Concentration in the Press Industry and the Theory of the "Circulation Spiral"

Jean J. Gabszewicz*, Didier Laussel† and Nathalie Sonnac‡

November 27, 2002

Abstract

In this paper we model a situation of competition between two editors who are rivals in both the newpapers' and advertising industries.. To identify the consequences of this competition, we analyse a two-period sequential game whose players are the editors each selling a differentiated newspaper, like newspapers of different political content.We characterise the equilibria and explore how they depend on the number of ad-avoiders and ad-lovers, and on the intensity of readers' attraction or repulsion feelings for advertising. Our main finding is that equilibria are often observed in the sequential game, at which one of the editors prevents the entry of his rival and fully monopolises both the press and advertising markets.

*CORE, Université Catholique de Louvain
†GREQAM, Université de la Méditerrannée
‡CREST-LEI and Université Paris II

1 Introduction

Public information about politics and opinions plays an essential role in the day-to-day operation of a democracy. Daily newspapers constitute a major vector for the spreading of political and social information among the citizens, and a fall in the number of titles may tend to restrict the diversity and pluralism of opinions and, as a consequence, endanger the democratic debate (Bagdikian (1980, 1983), Gabszewicz, Laussel and Sonnac (2001)). Accordingly, it is important to keep under close scrutiny the mechanisms underlying the creation and the destruction of daily newspapers. This examination reveals that concentration in the press industry, particularly in national and local daily press, is neither a recent, nor a local, phenomenon. In France, for example, the number of titles in the regional daily press passed from 175 to 66 between 1946 and 1991 (Le Floch (1997)). Similar figures are observed not only in many other European countries, like Ireland (Thompson (1984)), England, Germany, Italy (Kaitatzi-Whitlock (1996)), but also in the United States: "monopoly is the rule rather than an exception in the publication of daily newspapers in the United States" (Blair and Romano, (1993, p. 722)).

Specialists in media economics with a particular interest in the economy of the press industry, identify two major reasons for explaining concentration in this industry. The first is related to the size of the fixed costs which constitutes a major entry barrier. Le Floch (1997) states that, in average, the cost of the first specimen of a French provincial daily newspaper represents nearly 50 % of its total cost (see also Rosse (1967,1978)). Also, some authors, like Bucklin, Caves and Lo (1989), have identified the presence of significant sunk costs in this industry and, as a consequence, the importance of being the first to occupy the market. Secondly, concentration is often viewed as a direct consequence of the impact of the advertising market on the economy of newspapers. Most papers studying this aspect of press concentration constitute primarily empirical investigations (Thompson (1984), (1989), Dertouzos and Trautman (1990), Reimer (1992)), relating advertising rates to the circulation of newspapers. There is however a stream of interesting theoretical contributions, starting from Lars Furhoff (1973), which explain the growth of concentration observed within the newspaper industry as a result of the interaction between the advertising and newspapers' markets[1]. These theoretical

[1]The main representatives of this stream are Furhoff (1973), Gustafsson (1978) and Engwall (1981).

contributions are based upon the so-called "*circulation spiral*". According to this theory, "the larger of two competing newspapers is favoured by a process of mutual reinforcement between circulation and advertising, as a larger circulation attracts advertisements, which in turn attracts more advertising and again more readers. In contrast, the smaller of two competing newspapers is caught in a vicious circle; its circulation has less appeal for the advertisers, and it loses readers if the newspaper does not contain attractive advertising. A decreasing circulation again aggravates the problems of selling advertising space, so that finally the smaller newspaper will have to close down" (Gustafsson (1978, p. 1).

The problem posed by the circulation spiral is akin to the problems raised by the "network goods", which are produced and exchanged in several industries, and which have recently attracted the interest of several industrial economists (Katz and Shapiro (1994)). In a recent paper, Gabszewicz, Laussel and Sonnac (2002) analyse the network effects which can occur between two different industries, taking as an example the specific interaction observed between the *media* and *advertising* markets. To illustrate, consider the market for printed media.The profits of the editors operating in this market clearly depend on the size of advertising demand: the editors sell some fraction of their newsprints' surface to the advertisers and the larger the demand for advertising, the higher the share of advertising revenue in their total profits (the remaining share comes from the sales of the printed media to the readership). On the other hand, even if the attitude of media consumers toward advertising cannot be unambiguously ascertained, it is widely recognised that the readership is not neutral to the quantity of advertising contained in the media. It seems that the effective readership of the printed media industry is made of a mixture of readers who, for some of them, share a positive perception of press advertising while the remaining ones support the opposite view[2]. Then the utility of the readers is, positively or negatively, related to the size of advertising demand, revealing thereby the existence of *network effects* between the printed media and the advertising markets from the viewpoint of the readership as well. Thus the utility of all operators in the printed media market, editors and readers, depends on the

[2] Judgements about readers' attitudes toward printed media advertising are not unanimous. Some scientists think that advertising fosters the circulation of newspapers while others believe that it slows it down (see Blair and Romano (1993), Gustafsson(1978) or Rosse (1980) for the first viewpoint, or Musnick(1999) and Sonnac (2000) for the second).

size of demand in the advertising industry. Now remark that, conversely, *the utility of the advertisers in the latter industry depends as well on the size of demand in the former.* It is clear, indeed, that the larger the readership of a printed media, the higher the willingness to pay of an advertiser for inserting an ad in this media: the impact of the advertising message increases with the size of the audience ! In conclusion, there exist *two-sided* network effects between the printed media and advertising industries: the size of demand in the advertising industry influences the utility of the operators (editors and readers) in the press industry, and the size of demand in the press industry influences the utility of the operators in the advertising market.

In the paper referred to above, the authors consider an editor who is a monopolist both in the press and advertising markets.Taking into account the interaction between these two markets as described above, they characterise the monopoly solution on each of these markets in terms of the two monopolist's instruments: the price of the newspaper and the advertising rate. In the present paper, we extend this analysis to a situation of competition, now involving two editors competing in both the newspapers' and advertising markets. To identify the consequences of this competition, we analyse a two-period sequential game whose players are the editors each selling a differentiated newspaper, like newspapers of different political content. We characterise the equilibria and explore how they depend on the number of ad-avoiders and ad-lovers, and on the intensity of readers' attraction or repulsion feelings for advertising.

Our main finding is that equilibria are often observed in the sequential game, at which one of the editors prevents the entry of his rival and fully monopolises both the press and advertising markets. These appear to be the "natural" equilibria to be expected when readers have strong ad-attraction feelings, as explicitely assumed by Furhoff (1973) in his own heuristic explanation of the "circulation spiral". Moreover, when full monopoly is not observed at equilibrium, asymmetric outcomes must be expected in the advertising and newsprint markets, as a result of the asymmetry in beliefs concerning the advertising volumes sold by the editors to advertisers. These asymmetric outcomes are characterised by the fact that the editor who is expected to sell more advertising has higher prices and larger market shares in both markets. The existence of such equilibria could accordingly give a strong theoretical support to the assertion that the financial dependence of the press industry on advertising would constitute one of the major vectors of concentration in this industry. In the next section, we present the model; the following one is devoted to the equilibrium analysis. We end up with a short conclusion.

2 The model

Consider two editors producing differentiated newspapers or magazines(for instance, magazines of different political opinion) to a population of readers ranked, between the political opinions expressed in the newspapers, from the left to the right on the political spectrum $[0,1]$. Newspaper 1 is located on this spectrum at point 0, while editor 2 is located at point 1. Editors also sell some proportion of their newspaper's surface to advertisers who buy it to promote the sales of their products. At each point t of the unit interval $[0,1]$,there corresponds a continuum $[0,1]$ of readers, with a proportion γ of them being *advertising-avoiders* and a proportion $1-\gamma$ being *advertising-lovers*. By this we mean that the advertising-avoiders (resp. lovers) loose (resp. gain) in utility when the surface devoted to advertising spots increases: the larger the surface of a newspaper sold to advertisers, the larger the loss (resp. gain) in utility incurred when reading that newspaper. More precisely, for a reader located at a distance t (resp. $1-t$) of the left newspaper who belongs to the proportion γ of advertising-avoiders, total loss in utility when buying this newspaper is measured by

$$t^2 + \beta d_1 + p_1, \beta > 0$$

(total loss in utility when buying newspaper 2: $(1-t)^2 + d_2 + p_2$), when editor 1 (resp. editor 2) quotes a price p_1 (resp. p_2) for his newspaper and sells a proportion d_1 (resp. d_2) of it to advertisers. Similarly, for a reader located at a distance t (resp. $1-t$) of the left newspaper who belongs to the proportion $1-\gamma$ of advertising-lovers, total loss in utility when buying this newspaper is now measured by

$$t^2 - \beta d_1 + p_1$$

(total loss in utility when buying newspaper 2: $(1-t)^2 - \beta d_2 + p_2$), when editor 1 (resp. editor 2) quotes a price p_1 (resp. p_2) and sells a proportion

x_1 (resp. x_2) of the newspaper' s surface to advertisers. Consequently, the reader t_α for which the equality

$$t^2 + \beta d_1 + p_1 = (1-t)^2 + \beta d_2 + p_2$$

holds, ie

$$t_\alpha = \frac{1}{2} - \frac{\beta}{2}(d_1 - d_2) + \frac{1}{2}(p_2 - p_1),$$

separates those types of ad-avoiders who buy their newpaper from editor 1 from those who buy it from editor 2. Similarly, the reader t_λ for which the equality

$$t^2 - \beta d_1 + p_1 = (1-t)^2 - \beta d_2 + p_2$$

holds, i.e.

$$t_\lambda = \frac{1}{2} + \frac{\beta}{2}(d_1 - d_2) + \frac{1}{2}(p_2 - p_1)$$

separates those types of ad-lovers who buy their newspaper from editor 1 from those who buy it from editor 2. We observe that

$$\begin{aligned} t_\alpha &\leq t_\lambda \Leftrightarrow d_1 \geq d_2 \\ t_\lambda - t_\alpha &= \beta(d_1 - d_2). \end{aligned}$$

The parameter β measures the intensity of *ad-attraction* when a reader is ad-lover while it measures his intensity of *ad-repulsion* when he is ad-averse.[3].

In order to illustrate the resulting demand functions in the press industry, assume that $d_1 > d_2$. Then $t_\alpha \leq t_\lambda$: all readers at the left of t_α buy newspaper 1, whether being ad-avoiders or ad-lovers; all those at the right of $1 - t_\lambda$ buy from editor 2, while those between t_α and t_λ who are ad-lovers buy news 1 and those who are ad-avoiders buy in this sub-interval newspaper 2 (see Figure 1).

[3]In order to limit the number of parameters, we have assumed that the intensities of ad-attraction and ad-repulsion feelings are the same.There would be no difficulty to extend the analysis by assuming different intensity feelings for ad-lovers and ad-avoiders. Similarly, we have assumed that no fraction of the population of readers is *ad-neutral,* which would imply that $\beta = O$ for such readers. Introducing such a fraction of ad-neutral readers should not complicate the analysis either.

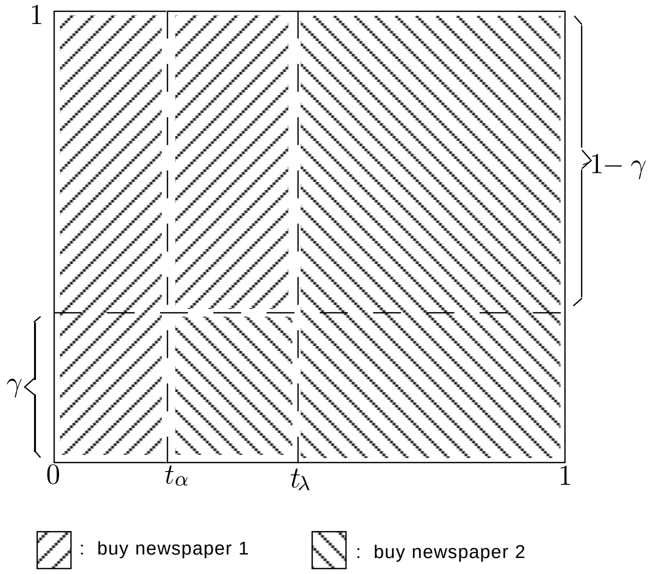

Figure 1: The monopoly demand at price p

Accordingly, when $d_1 > d_2$, and assuming that both firms have a strictly positive market share, the corresponding demand functions in the newsstand sales market are, respectively, for editor 1

$$D_1(p_1, p_2, d_1, d_2) = \frac{1}{2} + \frac{1}{2}(p_2 - p_1) + \frac{\beta}{2}(1 - 2\gamma)(d_1 - d_2)$$

and

$$D_2(p_1, p_2, d_1, d_2) = \frac{1}{2} + \frac{1}{2}(p_1 - p_2) + \frac{\beta}{2}(1 - 2\gamma)(d_2 - d_1)$$

for editor 2. More generally, defining k by $k = \frac{\beta}{3}(1-2\gamma)$, the demand function of editor i , $i = 1, 2$, in the press industry writes as

$$D_i(p_1, p_2, d_1, d_2) = 0$$

when $p_i \geq 1 + p_j + 3k(d_i - d_j)$;

$$D_i(p_1, p_2, d_1, d_2) = \frac{1}{2} + \frac{1}{2}(p_i - p_j) + \frac{3k}{2}(d_i - d_j) \qquad (1)$$

when $p_j - 1 + 3k(d_i - d_j) \geq p_i \geq 1 + p_j + 3k(d_i - d_j)$; and

$$D_i(p_1, p_2, d_1, d_2) = 1$$

when $1 + p_j + 3k(d_i - d_j) \geq p_i \geq 0$.

The difference $(d_i - d_j)$ between the advertising volumes accepted by the editors, whether positive or negative, plays a crucial role in the determination of demands in the newspapers' market: at equal prices, the editor with the larger advertising volume benefits from a larger demand in this market if, and only if, $\gamma < \frac{1}{2}$, that is, if, and only if, the majority of the readership's population is ad-lover. This simply expresses the fact that, if the majority of the readers' population is ad-lover, its members perceive, at equal prices, the newspaper with the larger advertising surface as being more attractive than the other.

Total revenues of the editors are not accruing only from their sales in the readership's market, or from their *editorial* revenues. Total revenue also includes *advertising* revenue, which comes from their sales of advertising space to advertisers[4]. Consequently, we must also develop a model of the advertising market to analyse demand of advertising space as a function of the advertising rates opposed by the editors in this market. We denote by s_1 and s_2 the unit price of an ad opposed to advertisers by editor 1 and editor 2, respectively. The population of advertisers is represented by the unit interval $[0, 1]$; they are ranked in this interval by order of increasing willingness to pay for an ad. Each advertiser θ, $\theta \in [0, 1]$, buys an ad in one of the two newspapers, at the exclusion of the other (ads are indivisible). We assume that the utility of advertiser θ depends on the size of the readership of each newspaper: the utility of inserting an ad in newspaper i increases proportionately to the size of the readership. More precisely, we suppose that the utility of buying an ad in newspaper i at a tariff s_i is given by

$$U_i(\theta) = D_i\theta - s_i,$$

where D_i corresponds to the readership of editor i, as obtained from the market demand D_i in the newsstand sales market. Consequently, if a proportion d_i of the advertisers' population buys their ad in newspaper i, the editor i' s total revenue $R_i$writes as

$$R_i(p_1, p_2, s_1, s_2) = p_i D_i(p_1, p_2, d_1, d_2) + s_i d_{i.} \tag{2}$$

[4]Here we find the main difference between the press industry and other medias industries, like television or radio broadcasting. Excluding the "pay-per-view" phenomenon, TV or radio broadcasting are free of charge for the listeners or TV-viewers, so that the only receipts of the stations are advertising receipts.

$i = 1, 2$.

In order to solve the problem of determining newspapers'prices at the newsstand, as well as advertising rates, we consider a two-period sequential game played between the editors. In period 1, they select newsstand prices $p_1(d_1^a, d_2^a)$ and $p_2(d_1^a, d_2^a)$ conditional on the expected volumes d_1^a and d_2^a of advertising which will be determined in period 2. Payoffs in the first-period game depend on the expectations of the editors and the readers about the difference $d_i^a - d_j^a$ between the advertising volumes sold by the editors in the second period. More precisely, these payoffs are given by (2) with $d_i - d_j = d_i^a - d_j^a$.

In period 2, strategies are the advertising prices s_1 and s_2[5]. Entering in this second period, prices p_1 and p_2 have been selected in period 1 determining readerships' sizes $D_i(p_1, p_2) = D_i$. Then the advertiser $\theta(s_1, s_2)$ who is indifferent between buying an ad in newspaper 1 or newspaper 2 at rates s_1 and s_2 is identified by the condition

$$D_1\theta - s_1 = D_2\theta - s_2$$

or

$$\theta(s_1, s_2) = \frac{s_1 - s_2}{D_1 - D_2}.$$

Similarly, the advertiser $\theta(s_i)$ who is indifferent between buying an ad in newspaper i or not buying at all is identified by the condition

$$\theta(s_i) = \frac{s_i}{D_i}.$$

Accordingly, when $D_1 > D_2$, the advertising demand functions in the second period are given by

$$d_1(s_{1,}s_2) = 1 - \frac{s_1 - s_2}{D_1 - D_2}$$

for editor 1, and by

$$d_2(s_{1,}s_2) = \frac{s_1 - s_2}{D_1 - D_2} - \frac{s_2}{D_2}$$

[5]We have assumed this sequentiality in the strategic interaction between the editors because advertisers cannot decide from which editor to buy advertising space without knowing beforehand the size of their respective readership. Since this size is determined through newspapers' prices, these have to be selected before the advertising tariffs.

for editor 2. When $D_2 > D_1$, these demand functions have to be reversed since editor 2 is now market leader in the advertising market, namely

$$d_1(s_1,s_2) = \frac{s_2 - s_1}{D_2 - D_1} - \frac{s_1}{D_1}$$

for editor 1 and

$$d_2(s_1,s_2) = 1 - \frac{s_2 - s_1}{D_2 - D_1}$$

for editor 2.[6] When $D_1 = D_2 = D$, the newspapers offer to the advertisers a homogeneous good. The editor i who sets the lower price captures all the market, i.e.

$$d_i(s_1,s_2) = 1 - \frac{s_i}{D}, \text{ iff } s_i < s_j$$

while

$$d_1(s_1,s_2) + d_2(s_1,s_2) = 1 - \frac{s}{D}, \; d_i \geq 0, \; i = 1,2, \text{ iff } s_1 = s_2 = s.$$

The resulting payoffs V_i in the second period game are accordingly

$$\begin{aligned} V_1(s_1, s_2) &= s_1(1 - \frac{s_1 - s_2}{D_1 - D_2}) \\ V_2(s_1, s_2) &= s_2(\frac{s_1 - s_2}{D_1 - D_2} - \frac{s_2}{D_2}) \end{aligned} \quad (3)$$

when $D_1 > D_2$,

$$\begin{aligned} V_1(s_1, s_2) &= s_1(\frac{s_2 - s_1}{D_2 - D_1} - \frac{s_1}{D_1}) \\ V_2(s_1, s_2) &= s_2(1 - \frac{s_2 - s_1}{D_2 - D_1}) \end{aligned} \quad (4)$$

when $D_2 > D_1$ and

$$\begin{aligned} V_i(s_1, s_2) &= s_i(1 - \frac{s_i}{D_i}) \text{ and } V_j(s_1, s_2) = 0 \text{ if } s_i < s_j \\ \sum_{i=1}^{2} V_i(s_1, s_2) &= s_i(1 - \frac{s_i}{D_i}), \; V_i(s_1, s_2) \geq 0 \text{ if } s_i = s_j \end{aligned} \quad (5)$$

[6] These demand functions are those of a vertical differentiation model in which the editor enjoying the larger demand in the press industry sells the high quality product to the advertisers; see Mussa and Rosen (1979).

when $D_1 = D_2$.

We define an equilibrium for the above two- period game in the following way. An *equilibrium* is a pair of strategies $[p_1^*(d_1^a, d_2^a), p_2^*(d_1^a, d_2^a)]$ in period 1 and a pair of strategies $[s_1^*, s_2^*]$ in period 2 such that

(i) $p_1^*(d_1^a, d_2^a)$ and $p_2^*(d_1^a, d_2^a)$ are mutual best replies, conditional on expectations about the difference $d_1^a - d_2^a$, with payoffs given by (2);

(ii)(s_1^*, s_2^*) are mutual best replies in the second period game, with payoffs given by (3) or (4) according as $D_1(p_1^*(d_1^a, d_2^a), p_2^*(d_1^a, d_2^a)) \gtrless D_2(p_1^*(d_1^a, d_2^a), p_2^*(d_1^a, d_2^a))$;

(iii) $d_i(s_1^*, s_2^*) = d_i^a, i = 1, 2$.

An informal description of the above notion of equilibrium is as follows. In period 1, editors' pricing decisions in the news' market are based upon editors'*expected advertising market shares.* Conditional on these expectations, a price equilibrium occurs in period 1, with the payoffs of the game defined according to these expectations (condition (i)). Then, in the second period, an equilibrium in advertising rates takes place, in which advertisers use, when evaluating their utilities, the *effective* editors' market shares D_i resulting from the price equilibrium in period 1 (condition (ii)). Finally, condition (iii) requires that *first-period expectations are fulfilled at equilibrium in the second period.*

Before proceeding to the equilibrium analysis of the above two-period game, we list the following properties of the payoff functions defined by (2):

1. the derivative $\frac{\partial R_i}{\partial p_i}$ is strictly positive for all values of p_i such that $D_i(p_1, p_2, d_1, d_2) = 1, i = 1, 2$;
2. the derivative $\frac{\partial R_i}{\partial p_i}$ is equal to 0 when $D_i(p_1, p_2, d_1, d_2) = 0, i = 1, 2$;
3. for all values of p_i such that the right-hand side of (1) belongs to $[0, 1]$:

$$\frac{\partial R_i}{\partial p_i} = \frac{1}{2}(1 + p_j - 2p_i) + \frac{3k}{2}(d_i - d_j). \tag{6}$$

3 Equilibrium Analysis

To identify the equilibria of the two-period game defined above, let us start by examining which are the pairs of prices $[p_1^*(d_1^a, d_2^a), p_2^*(d_1^a, d_2^a)]$ fulfilling condition(i) required by the definition of an equilibrium. Since we have necessarly $D_1(d_1^a, d_2^a) + D_2(d_1^a, d_2^a) = 1$, only three possible cases have to be considered[7]: either at equilibrium $D_1(d_1^a, d_2^a) > 0$ and $D_2(d_1^a, d_2^a) > 0$ is observed, or $D_1(d_1^a, d_2^a) = 1$ and $D_2(d_1^a, d_2^a) = 0$, or $D_1(d_1^a, d_2^a) = 0$ and $D_2(d_1^a, d_2^a) = 1$. First we identify when there exists a pair $[p_1^*(d_1^a, d_2^a), p_2^*(d_1^a, d_2^a)]$ fulfilling condition(i) required by the definition of an equilibrium, at which both editors have a strictly positive market share in the newspapers' market.

Lemma 1 *When $k > 0$,under expectations (d_1^a, d_2^a) satisfying*

$$-1 < k(d_1^a - d_2^a) < 1, \tag{7}$$

the pair of prices

$$\begin{aligned} p_1^*(d_1^a, d_2^a) &= 1 + k(d_1^a - d_2^a) \\ p_2^*(d_1^a, d_2^a) &= 1 - k(d_1^a - d_2^a) \end{aligned} \tag{8}$$

fulfills condition (i) required by the definition of an equilibrium. Furthermore, under (7), $D_1(d_1^a, d_2^a) > 0$, $D_2(d_1^a, d_2^a) > 0$ and

$$D_1(d_1^a, d_2^a) \gtreqless D_2(d_1^a, d_2^a) \Longleftrightarrow d_1^a - d_2^a \gtreqless 0;$$

finally,

$$D_1(d_1^a, d_2^a) = D_2(d_1^a, d_2^a) = \frac{1}{2}$$

when $d_1^a - d_2^a = 0$.

(the proof of lemma 1 is provided in the appendix).

The pair of prices in lemma 1 is not the only possible one to satisfy the condition (i) to be satisfied at an equilibrium. At the pair of prices identified by (8), both editors enjoy a strictly positive market share in the newspapers'market when assumption (7) holds. Now we establish that, under

[7]The notation $D_i(d_1^a, d_2^a)$ represents the value of the demand function D_i at prices $p_i^*(d_1^a, d_2^a)$, $i = 1, 2$.

the alternative condition $k(d_1^a - d_2^a) \geq 1$, another pair of prices satisfies condition (i) as well; at this pair of prices, editor 1 expels editor 2 from the newspapers'market.

Lemma 2 *When $k > 0$,under expectations (d_1^a, d_2^a) satisfying*

$$k(d_1^a - d_2^a) \geq 1, \tag{9}$$

the pair of prices

$$\begin{aligned} p_1^*(d_1^a, d_2^a) &= -1 + 3k(d_1^a - d_2^a) \\ p_2^*(d_1^a, d_2^a) &= 0 \end{aligned} \tag{10}$$

fulfills condition (i) required by the definition of an equilibrium. Furthermore, under (9),

$$D_1(d_1^a, d_2^a) = 1, D_2(d_1^a, d_2^a) = 0 \Longleftrightarrow d_1^a - d_2^a > 0.$$

Finally, using the same type of argument, it can also be shown that

Lemma 3 *When $k > 0$,under expectations (d_1^a, d_2^a) satisfying*

$$k(d_1^a - d_2^a) \leq -1, \tag{11}$$

the pair of prices

$$\begin{aligned} p_1^*(d_1^a, d_2^a) &= 0 \\ p_2^*(d_1^a, d_2^a) &= -1 - 3k(d_1^a - d_2^a) \end{aligned} \tag{12}$$

fulfills condition (i) required by the definition of an equilibrium. Furthermore

$$D_1(d_1^a, d_2^a) = 1, D_2(d_1^a, d_2^a) = 0 \Longleftrightarrow d_1^a - d_2^a < 0.$$

It is important to stress the fact that, even if the pairs of prices defined by (8), (10) and (12) all fulfill condition (i) required by the definition of an equilibrium, *they can never do it simultaneously* : indeed, it is easily checked that the parametric values for which these pairs of prices meet condition (i) are mutually exclusive (compare (7), (9) and (11)).

Now let us study which values of the advertising tariffs s_1^* and s_2^* can meet condition (ii) required by the definition of an equilibrium. Since the strategies s_1^* and s_2^* must be mutual best replies in the second period game, with payoffs given by (3), (4) or (5) according as $D_1 \gtrless D_2$, or $D_1 = D_2$, we have to consider the following five mutually exclusive alternatives: D_1=D_2, $D_1 > D_2 > 0$, $D_2 > D_1 > 0$; $D_1 = 1, D_2 = 0$, and $D_1 = 0, D_2 = 1$: in the first three alternatives, both editors have a strictly positive market share in the readership's market at the end of period 1 (no eviction case) while, in the remaining ones, one editor has excluded his rival from this market when entering in period 2 (eviction case). For the no-eviction case, we study which values of the advertising tariffs s_1^* and s_2^* meet condition (ii) when $D_1 > D_2 > 0$; a similar analysis applies when $D_2 > D_1 > 0$.

So assume $D_1 > D_2 > 0$. Then payoffs in the second period game are given by (3). Maximising these payoffs with respect to s_1 and s_2, respectively, yields the first-order conditions

$$\begin{aligned}\frac{\partial V_1}{\partial s_1} &= 1 - \frac{2s_1 - s_2}{D_1 - D_2} = 0\\ \frac{\partial V_2}{\partial s_2} &= \frac{s_1 - 2s_2}{D_1 - D_2} - \frac{2s_2}{D_2} = 0.\end{aligned}$$

These first-order conditions are not only necessary, but also sufficient because the function V_i is strictly concave in $s_i, i = 1, 2$. From these conditions we obtain that the only values s_1^* and s_2^* which meet condition (ii) when $D_1 > D_2 > 0$ are

$$\begin{aligned}s_1^*(D_1, D_2) &= \frac{2D_1(D_1 - D_2)}{4D_1 - D_2}\\ s_2^*(D_1, D_2) &= \frac{D_2(D_1 - D_2)}{4D_1 - D_2},\end{aligned} \tag{13}$$

with corresponding demands in the advertising markets

$$\begin{aligned}d_1(s_1^*(D_1, D_2), s_2^*(D_1, D_2)) &= \frac{2D_1}{4D_1 - D_2}\\ d_2(s_1^*(D_1, D_2), s_2^*(D_1, D_2)) &= \frac{D_1}{4D_1 - D_2},\end{aligned}$$

which entails

$$d_1(s_1^*(D_1, D_2), s_2^*(D_1, D_2)) - d_2(s_1^*(D_1, D_2), s_2^*(D_1, D_2)) = \frac{D_1}{4D_1 - D_2}. \tag{14}$$

Consequently, when $D_1 > D_2 > 0$, condition (i) and (ii) are simultaneously fulfilled, – as required at equilibrium –, if, and only if, the prices in the readership's market are those in (8), with corresponding demands given by (A.1) (see appendix), and the advertising tariffs are those satisfying the equalities (13). Accordingly, substituting (13) into (A.1), we get the system

$$\begin{aligned} D_1 &= \frac{1}{2}(1 + \frac{kD_1}{4D_1 - D_2}) \\ D_2 &= \frac{1}{2}(1 - \frac{kD_1}{4D_1 - D_2}). \end{aligned} \tag{15}$$

It is possible to spell out the explicit values of newspapers'prices and advertising tariffs at equilibrium when $D_1 > D_2 > 0$ by solving the system (15); this is done in appendix. It can be checked that these equilibrium values satisfy the conditions $D_1 > D_2 > 0$, if, and only if, $0 < \frac{\beta}{3}(1 - 2\gamma) = k < 4$, where the first inequality requires that $\gamma < \frac{1}{2}$ (the majority of the population is ad-lover)[8]. Accordingly, we conclude that, under these necessary and sufficient conditions, the pair of newspapers'prices in (A.7) (see appendix) and advertising tariffs in (A.8) (see appendix) form an equilibrium when expectations about market shares in the advertising market satisfy $d_1^a - d_2^a > 0$. Of course, by the same reasoning, it is possible to show that there exists another equilibrium, which mirrors the above one, when starting with the assumption $D_2 > D_1 > 0$ or, equivalently, whenever expectations about market shares in the advertising market satisfy $d_1^a - d_2^a < 0$.

Now we consider the eviction case. We start by assuming $D_1 = 1, D_2 = 0$; a similar analysis applies in the case $D_2 = 1, D_1 = 0$. Since, entering in period 2, editor 2 has a zero market share in the readership's market, advertisers get no utility from buying ads in his magazine so that editor 1 is a monopolist in the advertising market, i.e.

$$\begin{aligned} d_1(s_1,s_2) &= 1 - \frac{s_1}{D_1} \\ d_2(s_1,s_2) &= 0 \end{aligned}$$

With $D_1 = 1$, the advertising revenue of editor 1 is equal to

$$V_1(s_1) = s_1(1 - s_1).$$

[8]Notice that both pairs of prices are positive when $k < 4$.

Maximising this payoff with respect to s_1 yields

$$s_1^* = \frac{1}{2}$$

and, accordingly,

$$d_1(s_1^*) = \frac{1}{2},$$

so that

$$d_1(s_1^*) - d_2(s_1^*) = \frac{1}{2}.$$

On the other hand, we know from (3.3) in lemma 2 that $D_1 = 1$ if, and only if,

$$k(d_1^a - d_2^a) \geq 1$$

a condition which is satisfied if, and only if, $\frac{k}{2} \geq 1$. Consequently, we conclude that, under this condition, there exists an equilibrium with newspapers' prices given by

$$\begin{aligned} p_1^* &= -1 + \frac{3k}{2} \\ p_2^* &= 0 \end{aligned}$$

(see (9) and an advertising rate $s_1^* = \frac{1}{2}$. At this equilibrium, editor 1 is a monopolist both in the press and advertising industries. Of course, using a similar argument, but starting from the assumption that $D_2 = 1$ and $D_1 = 0$, we would conclude that there exists an equilibrium which mirrors the preceding one under the condition (11) on expectations, with prices in the newspapers' market given by

$$\begin{aligned} p_1^* &= 0 \\ p_2^* &= -1 + \frac{3k}{2}, \end{aligned}$$

and advertising rate $s_2^* = \frac{1}{2}$,firm 2 being a monopolist in both markets, and which exists if, and only if,$-\frac{k}{2} \geq 1$.

Finally, it remains to examine the symmetric case which obtains when $d_1^a - d_2^a = 0$. We have seen that, with such expectations, the prices in the the first period game are given by

$$p_1^*(d_1^a, d_2^a) = p_2^*(d_1^a, d_2^a) = 1,$$

leading to market shares

$$D_1(p_1^*(d_1^a, d_2^a), p_2^*(d_1^a, d_2^a)) = D_2(p_1^*(d_1^a, d_2^a), p_2^*(d_1^a, d_2^a)) = \frac{1}{2}$$

in the editors' market. Then, in the advertising market, all advertisers are indifferent between buying an ad from editor 1 or from editor 2. This entails Bertrand competition in the advertising market which, in turn, yields equilibrium advertising tariffs $s_1^* = s_2^* = 0$, and market shares $d_1(s_1^*, s_2^*) = d_2(s_1^*, s_2^*)$. Consequently, the values

$$\begin{aligned} p_1^* &= p_2^* = 1 \\ s_1^* &= s_2^* = 0. \end{aligned} \tag{16}$$

also constitute an equilibrium with symmetric expectations. Notice that the last argument showing that, with symmetric expectations, the set of values given by (16) constitutes an equilibrium, is valid whatever the value of the parameter γ. Consequently, contrary to the other equilibria which were identified above, it applies as well for the case in which $\gamma > \frac{1}{2}$, namely, when a majority of the population is ad-averse. We shall summarise the above equilibrium analysis in the following

Proposition 1:

(i) When $\gamma < \frac{1}{2}$ and $k = \frac{\beta}{3}(1 - 2\gamma) < 4$, there exist two asymmetric equilibria, i.e. equilibria corresponding to asymmetric expectations in period 1 about editors' market shares in the advertising market, with both editors enjoying strictly positive market shares in the readership's and in the advertising markets; the editor who is expected to sell more advertising has higher prices and larger market shares in both markets (no-eviction case).

(ii) Furthermore, when $\gamma < \frac{1}{2}$ and $2 \leq k = \frac{\beta}{3}(1-2\gamma)$, there exist two other equilibria at which one of the editors evicts his rival from both markets; the editor who evicts the other is the one who is expected to sell more advertising (eviction case).

Proposition 2:

Whatever the value of γ in $[0, 1]$, there exists a symmetric equilibrium, i.e. an equilibrium corresponding to symmetric expectations, with prices and market shares equal in both markets.

Proposition 1 is interesting because it reveals, in the case of ad-attraction, the existence of equilibria which correspond exactly to the limit point of the market dynamics imagined by Furhoff and observed by Gustafsson (1978) in the Swedish press industry or Le Floch (1996) in the french regional press. In case of significant ad-attraction (large value of the ad-attraction parameter β and/or small value of γ),the editor who is expected to sell a larger number of ads makes his own magazine more attractive to the readership than the one proposed by his rival. The more ads the former inserts, the more he reinforces its attractiveness, setting in motion the circulation spiral which leads to the eviction of the rival from both the readership's and advertising markets[9]. The two other asymmetric equilibria, even if they also exist for large values of the ad-attraction parameter, seem to correspond better to situations where competition operates in a context of weaker ad-attraction. Then concentration in the press industry should probably not be expected as a consequence of advertising since, in spite of the asymmetry of beliefs, both editors keep at these equilibria a strictly positive market share in the press industry. Nonetheless, the initial asymmetry of beliefs about advertising market' shares makes the editor with the larger expected share the leader in both industries since he sells more in both, and at higher prices. Finally, symmetric expectations about advertising market shares makes the game itself totally symmetric: then, it is not surprising, and true for *all* values of γ, that the corresponding equilibrium is itself symmetric (proposition 2). In particular, in this case, both advertising rates are equal to zero due to the supposed absence of advertising costs. With positive marginal cost, Bertrand competition would have driven down advertising rates to marginal cost. In any case, editors' profits are equal to zero at equilibrium in the advertising market when beliefs are symmetric. Also the smallest deviation from perfectly symmetric expectations renders extremely weak the probability of observing the symmetric outcome at equilibrium. To conclude our comments about the above propositions, it is also important to stress the fact that it is only in the case of ad-attraction that the asymmetric equilibria exist: only the symmetric one still survives under ad-repulsion.

[9]This informal argument suggests that, in the ad-attraction case, the symmetric equilibrium is never stable with respect to some dynamic tâtonnement process. We conjecture that the (locally) stable equilibria are the two interior asymmetric equilibria when $k < 2$ and the two corner equilibria when $k \geq 4$.

A natural question then arises: what happens in the case of asymmetric expectations and ad-repulsion ($\gamma > \frac{1}{2}$) ? Straightforwardly, it follows from the above equilibrium analysis that, ad-repulsion, combined with asymmetric expectations, destroys the very existence of an equilibrium. However, a new strategic option starts to become plausible for the editors, especially in the case of a significant ad-repulsion: is not it purely and simply more advantageous for them to withdraw from the advertising market, rather than compete with the rival ? The plausibility of this outside option comes from the fact that, with a significant ad-repulsion, the introduction of ads in the newspaper drastically reduces the market share in the press industry and the resulting loss can more than offset the gains obtained from advertising revenues. Since no equilibrium exists with ad-repulsion and asymmetric beliefs, we study this problem in the case of symmetric beliefs, namely when $d_1^a = d_2^a$. In this case, even if no advertising revenue accrues to the editors since advertising rates are equal to zero, there exists an equilibrium, and we can accordingly evaluate precisely what would be the advantage an editor could obtain from deviating from this equilibrium and exerting his outside option, rather than competing with his rival in the advertising market.

Thus, suppose that ad-repulsion is observed, namely, $\gamma > \frac{1}{2}$, which in turn implies $k = \frac{\beta}{3}(1 - 2\gamma) < 0$. Suppose also that one editor, say editor 1, credibly commits himself to withdraw from the advertising market. Then editor 2 is a monopolist in this market and sets a price $s_2 = \frac{D_2}{2}$ generating a market demand d_2 equal to $\frac{1}{2}$. Substituting this value in the demand and equilibrium price functions of the readers' market, we obtain

$$\begin{aligned} D_1^* &= \frac{1}{2}(1 - \frac{1}{2}k) \\ D_2^* &= \frac{1}{2}(1 + \frac{1}{2}k) \end{aligned}$$

and

$$\begin{aligned} p_1^* &= (1 - \frac{1}{2}k) \\ p_2^* &= (1 + \frac{1}{2}k) \end{aligned}$$

when $-2 < k$. Accordingly, in this case, editors'revenues write as

$$R_1(p_1^*, p_2^*, s_1^*, s_2^*) = \frac{1}{2}(1 - \frac{1}{2}k)^2$$

$$R_2(p_1^*, p_2^*, s_1^*, s_2^*) = \frac{1}{8}k^2 + \frac{5}{8}k + \frac{3}{4}.$$

In the opposite case ($k \leq -2 < 0$), editor 1 evicts his rival at equilibrium ($D_1^* = 1$, $D_2^* = 0$), equilibrium prices are $p_1^* = 1$, $p_2^* = 0$, and editors' revenues write as

$$\begin{aligned} R_1(p_1^*, p_2^*, s_1^*, s_2^*) &= 1 \\ R_2(p_1^*, p_2^*, s_1^*, s_2^*) &= 0. \end{aligned}$$

The revenues we have just identified should now be compared with those obtained by the editors when either both simultaneously decide to advertise, or to exert their outside option. In the first alternative, we know that, at equilibrium, we have

$$p_1^* = p_2^* = 1$$

and

$$s_1^* = s_2^* = 0$$

leading to equilibrium revenues

$$R_i(p_1^*, p_2^*, s_1^*, s_2^*) = \frac{1}{2}.$$

In the second alternative, in which neither editor accepts ads in his magazine, the advertising market disappears and only the readers' market survives. It is immediate to check that, in this market, the sole price equilibrium is then given by

$$p_1^* = p_2^* = 1$$

with corresponding market shares $D_i^* = \frac{1}{2}$ and revenues $R_i(p_1^*, p_2^*) = \frac{1}{2}, i = 1, 2$.

Accordingly, we obtain the following bi-matrix game, with two strategies for each editor: "Advertise (A) -Not advertise (NA)" and corresponding payoffs

	A	NA
A	$\frac{1}{2}, \frac{1}{2}$	$\frac{1}{8}k^2 + \frac{5}{8}k + \frac{3}{4}, \frac{1}{2}(1 - \frac{1}{2}k)^2$
NA	$\frac{1}{2}(1 - \frac{1}{2}k)^2, \frac{1}{8}k^2 + \frac{5}{8}k + \frac{3}{4}$	$\frac{1}{2}, \frac{1}{2}$

when $k > -2$, and

	A	NA
A	$\frac{1}{2}, \frac{1}{2}$	$0, 1$
NA	$1, 0$	$\frac{1}{2}, \frac{1}{2}$

when $k \leq -2$. Notice that, since $k < 0$, we have $\frac{1}{2}(1 - \frac{1}{2}k)^2 > \frac{1}{2}$, so that the pair of strategies (A, A) can, in neither case, be a Nash equilibrium of the corresponding bi-matrix game. Furthermore, it easy to check that

$$\frac{1}{8}k^2 + \frac{5}{8}k + \frac{3}{4} \geq \frac{1}{2} \text{if, and only if, } k \in \left[-\frac{5}{2} - \frac{\sqrt{17}}{2}, -\frac{5}{2} + \frac{\sqrt{17}}{2}\right].$$

Notice that the value -2 belongs to the interval $\left[-\frac{5}{2} - \frac{\sqrt{17}}{2}, -\frac{5}{2} + \frac{\sqrt{17}}{2}\right]$. Thus we conclude that

Proposition 3:

(i) When $-\frac{5}{2} + \frac{\sqrt{17}}{2} \leq k = \frac{\beta}{3}(1 - 2\gamma) < 0$, *the above bi-matrix game has two symmetric Nash equilibria at which one editor advertises while the other exerts his outside option;*

(ii) When $k = \frac{\beta}{3}(1 - 2\gamma) \leq -\frac{5}{2} + \frac{\sqrt{17}}{2} < 0$, *the unique Nash equilibrium consists of the pair of strategies at which both editors exert their outside option.*

Proposition 3 confirms, for the case of ad-repulsion, the tendency to monopoly in the advertising market which is often observed at equilibrium in the case of ad-attraction: either a single editor stays as a monopolist in the advertising market, while sharing with his rival the market for newspapers, or both editors exert their outside option, abandoning the advertising market, and share equally the newsprint industry. However, notice that, under ad-repulsion, the circulation spiral is not set in motion, as it was the case under ad-attraction: this confirms that the latter is essential to explain concentration in the press industry as a consequence of the impact of the advertising market on the economy of newspapers.

4 Conclusion

In the present paper, we have explored the possibility of explaining by a game-theoretic approach the tendency to concentration observed in the press industry, following the path proposed by the theory of the circulation spiral. Our main result is that our equilibrium analysis confirms the prediction of the latter theory when ad-attraction is observed for a majority of the readers' population: then, in most cases, eviction of one of the competitors must be expected at equilibrium. It must be observed however that our approach is purely static while the circulation spiral is based on a dynamic argument. A first natural extension of our work would thus consist in proposing a dynamic version of the model and studying the limit points of a process which copies the process underlying the circulation spiral.

Also, our model does not make justice to alternative strategic possibilities opened to the editors when threatened to be evicted from the newspapers' and advertising markets. In particular, it is natural to imagine that, in such a situation, an editor will try to differentiate more adequately his newspaper's content by specialising on a particular "niche" of readers, either geographically, or by proposing a content which is significantly correlated to the interests of a specific class of readers. In both cases, he can thereby resist to competitive rivalry and still remain attractive for the advertisers willing to advertise precisely the corresponding specific class of readers. It is true, indeed, that advertisers are not only interested in the size of the readership, but also in its intrinsic properties: this is the purpose of targeting, an advertising method aiming precisely at finding the advertising support which is the best adapted to the sale of a particular product to a particular class of consumers. What crucially matters, then, is not so much the absolute size of the readership, but rather the *penetration rate* of the advertising campaign, namely, the number of newspaper's readers who are potential buyers of the advertised product.

The threat of market eviction, which mainly affects editors with small and specialised readerships, could also be removed by cooperative agreements signed among them. According to these agreements, the editors who are in the syndicate decide together to bargain with the advertisers the advertising rates ("combination rates" or "couplages publicitaires" in french) at which ads will be simultaneously inserted in all the newspapers of its members. This arrangement appears attractive to both parties: first, to the advertisers, who benefit from access to specialised readership through all readers who are potential buyers of their product; and, then, to the editors, who are now offering a sizeable readership to the advertisers and can accordingly prevent the eviction predicted by the circulation spiral. One should hope that such forms of cooperation could guarantee the survival of newsprints which could otherwise be crushed by the circulation spiral.

5 Appendix

Proof of lemma 3.1. For all values of (p_1, p_2) such that the right-hand side of (2.1) belongs to $]0,1[$, we know from (2.5) that $\frac{\partial R_i}{\partial p_i} = \frac{1}{2}(1 + p_j - 2p_i) + \frac{3k}{2}(d_i^a - d_j^a)$. Consequently, any pair of prices fulfilling condition (i) must solve the first-order conditions

$$\frac{\partial R_i}{\partial p_i} = \frac{1}{2}(1 + p_j - 2p_i) + \frac{3k}{2}(d_i^a - d_j^a) = 0,$$

$i = 1, 2$. It follows that such a pair of prices must satisfy

$$\begin{aligned} p_1^*(d_1^a, d_2^a) &= 1 + k(d_1^a - d_2^a) \\ p_2^*(d_1^a, d_2^a) &= 1 - k(d_1^a - d_2^a) \end{aligned}$$

with corresponding demands

$$\begin{aligned} D_1(d_1^a, d_2^a) &= \frac{1}{2}(1 + k(d_1^a - d_2^a)) \\ D_2(d_1^a, d_2^a) &= \frac{1}{2}(1 - k(d_1^a - d_2^a)). \end{aligned} \tag{A.1}$$

The two inequalities $D_1(d_1^a, d_2^a) = \frac{1}{2}(1 + k(d_1^a - d_2^a)) > 0$ and $D_2(d_1^a, d_2^a) = \frac{1}{2}(1 - k(d_1^a - d_2^a)) > 0$ hold if, and only if

$$-1 < k(d_1^a - d_2^a) < 1.$$

Furthermore, we notice that, since it is assumed that $k > 0$, we must have

$$D_1(d_1^a, d_2^a) > D_2(d_1^a, d_2^a) \Longleftrightarrow d_1^a - d_2^a > 0$$

which also implies $p_1^*(d_1^a, d_2^a) > p_2^*(d_1^a, d_2^a) > 0$. On the contrary, under the same assumption, we have

$$D_2(d_1^a, d_2^a) > D_1(d_1^a, d_2^a) \Longleftrightarrow d_2^a - d_1^a > 0$$

which also implies $p_2^*(d_1^a, d_2^a) > p_1^*(d_1^a, d_2^a) > 0$. Finally, we observe that, when $d_1^a - d_2^a = 0$, we have from (3.2) that $p_1^*(d_1^a, d_2^a) = p_2^*(d_1^a, d_2^a)$, with

$$D_1(d_1^a, d_2^a) = D_2(d_1^a, d_2^a) = \frac{1}{2}.$$

Q.E.D.

Proof of lemma 3.2. Assume that there exists a pair of prices $[p_1^*(d_1^a, d_2^a), p_2^*(d_1^a, d_2^a)]$ fullfilling condition (i) required by the definition of an equilibrium, such that $D_1(d_1^a, d_2^a) = 1$ and $D_2(d_1^a, d_2^a) = 0$. This pair of prices must be robust against any unilateral deviation of editor $i, i = 1, 2$, from the corresponding price $p_i^*(d_1^a, d_2^a)$. Notice that, since $D_1(d_1^a, d_2^a) = 1$, it follows from the right-hand side of (2.1) that the equality

$$p_1^*(d_1^a, d_2^a) = p_2^*(d_1^a, d_2^a) - 1 + 3k(d_1^a - d_2^a) \tag{A.2}$$

must necessary hold. On the other hand, editor 1 should not benefit from increasing his price beyond this value, a condition which holds true if, and only if

$$p_2^*(d_1^a, d_2^a) \geq 3(1 - k(d_1^a - d_2^a)). \tag{A.3}$$

Finally, editor 2 is indifferent between all prices p_2 satisfying the inequality

$$p_2 \geq p_1^*(d_1^a, d_2^a) + 1 - 3k(d_1^a - d_2^a)$$

(remember that, at such prices, $D_2(d_1^a, d_2^a) = 0$). But editor 2 should also be prevented from using price strategies strictly smaller than this value in view of obtaining a strictly positive market share. This last condition is equivalent to

$$p_1^*(d_1^a, d_2^a) \leq -1 + 3k(d_1^a - d_2^a),$$

which, in order to be consistent with (A.2), requires that $p_2^*(d_1^a, d_2^a) = 0$. Thus, we conclude that the pair of prices

$$\begin{aligned} p_1^*(d_1^a, d_2^a) &= -1 + 3k(d_1^a - d_2^a) \\ p_2^*(d_1^a, d_2^a) &= 0, \end{aligned} \tag{A.4}$$

leading to demands $D_1(d_1^a, d_2^a) = 1$ and $D_2(d_1^a, d_2^a) = 0$ in the readership's market, also satisfies the condition (i) required by the definition of an equilibrium whenever condition (A.3) holds. Notice that, due to the fact that $p_2^*(d_1^a, d_2^a) = 0$, condition (A.3) is equivalent to

$$k(d_1^a - d_2^a) \geq 1.$$

With $k > 0$, as assumed, this condition can hold only if $d_1^a - d_2^a > 0$; it also implies that $p_1^*(d_1^a, d_2^a) \geq 0$. Q.E.D.

Equilibrium values in the case $D_1 > D_2 > 0$:

To spell out the explicit values of newspapers' prices and advertising tariffs at equilibrium, we solve the system (15)[10], i.e.

$$\begin{aligned} D_1^* &= \frac{1}{20}(7 + k + \sqrt{9 + 14k + k^2}) \\ D_2^* &= \frac{1}{20}(13 - k - \sqrt{9 + 14k + k^2}). \end{aligned} \tag{A.5}$$

Introducing (A.5) into (14), we get

$$d_1^* - d_2^* = \frac{7 + k + \sqrt{9 + 14k + k^2}}{5(3 + k + \sqrt{9 + 28k + 4k^2})}, \tag{A.6}$$

which, in turn, by substitution of (A.6) into (8), gives the newspapers' prices at equilibrium, namely

$$\begin{aligned} p_1^* &= 1 + k(\frac{7 + k + \sqrt{9 + 14k + k^2}}{5(3 + k + \sqrt{9 + 28k + 4k^2})}) \\ p_1^* &= 1 - k(\frac{7 + k + \sqrt{9 + 14k + k^2}}{5(3 + k + \sqrt{9 + 28k + 4k^2})}) \end{aligned} \tag{A.7}$$

Direct substitution of (A.5) into (13) provides the equilibrium advertising tariffs

$$\begin{aligned} s_1^* &= \frac{(-3 + k + \sqrt{9 + 14k + 4k^2})(7 + k + \sqrt{9 + 14k + k^2})}{25(3 + k + \sqrt{9 + 14k + k^2})} \\ s_2^* &= \frac{(-3 + k + \sqrt{9 + 14k + 4k^2})(13 - k + \sqrt{9 + 14k + k^2})}{50(3 + k + \sqrt{9 + 14k + k^2})}. \end{aligned} \tag{A.8}$$

---

[10]There is another solution to this system, namely

$$\begin{aligned} D_1 &= \frac{1}{20}(7 + k - \sqrt{9 + 14k + k^2}) \\ D_1 &= \frac{1}{20}(13 - k + \sqrt{9 + 14k + k^2}. \end{aligned}$$

However, these values do not correspond to an equilibrium since we have here $D_1 < D_2$, contradicting our initial assumption.

References

[1] Bagdikian B.H., (1980). Conglomerate, concentration, and the media. *Journal of Communication*, 30, 59–64.

[2] Bagdikian B.H., (1983). *The Media Monopoly.* Beacon press, Boston.

[3] Blair R. and R. E. Romano (1993). Pricing decisions of the newspaper monopolist. *Southern Economic Journal*, 54(1), April, 721–732.

[4] Bucklin R.E., R.E. Caves and A.W. Lo (1989). Games of survival in the US newspaper industry. *Applied Economics*, 21(5), 631–649.

[5] Dertouzos J.N. and W.B. Trautman (1990). Economic effects of media concentration: estimates from a model of the newspaper firm. *Journal of Industrial Economics*, 39 (1), 1–14.

[6] Engwall L., (1981). Newspaper competition: a case for theories of oligopoly. *The Scandinavian Economic History Review*, 29(2), 145–154.

[7] Furhoff L., (1973). Some reflections on newspaper concentration. *The Scandinavian Economic History Review*, 1, 1-27.

[8] Gabszewicz J., D. Laussel and N. Sonnac (2001). Press Advertising and the Ascent of the “ pensée unique ? *European Economic Review*, 45, 641–651.

[9] Gabszewicz J., D. Laussel and N. Sonnac (2002). Network effects in the press and advertising industries. Mimeo, CORE Discussion Paper, forthcoming.

[10] Gustafsson K.E., (1978). The circulation spiral and the principle of household coverage. *The Scandinavian Economic History Review*, 26(1), 1–14.

[11] Kaitatzi-Whitlock S., (1996). Pluralism and media concentration in Europe. *European Journal of Eommunication*, 11(4), 453–483.

[12] Katz M.L. and Shapiro C. (1994). Systems competition and network effects. *Journal of Economics Perspectives*, 8(2), 93–115.

[13] Le Floch P., (1997). *Economie de la presse quotidienne régionale: déterminants et conséquences de la concentration*. L'Harmattan-SPQR.

[14] Musnick I., (1999). Le cœur de cible ne porte pas la publicité dans son cœur. *CB News*, 585, 11–17 octobre, 8–10.

[15] Mussa M. and S. Rosen (1978), Monopoly and Product Quality, *Journal of Economic Theory*, 18, 301–317.

[16] Reimer E., (1992). The effects of monopolization on newspaper advertising rates. *American Economist*, 36(1), 65–70.

[17] Rosse J.N., (1967). Daily newspapers, monopolistic competition and economies of scale. *American Economic Review*, LVII (2), 522–534.

[18] Rosse J.N., (1978). The evolution of one newspaper cities. *Proceedings of the Symposium on Media Concentration, Washington D.C., Federal Trade Commission*, 429–471.

[19] Rosse J.N., (1980). The decline of direct newspaper competition. *Journal of competition*, 30, 65–71.

[20] Sonnac N., (2000). Readers' attitudes towards press advertising: are they ad-lovers or ad-averse ? *Journal of Media Economics*, 13(4), 249-259.

[21] Thompson R.S., (1984). Structure and conduct in local advertising markets: the case of Irish provincial Newspapers. *Journal of Industrial Economics*, 33, 1984, 241–250.