising along with the less informed consumers, diminishes the net consumers' surplus. Second, as the products tend to be perfect substitutes, we have shown that equilibrium output of each firm tends to decrease which has a detrimental impact on the net consumers' surplus.

The above analysis can be summarized in the following proposition.

Proposition 2: The net consumers' surplus when the goods are independent tends to increase as the expenditure in advertising increases. On the contrary, when the goods tend to be homogenous, the net consumers' surplus tends to decrease, since the level of advertising and equilibrium output decreases.

5. 2. Total Welfare

Having evaluate the net consumers' surplus, we continue with the total welfare which is defined as the net consumers' surplus plus the producers' surplus. In particular, total welfare is defined as:

$$TW^{Ad} = CS_{net}^{Ad} + 2PR \quad (36)$$

Plugging eq. (24) and (34) into the (36), we obtain the total welfare which is given by:

$$TW^{Ad}(A, C, \gamma) = \frac{(A - C)^2 \{44 + \gamma[96 + \gamma(5 + \gamma)(16 + \gamma(4 + \gamma))]\} - 4\Psi}{[7 + \gamma(12 + \gamma(6 + \gamma)) - \sqrt{\Psi}]^2} \quad (37)$$

where, $\Psi = \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}$. Normalizing, A-C=1 we have that:

$$TW^{Ad}(\gamma) = \frac{\{44 + \gamma[96 + \gamma(5 + \gamma)(16 + \gamma(4 + \gamma))]\} - 4\Psi}{[7 + \gamma(12 + \gamma(6 + \gamma)) - \sqrt{\Psi}]^2} \quad (38)$$

As it can easily be testified, the above equations leads to the following proposition.

Proposition 3: The Total Welfare when firms invest in Advertising, is decreasing as the substitution ability among goods increases.

Proof. Taking the first order condition of the eq.(38) with respect to γ , in order to obtain how the total welfare vary as the substitutability parameter changes we have that :

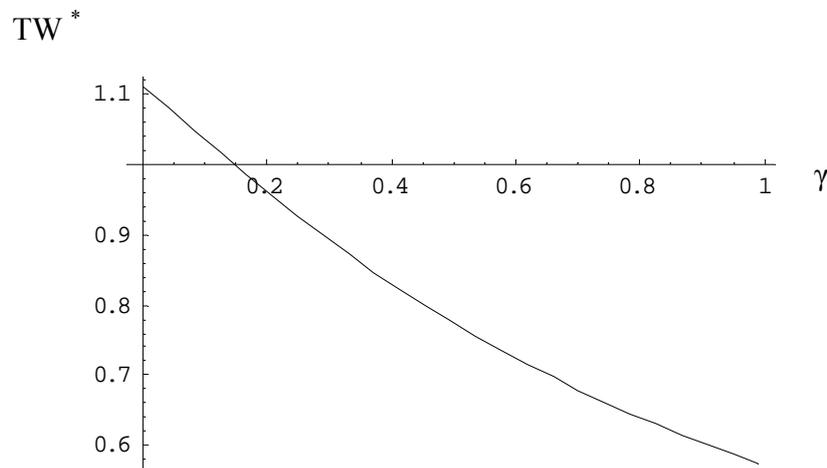
$$\frac{\partial TW^{Ad}}{\partial \gamma} = \frac{(2 + \gamma)^2 K(2\gamma^4 + 8\gamma^5 + \gamma^6 + \Psi - 248\gamma - 291\gamma^2 - 108\gamma^3)}{\Psi[\Psi - 7 - 12\gamma - 6\gamma^2 - \gamma^3]^3} \quad (39)$$

where $\Psi = \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}$, $K = [100 + \gamma(184 + \gamma(109 + \gamma(36 + \gamma(8 + \gamma))))]$

it is easily testified that the above equation is negative for all the given values of γ in the [0,1] interval. Thus the total welfare is decreasing, as the products tends to be perfect substitutes.

The above can be easily observed by the diagrammatical presentation of the total welfare with respect to γ .

Total Welfare in the case of Advertising.



In particular, the fact that total welfare decreases as the substitutability parameter γ increases is a combinative result of two effects (consumers' surplus effect and profits' effect). In more details, in the previous sections we have observed that, when the products are independent the consumers' surplus tends to increase, while the equilibrium profits always decreases in γ . Thus, if the total welfare decreases or increases, when the products are not close substitutes, depends on which effect (consumers' surplus or profits' effect) dominates. As it can be easily noticed from the above diagrammatical presentation of the total welfare in the equilibrium, when the products are not close substitutes, the decreasing effect of profits dominates the increasing effect of consumers' surplus and as a consequence the total welfare decreases. In addition, we have seen, when the products tend to be perfect substitutes both consumers' surplus and profits are decreasing, thus taking into account all the above discussion total welfare is always decreasing in γ .

6. The Comparison with the case of No Advertising.

In this section of the present thesis, we make the comparison of the advertising case with the case of no advertising, in order to obtain if firms have incentives to invest in advertising and how advertising affects output, profits, consumers' surplus and social welfare in general.

6.1 The Case of No Advertising.

In this case, we assume that none of the firms invest in any type of advertising. Thus, the level of investment in advertising for each firm is $S_i = S_j = 0$. Hence, the market outcomes can be described by the Simple Cournot game with differentiated products, where each firm chooses its output, in order to maximize its profits, $PR_i^C = (A - q_i - \gamma q_j)q_i - cq_i$. Solving the above maximization problem and taking the first order conditions, we evaluate the reaction function of each firm, which is given by:

$$q_i = R^C_i(q_j) = \frac{A - \gamma q_j - C}{2} \quad (40)$$

Due to symmetry, the equilibrium price, output and profit are given by:

$$q^C = \frac{A - C}{2 + \gamma}, \quad p^C = \frac{A + (1 + \gamma)C}{2 + \gamma}, \quad PR^C = (q^C)^2 = \frac{(A - C)^2}{(2 + \gamma)^2} \quad (41)$$

In addition, since we have assume 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 the same methodology as we have use in order to define the net Consumers' surplus and the Total Welfare in the case of Advertising, we evaluate the net Consumers' surplus and the Total Welfare in the case of no advertising which are given by:

$$CS^C_{net} = (1 + \gamma)q_C^2 = (1 + \gamma) \frac{(A - C)^2}{(2 + \gamma)^2}, \quad TW^C = (3 + \gamma) \frac{(A - C)^2}{(2 + \gamma)^2} \quad (42)$$

6. 2. The Comparison Analysis and Results.

In this part of the thesis we present and discuss the results which come up through the comparison between the advertising and no advertising case.

6. 2. 1 The comparison between equilibrium outputs.

Starting from the output decision, we compare the reaction functions of each case which are given by the equations (9) and (40). More precisely, the reaction function in the advertising case, eq.(9), can be written as :

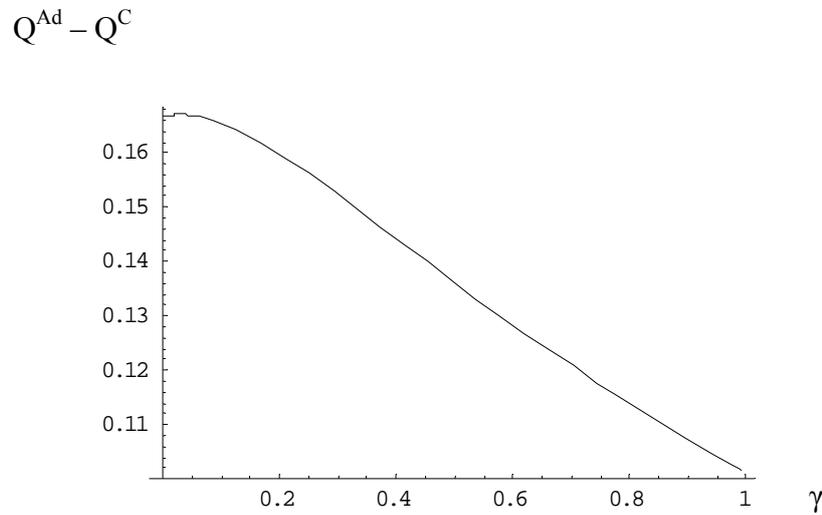
$$q_i(q_j) = \frac{A - C - \gamma q_j}{2} + \frac{S_i + F_i(S_i - S_j)}{2} \quad (43)$$

By comparing the above equation with the reaction function of the no advertising case, eq.(40), in which only the right term of eq.(43) appears, we observe that the investment in advertising, as it augments the demand of the advertised firm, tends to increase the equilibrium output. On the other hand, as an effect of comparative advertising, the rival's investment in advertising tends to decrease the equilibrium output. However, in the equilibrium, as we have showed, the optimal advertising expenditure is equal for both firms, $S_i^* = S_j^* = S^*$, thus, the effect of the investment in comparative advertising tends to neutralize one another and as a consequence $q^{Ad} > q^C$ always holds. Therefore, in equilibrium firms will set outputs at a higher level than that chosen by profit-maximizing in the no advertising case. From all the above analysis we conclude in the following proposition.

Proposition 4: The equilibrium output of the Advertising case is always higher than that of the No advertising case.

Proof. Taking the difference between the equations (24) and (41) it can be easily checked that $Q^{Ad} - Q^C > 0$ for all the given values of the parameter γ . Moreover the above proposition can easily be checked with the diagrammatical representation of the difference between the output in the case of advertising and the benchmark case.

The difference between the equilibrium outputs of the Advertising and the No advertising case:



As it can be easily testified by the above diagrammatical approach, the equilibrium output when firms invest in advertising is always higher than the equilibrium output when none of the firms undertakes advertising expenditures.

6. 2. 1 The comparison between equilibrium profits.

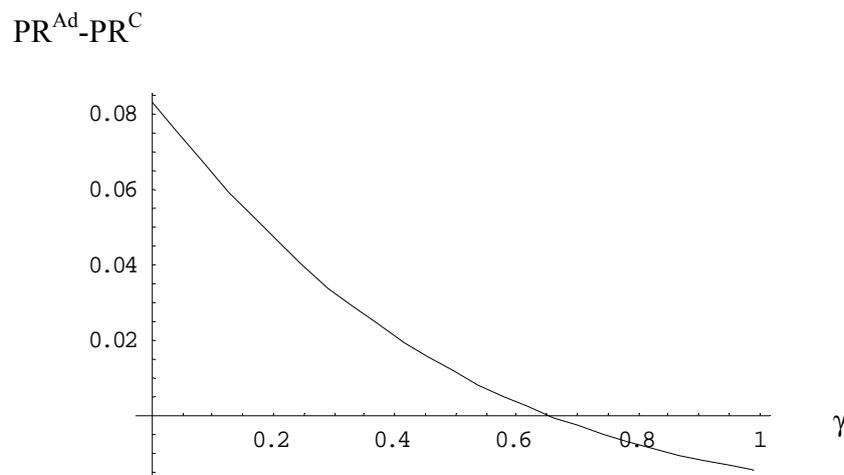
Continuing our comparison analysis, we evaluate the difference between the equilibrium profits of the advertising and no advertising case. Using equations (27) and (41) we have that the difference is given by:

$$PR^{Ad} - PR^C = [A - C]^2 \left[\frac{2}{7 + \gamma(12 + \gamma(6 + \gamma)) - \Psi} - \frac{1}{(2 + \gamma)^2} \right] \quad (43)$$

where $\Psi = \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}$.

Normalizing (A-C) into unit, and taking the diagrammatical presentation of the above equation we have that :

The difference between the equilibrium profits of the Advertising and the No advertising case:



From the above diagrammatic approach, we can easily observe the followings:

First, in the case of independent goods, where, as we have stated in the previous section, firms' optimal endogenous choice is to use Informative advertising, the profits of the advertising case are always higher than that of the no advertising case. This result reveals that, when the products are independent, which means that each firm acts as a monopolist, the use of Informative advertising increases consumers' valuation about each specific product and thus, demand and revenues of each firm increases.

Further, in the case where the products are not close substitutes, and as we have mentioned, firms promote their products through the use of Comparative advertising, we observe that advertising equilibrium profits are exceeding the profits without any investment in advertising. More precisely, the intuition behind this specific result is based on the two alternative effects that act on firms' profits. First, the effect of the dual role of the Comparative advertising and second, the effect of the increasing competition. In particular, the dual role of Comparative advertising is described as follows: On the one hand, the use of comparative advertising tends to augment the advertised firm's demand which leads to higher profits. On the other hand, the optimal rival's reaction to undertake a positive level of investment in comparative advertising, tends to decrease each firms' profits. On the contrary, the increasing competition effect comes from the fact that both firms in the case of advertisements set

higher output, which increases the market competition and as a consequence decreases profits. It is obvious from the diagrammatical presentation of profits that in the specific case where products are not close substitutes, the positive effect of comparative advertising dominates the other effects and thus profits are higher under investment in advertising.

Finally, in the case where products are close substitutes, we observe that the profits of no advertising case exceeding the profits of advertising case. Therefore, it is obvious that a Prisoner's Dilemma exists since, the investment in advertising leads both firms to be worst of than they would have been, if they have not undertake any advertising expenditure at all. The above result is based mainly on two alternative effects of advertising. First, as we have prove in a previous section, the use of advertising when the goods tend to be homogenous, increases further the market competition which diminishes profits. Second, firms' expenditures on advertising in the equilibrium neutralize one another, which leaves the firms' industrial position exactly as it would have been if neither had expended anything at all in advertising. Thus the investment in advertising, when the products are close substitutes, can be characterized as "wasteful advertising"²⁰ since firms undertake advertising costs without to improve their industrial position.

The existence of the Prisoner's Dilemma can be explained in more details using the following matrix.:

		firm 2	
		Advertise	No Advertise
firm 1	Advertise	$\diamond PR_i^{Ad}, PR_j^{Ad}$	$\diamond PR_i^{1Ad}, PR_j^{N.Ad}$
	No Advertise	$PR_i^{N.Ad}, PR_j^{1Ad}$	$PR_i^{N.Ad}, PR_j^{N.Ad}$

²⁰ The term was first introduced by Pigou 1924, in order to describe the Prisoner's Dilemma which arise when competing firms in a market invest equals efforts in advertising in order to attract the favour 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.

From the above matrix it easily understand that the firms' dominant strategy when they decide independently and simultaneously is to advertise since in the asymmetric case where only one of the two firms invest in advertising the profits for that firm are far exceeding the rival's profits without advertising. Thus, firms conclude to choose investment in advertising (Nash equilibrium), although it is not a Pareto optimal since if both firms do not advertise they will gain higher profits. It has been testified from the above analysis that profits when goods are close substitutes and firms do not invest in advertising, are exceeding the profits of advertising. Hence, it is obvious from the above discussion that the Prisoner's Dilemma case exists.

All the above analysis for the comparison between profits in advertising and non advertising case, can be summarized in the following lemma and corollary:

Proposition 5: The equilibrium profits of the Advertising case are higher than that of No Advertising case, when goods are not close substitutes, while they are lower when goods tend to be perfect substitutes.

Corollary 1: There is always a strong incentive for firms to invest in advertising when the products are not close substitutes.

6.3. The Welfare Analysis through the Comparison

In this section of the thesis, we compare the consumers' surplus and the total welfare of the advertising case with that of no advertising in order to observe the societal effects of Advertising.

6.3.1. Comparative Results: The Consumers' Surplus.

In order to observe how advertising in general, affects consumers' surplus we make the comparison between the consumers' surplus, in the case of advertising with that of no advertising. In particular, taking the difference between the equation (33) and (42), we have that:

$$\begin{aligned}
 CS_{net}^{Ad} - CS_{net}^{Cour} &= (1 + \gamma)(q_{Ad}^*)^2 - (1 + \gamma)(q^C)^2 \Leftrightarrow \\
 CS_{net}^{Ad} - CS_{net}^{Cour} &= (1 + \gamma)[(q_{Ad}^*)^2 - (q^C)^2] = (1 + \gamma)(q_{Ad}^* + q^C)(q_{Ad}^* - q^C) \quad (44)
 \end{aligned}$$

The above equation is always positive for all the given values of $\gamma \in [0,1]$, since as we have proved in the previous section, $q^{Ad} - q^C > 0$, always holds. Thus, using eq.(44) $CS_{net}^{Ad} > CS_{net}^{Cour}$ always holds.

The intuition behind this result is based on the two advertising effects that acts on the net consumers' surplus. First, is the effect of the increased competition. More precisely, as the equilibrium output in the advertising case is always exceeding the equilibrium output of the no advertising case, we have that the competition among firms increases, which tends to be consumers' beneficial. Second is the effect from the improved information that consumers possess through the use of advertising. The following proposition summarize.

Proposition 5: The net Consumers' surplus in the advertising case is always higher comparing to the case without investment in advertising.

6.3.2. Comparative Results: The Total Welfare.

Considering now the effect of advertising on the total welfare, we take the difference between the equations (37) and (42). Thus, we have that:

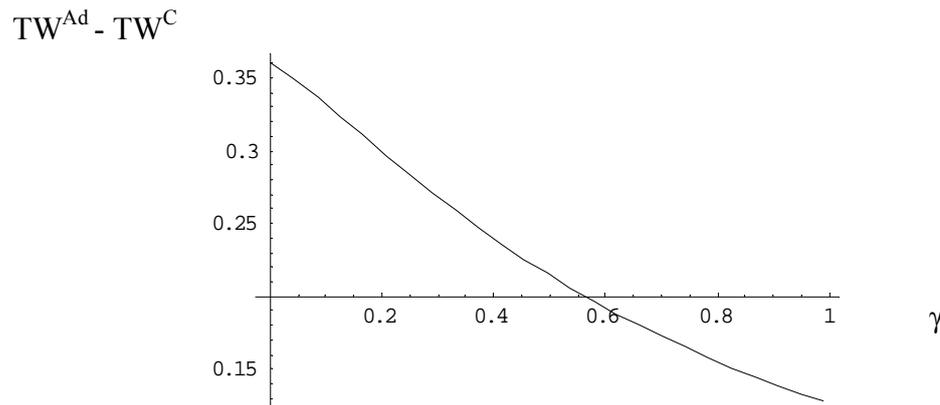
$$TW^{Ad} - TW^C = \frac{(A-C)^2 [2\Psi (13 + \gamma(14 + \gamma(6 + \gamma))) + 26 - 24\gamma - 27\gamma^2 - 38\gamma^3 - 15\gamma^4 - 2\gamma^5]}{(1+\gamma)(2+\gamma)^4(3+\gamma)^2} \quad (45)$$

where $\Psi = \sqrt{(1+\gamma)(1+\gamma(7+\gamma(5+\gamma)))}$

From the above equation, it is obvious that the denominator is always positive for all the given prices of γ . Moreover, it can be testified that the numerator is always positive for all the given values of γ in the $[0,1]$ interval. Hence, $TW^{Ad} > TW^C$ always holds.

In order to be more clear, we take the diagrammatical approach of the eq.(45) with respect to γ . Thus we have that:

The difference between total welfare in the Advertising case and the No Advertising case:



From the above diagram can be easily observed that the total welfare of advertising is always higher than the total welfare in the case without advertising activities, while, the difference of the total welfare between the two cases tends to decrease as the substitutability parameter γ increases. Therefore, it is obvious that the positive effect of the increased consumers' surplus dominates the negative effect on firms profits that exists when the products tend to be homogenous.

All the above discussion about consumers' surplus and total welfare can be summarized in the following proposition.

Proposition 6: Firms' endogenous choice to invest in advertising always increases Social Welfare.

7. Concluding Remarks

In the present thesis, we were trying to endogenize the strategic firms' advertising behavior, in an oligopolistic market with horizontal and vertical product differentiation, in order to investigate firms' incentives to use Informative instead of Comparative Advertising and vice versa. Taking as basic premise that, when a firm advertise her product using Informative Advertising, she wants only to transmit information to consumers, in order to help them to identify the product that covers better their needs, and thus to augment her demand. While, when firms use Comparative Advertising they want not only to transmit information to consumers, but also to manipulate their preferences by presenting their products as superior to that of the rivals. Hence, a firm's advertising campaign against another firm benefits the advertiser and harms the target.

Our main findings suggest, that in the equilibrium if the products are independent, firms' endogenous optimal choice is to use Informative instead of Comparative Advertising. Thus, in the case of independent goods there is no role of Comparative Advertising. On the contrary, when products are not close substitutes, firms' optimal decision is to use Comparative Advertising. While, when products tend to be homogenous, firms tend to use Informative Advertising.

Moreover, comparing with the case of no advertising, we find that firms have strong incentives to invest in advertising only when the products are not close substitutes. In addition, in this specific case, the interaction among the competing firms, leads to higher equilibrium output and profits than that of the no advertising case. On the contrary, when the goods tend to be perfect substitutes, even if firms do not have any incentive to invest in advertising, they actually undertake advertising activities due to the existence of the Prisoners' Dilemma. Furthermore, from the welfare perspective, our analysis reveals that advertising increases consumers' surplus and social welfare.

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 Advertising. We are also aware that the undertaken analysis has several limitations which emerge from the functional forms we have use, but, due to the complexity of the problem we strongly believe that the use of more general forms will not be helpful, since it will not change the qualitative character of our findings. In addition,

given the large publicity that comparative advertising has focus in the recent years we are in a position to say that this thesis sheds light on the firms' incentives to use Comparative instead of Informative advertising and vice versa.

In conclusion, our analysis confirms what the existing literature has noted i.e. that in the case of independent goods there is no incentive to invest in Comparative Advertising, while it comes to a contradiction with the literature in the case where products are close substitutes. Although, the empirical and theoretical literature states that when the products tend to be close substitutes, firms' dominant strategy is to use Comparative Advertising, our analysis proves that as the products tend to be homogenous, firms' endogenous optimal choice is to use Informative Advertising. In addition, from the social welfare perspective, the existing literature states that advertising expenses in a symmetric duopoly constitute a clear welfare loss, while, our analysis reveals that, although the total welfare tends to decrease with the use of advertising is always higher than if there is not exist investment in advertising.

Hence, our analysis provides a first theoretical step in understanding better the aspect of Comparative Advertising. However, there are several directions for further work. For example, an interesting enough aspect is to explore if comparative advertising can be used by a follower in order to attack a leader or, if comparative advertising can be used as an entry deterrence tool. For that reason, we are strongly believe that comparative advertising is a fruitful area for modelers.

8. Appendix

8.1. Legislation about Comparative Advertising

In this section we present an in length discussion about the legislation of Comparative advertising in the United States and in the European Union.

8.1.1 Comparative advertising legislation in the United States.

As comparative advertising tends to be the dominant advertising practice in today's advertising world, it is important to investigate its' the legal background. We begin giving the legislation of Comparative advertising in the U.S.

In the United States the Federal Trade Commission is the government body that regulates trade and is responsible to protect businesses against any unfair practise of competition in advertising. From the 1960's, where Comparative advertising began to been used FTC has started to engage with that issue. In 1963, the FTC narrowed an order in order to encourage firms to make "truthful and non-deceptive statements that a product has certain desirable properties or qualities which competing products do not possess. Such a comparison may have the effect of disparaging the competing product, but we know of no rule of law which prevents a seller from honestly informing the public of the advantages of its products as opposed to those of competing products." (60 F.T.C. at 796)

Moreover, the obtained popularity of Comparative advertising in 1970's and 1980's in the U.S can be explained as a result of the appraisal of the FTC, that comparison advertising is a marketing practise through which we can improve competition. As FTS states " The Commission has supported the use of brand comparisons where the bases of comparison are clearly identified. Comparative advertising, when truthful and non- deceptive, is a source of important information to consumers and assists them in making rational purchase decisions. It encourages product improvement and innovation, and can lead to lower prices in the marketplace. For these reasons the Commission will continue to scrutinize carefully restraints upon its use" (Statement of Policy Regarding Comparative Advertising, Federal Trade Commission, Washington, D.C, August 13, 1979).

In addition, in order to protect consumers and competitors by unfair practises through the use of comparative advertising the Commission has narrowed an order that allows any competitor or consumer to attend the FTC for any case which he credits that comparative advertising is being harmful. As Lanham Act²¹ supports “ any person who, on or in connection with any goods or services... uses in commerce any word, term, name, symbol, or device, or any combination thereof, or any false designation of origin, false or misleading description of fact, which... in commercial advertising or promotion, misrepresents the nature, characteristics, qualities, or geographical origin of his or her or another person’s goods, services, or commercial activities, shall be liable in a civil action by any person who believes that he or she is likely to be damaged by such act”.

However, this order was misapprehended, as Bixby and Lincoln (1989), in a theoretical work of comparative advertising, showed “Plaintiffs usually used in the court the Lanham Act because it may give them immediate relief from competitive advertising by means of injunction, it may oblige the competitor to run corrective advertising and finally may allow the plaintiff to collect damages from the defendant”. Thus as they have stated, when an ad is identified by the competitors or by consumers as harmful, misleading or using unverifiable claims, then the interested party can apply to the court. If the court address that the specific ad is untruthful, then it can possess penalties to the advertising brand.

8.1.2 Comparative advertising legislation in the European Union.

Until very recently, Comparative advertising in the European countries was of little use due to the many legislation barriers. The explicit identification of a competitor brand had been banned in Belgium, Italy and Luxemburg, while it was generally prohibited as unfair competition practice in Germany and France (unless if advanced notification is given to the competitor). On the contrary, it is permitted in Spain, Netherlands and Nordic states, but only under very limited circumstances and only if it performs several relevance criteria. (Sprink and Petty, 1998).

Although, the European Union first addressed the issue of Comparative Advertising in 1970s, it was only in April 2000 that laws on comparative advertising

²¹ Trademark (Lanham) ACT is an alternative instrument in the U.S that regulate trade.

were harmonized across the European countries. According to the present European legislation comparative advertising is allowed , only if it is not denigrate or take unfair advantage of a rival's trademark or present goods or services as imitation of those bearing a well established and protected brand name. Comparative ads must compares like with like, does not create confusion and does not mislead. More precisely, in the European Union legislation (Article 3a of the Directive 97/55/EC of the European Parliament and of the Council of 6 October 1997), the comparative advertising is permitted only when the following conditions are accomplished:

- ❖ It is not misleading
- ❖ It compares goods or services meting the same needs or intended for the same purpose;
- ❖ It objectively compares one or more material, relevant, verifiable and representative features of those goods and services, which may include price;
- ❖ It does not create confusion in the market place between the advertiser and a competitor or between the advertiser's trade marks, trade names, other distinguishing marks, goods or services and those of a competitor;
- ❖ It does not discredit or denigrate the trade marks, trade names, other distinguishing marks, goods, services, activities or circumstances of a competitor;
- ❖ For products with designation of origin, it relates in each case to products with the same designation;
- ❖ It does not take unfair advantage of the reputation of a trade mark, trade name or other distinguishing marks of a competitor or of the designation of origin of competing products;
- ❖ It does not present goods or services as imitations or replicas of goods or services bearing a protected trade mark or trade name.

8.1.3. Comparing the legislation between the U.S and E.U.

Comparing the legislation of Comparative advertising in the E.U and the U.S, Petty and Spink (1995) underline that “The tenor and language of the European (proposal) directive contrast sharply with the permissiveness of U.S policy toward comparative advertising. Although legal violations, such as trademark infringement, disparagement, and passing off, are recognized in both the United States and Europe, they are more broadly construed in Europe.” They also claim that competitors should be very careful, because comparison ads that are allowed in the United States will be prohibited in European Countries. Nevertheless, during the last two decades many European Countries have started to relax their advertising restrictions which encourage the use of Comparative advertising. For instance, United Kingdom permits the use of comparison ads provided that they do not mislead, or take unfair advantage of another’s trade mark.

8.2 The Extensive Presentation of the sub-games equations.

In the present section we adduce in length all the equations we have evaluate in each sub-game. Starting from the equations of the third stage and moving on until the first stage.

Stage 3:

Output and Profits in the third stage are given by:

$$q_i(A, C, S_i, S_j, F_i, F_j, \gamma) = \frac{(2 - \gamma)(A - C) + 2[S_i + F_i(S_i - S_j)] - \gamma[S_j + F_j(S_j - S_i)]}{4 - \gamma^2}$$

$$PR_i[A, C, S_i, S_j, \gamma, F_i, F_j] = \frac{\begin{aligned} &< 2[C + S_i - F_i(S_i + S_j)] + A(\gamma - 2) - \{\gamma[C + F_j(S_i - S_j) - S_j + \gamma S_i]\} \\ &\{2[C - (3 + F_i)S_i + F_i S_j]\} + A(\gamma - 2) + \gamma[S_j + F_j(S_j - S_i) + \gamma S_i - C] > \end{aligned}}{(\gamma^2 - 4)^2}$$

Stage 2:

Output and Profits and level of advertising in the second stage are given by:

$$q_i[A, C, \gamma, F_i, F_j] \Rightarrow$$

$$Q_i = \frac{-\{(A-C)(\gamma^2-4)(-2(-3+F_j+F_i(2+F_i+F_j))-(4+F_j+F_i))\gamma-2\gamma^2+\gamma^3\}}{\{4[9-3F_i(2+F_i)-6F_j+(3+F_i)F_iF_j+(F_i-3)F_j^2]+2(F_i^3+F_i^2(2+F_j)+F_i((F_j-14)F_j-7)+\gamma F_j(-7+F_j(2+F_j)))\}+\gamma^2(8(-5+F_j)+F_i(8+F_j(1+F_j+F_i)))\}+4\gamma^3(F_i+F_j+F_iF_j)+\gamma^4(12+F_i^2+F_j^2)-\gamma^6\}}$$

$$PR_i[A, C, \gamma, F_i, F_j] \Rightarrow$$

$$PR_i = \frac{-(A-C)^2(6+2F_i+(F_j-\gamma)\gamma)(-2+2F_i+\gamma(F_j+\gamma))(-6+2F_j(F_j+2)+\gamma F_i^2+F_i(F_j+1)(2+\gamma))+\gamma[4-(\gamma-2)\gamma]^2}{\{4[9-3F_i(2+F_i)-6F_j+(3+F_i)F_iF_j+(F_i-3)F_j^2]+2(F_i^3+F_i^2(2+F_j)+F_i((F_j-14)F_j-7)+\gamma F_j(-7+F_j(2+F_j)))\}+\gamma^2(8(-5+F_j)+F_i(8+F_j(1+F_j+F_i)))\}+4\gamma^3(F_i+F_j+F_iF_j)+\gamma^4(12+F_i^2+F_j^2)-\gamma^6\} >^2}$$

$$S_i^* = S_i(A, C, \gamma, F_i, F_j) \Rightarrow$$

$$S_i^* = \frac{-\{(A-C)(2+2F_i+\gamma F_j)(-6+2F_j(2+F_j)+\gamma F_i^2+F_i(1+F_j))(2+\gamma)+\gamma[4-(2+\gamma)\gamma]\}}{\{4[9-3F_i(2+F_i)-6F_j+(3+F_i)F_iF_j+(F_i-3)F_j^2]+2(F_i^3+F_i^2(2+F_j)+F_i((F_j-14)F_j-7)+\gamma F_j(-7+F_j(2+F_j)))\}+\gamma^2(8(-5+F_j)+F_i(8+F_j(1+F_j+F_i)))\}+4\gamma^3(F_i+F_j+F_iF_j)+\gamma^4(12+F_i^2+F_j^2)-\gamma^6\}}$$

Stage 1:

Advertising type, level of advertising in the equilibrium are given by:

$$F_j = F_i = F^* = \frac{(2-\gamma)\sqrt{(1+\gamma)(1+\gamma(7+\gamma(5+\gamma)))}-3\gamma-2}{(2+\gamma)^2}$$

$$S_i^* = S_j^* = S^* = \frac{(A-C)(1+\gamma+\sqrt{(1+\gamma)(1+\gamma(7+\gamma(5+\gamma)))})}{(1+\gamma)(2+\gamma)(3+\gamma)}$$

Equilibrium Output and Profits are given by:

$$Q^*(\gamma) = \frac{(2 + \gamma)^2 (A - C)}{7 + 12\gamma + 6\gamma^2 + \gamma^3 - \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}}$$

$$PR^*[A, C, \gamma] = \frac{2(A - C)^2}{7 + 12\gamma + 6\gamma^2 + \gamma^3 - \sqrt{(1 + \gamma)(1 + \gamma(7 + \gamma(5 + \gamma)))}}$$

9. References

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