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CONTENT, ADVERTISING, AND CIRCULATION IN AN OPTIMIZING MODEL OF THE MEDIA FIRM

by

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ABSTRACT

The paper determines the effects of different influencing variables on the media company's optimal subscription and advertising prices and editorial content. The company maximizes profit consisting of subscription and advertising revenue, minus the costs of content, advertising, and circulation, by setting the subscription and advertising prices and the amount of editorial content. Subscription demand is a function of the subscription price, the media's editorial content, and advertising, and advertising demand a function of the advertising price and circulation. The condition for the circulation spiral to be finite is derived. It is shown that an increase in a variable or a parameter (e.g. circulation demand) causes the respective price to increase only if the demand for the other product (advertising) is elastic enough, the price declining if the other product's demand is less elastic. Moreover, the increase leads to an increase in editorial content if advertising demand is elastic, and to a decrease in the advertising price. An increase in advertising demand leads to an increase in the advertising price if subscription demand is elastic enough, and to a decrease in the subscription price and editorial content. An increase in the marginal effect of editorial content on subscriptions leads to an increase in editorial content without affecting the prices.

JEL classification number: L82

Key words: media company, circulation, advertising, editorial content, media firm.

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1. INTRODUCTION

A media company can be characterized as a business selling editorial material and advertisers' messages to the public, thereby selling advertisers access to the same public. However, I am not aware of studies where the interdependence of the media company's "three legs", or of editorial content, advertising, and circulation is explicitly incorporated in an optimizing model of the media company. Providing such an analysis is the objective of this paper.

In the literature, in Baye and Morgan (2000), (2001) advertisers sell and consumers buy a homogenous good, its price being the only attribute of the advertisers' offers in a game-theoretic setting, where a "gatekeeper" sets up a newspaper or a website to maximize profits. They show that the gatekeeper's optimal subscription fee is low enough to induce every consumer to subscribe, but the optimal advertising price is high enough to induce only partial participation by advertisers and guarantee price dispersion, and advertised prices are lower than unadvertised prices. This model is quite rich for a game-theoretical model, but some of its findings appear to be model-specific.[1]

Chaudhri (1998) examines newspaper pricing from an efficiency point of view mainly with exogenous advertising demand. He finds that it is optimal to price subscriptions below marginal cost and that an increase in advertising demand leads to a decline in the optimal subscription price.

The purpose of this paper is to extend previous work with a model that explicitly incorporates the interdependence of the "three legs" of a media company, or of content, advertising, and circulation, to determine the effects of different influencing variables on the media company's optimal subscription and advertising prices and editorial content. The focus being on the media company, we will characterize the market structure by the dependence of circulation on advertising, editorial content, and subscription price, and by the dependence of advertising demand on circulation and the advertising price, thereby abstracting from strategic considerations. The media company maximizes profit consisting of subscription and advertising revenue, minus the costs of content, advertising, and circulation, by setting the subscription and advertising prices and the amount of editorial content. Subscription demand results from subscriber utility maximization with respect to the media product's content and advertising, and other goods subject to a budget constraint. Advertising demand results from advertiser profit maximization subject to the demand function of its products. Product demand depends on the product price and the amount of advertising the advertiser purchases from the media company. The effect of advertising on the demand for the products is also a function of the circulation of the advertising media.

In this paper, the well-known circulation spiral is formally derived from the media company's optimization problem. It will be shown that the multiplier of the circulation spiral is an increasing function of the partial of subscription demand with respect to advertising (X_A), and of the partial of advertising demand with respect to subscriptions (A_X), and it is finite if the product of these partials is smaller than one. An exogenous increase in a variable or a parameter (e.g. circulation) causes the respective price to increase only if the demand for the other activity (advertising) is elastic enough, the price declining if the demand is less elastic. Moreover, an increase in circulation leads to an increase in profits and in the optimal amount of editorial content, and to a decrease in the optimal advertising price if advertising demand is elastic enough. Thus an increase in circulation leads to a decrease in the advertising price, although advertising demand is an increasing function of circulation.

An exogenous increase in advertising demand leads to an increase in profits and the optimal advertising price, and to a decline in the optimal subscription price and optimal editorial content if the demand for subscriptions is elastic enough. The result of Chaudhri (1998) thus holds in our more general model on this condition, its reverse holding if subscription demand is less elastic. Increases in (declines in the absolute values of) the demand elasticity of subscriptions and of advertising have qualitatively similar effects as an increase in subscription and advertising demand, respectively. An increase in A_X leads to an increase in profits. The advertising price increases if subscription demand is elastic enough, the subscription price and editorial content declining. They increase if advertising demand is less elastic. An increase in X_A leads to an increase in profits. The subscription price and editorial content increase if advertising demand is elastic enough. The advertising price declines. Increases in the marginal costs of circulation and advertising have qualitative effects roughly opposite to those of A_X and X_A, respectively. An increase in the marginal effect of editorial content on circulation (X_S) (and a decline in the marginal cost of editorial content) leads to an increase in profits and in optimal editorial content without affecting either price, provided advertising demand is elastic enough.

The spread between the optimal subscription price and the marginal cost of a copy can be positive or negative, but it increases as the marginal cost increases, provided advertising demand is elastic enough, and declines if the demand is less elastic. An increase in the marginal cost of advertising space increases the optimal price of advertising space by more than the marginal cost if subscription demand is elastic enough. If subscription demand is inelastic, the optimal advertising price declines, causing a positive spread to decline and a negative spread to increase.

In the following, the model is developed and analyzed in Part 2. Part 3 is the Conclusion.

2. THE MODEL AND THE EQUILIBRIUM

The media company publishes a product, e.g. a newspaper, which contains editorial content (S) and advertisements (A). The paper is purchased by subscribers, who derive utility from S and A. The paper earns revenue from subscriptions and from advertising, the space for which it sells to advertisers. We will treat possible other media as exogenous to our problem, their effects being expressed in terms of the values of the demand elasticities as well as the cross-partials between circulation and advertising.

The Subscriber's model is of the form:

(1) $U = U(X_1, X_2)$

(2) $Y = P_1 X_1 + P_2 X_2$

Eq. (1) is the subscriber's utility function in the newspaper's services (X_1) and in other goods (X_2). The function is assumed to have positive first and negative second derivatives with respect to the X_i. Eq. (2) is his budget equation, where income (Y) is spent on the two goods, with the P_i their respective prices. We will leave out the indices referring to the individuals for simplicity.

Maximizing utility with respect to the X_i subject to the budget constraint, and aggregating over individuals yields the demand function for what we will call the media's "subscriptions" for short:

(3) $X_1 = X\left(\underset{+}{Y}, \underset{+}{S}, \underset{+}{A}, \underset{-}{P_1}\right)$,

where the signs below the arguments denote the assumed signs of their partials.[2] We have written the function explicitly in terms of S and A, which are behind the utility of X_1.

<u>The Advertiser</u>'s model is the form:

(4) $\pi^A = KQ - C^A(Q) - P_1^A A_1$

(5) $K = K\left(\underset{+}{A_1}, \underset{-}{Q}\right)$

Eq. (4) is the expression for the advertiser's profit π^A, consisting of sales revenue, or the price of its products (K) times the quantity sold (Q), minus production cost $C^A(Q)$, and the cost of advertising in the media $(P^A A)$. Eq. (5) represents the demand curve of the goods sold by the advertiser, which is a subset of X_2: the selling price is an increasing function of the advertising space bought from the media company, and a decreasing function of the quantity of goods sold. The K_A, or the partial of K with respect to A, is an increasing function of the media's circulation: All else equal, an increase in circulation shifts out the demand curve of the advertiser's products, as advertising reaches more potential customers.[3] We will leave out the indices referring to the individual advertisers like above.

We assume customers' expenditures on X_1 and Q to be so small that we can ignore their effects on each others' demand. Maximizing profit with respect to Q and A, subject to Eq. (5) yields, after aggregation over advertisers:

(6) $$A_1 = A\left(\underset{+}{X_1}, \underset{-}{P_1^A}\right).$$

<u>The Media Company</u>

(7) $$\pi^M = P_1 X_1 + P_1^A A_1 - C\left(\underset{+}{X_1}, \underset{+}{S_1}, \underset{+}{A_1}\right)$$

The media company's profit consists of its subscription revenue $\left(P_1 X_1\right)$ and its advertising revenue $P_1^A A_1$, minus production and distribution costs $C(\cdot)$. The costs are an increasing function of circulation, of news and other editorial material, and of the amount of advertising. We assume diminishing returns in the short run so that the cost function has positive first and second derivatives with respect to its arguments.[4,5]

Maximizing profit with respect to the company's decision variables P_1, P_1^A, and S_1 subject to Eqs. (3) and (6) yields, leaving out subscripts "1", since we are examining company 1:

(8) $$\begin{bmatrix} G+\eta_X^{-1} & A_X G & 0 \\ X_A G & G+\eta_A^{-1} & 0 \\ X_S G & A_X X_S G & -1 \end{bmatrix} \begin{bmatrix} P \\ P^A \\ C_S \end{bmatrix} = \begin{bmatrix} (C_X + A_X C_A)G \\ (X_A C_X + C_A)G \\ (C_X + A_X C_A)G X_S \end{bmatrix}$$. This yields:

(9) $$P^* = -\frac{G}{\eta_A D}\left[(\eta_A + 1)C_X + A_X C_A\right]$$

(10) $$P^{A*} = -\frac{G}{\eta_X D}\left[X_A C_X + (\eta_X + 1)C_A\right]$$

(11) $$C_S^* = \frac{X_S G}{\eta_A \eta_X D}\left[(\eta_A + 1)C_X + A_X C_A\right],$$

where a capital letter subscripted by another capital letter (e.g. C_A) denotes the partial of C with respect to A; $G \equiv 1/(1 - X_A A_X)$; $\eta_X \equiv X_P P / X_1$; $\eta_A \equiv (\partial A / \partial P^A) P^A / A$; $D \equiv G[X_A A_X - (1+\eta_A)(1+\eta_X)] / \eta_A \eta_X$.

In the expressions, G is a multiplier, resulting from the fact that circulation is a function of advertising, and advertising a function of circulation. Thus, for example, if the media company lowers its subscription price, this increases circulation. The increase in circulation increases advertising demand, which feeds back to circulation, continuing the spiral. This well-known circulation spiral provides an explanation for the dynamics of changing market share: why it is relatively easy to sustain a rising spiral, and very hard to stop a declining spiral. The effect of the spiral on profits is further strengthened by scale and scope economies on the production side. Thus on a given market, an equilibrium between newspapers of roughly equal size is often unstable. If the circulation of one of them increases at the expense of others even if by chance, the multiplier extends the effect of the change. If $A_X X_A$ equals or exceeds unity, the multiplier is infinite, and the process continues until only one newspaper is left (c.f. Alexander et al. (1993), Bucklin et al. (1989), Dertouzos et al. (1990). Furhoff (1967), Gustafsson (1978), and Rosse et al. (1979)). Likewise, the first newspaper in a market enjoys a considerable first-mover advantage.[6]

There are several restrictions on the parameter values. The $X_A A_X$ must be smaller than unity for G to be finite, as stated above. If G is infinity, the decision variables go to plus or minus infinity in response to a disturbance, as can be inferred from the effects below. In such a case, the interpretation is of course that the new equilibrium is a corner solution.

Secondly, the P^i and C_S have to be nonnegative. This means that in Eqs. (9)-(11) the denominators and the numerators, including the expressions in the brackets, have to have the same signs. Examine the case of strictly positive P^i for simplicity. In Eqs. (9) and (11) the case of positive P and C_S translates into:

(12) $A_X X_A / (\eta_X + 1) > \eta_A + 1 > -A_X C_A / C_X$, or

(13) $A_X X_A / (\eta_X + 1) < \eta_A + 1 < -A_X C_A / C_X$,

and in Eq. (10) the case of a positive P^A:

(14) $A_X X_A / (\eta_A + 1) > \eta_X + 1 > -X_A C_X / C_A$, or

(15) $A_X X_A / (\eta_A + 1) < \eta_X + 1 < -X_A C_X / C_A$.

It is easy to see that the condition in Eq. (12) implies that in Eq. (15), and the condition in Eq. (13) that in Eq. (14). We will therefore use Eqs. (12) and (13) as a reference in the following. It is also seen that $\eta_A + 1$ and $\eta_X + 1$ can be positive or negative, but they must always have the same sign. In the following, we will examine the case of the negative $(\eta_i + 1)$ to keep the discussion focused. The interested reader can work out the cases of positive $(\eta_i + 1)$, which may apply to monopoly papers, if at all. Many of these papers may, however, be in a corner, where marginal conditions do not hold.[7]

The effects of the parameters and variables on P^*, P^{A*}, S^*, and π^* are summarized in Table 1. An increase in the demand for subscriptions (X) causes the marginal revenue on X to increase above its original level, leading to an initial increase in X and in P^*. Now the value, in terms of X, of the marginal yield on A and S ($X_A P^*$ and $X_S P^*$, respectively) has increased, giving the company an incentive to increase S and cut P^A. (Note that A and S shift the entire demand curve of X, whereas a change in P causes a movement along it; Eq. (3)). If advertising demand is more than unitarily elastic (adjusted for G in case of the effect on P^*), the marginal revenue on advertising is positive. Thus advertising revenue increases when P^A is cut, making a greater decline in P^A optimal. The increase in A feeds back to X and S, increasing the expansionary effect, and P^* and S^* end up on higher levels than originally.

More exactly, P^* and S^* increase if $\eta_A + 1$ is smaller than $-A_X C_A / C_X$.[8] Otherwise they decline. The P^A declines on the same condition and increases if the reverse inequality holds. Thus a key variable affecting the effects of changes in the demand for subscriptions also on the optimal subscription price is $(1+\eta_A)$, i.e. the price elasticity of the demand for <u>advertising</u> space.

[Table one about here]

An exogenous increase in the elasticity of subscription demand (decline in its absolute value) has qualitatively similar effects, η_X being an increasing function of X. There is now an initial decline, rather than increase, in the marginal revenue on X, given X, leading to a decline in X. The decline leads to an increase in P^*. The price increase gives the company an incentive to increase S and cut P^A, and these effects dominate those of the initial decline in X, provided advertising demand is elastic enough. Moreover, the increase often also increases X_A, which strengthens the effects.

An increase in the demand for advertising space (A) leads to a response symmetrical to that in response to an increase in X: an increase in profits and a decline, proportional to η_X, in P^*, while P^{A*} changes proportionately to the negative of $1+G\eta_X$, increasing if η_X+1 is smaller than $-X_A C_X / C_A$. The S^* declines on the same condition. Thus the direction of the change of the price of advertising space is a function of the demand elasticity of subscriptions, which has to be adequately elastic for the conventional response. The explanation is a mirror image of the above. Thus the result of Chaudhri (1998) holds in our more general model if subscription demand is more than unitarily elastic, by so much that η_X+1 is smaller than $-X_A C_X / C_A$, whereas the reverse holds if subscription demand is less elastic.

Again, an exogenous increase in the elasticity of advertising demand A has qualitatively similar effects, as η_A is an increasing function of A. There is now an initial decline, rather than increase, in A. Moreover, the increase often also increases A_X, which strengthens the effects. The P^* declines if subscription demand is elastic enough. To sum up, the optimal price of the company's product increases when its demand increases (or becomes less elastic), if the other product's demand, adjusted for the multiplier, is elastic enough, and declines if the demand is less elastic.

An increase in the marginal effect of editorial content on circulation (X_S) leads to an increase in the value of the marginal product of S $(X_S P)$, to an increase in profits and to an increase in the optimal amount of editorial content. What is of some interest is that X_S does not affect either price: in increasing S^* it leads to further increases in profits and sales but not the optimal prices. As the reader can see from Eq. (8), the model is recursive, with the top two rows forming the independent block: the prices and sales are determined jointly, on the basis of which S^* is determined at a level at which the value of its marginal product equals C_S.

An increase in the parameters of the multiplier (X_A and A_X) increases the multiplier and profits. An increase in the marginal "yield" of A in terms of the demand for X (X_A), shifts out the demand curve for X, given A, increasing P^* proportionately to $-\eta_X$, all these responses provided $\eta_A + 1 < -A_X C_A / C_X$. The price rise increases the value of the marginal product of A (or $X_A P^*$). It is optimal to utilize the increase in X_A by cutting P^{A*} proportionately to $\eta_X + 1$. The increase in P^* also increases the value of the marginal product of S (or $X_S P^*$), increasing S^*. However, if $\eta_A + 1 > -A_X C_A / C_X$, all the responses are reversed.

Likewise, an increase in A_X increases P^{A*} proportionately to $-\eta_A$, (all these responses provided $\eta_X + 1 < -X_A C_X / C_A$), while it changes P^* and S^* proportionately to $(\eta_A + 1)$, thereby lowering them. It is optimal to try to increase circulation (X) by means of cutting P, since the value of its marginal product $(A_X P^{A*})$ has increased. As a result of the decline in P^*, the value of the marginal product of editorial content $(X_S P^*)$ declines, leading to a decline in S^*. A key reason for the difference between the effects of X_A and A_X reflects the phenomenon discussed in connection with the demand elasticities. Moreover, an increase in X_A increases the marginal returns on S directly, which is true of an increase in A_X only via X. Again, if $\eta_X + 1 > -X_A C_X / C_A$, the responses are reversed.

Increases in the marginal costs C_X, C_A, and C_S lead to a decline in profits, because the profitability of the respective activities has declined. An increase in C_X has effects qualitatively opposite to those of A_X: it changes the own price P^*, and S^*, proportionately to the negative of $\eta_A + 1$, thereby increasing them, (provided $\eta_A + 1$ is smaller than $A_X X_A / (1 + \eta_X)$). The increase in the net marginal value of dX, or $X_A(P - C_X)$ makes it optimal to cut P^A (proportionately to η_A), and the increase in $X_S(P - C_X)$ leads to an increase in S^* (for proof, se Eqs. (16) and (17) below). An increase in C_A has effects qualitatively opposite to those of X_A : provided $\eta_A + 1$ is smaller than $A_X X_A / (1 + \eta_X)$, it causes the own price P^{A*} to increase proportionately to the negative of $\eta_X + 1$. The increase in $A_X\left(P^A - C_A\right)$ makes it optimal to cut P proportionately to η_X. The S^* also declines. The responses are reversed if the reverse inequality holds. Again, an increase in C_S has effects qualitatively opposite to those of X_S: it leads to a decline in profits and S^* without affecting P^* or P^{A*}: C_S is a fixed cost with respect to X and A. These effects reflect the structure discussed above.

The optimal subscription price is not necessarily below the marginal cost of production C_X. We obtain the expression for the difference between the subscription price and its marginal cost Δ_X from Eq. (9):

(16) $$\Delta_X = -\frac{G}{\eta_A D}\left[A_X C_A - \frac{G\eta_A + 1}{G\eta_X} C_X\right].$$

The multiplier of Eq. (16) is negative, observing its sign if $\eta_A + 1 < A_X X_A / (\eta_X + 1)$. The first term in the expression in the brackets is positive and the second negative, observing its sign. The expression is negative if either $\eta_A + 1 < A_X X_A / (\eta_X + 1)$ and the expression in the brackets is positive, or if both conditions are reversed. Otherwise the expression is positive. The result of Chaudhri (1998) thus holds only under the above conditions in our more general model. Moreover, it is easy to see from the expression that $d\Delta_X / dC_X > 0$: a negative spread narrows and a positive spread widens as C_X increases, the price increasing by more if $\eta_A + 1 < A_X X_A / (\eta_X + 1)$.

The difference between the advertising price and its marginal cost Δ_A increases when the marginal cost increases. We have:

(17) $$\Delta_A = -\frac{G}{\eta_X D}\left[X_A C_X - \frac{G\eta_X + 1}{G\eta_A} C_A\right] .$$

The multiplier of Eq. (17) is negative, observing its sign if $\eta_A + 1 < A_X X_A / (\eta_X + 1)$. The first term in the brackets is positive, and the second negative, observing its sign. Thus the spread between the advertising price and its marginal cost can be positive or negative. The $d\Delta_A / dC_A$ is positive on the above condition and negative if the reverse inequality holds. In the former case, an increase in C_A causes P^{A*} to increase so that a positive spread widens and a negative spread narrows. If the reverse inequality holds, the responses are reversed. These results are a consequence of the fact that X, A and S are jointly determined: When e.g. C_X increases, P^* increases if $\eta_A + 1 < A_X X_A / (\eta_X + 1)$, which increases $X_A(P - C_X)$ and $X_S(P - C_X)$, leading to a decline in P^{A*} and an increase in S^*, which feeds back to the market for X. As we explained the responses when discussing the effects of the different parameters and variables on the optimal decision variables, we will not repeat them at greater length here.

3. CONCLUDING COMMENTS

We have developed an optimizing model of the media company, explicitly incorporating the interdependence of editorial content, advertising, and circulation, to determine the effects of different influencing variables on the media company's optimal subscription and advertising prices and editorial content.

It was shown that the circulation spiral leads to a finite change only if the product of the partial of circulation with respect to advertising (X_A) and the partial of advertising with respect to circulation (A_X) is smaller than one. An increase in a variable or a parameter (e.g. circulation) causes the respective price to increase only if the demand for the other product (advertising) is elastic enough, the price declining if the demand is less elastic. Thus an increase in A (X) leads to an increase in the advertising (subscription) price and to a decrease in the subscription (advertising) price if the demand for subscriptions (advertising) is elastic enough. It leads to a decrease (increase) in editorial content on the above condition on elasticity. Thus an increase in circulation leads to a decline in the advertising price on this condition, although advertising is an increasing function of circulation. Increases in the demand elasticities of subscriptions and advertising have qualitatively similar effects as increases in X and A, respectively.

An increase in A_X leads to an increase in profits and the advertising price if subscription demand is elastic enough. It leads to a decline in the subscription price and editorial content. It leads to an increase if advertising demand is less elastic. An increase in X_A leads to an increase in profits, the subscription price, and editorial content if advertising demand is elastic enough. The advertising price declines. It increases if subscription demand is less elastic. Increases in the marginal costs of circulation and advertising have qualitative effects roughly opposite to those of A_X and X_A, respectively. An increase in the marginal effect of editorial content on circulation (a decline in the marginal cost of editorial content) leads to an increase in profits and the optimal amount of editorial content without affecting either price, provided advertising demand is more than unitarily elastic.

An increase in the marginal cost of advertising space increases the optimal price of advertising by more than the change in the marginal cost, provided subscription demand is elastic enough, causing a positive spread to widen and a negative spread to narrow. If subscription demand is less elastic, the optimal advertising price increases by less or declines, causing a positive spread to decline and a negative spread to increase.

A symmetrical condition holds for an increase in the marginal cost of circulation.

Three conditions turned out to be critical for the direction of the responses of the optimal prices and editorial content: The values of the elasticities of circulation and advertising demand relative to weighted ratios of the respective marginal costs, and relative to the multiplier, given that we focused the discussion on demand elasticities in excess of unity.

The present approach can be extended to the media company's long-run strategy choices, where A_X, X_A, X_S, and C are variables. The company then tries to achieve a good match between subscribers and advertisers. By choosing its editorial content, it defines subscriber group. That defines a potential advertiser group. Advertising increases the value of the media to subscribers at least within a range, increasing circulation, which continues the spiral. There is a large number of strategies that the company can choose from, given the other players on the market. (See e.g. Gabszewitz et al. (2002), and Häckner et al. (2002).

Interdependence of products is classic for newspapers, but it has applications for a number of businesses: Soccer, hockey, and football clubs have only recently woken up to the unexploited opportunities offered by advertising and sponsorships, and those that have not find themselves in difficulties, with declining gate and television revenues, while player costs (the counterpart of C_S) are bid up by the clubs that have. Economies of scale in the production of the clubs in terms of the sizes of stadiums and opportunities for television coverage have also caused player costs to be bid up, which has increased the critical population of a city making a good team viable, let alone two. On the other hand, a niche strategy makes it possible for a small community to have a successful team on a lower level or in a smaller sport -- or if the club manages to focus enough potential fans on its sport at the expense of other sports or attractions. Therefore the present approach finds applications in a number of industries, on each of which there are numerous parameter estimates, optimum prices, and strategies waiting to be discovered.

REFERENCES

Alexander, Alison, James Owers, and Rod Carveth (eds.), Media Economics: Theory and Practice, Hillsdale, N.J.: Lawrence Erlbaum Associates 1993, 391 p.

Baye, M.R., and J. Morgan, "A Simple Model of Advertising and Subscription Fees", Economics Letters, 62, 2000, 345-351.

----------, "Information Gatekeepers on the Internet and the Competitiveness of Homogeneous Product Markets", American Economic Review, 91:3, June 2001, 454-474.

Becker, Gary S., and Kevin M. Murphy, "A Simple Theory of Advertising as a Good or Bad", Quarterly Journal of Economics, Vol. 108 No. 4, November 1993.

Busterna, J.C., "The Cross-Elasticity of Demand for National Newspaper Advertising", Journalism Quarterly, 64, 1987, 25-36.

----------, "Concentration and the Industrial Organization Model", in R.G. Picard, J.P. Winter, M. McCombs, and S. Lacy (eds.), Press Concentration and Monopoly: New Perspectives on Newspaper Ownership and Operation, Norwood, N.J.: Ablex, 1988(a), 35-53.

----------, "Trends in Daily Newspaper Ownership", Journalism Quarterly, 65, 1988(b), 831-838.

Chaudhri, Vivek, "Pricing and Efficiency of a Circulation Industry: The Case of Newspapers", Information Economics and Policy, 10,1998, 59-76.

Dertouzos, James N., and K.E. Thorpe, Newspaper Groups: Economies of Scale, Tax Laws, and Merger Incentives, Santa Monica, CA: Rand, 1982.

Dertouzos, James N., and William B. Trautman, “Economic Effects of Media Concentration: Estimates from a Model of the Newspaper Firm”, The Journal of Industrial Economics, 39, September 1990,

Furhoff, Lars, Upplagespiralen, Ekonomisk-historiska studier, 3, Stockholm: Svenska Bokförlaget, Norstedts, 1967.

Gabszewitz, Jean J., Didier Laussel and Nathalie Sonnac, “Press Advertising and the Political Differentiation of Newspapers”, Journal of Public Economic Theory, 4(3), 2002, 317-324.

Grotta, G., “Daily Newspaper Price Inelastic for 1970-1975”, Journalism Quarterly, 54, 1977, 379-382.

Gustafsson, K.E., “The Circulation Spiral and the Principle of Household Coverage”, Scandinavian Economic History Review, 28, 1978, 1-14.

Häckner Jonas, and Sten Nyberg, “Price Competition, Advertising and Media Market Concentration”, unpublished manuscript, Department of Economics, Stockholm University, 2000.

Masson, R., R. Mudambi, and R. Reynolds, “Oligopoly in Advertiser-Supported Media”, Quarterly Review of Economics and Business, 30(2),1990, 3-16.

Picard, Robert G., James P. Winter, Maxwell E. McCombs, and Stephen Lacy (eds.), Press Concentration and Monopoly: New Perspectives on Newspaper Ownership and Operation, Norwood, N.J.: Ablex, 1988.

Picard, Robert G., Media Economics: Concepts and Issues, Newbury Park, CA: Sage, 1989.

----------, “Economics of the Daily Newspaper Industry”, in Alexander, Alison, James Owers, and Rod Carreth (eds.), Media Economics: Theory and Practice, Hillsdale, N.J.: Lawrence Erlbaum Associates, 1993, 181-203.

Rosse, J.N., "Daily Newspaper Monopoly, Competition, and Economies of Scale, American Economic Review, 57, 1967, 522-533.

Rosse, J.N. and J.N. Dertouzos, "The Evolution of One Newspaper Cities", in Federal Trade Commission, Proceedings of the Symposium on Media Concentration, Vol. 2, Washington, D.C.: Government Printing Office, 1979, 429-471.

NOTES

1. Of studies of the media company and market structure, Gabszewitz et al. (2002) examine the editorial line of the newspapers in a sequential game framework of a duopoly, and show that the papers have a tendency to approach the line of the median subscriber analogously with Hotelling's well-known theory of spatial competition.

Häckner et al. (2000) study the interplay of circulation, advertising, and market structure in a duopoly framework.

Masson et al. (1990) examine the relationship between concentration and advertising in a framework where consumer utility is a declining function of advertising and the media is a public good -- a situation that sometimes holds for commercial broadcasting.

2. While subscription being an increasing function of advertising appears to be a reasonable assumption for newspapers at least within a range, this does not necessarily have to hold for broadcasting: it is easy to turn the page of a newspaper if an advertisement is not of interest, whereas a commercial break with an uninteresting message constitutes a disruption in a radio or television program and can at worst generate negative marginal utility for the viewer. See Masson et al. (1990), and Becker et al. (1993). While extending the analysis to cover the case of a negative X_A is straightforward, it is beyond the scope of this paper.

3. For instance, if the advertiser is willing to pay a certain price per column inch of advertising space for each contact, it should be willing to pay twice as much per inch if the circulation doubles.

4. In the long run the cost function has been found to have the following properties. Considerable economies of scale have been found at least with respect to circulation because the cost of content and advertising (first copy cost) is roughly fixed with respect to X_1, only printing and distribution costs being a

function of X_1 (see Picard (1993) and Rosse et al. (1979)). Thus most newspapers operate on the declining portion of their envelope curve at least if one abstracts from distribution costs. Therefore $C(X_1, \overline{S}_1, \overline{A}_1) > X_1 C'(X_1, \overline{S}_1, \overline{A}_1)$, where C' denotes marginal cost, and a bar that the variable is fixed. Rosse (1967) finds that the average cost per subscriber inch declines by 3 per cent for each 10 per cent increase in subscriber inch output. There also appears to be economies of scope between S_1 and A_1 so that $C(S_1, A_1) < C(S_1) + C(A_1)$.

5. 7-10 % of a newspaper's operating expenses is attributable to editorial or non-advertising content, and 5-6 % to advertising. 25-45 % is attributable to printing, of which a half is on newsprint alone. Distribution accounts for 10 % of operating expenses. (See Busterna (1988a) and Picard (1993).)

Picard states: "Readers more than bear the cost of producing the editorial portions of newspapers. Only 16 % of the cost of producing a paper is attributable to editorial or nonadvertising content, and circulation revenue accounts for 20-35 % of newspapers' revenue". It may be tempting to read too much into this statement, because in a newspaper, the subscriber purchases both nonadvertising and advertising content, and the cost of a subscription is payment for both. The statement holds even more for advertisers, advertising accounting for some 65 % of revenue.

6. Of course, the multiplier process takes place over time. The current formulation can easily be extended to nest discounting for e.g. investment decisions. We then have: $G \equiv 1/(1 - \beta A_X X_A)$, where $\beta \equiv (1 + r)^{-1}$, and r the discount rate. (In addition, X_A, X_S, and A_X get discounted to account for within-round lags, but this is a minor effect.)

7. The demand for advertising space by retail advertisers has been found to be inelastic with respect to price except in larger markets where there are competing media (see Busterna (1987)). 90 % of U.S. newspapers are monopolies in their markets, (see Busterna (1988b), and their circulation demand has been found to

be inelastic with respect to price (see Grotta (1977)). It is important to note, however, that these estimates have been from models ignoring the interdependence of circulation, advertising, and content, and are therefore likely to be biased downward compared to the effects that we have been emphasizing.

8. If $(\eta_A + 1)$ is positive, S^* and P^* increase, as well, provided also $(1 + G\eta_A)$ is positive.

Table 1. The Effects of the Parameters on the Optimal Prices and S

	X_S	X_A	A_X	C_S	C_A	C_X	η_A, A	η_X, X
P^*	0	+[1]	-[2]	0	-[3]	+[3]	-[2]	+[1]
P^{A*}	0	-[1]	+[2]	0	+[3]	-[3]	+[2]	-[1]
S^*	+	+[1]	-[2]	-	-[3]	+[3]	-[2]	+[1]
Δ_X						+[3]		
Δ_A					+[3]			
π	+	+	+	-	-	-	+	+

1 $if\ \eta_A + 1 < -A_X C_A / C_X$, otherwise reverse inequality holds

2 $if\ \eta_X + 1 < -X_A C_X / C_A$, otherwise reverse inequality holds

3 $if\ \eta_A + 1 < A_X X_A / (1 + \eta_X)$, reverse sign if reverse inequality holds