Fişa suspiciunii de plagiat / Sheet of plagiarism's suspicion	Indexat la: 00283.03

Opera suspicionată (OS)	Opera autentică (OA)
Suspicious work	Authentic work

OS	BUSU, Cristian; BUSU, Mihail; DRĂGOI, Mihai; POPA, Ion; DOBRIN, Cosmin, and GIURGIU, Adriana. Dissipative advertising in retail markets. *Economic computation and economic cybernetics studies and research*. **49**(2). ISSN: 0424-267X. ISSN: 1842-3264. 2015. p.52-69. **Notă**: Lucrarea cofinanţată de Fondul Social European prin Programul Operaţional Sectorial pentru Resurse Umane 2007-2013 / proiect POSDRU/159/1.5/S/142115 „Performanţă şi excelenţă în cercetarea doctorală şi postdoctorală în domeniul de ştiinţe economice în România".
OA	BAGWELL, Kyle and LEE, Gea Myoung. Advertising Competition in Retail Markets. The B.E.Journal of Economic Analysis & Policy. **10**(1) (Advances). Article 70. 2010. p.1-36.

Incidenţa minimă a suspiciunii / Minimum incidence of suspicion	
p.06:16 - p.07:00	p.10:25 - p.12:07
p.08:01 - p.08:17	p.13:07 - p.07:31
p.08:17 - p.09:03	p.15:01 - p.15:17

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Notă: p.285:00 semnifică „pagina 285 până la capăt".	**Note**: p.285:00 means „page 285 to the end".

Argumentarea calificării de plagiat

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a) Prin „provenienţă" se înţelege informaţia din care se pot identifica cel puţin numele autorului / autorilor, titlul operei, anul apariţiei.

b) Plagiatul este definit prin textul legii[1].

> *„ …plagiatul – expunerea într-o operă scrisă sau o comunicare orală, inclusiv în format electronic, a unor texte, idei, demonstraţii, date, ipoteze, teorii, rezultate ori metode ştiinţifice extrase din opere scrise, inclusiv în format electronic, ale altor autori, fără a menţiona acest lucru şi fără a face trimitere la operele originale…*".

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> *„…este un element de comunicare prezentat în formă scrisă, ca text, imagine sau combinat, care posedă un subiect, o organizare sau o construcţie logică şi de argumentare care presupune nişte premise, un raţionament şi o concluzie. Piesa de creaţie presupune în mod necesar o formă de exprimare specifică unei persoane. Piesa de creaţie se poate asocia cu întreaga operă autentică sau cu o parte a acesteia…"*

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[1] Legii nr. 206/2004 privind buna conduită în cercetarea ştiinţifică, dezvoltarea tehnologică şi inovare, publicată în Monitorul Oficial al României, Partea I, nr. 505 din 4 iunie 2004

[2] ISOC, D. *Ghid de acţiune împotriva plagiatului: bună-conduită, prevenire, combatere*. Cluj-Napoca: Ecou Transilvan, 2012.

[3] ISOC, D. *Prevenitor de plagiat*. Cluj-Napoca: Ecou Transilvan, 2014.

8-2010

Advertising Competition in Retail Markets

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Advertising Competition in Retail Markets

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Advertising Competition in Retail Markets*

Kyle Bagwell and Gea M. Lee

Abstract

We consider non-price advertising by retail firms that are privately informed as to their respective production costs. We construct an advertising equilibrium in which informed consumers use an advertising search rule whereby they buy from the highest-advertising firm. Consumers are rational in using the advertising search rule since the lowest-cost firm advertises the most and also selects the lowest price. Even though the advertising equilibrium facilitates productive efficiency, we establish conditions under which firms enjoy higher expected profit when advertising is banned. Consumer welfare falls in this case, however. Under free entry, social surplus is higher when advertising is allowed. In addition, we consider a benchmark model of price competition; we provide comparative-statics results with respect to the number of informed consumers, the number of firms and the distribution of costs; and we consider the possibility of sequential search.

KEYWORDS: advertising, regulation, private information, retail markets

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use Bayes' Rule whenever possible (i.e., whenever $a_i = A(\theta_i)$ for some $\theta_i \in [\underline{\theta}, \overline{\theta}]$) in forming their beliefs as to firm i's cost type θ_i and thus price $p(\theta_i)$. Third, for any observed vector of advertising levels $[a_1, ..., a_N] \in \mathbb{R}_+^N$, given their beliefs, informed consumers' search rule directs them to the firm or firms with the lowest expected price.

We may now simplify our notation for equilibrium variables somewhat further. We may define firm i's interim-stage market share as $M(A(\theta_i); A) \equiv E_{\boldsymbol{\theta}_{-i}}[m(A(\theta_i), \mathbf{A}(\boldsymbol{\theta}_{-i}))]$. Similarly, we can define firm i's interim-stage profit and net revenue as follows:

$$\begin{aligned} \Pi(A(\theta_i), \theta_i; A) &\equiv r(p(\theta_i), \theta_i) M(A(\theta_i); A) - A(\theta_i). \\ &\equiv R(A(\theta_i), \theta_i; A) - A(\theta_i). \end{aligned}$$

We note that the interim-stage profit function satisfies a single-crossing property: higher types are less willing to engage in higher advertising to increase expected market share.[16] For here and later use, we now write interim-stage profit in direct-form notation, ignoring subscript i: if a firm of type θ picks an advertising level $A(\widehat{\theta})$ when its rivals employ the strategy A, then we define $\Pi(\widehat{\theta}, \theta; A) \equiv \Pi(A(\widehat{\theta}), \theta; A)$, $M(\widehat{\theta}; A) \equiv M(A(\widehat{\theta}); A)$ and $R(\widehat{\theta}, \theta; A) \equiv R(A(\widehat{\theta}), \theta; A)$.

We are primarily interested in two kinds of equilibria. In an *advertising equilibrium*, informed consumers use the advertising search rule. Since $p(\theta)$ is strictly increasing, such equilibria can exist only if the advertising schedule A is nonincreasing, so that higher-advertising firms have lower costs and thus offer lower prices. In a *random equilibrium*, informed consumers ignore advertising and use the random search rule. A random equilibrium thus can exist only if firms maximize expected profits and do not advertise (i.e., $A \equiv 0$).

2.2 Advertising Equilibrium

In an advertising equilibrium, informed consumers use the advertising search rule while uninformed consumers are randomly distributed across all N firms. We now report the following existence and uniqueness result.

Proposition 1. *There exists a unique advertising equilibrium, and in this equilibrium $A(\theta)$ is strictly decreasing and differentiable and satisfies $A(\overline{\theta}) = 0$.*

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for some $\theta \in [\underline{\theta}, \overline{\theta}]$) as well as "off-schedule" (i.e., a_i such that $a_i \neq A(\theta)$ for any $\theta \in [\underline{\theta}, \overline{\theta}]$).

[16] When a firm increases its advertising level, it may confront a trade off between the larger advertising expense, a_i, and the consequent higher expected market share, $M(a_i; A)$. When the interim-stage profit is held constant, the slope $da_i/dM(a_i; A)$ is given by $r(p(\theta_i), \theta_i)$, which is strictly decreasing in θ_i.

Proof. We first derive the necessary features of an advertising equilibrium. The following incentive constraints are necessary: For any $\theta \in [\underline{\theta}, \overline{\theta}]$ and any $\widehat{\theta} \in [\underline{\theta}, \overline{\theta}]$,

$$\begin{aligned} r(p(\widehat{\theta}),\widehat{\theta})M(\widehat{\theta};A) - A(\widehat{\theta}) &\geq r(p(\widehat{\theta}),\widehat{\theta})M(\theta;A) - A(\theta) \\ r(p(\theta),\theta)M(\theta;A) - A(\theta) &\geq r(p(\theta),\theta)M(\widehat{\theta};A) - A(\widehat{\theta}). \end{aligned}$$

Adding yields $[r(p(\widehat{\theta}),\widehat{\theta}) - r(p(\theta),\theta)][M(\widehat{\theta};A) - M(\theta;A)] \geq 0$. Since $r(p(\theta),\theta)$ is strictly decreasing in θ, it is thus necessary that $M(\theta;A)$ is nonincreasing. It follows from the incentive constraints that $A(\theta)$ is nonincreasing. Further, given the advertising search rule, it is clear that $A(\theta)$ cannot be constant over any interval of types: by increasing its advertising an infinitesimal amount, a firm with a type on this interval would experience a discrete gain in its expected market share. Thus, $A(\theta)$ must be strictly decreasing, and consequently it is necessary that $M(\theta;A) = \frac{U}{N} + [1 - F(\theta)]^{N-1}I$. It follows that $M(\overline{\theta};A) = \frac{U}{N}$. A firm with type $\overline{\theta}$ thus cannot be deterred from selecting zero advertising, and hence $A(\overline{\theta}) = 0$ is also necessary.

We next establish that $A(\theta)$ must be differentiable, and we also derive the necessary expression for $A'(\theta)$. Consider any $\widehat{\theta} < \theta$. Rearranging the incentive constraints presented above, we find that

$$\frac{r(p(\theta),\theta)[M(\widehat{\theta};A) - M(\theta;A)]}{\widehat{\theta} - \theta} \geq \frac{A(\widehat{\theta}) - A(\theta)}{\widehat{\theta} - \theta} \geq \frac{r(p(\widehat{\theta}),\widehat{\theta})[M(\widehat{\theta};A) - M(\theta;A)]}{\widehat{\theta} - \theta}.$$

Similarly, consider any $\widehat{\theta} > \theta$. The incentive constraints may now be rearranged to yield

$$\frac{r(p(\theta),\theta)[M(\widehat{\theta};A) - M(\theta;A)]}{\widehat{\theta} - \theta} \leq \frac{A(\widehat{\theta}) - A(\theta)}{\widehat{\theta} - \theta} \leq \frac{r(p(\widehat{\theta}),\widehat{\theta})[M(\widehat{\theta};A) - M(\theta;A)]}{\widehat{\theta} - \theta}.$$

Allowing that $\widehat{\theta}$ may approach θ from the right or the left, we may now take limits as $\widehat{\theta} \to \theta$, use the differentiability of the function $M(\theta;A) = \frac{U}{N} + [1 - F(\theta)]^{N-1}I$, and conclude that

$$A'(\theta) = r(p(\theta),\theta)\frac{\partial M(\theta;A)}{\partial \theta}.$$

When combined with the boundary condition $A(\overline{\theta}) = 0$, this differential equation may be solved to yield

$$A(\theta) = -\int_{\theta}^{\overline{\theta}} r(p(x),x)[\partial M(x;A)/\partial x]dx,$$

where $\frac{\partial M(x;A)}{\partial x} = -(N-1)[1 - F(x)]^{N-2}f(x)I < 0$ for all $x < \overline{\theta}$.

We now integrate by parts and establish that $A(\theta)$ must take the following unique form:

$$A(\theta) = R(\theta, \theta; A) - R(\overline{\theta}, \overline{\theta}; A) - \int_{\theta}^{\overline{\theta}} D(p(x)) \left[\frac{U}{N} + [1 - F(x)]^{N-1} I \right] dx, \quad (1)$$

where $R(\overline{\theta}, \overline{\theta}; A) = r(p(\overline{\theta}), \overline{\theta}) \frac{U}{N}$. Rearranging, we note that interim-stage profit for type θ then must be given as

$$\Pi(\theta, \theta; A) = R(\overline{\theta}, \overline{\theta}; A) + \int_{\theta}^{\overline{\theta}} D(p(x)) \left[\frac{U}{N} + [1 - F(x)]^{N-1} I \right] dx. \quad (2)$$

Observe that interim-stage profit is positive for all $\theta \in [\underline{\theta}, \overline{\theta}]$.

The second step in our proof is to construct an advertising equilibrium using the $A(\theta)$ function defined in (1). Observe that $\Pi_1(\theta, \theta; A) = r(p(\theta), \theta) \frac{\partial M(\theta; A)}{\partial \theta} - A'(\theta) = 0$ when this function is used. It follows that no type θ will deviate by mimicking some other type $\widehat{\theta}$, since for all $\widehat{\theta} < \theta$ we have

$$\begin{aligned} \Pi(\theta, \theta; A) - \Pi(\widehat{\theta}, \theta; A) &= \int_{\widehat{\theta}}^{\theta} \Pi_1(x, \theta; A) dx \\ &= \int_{\widehat{\theta}}^{\theta} [\Pi_1(x, \theta; A) - \Pi_1(x, x; A)]\, dx \\ &= \int_{\widehat{\theta}}^{\theta} \int_{x}^{\theta} \Pi_{12}(x, y; A) dy dx > 0, \end{aligned}$$

where the inequality follows from

$$\Pi_{12}(x, y; A) = D(p(y))(N-1)[1 - F(x)]^{N-2} f(x) I > 0 \text{ for all } x < \overline{\theta}.$$

A similar argument ensures that $\Pi(\theta, \theta; A) > \Pi(\widehat{\theta}, \theta; A)$ for all $\widehat{\theta} > \theta$. Next, if no type $\theta > \underline{\theta}$ gains from deviating to $A(\underline{\theta})$, then a deviation to any advertising level $a > A(\underline{\theta})$ is also unattractive. Finally, since $A'(\theta) < 0$, the advertising search rule is optimal for informed consumers. ■

Proposition 1 thus establishes the existence and uniqueness of an advertising equilibrium.[17] The advertising equilibrium acts as a fully sorting (separating)

[17] See Maskin and Riley (1984) for a related equilibrium characterization of bidding functions in the context of optimal auctions when buyers are risk averse. Our model also endogenizes the beliefs and strategies of informed consumers. For an advertising equilibrium, beliefs are uniquely defined on the equilibrium path (by Bayes' rule) and off the equilibrium path (since the advertising search rule is optimal for informed consumers when they observe an advertising level in excess of $A(\underline{\theta})$ only if they believe that the deviating firm has cost type $\underline{\theta}$).

mechanism: firms truthfully reveal their cost types along the downward-sloping advertising schedule. The informed consumers behave rationally in the advertising model: the lowest-cost firm advertises the most and offers the lowest price, and the informed consumers purchase from the highest-advertising firm. Thus, ostensibly uninformative advertising directs market share to the lowest-cost supplier and promotes productive efficiency.

In the advertising equilibrium, the expected market share allocated to a firm of type θ takes the following form: $M(\theta; A) = \frac{U}{N} + [1 - F(\theta)]^{N-1} I$. A firm is sure to get its share of uninformed consumers; further, since the advertising schedule is downward sloping, a firm wins the informed consumers with the probability that the other $N-1$ firms draw higher types. The advertising equilibrium thus induces a market share allocation that is strictly decreasing in a firm's type. The highest type does not advertise and sells only to its uninformed consumers: $M(\overline{\theta}; A) = \frac{U}{N}$.

We now characterize the expected profit for firms in the advertising equilibrium. Using (2) and integrating by parts, we find that expected profit may be represented as:

$$E_\theta\left[\Pi(\theta,\theta;A)\right] = r(p(\overline{\theta}),\overline{\theta})\frac{U}{N} + E_\theta\left[D(p(\theta))\frac{F}{f}(\theta)\left[\frac{U}{N} + [1-F(\theta)]^{N-1} I\right]\right]. \tag{3}$$

The first term on the RHS is the "profit at the top." As noted, the fully sorting scheme allocates a market share of only $\frac{U}{N}$ to the highest type, $\overline{\theta}$. The second term represents the expected information rents. It is not immediately clear whether a strictly decreasing market share allocation enhances the magnitude of this term. The strength of the fully sorting scheme is based on downward-sloping demand. Lower-cost firms set lower prices and thus generate greater demand from visiting consumers; hence, $D(p(\theta))$ is decreasing in θ. By directing more market share to lower-cost firms, the fully sorting scheme thus acts to expand the size of the market and increase expected information rents. The weakness of the fully sorting scheme is associated with the term $\frac{F}{f}(\theta)$. For many popular distributions, F is log-concave ($\frac{F}{f}(\theta)$ is nondecreasing in θ).[18] By allocating less market share to higher types, the fully sorting scheme works against the direct to which log-concavity of F appeals.

Log-concavity of F plays a prominent role in our analysis below. It is thus important to develop some intuition for the role played by this property.[19] Market share must be allocated so as to satisfy incentive compatibility. When greater market share is directed to type θ, this type earns greater profit

[18] This assumption is common in the contract literature and is satisfied by many distribution functions.

[19] For further discussion, see also Athey et al. (2004).

2.3 Random Equilibrium

In this subsection, we analyze the random equilibrium, wherein all consumers use the random search rule and thus divide up evenly across firms. Each firm then receives an equal share, $\frac{1}{N}$, of the unit mass of consumers. Given the random search rule, firms necessarily choose zero advertising, since even informed consumers are unresponsive to advertising; furthermore, when firms pool and do not advertise, the random search rule is a best response for each consumer.[23] The random equilibrium thus exists and takes the form of a pooling equilibrium.

In the random equilibrium, the interim-stage profit for the firm of type θ is given by $r(p(\theta), \theta)\frac{1}{N}$. The random equilibrium sacrifices productive efficiency; however, all advertising expenses are avoided. Using $\frac{dr(p(\theta),\theta)}{d\theta} = -D(p(\theta))$, it is straightforward to confirm that the expected profit for a firm in the random equilibrium is

$$E_\theta \left[r(p(\theta), \theta)\frac{1}{N} \right] = r(p(\overline{\theta}), \overline{\theta})\frac{1}{N} + E_\theta \left[D(p(\theta))\frac{F}{f}(\theta)\frac{1}{N} \right]. \tag{4}$$

The RHS contains the profit at the top and the expected information rents, respectively.

2.4 Comparison of Advertising and Random Equilibria

We now compare the advertising and random equilibria. We begin by comparing the expected consumer surplus in these equilibria. An uninformed consumer expects the same consumer surplus whether the advertising or random equilibrium is anticipated. For both equilibria, the uninformed consumers samples from the induced distribution of monopoly prices and expects to pay $E_\theta [p(\theta)]$. By contrast, an informed consumer expects strictly higher consumer surplus in the advertising equilibrium than in the random equilibrium. The key point is that, in the advertising equilibrium, an informed consumer can infer the identity of the lowest-cost, and thus lowest-price, firm. Accordingly, while

[23] If informed consumers observe a deviation whereby some firm selects positive advertising, then random search remains optimal in the event that informed consumers believe that the deviating firm has an average type. Since such a deviation may be more attractive to a lower-cost type, the random equilibrium may fail to be a "refined" equilibrium in the static model. See Bagwell and Ramey (1994b) for an analysis of the refined equilibrium in a related model of advertising in which one firm has two possible cost types. As noted in the Introduction, the random equilibrium can also be associated with a setting in which advertising is prohibited (in which case deviant positive advertising selections are not possible). Our analysis here of random equilibria is also useful for our companion paper (Bagwell and Lee, 2010), where we consider the repeated game and the possibility of a self-enforcing agreement among firms in which a deviation from zero advertising would cause a future advertising war.

the distribution of prices is not altered across equilibria, the informed consumer in the advertising equilibrium transacts at the lowest available price. Formally, an informed consumer expects to pay $E_\theta\left[p(\theta)\right]$ in the random equilibrium and $E_\theta[p(\theta_{\min})]$, where $\theta_{\min} \equiv \min\{\theta_1, ..., \theta_N\}$, in the advertising equilibrium. Under our assumption that $N \geq 2$, we have that $E_\theta[p(\theta_{\min})] < E_\theta\left[p(\theta)\right]$.

The comparison of expected profit across equilibria is more subtle. As illustrated in (3) and (4), in both types of equilibria, expected profit consists of two terms: the profit at the top and the expected information rents. To increase the profit at the top, the random equilibrium (pooling) is strictly preferred to the advertising equilibrium (full sorting). Intuitively, the highest-cost firm is never "out-advertised" in the random equilibrium and thus sells to its share of all consumers, $\frac{1}{N}$; by contrast, in the advertising equilibrium, the highest-cost firm is always out-advertised and thus sells only to its share of uninformed consumers, $\frac{U}{N}$. To increase expected information rents, however, it is not immediately clear whether the random or advertising equilibrium is preferred. On the one hand, if $\frac{F}{f}(\theta)$ is nondecreasing, then the random equilibrium is attractive, since this equilibrium allocates more market share to higher-cost types. On the other hand, downward-sloping demand creates a force that favors the advertising equilibrium, which allocates more market share to lower-cost types, since these types price lower and thus generate larger demand $D(p(\theta))$.

For the special case in which the support of possible cost types is small, we can unambiguously rank expected profits under the advertising and random equilibria. As $\overline{\theta} - \underline{\theta}$ approaches zero, expected information rents also approach zero in both the advertising and random equilibria. Profit at the top remains strictly higher under the random equilibrium, however, since the highest-cost firm gets strictly more market share in the random than the advertising equilibrium. Thus, for $\overline{\theta} - \underline{\theta}$ sufficiently small, expected profit is strictly higher under the random equilibrium than under the advertising equilibrium. Given the purification result described above and established in the Appendix, this finding can be understood as a direct extension of Bagwell and Ramey's (1994a) analogous finding for the associated complete-information game.

Consider next the general case in which the support of possible costs may be large. To go further in ranking expected profits, we must formally analyze the expected information rents.[24] Let A denote the advertising schedule used in the advertising equilibrium, in which the market share allocation, $M(\theta; A) = \frac{U}{N} + [1 - F(\theta)]^{N-1} I$, is strictly decreasing. Similarly, let $A^p \equiv 0$ denote the advertising schedule used in the random (pooling) equilibrium, in

[24] Our analysis here builds on arguments made by Athey et al. (2004) in their analysis of price collusion.

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