

# ECONOMICS OF STORY CHOICE IN BROADCAST TELEVISION

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## Abstract

Some extant research suggests a link between news content and social, economic, and political outcomes because media can increase political participation by providing voter-relevant information. However, the implications of ownership structure on the provision of local news have not been well specified and analyzed. This paper investigates these issues by studying how broadcast television firms allocate news minutes among local news stories. Empirical estimates indicate that serving a larger local market does not have a statistically significant effect on provision of local news, while serving a larger non-local market increases the number of local stories and total local news seconds. Owning a radio station outside of the broadcaster's local market increases the number of local stories and owning a radio station within the local market decreases the number of local stories.

## Introduction

The media landscape, broadly defined, has undergone dramatic change over the last decade. For example, there is greater diversification of news media due to the increased role of the Internet and greater ownership concentration of traditional media.

The Federal Communications Commission (FCC) is obligated to ensure that broadcasters serve their local communities by providing content, including news that is of local public interest. The FCC is currently revising their media ownership rules relating to the number of television/radio stations and newspaper outlets that can be owned by a single owner within a single market. However, the lack of empirical and analytical work related to ownership structure and the provision of local news makes it difficult for the FCC to specify new rules with much precision.<sup>2</sup> This paper sheds light on some of these important issues by examining how various ownership structures affect the provision of local news.

Some extant research suggests a link between news content and social, economic, and political outcomes. Importantly, this literature suggests that media can increase political participation by providing voter-relevant information.<sup>3</sup> However, the implications of ownership structure on the provision of local news have not been well specified. For example, do local owners have cost advantages in providing local news? Does a television station that cross-owns a radio station have economic incentives to air more news stories? Insight into such questions may have far-reaching implications for policymakers, consumers, and broadcast firms.

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<sup>2</sup> The FCC is mandated by the 1996 Telecommunications Act to periodically review and revise its ownership rules in order to promote competition, diversity, and localism. See Besley and Burgess (2002), Coase (1974), Mullainathan and Shleifer (2003), and George and Waldfogel (2002) for economic studies related to media ownership.

<sup>3</sup> See Donner (1998), Emig (1995), Morgan (1986), and Napoli (1997, 2001).

Certainly, a clear understanding of economic factors affecting the behavior of media firms would aid the regulator in determining ownership rules that encourage competition in broadcast markets while safeguarding and promoting provision of diverse viewpoints. Thus, this paper investigates the role of economies of scale and scope in the media firms' decisions to provide local contents. In particular, the paper constructs a theoretical model of ownership characteristics and local news content and uses the data collected by the Project for Excellence in Journalism (PEJ) to estimate the effects of various ownership structures.

Empirical estimates indicate that serving a larger local market does not have a statistically significant effect on provision of local news, while serving a larger non-local market increases the number of local stories and the total local news seconds. Owning a radio station in another market increases the number of local stories because the station owner may direct the audio from its television broadcast to radio stations. Owning a radio station within the local market decreases the number of local stories. A locally-owned station airs more and longer local stories and longer total local news seconds, possibly, because the station has cost advantages in providing local news.

### Model

Suppose a station owner chooses the number and the length of local news stories. Let  $l_i$  denote the length of a local story  $i$ ,  $L$  denote the total local news seconds, and  $n$  denote the number of local stories. Assume the owner's per-viewer profit from local news is represented by the following:

$$\begin{aligned} \pi &= \sum_i bR(l_i) - \sum_i cl_i - nF - \delta E(L) \\ \text{s.t. } \sum_i l_i &= L \end{aligned} \quad (1)$$

In the per-viewer profit function above, parameters  $b$ ,  $c$ ,  $\delta$ , and  $F$  are assumed to be positive.  $R(\cdot)$  is a per-viewer revenue function from a local story. It is assumed that  $R(0) = 0$ ,  $R' > 0$ , and  $R'' < 0$ . Further, denote a story specific per-viewer marginal cost and a story specific per-viewer fixed cost by  $c$  and  $F$ , respectively. Let  $b$  denote a marginal revenue parameter. Also, let  $E(\cdot)$  denote a diminishing marginal return function related to local news and assume that  $E(0) = 0$ ,  $E' > 0$ , and  $E'' > 0$ .

Now, consider the owner's optimal choice of local news stories. At the optimum, the per-viewer marginal revenue from each local story should be equal, i.e.,  $R'(l_1) = R'(l_2) = \dots = R'(l_n)$ . If the marginal revenues from local stories are not equal, the broadcasting firm could increase its total profits by reducing the length of a lower marginal revenue story and by increasing the length of a higher marginal revenue story. Further, to simplify the analysis, assume that local stories are identical, i.e.,  $l = l_i$  for all  $i \leq n$ , and that  $n$  is continuous. Then, the broadcasting firm's per-viewer profit function can be rewritten as the following:

$$\begin{aligned} \pi &= nbR(l) - ncl - nF - \delta E(L) \\ \text{s.t. } nl &= L \end{aligned} \quad (2)$$

This profit condition can be further simplified:

$$\pi(l, L) = bL \frac{R(l)}{l} - cL - F \frac{L}{l} - \delta E(L) \quad (3)$$

The first-order conditions, assuming that the per-viewer profit function is strictly concave and that there is an interior solution, are given below:

$$bL \frac{R'(l)l - R(l)}{l^2} + L \frac{F}{l^2} = 0 \quad (4)$$

$$b \frac{R(l)}{l} - c - \frac{F}{l} - \delta E'(L) = 0 \quad (5)$$

The first term in condition (4) is a change in total per-viewer revenue from increasing the length of a local story by one unit while keeping the length of total local news seconds constant. The second term in condition (4) is a change in the per-viewer fixed cost due to a one-unit increase in a local story length. Condition (4) implies that the optimal individual story length is not a function of the total local news seconds. There are two reasons for this result. The first reason is that all news stories are assumed to be identical. The second reason is that the revenue derived from each story is assumed to be independent from the lengths of other stories.

The first term in condition (5) is a per-viewer marginal revenue from increasing total local news second. The last three terms in condition (5) are the changes in per-viewer costs from increasing total local news seconds by one unit. At the profit maximizing level, the per-viewer marginal revenue from increasing total local news seconds should equal the per-viewer marginal cost from increasing total local news seconds.

Next, consider comparative statics results. For convenience, let  $X(l) = R(l)/l$ . This implies that  $X'(l) = (R'(l)l - R(l))/l^2$ . Further, note that  $X'(l) < 0$  because  $R'(l) < R(l)/l$  for a concave function passing through the origin. Because  $-l^2/X'(l) = b/F$ , the optimal story length is a function of a revenue to fixed cost ratio that is defined as  $b/F$ . Then, the following results can be derived:

$$\frac{dl}{db} = -\frac{X'(l)L}{\pi_{11}} < 0 \quad (6)$$

$$\frac{dL}{db} = \frac{X(l)}{\delta E''(L)} > 0 \quad (7)$$

$$\frac{dn}{db} = \frac{d(L/l)}{db} = (1/l) \frac{dL}{db} - (L/l^2) \frac{dl}{db} > 0 \quad (8)$$

The intuition behind conditions (6) – (8) is following. If a local story revenue parameter increases, the local story's revenue to fixed cost ratio increases. Thus, the station owner responds by broadcasting more but shorter local news stories as indicated by conditions (6)-(7). In addition, since increasing parameter  $b$  increases the marginal benefit

from broadcasting local stories, the station owner increases total local news seconds as indicated by condition (8).

Next, consider how a change in the per-viewer fixed cost affects the length of each local story, total local news seconds, and the number of local stories. Since an increase in the fixed cost decreases the revenue to fixed cost ratio, the broadcasting firm should respond by broadcasting longer but fewer local news stories and by decreasing total local news seconds. Mathematical derivation of these results is shown below:

$$\frac{dl}{dF} = -\frac{1/l^2}{\pi_{11}} > 0 \quad (9)$$

$$\frac{dL}{dF} = -\frac{1/l}{\delta E''(L)} < 0 \quad (10)$$

$$\frac{dn}{dF} = (1/l) \frac{dL}{dF} - (L/l^2) \frac{dl}{dF} < 0 \quad (11)$$

Now, consider the implications of a change in the per-viewer marginal cost parameter. The length of individual stories should not change when the per-viewer marginal cost changes because the revenue to fixed ratio is not affected. However, an increase in the per-viewer marginal cost decreases total local news seconds. The number of local news stories decreases as well because total local news seconds are decreased while the length of individual local stories is not affected. These comparative statics results are given below:

$$\frac{dl}{dc} = 0 \quad (12)$$

$$\frac{dL}{dc} = -\frac{1}{\delta E''(L)} < 0 \quad (13)$$

$$\frac{dn}{dc} = (1/l) \frac{dL}{dc} - (L/l^2) \frac{dl}{dc} < 0 \quad (14)$$

Finally, consider the implications of varying parameter  $\delta$ . Intuitively, higher  $\delta$  implies that the opportunity cost of airing local news is higher. For example,  $\delta$  might denote higher opportunity cost of replacing advertising time with news seconds. Thus, for higher levels of  $\delta$ , the broadcasting firm decreases the length of total local news seconds. Note that the length of individual stories is not affected because higher  $\delta$  increases the overall cost of the program but not the cost of individual local stories. Further, an increase in  $\delta$  decreases the number of local stories because the total local news seconds decrease. These comparative statics results are given below:

$$\frac{dl}{d\delta} = 0 \quad (15)$$

$$\frac{dL}{d\delta} = -\frac{E'(L)}{\delta E''(L)} < 0 \quad (16)$$

$$\frac{dn}{d\delta} = (1/l) \frac{dL}{d\delta} < 0 \quad (17)$$

### **Data and Estimation Results**

The data, all from 1998 local news broadcasts, was obtained from the University of Delaware.<sup>4</sup> According to the PEJ, which gathered the original news clips, “market selection was performed based on Nielson Media Research market rankings. Markets were group into four quartiles on the basis of the number of television households in each. Markets were then chosen randomly within each quartile, after stratification in order to ensure geographic diversity. Within each market, the highest-ranked half-hour timeslot for news was studied.”

There is a good variation in market size in the data set, which includes both large (populous) Designated Market Areas (DMAs) like New York and Los Angeles and smaller DMAs like Evansville and Tallahassee. Specifically, the data set consists of over 4,000 individual news stories measured in seconds, from five different days and sixty stations across twenty DMAs. This yields 275 observations on the number of local stories, the median length of local stories, and the total local news seconds.

Ownership variables are collected from publicly available sources. Summary statistics for these variables are provided in Table 1. MARKETSIZE is a population within a given DMA, O&O is a dummy variable indicating whether the station is owned and operated, OWNCITIES is the number of cities in other DMAs where an owner, who is not owned and operated, has television stations, CAPITA is a per-capita income within the DMA, CABLE is the percentage of cable penetration within the DMA, UHF is a dummy variable indicating channel above 13, OWN RADIO is a dummy variable indicating a local owner who owns a radio station in another DMA, NEWSPAPER is a dummy variable indicating whether the station owner owns a newspapers in other DMA, CROSSRADIO is a dummy variable indicating whether the station owner owns a radio station within the DMA, AVENONLOCAL is the average size of the audience that the station owner reaches through stations in other DMAs.

The estimation results are presented in Table 2. We estimate the median local story length, the total local news seconds, and the number of local stories by employing two types of specifications. The first specification employs day dummy variables so that the effects of certain market characteristics on the provision of news can be estimated (odd numbered columns). The second specification employs market-day interaction dummy variables in order to control for all otherwise unobservable market-day characteristics (even numbered columns). Columns (1)-(4) are the results form OLS regressions and columns (5)-(6) are the results from negative binomial regressions.

### **Local and non-local market size**

If there are economies of scale in proving local news, the per-viewer fixed costs should decrease as the size of a local market increases. Thus, a larger local market increases the revenue to fixed cost ratio. The theoretical model predicts that the existence of economies of scale in providing local news should increase the number of local stories and the length of

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<sup>4</sup> We thank Danilo Yanich for providing this data set.

total local news seconds and decrease the length of individual stories as implied by conditions (9)-(11). The estimates, however, show that MARKETSIZE has statistically insignificant effect. This may indicate that larger market size does not confer significant economies of scale in local broadcast.

AVENONLOCAL has statistically significant positive effect on the number of local stories and on the total local news seconds. This result is consistent with a decrease in the marginal cost of providing local news (see conditions (12)-(14)). In other words, a broadcasting firm that owns stations outside of the DMA might have lower marginal cost of producing local stories. This finding is interesting because it implies that the size of the markets outside of the broadcasting firm's DMA have stronger effect on the firm's costs than the size of a local market does.

### **Owned and operated**

Owned-and-operated stations face greater demand for advertising time. This indicates that the opportunity cost of airing news seconds is higher for these stations. Conditions (15)-(17) imply that increasing the opportunity cost of airing news seconds would decrease the number of stories and the length of total local news seconds while leaving the length of individual local stories constant. The estimates are consistent this prediction. O&O has negative statistically significant effect on the total local news seconds and on the number of local stories. Specifically, the total local news seconds decrease by 3.75 minutes in the station is owned and operated.

### **Radio ownership**

CROSSRADIO have no significant effect on the length of individual stories and on the total local news seconds. CROSSRADIO, however, decreases the number of local news stories. At first, these results seem to contradict the predictions of the theoretical model. For example, if the broadcasting firm can direct the audio from its television programs to radio broadcast, the firm should produce more but shorter local news stories as suggested by conditions (6)-(8). Further, if one argues that radio ownership decreases the per-viewer fixed cost of producing local news stories, the firm should again produce more but shorter local news stories as suggested by conditions (9)-(11). However, if radio and television are substitutes in consumption within the same DMA, the parameter  $\delta$  is higher for a firm that owns a radio station within the DMA. Then, the firm would broadcast fewer local stories.

The estimates of OWNRADIO variable indicate that owning a radio station outside of the DMA may increase the number of local news stories. This result is consistent with the economies of scope argument that OWNRADIO increases the marginal benefit from producing a local story because the broadcasting firm can direct the audio from local television stories as non-local news to its radio stations in other DMAs. This argument, however, does not explain why owning a radio station in another DMA does not have statistically significant effect on the total local news seconds or on the median length of local stories.

### **Newspaper ownership**

The estimates employ a WSB dummy variable because WSB in Atlanta was the only station in the sample that was co-owned with a newspaper within the DMA. WSB's owner, Cox Communications, also owned the Atlanta Journal-Constitution. WSB aired more local news

stories than its Atlanta broadcast counterparts. However, owning a newspaper within the DMA does not have statistically significant effect on the total local news seconds and on the median local story length. Owning a newspaper in another market does not have statistically significant effect the total local news seconds or on the length of individual stories but have statistically significant negative effect on the number of local stories in one of the specifications.

### **Other results**

In the data set, WCAX was the only station that was both locally owned and not part of an ownership group. A WCAX dummy variable denotes this broadcasting station. WCAX aired more local stories and longer total local news seconds (from 11.4 to 16 more minutes of local news stories). In addition, WCAX had higher length of a median story. This finding may indicate that this broadcasting station has a lower per-viewer fixed or marginal cost of producing local news stories as predicted by conditions (10)-(14). The theoretical model, however, cannot explain why the median local story length has increased because a lower per-viewer marginal cost should decrease individual local story length but increase the number of local stories and the total local news seconds as implied by conditions (9)-(11).

OWNCITIES does not have a significant effect in any of our estimates. Per-capita income decreases the length of a median story. Cable penetration increases the length of a median local story by 0.8 seconds but decreases the total local news coverage by 3.0 seconds. UHF decreases the number of local stories.

### **Conclusion**

The paper investigated the impact of media ownership and broadcast television market characteristics on the provision of local news. The theoretical model predicted how a change in the per-viewer marginal revenue, marginal cost, and fixed cost affects the length of local news stories and the number of local stories. In particular, the model predicted that an increase in the benefit to fixed cost ratio should increase the number of local stories and should decrease the length of individual stories. These theoretical predictions facilitate the investigating of the implications of economies of scale and scope in media markets.

The empirical estimates indicated that an increase in the local market size did not alter provision of local news, while an increase in the non-local market size increased the number of local stories and total local news seconds. These findings may indicate that there are economies of scale in provision of local news with respect to a non-local market but not with respect to a local market.

Newspaper and radio ownership estimates allowed us to investigate the implications of economies of scope. Owning a radio station in another DMA increased the number of local stories because the station owner may direct the audio from its television broadcast to radio stations. Owning a radio station within the DMA decreased the number of local stories. This result is consistent with the model predictions if radio and television are substitutes in consumption.

Owned-and-operated stations aired fewer seconds of local stories, possibly, because of a higher opportunity cost of total news seconds. A locally-owned station aired more and longer local stories and longer total local news seconds possibly because this station had cost

advantages in providing local news. Yet, the theoretical model cannot fully explain why the local owner increased both the length of the median local story and the number of local stories. The theoretical model predicts that the number of stories should decrease as the length of individual stories increase. The prediction that the length of individual stories decreases may be partly attributed to the assumption that local stories are identical. For example, if local stories are not identical, the station owner with a lower per-story fixed cost might increase the length of existing stories rather than increasing the number of stories, once the owner runs out of high-revenue stories. However, note that the estimates partially took into account story heterogeneity because we estimated the median story length rather than the average story length.

The above findings have important regulatory implications, yet there are several important extensions that should be investigated. The first extension is to examine the implications of heterogeneous story choice on the broadcasting firm's allocation of broadcast minutes among local stories, non-local stories, and advertising. The second extension is to investigate the extent to which news stories and the quality of news stories differ across stations. These extensions of the current analysis will enhance the understanding of broadcasting firms' complex behavior in media markets.

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**Table 1: Summary Statistics**

Variable	Mean	Standard Deviation
MARKETSIZE	1475.00	1646.58
O&O	0.21	--
CAPITA	15607.37	2078.43
CABLE	65.86	6.86
UHF	0.17	--
OWNRADIO	0.45	--
NEWSPAPER	0.48	--
CROSSRADIO	0.22	--
AVENONLOCAL	780.12	576.95

**Table 2: Estimation Results**

Variable	Median Local		Total Local		Count Local	
	(1)	(2)	(3)	(4)	(5)	(6) <sup>+</sup>
MARKETSIZE	-0.002 (1.37)		0.016 (1.59)		-0.000 (0.06)	
O&O	4.287 (0.41)	-0.779 (0.06)	-224.944 (3.36)***	-20.783 (0.28)	-0.329 (2.00)**	-0.178 (1.48)
OWNCITIES	0.336 (1.49)	0.068 (0.32)	-0.411 (0.30)	-1.860 (1.29)	-0.003 (0.73)	-0.002 (0.93)
CAPITA	-0.003 (3.58)***		-0.003 (0.43)		0.000 (0.25)	
CABLE	0.817 (3.93)***		-3.015 (2.04)**		-0.001 (0.38)	
UHF	4.535 (0.91)	2.052 (0.39)	-18.299 (0.60)	-7.635 (0.27)	-0.190 (2.97)***	-0.183 (3.84)***
OWNRADIO	-0.639 (0.20)	1.692 (0.35)	26.056 (0.96)	39.345 (1.14)	0.282 (4.86)***	0.053 (1.17)
NEWSPAPER	-1.354 (0.37)	3.927 (1.04)	-28.778 (0.89)	11.094 (0.44)	-0.089 (1.46)	-0.145 (3.49)***
CROSSRADIO	-3.146 (0.79)	-1.643 (0.34)	-13.872 (0.37)	-46.829 (1.23)	-0.301 (3.60)***	-0.236 (4.34)***
AVENONLOCAL	0.009 (1.60)	0.005 (0.52)	0.159 (4.19)***	-0.026 (0.50)	0.000 (3.81)***	0.000 (1.19)
WCAX	28.706 (6.63)***	11.789 (1.52)	960.036 (19.92)***	685.721 (13.80)***	1.021 (11.88)***	0.373 (6.60)***
WSB	-2.762 (0.49)	-1.895 (0.25)	32.715 (0.58)	-47.930 (0.70)	0.396 (2.72)***	0.194 (1.79)*
Constant	6.688 (0.44)	23.415 (3.92)***	734.127 (6.16)***	596.311 (10.42)***	1.991 (7.43)***	2.633 (27.97)***
Observations	275	275	275	275	275	275
R-squared	0.14	0.52	0.32	0.72		

Robust t or z statistics in parentheses: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

<sup>+</sup> Includes both market and day dummies but no day-market interaction dummies.