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**STRATEGIC ADVERTISING**
**FOR ENTRY DETERRENCE PURPOSES**

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Abstract

This paper evaluates the possible effects of advertising on conditions of entry in a market with one incumbent and one potential entrant. Through a game-theoretic framework, it is shown that the use of pre-entry advertising expenditures (which are supposed to exhibit diminishing returns) may discourage entry even when firms behave rationally and face the same conditions of cost and demand.

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1. Introduction

In the last decades a growing attention has been addressed to models of entry deterrence. The contributions by Bain (1956), Sylos Labini (1962) and Modigliani (1958) have become milestones in the literature of industrial economics, even if they have been criticised on the ground of the credibility of the main hypotheses.

Recent debates in oligopoly theory have therefore tried to draw situations where strategic actions for entry deterrence purposes are also rational for all the firms (actual and potential). Since Schelling (1960), the concept of “binding commitment”\(^1\) has been widely used in the modern theory of strategic entry barriers, where it consists mainly in an irreversible investment from the incumbent firm. Spence (1977) suggests that an established firm can commit itself by overinvesting in production capacity before entry occurs, while Dixit (1980) develops Spence’s model and shows that rationality and profit-seeking behaviour determine the convenience to use all of the excess capacity both with and without entry\(^2\).

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\(^2\) According to Bulow et al. (1985), this conclusion depends strongly on the slope of firms’ reaction curves: if they are downward sloping Dixit’s result is true, but when they are upward sloping, Spence’s intuition may reappear.
In this paper we give an evaluation of the choice of advertising as an entry deterrence instrument. Actually, the existence of homogeneous goods in a market is surely one of the strongest simplifications in economic theory, since product differentiation allows firms to avoid the competition and search for market niches, at the same time persuading consumers that different products are different goods. Advertising is a way to differentiate products, providing information on their presence, price or quality.

According to the Dorfman-Steiner\(^3\) condition, a profit-maximising firm will use advertising up to the point at which its marginal value product is equal to the price elasticity of demand. This result is usually employed to show that advertising is normally associated with non-competitive markets. The positive relationship between advertising-sales ratio and price-cost margin, underlying the Dorfman-Steiner condition, has been confirmed by empirical studies\(^4\). Furthermore, Cubbin and Domberger (1988) show that in a static market the dominant firms are more likely to use advertising in order to respond to entry. This implies that advertising is considered one of the instruments to be employed by the incumbent firms if they wish to assume a hostile behaviour and hence to deter entry.

The impact that advertising is supposed to have on market structure, and particularly on conditions of entry is one of the most controversial aspects in economic literature. It has been impossible to prove either the informative (pro-competitive) or the persuasive (anti-competitive) role of advertising in a market. Many studies, both theoretical and empirical, have been pursued in support of the two views, but the results have not always been fully convincing\(^5\). Probably it is hard to choose unequivocally between these extreme positions, since the effects of advertising on market structure are related to product attributes, the nature of advertising

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\(^3\) Actually, while the “advertising as persuasion” view suggests a positive relationship between the level of advertising and market concentration, either a positive or negative relationship would be consistent with the “advertising as information” view. See DORFMAN and STEINER (1954). See also NERLOVE and ARROW (1962), SCHMALERSEE (1972) and CABLE (1972).

\(^4\) For example, COMANOR and WILSON (1974) and CABLE (1972).

\(^5\) FERGUSON and FERGUSON (1994), pp. 75-76.
and consumer information. In any case, it is undeniable that advertising activity exerts some influence on the behaviour of incumbents or potential firms. When a firm decides to advertise, its main aim is to change demand conditions, especially to reduce price competition through product differentiation. The effects of this single action spread over the whole market: the consumers who buy the product of the advertiser might not be the purchaser of other similar goods for a certain time, with negative implications on the demand of the other firms. As a consequence, potential entrants could face an entry barrier, whose height is linked to aspects such as brand loyalty and penetration costs.

It is not clear whether advertising can play a decisive role in entry deterrence, also if the economic literature provides several models where advertising gives rise to entry barriers. Since Bain (1956), many scholars argue that product differentiation is one of the most important sources of barriers to entry, and that this advantage is linked mainly to the long-term effects of advertising on consumers’ behaviour (goodwill). However, it has been also argued that, in order that advertising creates an entry barrier, there must be asymmetries between existing and entrant firms.

Schmalensee (1974) uses a general distributed lag model to consider a dynamic demand function; his results demonstrate that if the incumbent firms and the potential entrants can produce equally effective advertising and equally desirable products, it is hard to see advantages for established firms which can be used to hinder entry. The need of the presence of some absolute advantage for existing firms is contradicted by Cubbin (1981), who shows that advertising can contribute to the creation of entry barriers even when there is no asymmetry in firms’ cost or demand functions. This result depends on the nature of the previous functions as well as the requirement that the entrant expects the post-entry advertising of the incumbent firm will be positive, and is con-

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6 See Schmalensee (1986), p. 386. It has been also stressed that from a theoretical point of view the correlation between advertising and profitability does not necessarily reflect entry difficulties. On this point, see Schmalensee (1976) and Needham (1976). An opposite view is by Vernon and Nourse (1973).

nected to the fact that the entrant faces a more limited demand set than the established firm\textsuperscript{8}.

Since advertising has long-term effects, in analogy with investment in production capacity one might think that an incumbent monopolist would sometimes find optimal to overinvest in promotional expenditures in order to deter entry. Schmalensee (1983) suggests that investment in advertising may differ strongly from the investment in capacity, and shows that the optimal response to the entrant implies underinvestment in advertising with respect to the situation where there is no threat of entry\textsuperscript{9}. Using the taxonomy introduced by Fudenberg and Tirole (1984), the established firm should have a “lean and hungry look”, underinvesting in order to respond aggressively to potential competitors, while overinvestment in advertising would make it a pacifistic “fat cat” with little incentive to deter entry.

There have been also many empirical studies trying to evaluate the impact of high advertising intensity on barriers to entry. Also in this case we have different results, so that the dispute between those who believe that advertising deters entry and those who do not is far from being solved. The former group refers to regression results exhibiting strong positive relationships between advertising and profits, while the latter group mainly maintains that these studies suffer from simultaneous equation bias or specification errors or both\textsuperscript{10}.

Using a game-theoretic approach, this paper aims at offering a contribution to this debate. Our results show that, under particular conditions of cost and demand and even without uncertainty, ad-

\textsuperscript{8} SPENCE (1980) maintains that an incumbent can deter entry through a binding commitment to heavy post-entry advertising if there exist scale economies in advertising.

\textsuperscript{9} This happens because an incumbent’s investment in advertising increases the number of loyal consumers, what contrasts with an expansion of production or a reduction of price in case of entry since this behaviour would involve giving up secure profits coming from the sales to the captive clients.

\textsuperscript{10} CUBBIN (1981), p. 289. The potential pro-competitive effects of advertising emerge from the empirical studies by BENHAM (1972) and BOYER (1974), KESSIDES (1991) and GRABOWSKI and VERNON (1992). Instead, RIZZO and ZECHHAUSER (1990) and ROSENBAUM and LAMORT (1992) provide empirical results showing that advertising could be a factor inhibiting entry.
Advertising can be used for entry deterrence purposes. The presence of asymmetry is a mere consequence of the fact that the incumbent firm is already in the market and can choose to commit resources in advertising activity, thus reinforcing its first-mover advantage. Furthermore, it will not be necessary to suppose that the entrant expects the incumbent will surely invest in advertising. In section 2 we set out our model of a three-stage entry game. Section 3 identifies the solutions of the game, which are discussed in section 4. Finally, section 5 offers some concluding remarks.

2. The hypotheses and the model

The main premise of this analysis is that promotional expenditures shift out the demand curve for the firm that affords them. This can be thought of as an increase in consumers' “willingness to pay”, or as an increase in quantity demanded at a given price. In other words, advertising conveys information about the good, creates loyalty to the product and so allows the firm to set a higher price\(^\text{11}\), at the same time leading to a reduction of demand for a similar good produced by another firm.

The cost of promotional advertisements is assumed to be quadratic to permit diminishing returns to advertising expenditures: as they increase, their effectiveness is lower and lower, because it is more and more difficult to reach consumers who didn't receive messages before\(^\text{12}\).

Since the hypothesis to be tested in this paper is that advertising can be used as a strategic weapon to deter entry, it is assumed that there is an established firm (called 1) in the market (a monopoly initially), and a potential entrant (called 2). The incumbent can

\(^{11}\) Like many papers about the relationship between advertising and entry barriers, by choice here we don’t focus our attention on the effects of firms’ promotional expenditures on consumer sovereignty and welfare.

invest in advertising either to maximise its own profit or to discourage the entry of the rival firm (driving its profits to zero), but it can also decide to accommodate entry, therefore choosing a level of advertising expenditure compatible with Cournot duopoly. In turn, the latter can decide whether to enter or not, and whether to advertise or not. The game is sequential: the monopolist decides first, then the entrant observes the action of the incumbent and makes its own choice. In the final stage, if firm 2 decides to enter, a Cournot-Nash equilibrium with quantity-setting will emerge; otherwise, the established firm will maintain its monopolistic position. The game can therefore be solved by backward induction, assuming a common discount factor equal to one. Post-entry behaviour is noncooperative. The game tree is shown in Figure 1.

Let us consider the following quadratic utility function\(^{13}\):

\[
U = y + aQ - \frac{1}{2} bQ^2 + (A_i - A_j)(q_i - q_j)
\]

\[a, b > 0, \quad Q = q_i + q_j, \quad i, j = 1, 2, \quad j \neq i\]

where \(y\) is a composite good, \(Q\) is the total quantity of the good whose market we are studying, \(A_i\) and \(A_j\) are the advertising expenditures, all affecting the utility as described above.

When there is no advertising in the market \((A_i = A_j = 0)\), the good is homogeneous and the inverse market demand function is

\[p = a - bQ \quad Q = q_i + q_j, \quad i, j = 1, 2, \quad j \neq i\]

If one or both firms advertise, two different demand curves must be considered. Now \(A_i\) \((i = 1, 2)\) represents the increase in the willingness to pay of consumers induced by advertising; it can also be regarded as the rise of price that firms can apply to every unit of good sold. This is possible thanks to the brand loyalty ensured by ad campaigns (note also that in this model they don’t affect the degree of product differentiation between goods).

Now the inverse demand functions can be written as:

\(^{13}\) For similar functions, see Shubik and Levitan (1980) and Singh and Vives (1987).
\[ p_i = a + A_i - A_j - bq_i - bq_j \quad i, j = 1, 2, \quad j \neq i. \]

We can notice that here advertising affects the utility function in a "persuasive" way: if \( A_i = A_j \), the perceived utility of the goods is the same, and the consumer is indifferent between them; if \( A_i > A_j \), the utility increases as the consumption of good \( i \) grows and/or the consumption of good \( j \) goes down. In terms of market demand, this means that advertising by firm \( i \) has the effect of increasing the price of good \( i \) for any given level of demand\(^{14} \).

For simplicity the cost of production is assumed equal to zero, while the cost of advertising is the same for the two firms:

\[ c_A = \frac{\nu}{2} A_i^2 \quad i = 1, 2. \]

Before turning to the detection of the optimal behaviour of the firms, let us first introduce the following proposition.

**Proposition 1.**

The optimal amount of advertising is such that \( 0 \leq A_i \leq a, \) \( i = 1, 2. \)

**Proof.**

The value of the lower bound of \( A_i \) does not require any particular discussion. To calculate the upper bound, we have to consider that the maximum amount of advertising from one firm must induce the exit of the rival, which happens when the latter is willing to offer its own good at zero price but is unable to find customers. So firm \( i \) has to find a \( q_i^M \) such that \( q_i = 0 \) in the limit case \( p_i = 0 \). Substituting in the inverse demand function of firm \( j \), we get \( q_j^M = a/b \). To reach the new \( a/b \) consumers, the amount of advertising \( A_i^M \) required for this purpose is such that at old price \( p_i \) the size of its own market must be equal to the old one plus \( a/b \) units (just the quantity stolen to the rival). Therefore we must impose the equality between \( p_i' = a - bq \) and \( p_i'' = a + A_i - b(q_i + a/b) \), obtaining \( A_i = a \). QED

\(^{14}\) Note also that we are considering the case of perfect "business-stealing", since the ads of one firm attracts only consumers who would otherwise buy from the other firm. See Motta (1997), p. 30.
The derivation of quantities and profits for firm 1 (the incumbent) and firm 2 (the entrant) is found in the Appendix. These values are associated to each point of the game tree as shown in Figure 1.

3. The market equilibrium solutions

To find out the solutions of this game, we have to evaluate the profit of each of the two firms. Using backward induction, the behaviour of the entrant must be considered first. It will enter the market only if its profit is positive.

PROPOSITION 2.
If the incumbent chooses not to advertise, the rival will enter and invest in advertising.

PROOF.
According to the game tree in Figure 1, the options for the entrant are: no entry (1), enter but not advertise (2), enter and advertise (3). From the Appendix, the profits are \( \pi_2(1) = 0 \), \( \pi_2(2) = \frac{a^2}{9b} \), and \( \pi_2(3) = \frac{a^2v}{9bv - 2} \). The latter is positive for \( bv > 2 \). In the same interval, it is \( \pi_2(3) > \pi_2(2) \) for any value of \( bv \). When \( bv < 2 \), the second derivative of \( \pi_2(2) \) with respect to \( A_2 \) is positive, so the entrant chooses \( A_2 = A_2^* = a \), what would also cause the exit of the incumbent since \( q_1^* < 0 \) in this case. QED

PROPOSITION 3.
If the incumbent chooses the amount of \( A_1 \) which maximises \( \pi_1 \) in the monopolistic case, the rival will enter and invest in advertising
when $bv < 1/2$ or $bv > 2$; otherwise, it will not enter.

**PROOF.**
The monopolistic choice of $A_1$ for the incumbent (corresponding to case 4) is $A_1^* = \frac{a}{2bv - 1}$. Again, the options available to the entrant would be: no entry (4), enter but not advertise (5), enter and advertise (6). From the Appendix, the corresponding profits are:

- $\pi_2(4) = 0$
- $\pi_2(5) = \frac{4a^2(bv - 2)^2}{9b(2bv - 1)^2}$
- $\pi_2(6) = \frac{4a^2v(bv - 2)}{9(2bv - 1)^2}$.

Both cases 5 and 6 exhibit positive values for $q_2$ and/or $\pi_2$ when $bv < 1/2$ and $bv > 2$. In these intervals, we can easily check that $\pi_2(6) > \pi_2(5)$.

**QED**

**PROPOSITION 4.**
*If the incumbent decides to set an $A_1$ that accommodates the entry of firm 2, the rival will enter and invest in advertising when $bv < 2/9$ or $bv > 2$; otherwise, it will not enter.*

**PROOF.**

From the Appendix, profits in case 8 are $\pi_i(8) = \pi_2(8) = \frac{a^2(bv - 2)}{9b^2v}$, which are clearly positive for $bv > 2$. When $bv < 2$, the second derivative of $\pi(8)$ with respect to $A_i$ is positive ($i = 1, 2$); therefore both firms set $A_i = A_i^M = a$. Since the corresponding profits become $\pi_i^M(8) = \frac{a^2(2 - 9bv)}{18b}$, they are negative when $bv < 2/9$. Hence, in this interval firm 2 will choose not to enter. **QED**

**PROPOSITION 5.**
*For $bv < 1/2$, the incumbent will set $A_1 = A_1^M = a$, thus making unprofitable the entry of the rival.*

**PROOF.**

According to Proposition 2, in this interval firm 1 must invest in ad-
vertising to avoid to be put away by firm 2. Furthermore, Proposition 3 tells us that the rival will enter if the incumbent sets the value $A_1$ without taking into account the other firm’s behaviour. But firm 1 will choose $A_1 = A_1^M = a$ when $bv < 1/2$, since in this interval the second derivative of $\pi_1(4)$ is positive. This choice allows the incumbent to hold its monopolistic position, because $\pi_1^M(4) > 0$ and $\pi_1^M(5) > 0$, while $\pi_2(5) < 0$. In case 6 (when firm 2 can invest in advertising), the optimal choice of the entrant would be $A_2 = A_2^M = a$.

From Proposition 4 we know that this is just case 8 with $A_i = A_i^M = a$, when $\pi_i^M(8) = \frac{a^2 (2 - 9bv)}{18b}$, and also that these profits are positive for $bv < 2/9$. The earlier discussion allows us to evaluate the behaviour of the established firm in two intervals: a) when $bv < 2/9$, the incumbent will compare $\pi_1^M(4)$, $\pi_1(7)$ and $\pi_1^M(8)$; b) when $2/9 < bv < 1/2$, he will only compare $\pi_1^M(4)$ and $\pi_1(7)$, given that $\pi_1^M(8) < 0$. Since it is always $\pi_1^M(4) > \pi_1(7) > \pi_1^M(8)$, firm 1 will set $A_1 = A_1^M = a$ and firm 2 will not enter. QED

**PROPOSITION 6.**

For $2 < bv < 3 + \sqrt{13}$, the incumbent will deter the entry of the rival setting $A_1 = a/3$.

**PROOF.**

Propositions 2, 3 and 4 have shown that for $bv > 2$ the optimal choice of firm 2 is to enter and advertise, no matter what firm 1 decides. Accordingly (and also considering the possibility of deterring entry), the latter has to select one among points 3, 6, 7, 8 (see Figure 1). It is easy to verify that $\pi_1(7) > \pi_1(3)$ for $2 < bv < 5 + \sqrt{5}$ (note that $q_1(3) > 0$ only when $bv > 4$), $\pi_1(7) > \pi_1(6)$ for $\frac{7 - \sqrt{41}}{2} < bv < \frac{7 + \sqrt{41}}{2}$ and $\pi_1(7) > \pi_1(8)$ for $bv < 3 + \sqrt{13}$. Therefore, the incumbent will invest in advertising to deter entry as long as $2 < bv < 3 + \sqrt{13}$, gaining $\pi_1(7)$. QED
PROPOSITION 7.
For $bv > 3 + \sqrt{13}$, the incumbent will accommodate the entry of the rival.

PROOF.
In this interval, it is always $\pi_1(8) > \pi_1(3)$ and $\pi_1(8) > \pi_1(6)$, and a Cournot duopoly with advertising will emerge. QED

We can sum up the market equilibria as follows:

\begin{align*}
0 < bv < \frac{1}{2} & \quad \rightarrow \quad \text{The incumbent chooses } A_1^M = a, \text{ the rival does not enter.} \\
\frac{1}{2} < bv < 2 & \quad \rightarrow \quad \text{The incumbent chooses } A_1 \text{ so as to maximise its monopolistic profit, the rival does not enter.} \\
2 < bv < 3 + \sqrt{13} & \quad \rightarrow \quad \text{The incumbent chooses } A_1 \text{ so as to deter the entry, the rival does not enter.} \\
{}_{\;\;\;} bv > 3 + \sqrt{13} & \quad \rightarrow \quad \text{The incumbent chooses } A_1 \text{ to accommodate the entry, the rival enters and advertises.}
\end{align*}

Therefore, entry is blockaded for $bv < 2$, deterred for $2 < bv < 3 + \sqrt{13}$, accommodated for $bv > 3 + \sqrt{13}$.

4. Discussion

We can verify that for $2 < bv < 3 + \sqrt{13}$ there is overinvest-
ment in advertising in order to prevent entry, because it is \( A_i(7) > A_i(8) > A_i(6) \); actually, if \( bv > 2 \) firm 2 surely enters and advertises, so that now case 7 must be compared with cases 6 and 8. If \( bv > 3 + \sqrt{13} \), since there is no possibility to deter the rival’s entry and its investment in advertising, the existing firm has to afford promotional expenses in any case (we have already seen that for these values of \( bv \) it is \( \pi_i(8) > \pi_i(3) \)), even if the best choice for both of them would be to refrain from advertising \((\pi_i(8) < \pi_i(2), i = 1, 2)\); once more there is overinvestment in advertising from firm 1, but now it has to accommodate entry.

Here the simple taxonomy of investment strategies provided by Fudenberg and Tirole (1984) can not be applied because in this model we admit strategic investments for both the incumbent and the entrant. Nevertheless, we can try to extend the results of the standard Fudenberg-Tirole asymmetric analysis to our symmetric framework and thus evaluate the emerging equilibria.

The profit of the two firms can be written as:

\[
\pi_i = \pi_i(A_i, A_j, q(A_i, A_j), q(A_i, A_j)) \quad i, j = 1, 2, \ j \neq i.
\]

Differentiating with respect to \( A_i \) and \( A_j \), and considering that \( \partial \pi_i / \partial q_i = 0 \), we have:

\[
d\pi_j = \left[ \frac{\partial \pi_i}{\partial A_i} + \frac{\partial \pi_i}{\partial q_j} \frac{dq_i}{dA_i} \right] dA_i + \left[ \frac{\partial \pi_i}{\partial A_j} + \frac{\partial \pi_i}{\partial q_j} \frac{dq_i}{dA_j} \right] dA_j
\]

The first bracket of \( d\pi_j \) contains the effect of the advertising of firm \( i \) on its own profit; the second one shows the impact of the advertising of the rival on the same profit. Both are formed by two parts: the direct effect and the strategic effect. In our model, it is:

\[
\frac{\partial \pi_i}{\partial q_j} < 0, \quad \frac{dq_i}{dA_i} < 0, \quad \frac{dq_j}{dA_j} > 0, \quad \frac{\partial \pi_i}{\partial A_i} < 0, \quad \frac{\partial \pi_i}{\partial A_j} < 0.
\]

Therefore, we can state that the second part is surely negative: according to Fudenberg and Tirole (1984), firm \( j \) will overin-
vest in advertising because this investment makes it tough. The first part of \( d\pi \), has a negative direct effect and a positive strategic effect, but the global sign is positive, what means that firm \( i \) will overinvest for strategic purposes. Hence, the equilibrium is one where both firms overinvest in advertising: the entrant aims to avoid an aggressive post-entry play by the incumbent firm, who will choose the same conduct to look tough in turn. In the “animal” terminology of Fudenberg and Tirole, there are two “top dogs” facing each other.

This result recalls the equilibrium occurring in the production capacity models by Spence and Dixit\(^{15}\), but is different from the Schmalensee’s (1983) model. In the latter the optimal strategy for entry deterrence was underinvestment in advertising because price discrimination was ruled out and a single price prevailed in the market\(^{16}\), while in our model we admit two different demand curves for the two firms.

As we have seen before, when \( bv > 3 + \sqrt{13} \) both firms earn lower profits than they would under Cournot duopoly (\( \pi_i(8) < \pi_i(2), i = 1, 2 \)). Hence, strategic implications force them to afford promotional expenditures, and the resulting Nash equilibrium is not the Pareto-efficient solution: strategic interaction between rational players who behave noncooperatively doesn’t yield the optimal outcome for each of them. In any case, the choice of the optimum level of advertising from the two firms in this interval is in line with the solution suggested by the Dorfman-Steiner condition\(^{17}\).

It should be noted that entry is more likely to occur as \( b \) and/or \( v \) increase. It is clear that when \( v \) is higher advertising is more

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\(^{15}\) See also Tirole (1988), p. 327.


\(^{17}\) Following Waterson (1984, p. 131), it can be demonstrated that in a duopoly for firm 1 the Dorfman-Steiner condition can be written as follows:

\[
\frac{p_{A1}}{p_1q_1} = \left[\frac{(p_1 - MC_1)}{p_1}\right]\varepsilon(q_1A_1) + \varepsilon(q_2A_2)\varepsilon(A_2A_1),
\]

where \( \varepsilon(q_1A_1) \) represents the direct effect of own advertising on own demand, \( \varepsilon(q_2A_2) \) the effect of rival’s advertising on own demand, and \( \varepsilon(A_2A_1) \) the effect of own advertising on rival’s advertising behaviour. With Cournot conjectures about advertising, it is \( \varepsilon(A_2A_1) = 0 \); rearranging the previous expression according to the values used in the model, we obtain that \( A_1 = 2p/ bv \). Since in a Cournot duopoly (like in point 8) it is \( p^* = a^3 \), substituting we get \( A_1^* = 2a/3bv \).
costly, lowers profits and thus discourages its use for entry deterrence purposes. When $b$ increases, the possibility of entry is higher because the demand curve of each firm is steeper and steeper, so a given amount $A$ of advertising investment from the incumbent (which moves its own curve toward right and the other firm’s curve toward left) has less and less effect on the quantity sold by the rival: when $b$ tends to an infinite number, the demand curves are vertical and any promotional expenditure will have no effect on the sales of the other firm (entry deterrence is then impossible). Figure 2 points out this occurrence in the hypothesis of a linear demand curve: when $b$ is low (flatter curve), the advertising expenditure $A$ from the incumbent shifts the potential entrant's curve backwards, and at a given level of price $p^*$ the reduction of demand for the entrant ($\Delta q$) is bigger than it would when $b$ is high (steeper curve).

To sum up, the theoretical outcome of this paper confirms the effectiveness of advertising as a barrier to entry, even though its viability is restricted within a particular range of values of $b$ and $v$. In this model, advertising has the same effect on the demand of incumbent and entrant. Nevertheless, the incumbent is already in the market, and has the possibility to choose between allowing entry and competing with the rival, according to the profit expected in each of post-entry regimes. The advantage of the established firm consists in being the first to invest in advertising, thus creating a captive market for its products and at the same time reducing the size of potential clientele for the entrant. In other words, the prior existence gives a pre-entry asymmetry advantage\(^{18}\), even if the potential competitor can decide already knowing the incumbent’s decisions.

5. Conclusions

The development of the game theory literature has allowed a

\(^{18}\) See Salop (1979), p. 335.
deeper analysis of the interrelations between firms in entry deter-
rence modelling. In particular, it helped to improve the specification
of the games between the incumbents and the entrants\textsuperscript{19}, as well
as the strategic instruments to be used for entry deterrence pur-
poses (mainly R&D, capacity, product differentiation).

Many studies have also tried to find out the conditions under
which advertising can be chosen to impede entry. They showed
that both underinvestment and overinvestment in promotional ex-
penditures by the incumbent can turn out to be optimal strategies,
depending on the specification of the relationship between the cost
and demand functions of the players.

Our model has shown that in a context of decreasing returns
to advertising there exist certain conditions of cost and demand
under which a rational behaviour of established and potential firms
may generate entry barriers. Specifically, according to this model,
the pressure of potential entry and the effect that advertising is
supposed to have on demand imply that the incumbent firm will
always overinvest in promotional activities, while entry may be
possible depending on the slope of demand function and the cost
of advertising.

\textsuperscript{19} Among the others, it is worth to recall SELTEN’S (1975) concept of perfect
equilibrium, and the papers by KREPS and WILSON (1982) and MILGROM and
ROBERTS (1982), that illustrate the viability of entry deterrence in contexts of
incomplete and imperfect information.
References


Appendix

Three-stage game tree: computation of the payoffs for each firm

1) Firm 1 doesn’t advertise, firm 2 doesn’t enter (standard monopoly equilibrium)

\[ q_1 = \frac{a}{2b}, \quad \pi_2 = 0, \quad \pi_1 = \frac{a^2}{4b}, \quad \pi_2 = 0. \]

2) Firm 1 doesn’t advertise, firm 2 enters but doesn’t advertise (standard Cournot outcome)

\[ q_i = \frac{a}{3b}, \quad \pi_i = \frac{a^2}{9b}, \quad i, j \in \{1, 2\}, \quad j \neq i. \]

3) Firm 1 doesn’t advertise, firm 2 enters and advertises

The profit functions are:

\[ \pi_1 = (a - A_2 - bq_1 - bq_2)q_i, \]

\[ \pi_2 = (a + A_2 - bq_1 - bq_2)q_2 - \frac{v}{2} A_2^2. \]

It follows that:

\[ A_1 = 0, \quad A_2 = \frac{2a}{3(bv - 2)}, \quad q_1 = \frac{a(bv - 4)}{3b(bv - 2)}, \quad q_2 = \frac{av}{3(bv - 2)} \]

\[ \pi_1 = \frac{a^2(bv - 4)^2}{9b(bv - 2)^2}, \quad \pi_2 = \frac{a^2v}{9(bv - 2)}. \]
4) Firm 1 advertises to maximise its profit, firm 2 doesn’t enter

Given that $\pi_1 = (a + A_1 - bq_1)q_1 - \frac{v}{2} A_1^2$, the solutions are:

$$A_1 = \frac{a}{2bv - 1}, \quad A_2 = 0, \quad q_1 = \frac{av}{2bv - 1}, \quad q_2 = 0$$

$$\pi_1 = \frac{a^2v}{2(2bv - 1)} \quad \pi_2 = 0.$$

5) Firm 1 advertises to maximise its profit, firm 2 enters but doesn’t advertise

Here (and in the following point) the key assumption is that the incumbent firm doesn’t know what kind of behaviour the potential entrant will adopt about entry and advertising expenditures (the game is sequential). For this reason it seems plausible that firm 1 will invest in advertising in order to maximise its own profit, with no regard to the consequences of this irrecoverable expenditure on the conduct of firm 2. Therefore, since $A_1 = \frac{a}{2bv - 1}$ maximises $\pi_1$ when the incumbent is the only firm in the market, we can write:

$$\pi_1 = (a + \frac{a}{2bv - 1} - bq_1 - bq_2)q_1 - \frac{a^2v}{2(2bv - 1)^2}$$

$$\pi_2 = (a - \frac{a}{2bv - 1} - bq_1 - bq_2)q_2.$$

The solutions are:

$$A_2 = 0 \quad q_1 = \frac{2a(bv + 1)}{3b(2bv - 1)} \quad q_2 = \frac{2a(bv - 2)}{3b(2bv - 1)}$$
\[
\pi_1 = \frac{a^2(8b^2v^2 + 7bv + 8)}{18b(2bv - 1)^2}, \quad \pi_2 = \frac{4a^2(bv - 2)^2}{9b(2bv - 1)^2}.
\]

6) Firm 1 advertises to maximise its profit, firm 2 enters and advertises

Like before, \( A_1 = \frac{a}{2bv - 1} \), what means that:

\[
\pi_1 = (a + \frac{a}{2bv - 1} - A_2 - bq_1 - bq_2)q_1 - \frac{a^2v}{2(2bv - 1)^2}
\]

\[
\pi_2 = (a - \frac{a}{2bv - 1} + A_2 - bq_1 - bq_2)q_2 - \frac{v}{2}A_2^2.
\]

Solving, we get:

\[
A_2 = \frac{4a}{3(2bv-1)} \quad (> A_1) \quad q_1 = \frac{2a(bv - 1)}{3b(2bv - 1)} \quad q_2 = \frac{2abv}{3b(2bv - 1)}
\]

\[
\pi_1 = \frac{a^2(8b^2v^2 - 25bv + 8)}{18b(2bv - 1)^2}, \quad \pi_2 = \frac{4a^2v(bv - 2)}{9(2bv - 1)^2}.
\]

7) Firm 1 advertises to lower \( \pi_2 \) up to zero

Here we have the following profit functions:

\[
\pi_1 = (a + A_1 - bq_1 - bq_2)q_1 - \frac{v}{2}A_1^2
\]

\[
\pi_2 = (a - A_1 - bq_1 - bq_2)q_2.
\]

Imposing that the optimal value of \( A_1 \) must make the entry of
firm 2 unprofitable, we obtain:

\[ A_1 = \frac{a}{3}, \quad A_2 = 0, \quad q_1 = \frac{2a}{3b}, \quad q_2 = 0. \]

\[ \pi_1 = \frac{a^2(8 - bv)}{18b}, \quad \pi_2 = 0. \]

8) Firm 1 advertises to accommodate entry and share the market with the rival; firm 2 enters and advertises.

For both firms, profits are:

\[ \pi_i = (a + A_i - A_j - bq_i - bq_j)q_i - \frac{v}{2}A_i^2 \quad i, j = 1, 2, \quad j \neq i. \]

The maximisation for \( q_i \) and \( A_i \) gives:

\[ A_i = \frac{2a}{3bv}, \quad q_i = \frac{a}{3b}, \quad \pi_i = \frac{a^2(bv - 2)}{9b^2v} \quad i, j = 1, 2, \quad j \neq i. \]
Figure 1

Figure 2