Same Story Different Channel?
Competition and Diversity in Broadcast Television News

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Abstract

Consumers derive uncertain utility from media output, in particular news. We suggest that consumer welfare is enhanced by the existence of diversity in news output and that diversity of news output is related to market structure. We employ two novel databases measuring broadcast news content at the local and national levels in order to quantify news diversity, and find evidence that measures of market structure among broadcast media firms are a statistically significant determinant of diversity, conditional upon a variety of demographic and economic determinants. We also present evidence that a broader indicator of market structure, capturing the level of competition from cable programming, displays a positive, significant, and robust relationship with diversity.

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1 Introduction

Local and national broadcast news is an important source of information for individuals in their dual roles as consumers and voters, and several recent studies demonstrate that the provision of such information can have a significant impact on social welfare (see strom1 strom1,strom2; ms; gw1). First, news information, perhaps about a subsidy program, may provide a significant private value in that an individual can use the information as a private decision maker (see bb and see strom1 strom1,strom2). Second, information may have value to viewers in their capacity as social decision makers (voters).[1] As Besley, Burgess, and Prat (2002) note, "mass media can play a key role in enabling citizens to monitor the actions the actions of incumbents and use this information in their voting decisions." (p.1) Similarly, Stromberg (2004) observes that "for a group of voters to defend their political interests, they must vote and they must know whether their elected representatives have done something for them. These two aspects are not unrelated, as better informed citizens are more inclined to vote, and information from the media helps voters with both." (p.2)

Our approach to the value of information provided by broadcast news proceeds by analogy from portfolio theory. In the portfolio approach, an efficient frontier of optimal portfolios is constructed, where each portfolio on the frontier offers the best possible expected return given the risks associated with the return. We view the various outputs of broadcast news as uncertain in their value to viewers, and we suggest that news consumers optimally diversify by constructing and consuming a combination of news "assets" i.e., information. In our model, a low co-variance of media values across firms allows consumers to diversify away the risk that the value which consumers derive from information produced by one outlet mimics closely the value from other outlets. In fact, our approach to the value of news information is close in spirit to that of ms who suggest market competition is necessary but not sufficient for the emergence of accuracy in media; rather, a consumer's taste for heterogeneity in news content, within a competitive environment, produces a convergence to some average accuracy. It is this average that we suggest is valuable to consumers and voters.

Employing a representative consumer model, we suggest that consumer utility is determined by the quality, consistency, and variety of output provided by broadcast news media. Media with these characteristics is welfare-enhancing for consumers but costly for media firms to produce. We assume broadcast stations select the attributes of their news content in a given competitive environment by balancing the positive impact of media characteristics on market share with their potential impact on costs.

We model two market structures - a two-firm competitive market and a monopolist who owns both stations. We find that the quality of news output is a strategic complement under competition; in essence, this is a business stealing effect of the type first described by steiner - an increase in quality by one station will increase it's market share and induce an equivalent increase in quality by the second station. An increase in quality by the firms is assumed utility-enhancing for consumers, ceteris paribus.[2] In addition, the variance of news output is a strategic substitute for competitive firms. Thus, as a station increases the variance of its content quality (and hence the uncertainty over quality to consumers), consumers shift their focus to its competitor, which then optimally decreases its variance. However, a monopolist who controls two stations is not subject to these same competitive pressures and may have no incentive to increase quality or to maintain low uncertainty over such quality. Finally, in our model, diversity is not fundamentally determined

[1] This assumes away rational ignorance arguments. Rational ignorance suggests that voters may not wish to gather much information, since absent being pivotal, an individual's vote makes no difference, and information gathering is costly.

[2] Since we do not model the price consumers pay for quality enhancement - in the case of over-the-air broadcasting the price is determined by the amount of commercial time - we cannot make direct welfare assessments.

by strategic considerations, but rather is largely driven by the marginal cost of providing unique content. We find that relative to a monopoly market structure, duopoly is characterized by a higher average quality of media content, lower uncertainty over that quality, and more diverse content. This result is similar to the findings of gd and gls.

In our empirical section we use two archives of broadcast news, one local and one national, which quantify the amount of time devoted to particular stories by news broadcasts. Our local data captures the news content produced across the "Big Three" network affiliates (CBS, NBC, ABC), covering over sixty stations in twenty designated market areas (DMA). From this data we construct two measures of local news broadcast diversity - one station level and one DMA level. We then relate our measures of diversity back to structural and demographic characteristics. Our national data measures the amount of time devoted to unique stories during the national evening news broadcast of the Big Three.

In contrast to prior analysis of media industry behavior which either place media output into broad format categories or measure the allocation of inputs (see bw and george), our data captures the precise nature of the output produced by the broadcast industry. We then relate each of our measures of diversity back to a number of potential explanatory variables, including cable penetration, total market revenues, average income, and market structure. Market structure is measured by both the Herfindahl-Hirschman Index (HHI) and the number of stations in the market. We employ two structural measures since the HHI may not be sensitive to overall competition within a given market.[3]

Our OLS results suggest that market concentration, as measured by the HHI, has a negative impact on news diversity, while the total number of stations in a market has a positive impact on news diversity. In short, our estimates suggest that increasing concentration appears to diminish diversity in broadcast news, both at the firm and market level. This result is robust to the measure of diversity used in estimation and emerges after controlling for possible endogeneity in market structure. Moreover, there is an apparent link between broadcast news and substitutes (broadly defined) for local broadcast news - the number of broadcast firms at the market level and the presence of cable have a strong positive effect on local news diversity. This suggests that competition and the availability of substitute programming stimulates greater diversity in the offerings of news broadcasts. The empirical results obtained from the local data are broadly consistent with the estimates which emerge from our national data.

2 A Model of Media Variety

Our stylized theoretical description of media industries is derived from an assumption that consumers confront a fundamental uncertainty regarding the value of media content produced by an individual broadcaster. This uncertainty implies that media consumers, when allocating their viewership across broadcasters, confront a problem which is broadly analogous to the allocation of funds across risky assets. As such, this component of our model draws from the well-understood CAPM approach to portfolio allocation decisions. Our most significant augmentation to this approach involves incorporating uncertainty into the production technology of media firms: we allow broadcasters to choose a variety of parameters which determine the nature of uncertainty confronting its audience. We then analyze the level of product diversity emerging from two versions of our model; a duopoly of two independent stations and a monopoly in which the two stations are managed by a single owner.

[3]Ideally, one would adjust the number of firms in the market for reach, but we do not have the data to make this transformation.

2.1 Stochastic Media Production

Throughout our model, the media industry consists of two outlets, or stations, producing a specific output, where we assume a representative consumer chooses between the broadcast content created by these two outlets. We assume that media output from each station creates an uncertain value for the consumer. This assumption is motivated by a number of observations. First, the specific content of media broadcasts is unknown to the consumer *ex-ante*. Second, even if this uncertainty were insignificant, the utility of media content in general, and news in particular, is fundamentally determined by the context in which media is consumed. This context frequently changes in ways which may or may not be successfully anticipated by broadcasters. For example, voters in a particular region with approaching elections will, in all likelihood, seek additional information regarding candidates. However, broadcasters may or may not alter their content in the desired direction of an audience.

All variables relating to the two media stations are indexed by the subscript $i = 1, 2$. We let r_i represent the random value associated with consumption of media produced by an individual station. Media outlets are able to alter the characteristics of the random process governing the value which consumers derive from media. More specifically, we assume this value follows a probability density function (pdf) of the uniform variety:

$$f_i(r_i) = \begin{cases} \frac{1}{2\theta_i b_i} & \eta_i a_i - \theta_i b_i \leq r_i \leq \eta_i a_i + \theta_i b_i \\ 0 & \text{otherwise} \end{cases} \tag{1}$$

where a_i and b_i are chosen by the station and $\eta_i, \theta_i > 0$. We denote the cumulative density function (cdf) corresponding to this pdf by $F_i(r_i)$. Under this assumption, the expected value of media consumption from a single station is $\eta_i a_i$ while the variance of media value is $(\theta_i b_i)^2/3$. Therefore, a station can raise the expected return to consumers of its media output by increasing a_i and it can diminish the variance of media value by reducing b_i. The exogenous parameters η_i and θ_i account for the possibility that stations may not have equal control over the mean and variance of their output.

The two stations will strategically choose the parameters a and b in order to alter their appeal to audiences. We assume that the output from both stations follows a specific joint distribution; this allows for a third source of strategic interaction. Specifically, we employ a joint cumulative density function from the Farlie-Morgenstern family:

$$G(r_1, r_2) = F_1(r_1)F_2(r_2)\left\{1 + \left[\frac{\chi_1 + \chi_2}{b_1 b_2}\right][1 - F_1(r_1)][1 - F_2(r_2)]\right\} \tag{2}$$

and denote the associated pdf by $g(r_1, r_2)$.[4] We assume that each station is also free to choose the parameter χ_i. Under this specification, the covariance of media value across the two stations is $\theta_1\theta_2(\chi_1 + \chi_2)/9$. Thus, the stations can individually influence this covariance. For instance, a consumer will find that when station one chooses a high value for χ_1, other things equal, the utility derived from station one's output is more likely to be close in value to the media created by station two. For this reason, we employ the value of χ_i selected by each station as an indicator of product diversity in media output. We identify high levels of variety with low, or zero, values for the covariance of media utility and, hence, χ_i. As the covariance increases, the representative consumer finds that media consumption across the two stations yields a more similar payoff. We now turn to the precise consumer utility implications of media station choices.

[4]For additional information on the Farlie-Morgenstern distribution, see rice, p. 75.

2.2 Media Demand

Our model is populated by a representative consumer who is endowed with some time, normalized to one unit, which can be allocated between the two broadcast stations. If α is the share of the consumer's time devoted to consumption of media output from station one, then the random value of media consumed from both stations is $R = \alpha r_1 + (1-\alpha) r_2$. We assume the consumer's utility is linear-quadratic in the expected value of total media consumption and the variance of this consumption. We employ the following functional form to calculate the representative consumer's utility:

$$U = E(R) - \gamma E[R - E(R)]^2. \tag{3}$$

Under this specification, our consumer displays risk aversion in that a higher variance in the value of media consumption lowers utility. A higher value of γ implies the consumer is more averse to dispersion in the value of its media consumption.

In the Appendix, we discuss how this form of consumer utility, along with our assumptions regarding the stochastic nature of media content, yield the following first-order condition characterizing the interior utility-maximizing demand for the media content created by station one:

$$\eta_1 a_1 - \eta_2 a_2 - 2\gamma\left[\frac{(\chi_1+\chi_2)\,\theta_1\theta_2}{9} - \frac{(\theta_2 b_2)^2}{3}\right] - 2\gamma\left[\frac{(\theta_1 b_1)^2 + (\theta_2 b_2)^2}{3} - \frac{2\,(\chi_1+\chi_2)\,\theta_1\theta_2}{9}\right]\alpha = 0. \tag{4}$$

This condition will determine the consumer's viewership of media from station one provided the choices of the stations are such that utility is convex in α.[5] Allocating additional viewership to station one provides a benefit to the consumer driven by the average quality of the station's broadcast. In addition, the overall volatility of the media portfolio is lower since the consumer is no longer relying upon the output of station two; these two marginal benefits are reflected in the positive terms on the left-hand side of (**??**). In contrast, the remaining negative terms quantify two opportunity costs which emerge when the consumer marginally increases viewership of station one: 1) lost utility associated with the average value of the second station's media output and 2) additional volatility from concentrating viewership with station one.

Solving (**??**) for α yields an expression for the utility-maximizing share of viewership time allocated to station one:

$$\alpha^* = \left\{2\gamma\left[\frac{(\theta_1 b_1)^2 + (\theta_2 b_2)^2}{3} - \frac{2\theta_1\theta_2(\chi_1+\chi_2)}{9}\right]\right\}^{-1} \cdot \left\{\eta_1 a_1 - \eta_2 a_2 + 2\gamma\left[\frac{(\theta_2 b_2)^2}{3} - \frac{2\theta_1\theta_2(\chi_1+\chi_2)}{9}\right]\right\}. \tag{5}$$

Demand for the media created by station one is rising in the expected value of its content (a_1) and the variance of station two's media value (b_2) while station one's demand is falling in the variance of its media value (b_1) and the average value of the competitor's content (a_2). These predictions of our model seem intuitively plausible. In addition, provided the consumer's risk aversion parameter, γ, is sufficiently large, station one will lose audience as it increases the covariance of its media value through the parameter χ_1.[6]

In the next section, we explore the choices of the stations under the assumption of profit maximization. When selecting the characteristics of their output, we assume media outlets account for the fact that, per (**??**), the consumer responds to the nature of uncertainty surrounding a

[5] The utility function is concave in α whenever the sum of the variance of r_1 and r_2 is twice the covariance of these variables. This condition ensures that both stations face strictly positive demand.

[6] More specifically $\partial\alpha^*/\partial\chi_1 < 0$ if $\gamma > [6\theta_2^2 b_2^2 + (1/9) + 2(\chi_1+\chi_2)\theta_1\theta_2]^{-1}(\eta_1 a_1 - \eta_2 a_2)$.

particular outlet's media value. We explore the implications of these assumptions under duopoly and monopoly market structure.

2.3 Broadcaster Behavior Under Duopoly

We assume that each broadcaster receives revenue, normalized to one, for each unit of time the consumer devotes to watching the station. In addition, we assume broadcasters are aware that their choice of broadcast characteristics will alter the consumer's viewership patterns. We further assume that production costs are increasing in a_i at a constant marginal rate of $\zeta > 0$. This assumption captures the notion that producing broadcasts of higher average quality is costly to the station. In contrast, the variance of media value reduces costs by $.5\delta b_i^2$ with $\delta > 0$. Under this specification, a station can directly enhance its profit by reducing its collection of information regarding consumer interests or by failing to enhance its media content, thereby increasing the uncertainty regarding a consumer's realized value of media. We also assume that differentiation from the competing station is costly. To capture this notion, we imagine that χ_i increases costs according to $.5\epsilon\chi_i^2$ with $\epsilon > 0$. In this framework, if we denote profits for each station by π_i, we obtain the objective functions for each station:

$$\pi_1 = \alpha^* + .5\delta b_1^2 + .5\epsilon\chi_1^2 - \zeta a_1 \quad (6)$$

$$\pi_2 = 1 - \alpha^* + .5\delta b_2^2 + .5\epsilon\chi_2^2 - \zeta a_2. \quad (7)$$

In order to maximize profits, each station will choose a_i, b_i and χ_i, balancing the revenue derived from audiences with the costs implied by the characteristics of media content.

In the Appendix, we show that the following best response functions:

$$a_i = A_i + \frac{\eta_j}{\eta_i}a_j + \frac{2\gamma}{\eta_i}\left(\frac{\theta_i\theta_j}{9}\chi_j - \frac{\theta_j^2}{\eta_i}b_j^2\right) \quad (8)$$

$$b_i = \left[B_i + \frac{1}{\theta_j^2}\left(\frac{2\theta_i\theta_j}{3}\chi_j - \theta_j^2 b_j^2\right)\right]^{.5} \quad (9)$$

$$\chi_i = \frac{2\gamma\zeta\theta_i\theta_j}{9\epsilon\eta_i} - \frac{\delta\theta_j}{3\epsilon\theta_i} \quad (10)$$

arise from station i's attempt to maximize profits in light of the decisions made by station j in a duopoly market structure. Note that A_i and B_i are exogenous constants.[7] The first of these results implies that the expected value of media is a strategic complement: each station will increase the expected value of its broadcast, via the choice variable a_i, in response to a competitor's increase in broadcast quality. A station's audience share will decline when its competitor increases the quality of its broadcast: there is a negative revenue, or "business stealing," effect. In our model, a broadcaster will optimally choose to increase the average quality of its media content in order to offset this revenue effect and restore profits.

[7] These constants are related to the model's parameters according to:

$$A_i = \frac{3\eta_i\delta}{8(\gamma\zeta\theta_i)^2} + \frac{2\gamma\theta_j^2[2\gamma\zeta\theta_i^2 - 3\delta\eta_i]}{81\epsilon\eta_i^2}$$

$$B_i = \frac{3\eta_j}{2\gamma\zeta\theta_i^2 + \frac{4\gamma\zeta\theta_j^2}{27\eta_i\epsilon}}$$

From the best response function (**??**) we can conclude that the variance of media value is a strategic substitute. When station two, for example, increases its choice of b_2, station one experiences a positive revenue effect in that the audience will shift away from the rising level of uncertainty over station two's media value. Station one will optimally respond by cutting the consumer's uncertainty over the value of its broadcast. This response is costly, however, it further enhances the revenue effect and in our model yields a net positive increase in profits. We also conclude that media diversity, as represented by the level of χ_i, is neither a strategic complement nor substitute. Instead, equation (**??**) implies that diversification is driven by the marginal cost of providing unique content, among other exogenous parameters.

One advantage of our assumptions lies in the block-recursive nature of the system of best response functions which emerges from our model. Under a duopoly market structure characterized by competition for audience, this outcome can be exploited to obtain, in closed form, the Nash-Cournot equilibrium values of a_i^* and b_i^*. The full expressions for these equilibrium values are presented in the Appendix. In general, the equilibrium is a complicated function of the underlying parameters which characterize the consumer's utility function and the cost functions of broadcast firms. There is ambiguity surrounding the impact of some of these parameters on the equilibrium. However, we do find a number of clear predictions from the model regarding the equilibrium variance of media production (b^*) and diversity (χ_i^*).[8] At the margin, a decrease in the rate at which media instability reduces costs (a lower value of δ) induces stations to restore profits by increasing the equilibrium uncertainty confronting consumers: $\partial b_i^*/\partial\delta < 0$. We also find that a firm with more significant leverage over the average quality of its broadcast will choose higher uncertainty in equilibrium: $\partial b_i^*/\partial\eta_i > 0$.

The model also produces a fairly rich set of predictions regarding the equilibrium level of variety in media production. Inspection of (**??**) confirms that diversity in media output under duopoly falls as consumer utility becomes more sensitive to volatility in the media portfolio: $\partial\chi_i^*/\partial\gamma > 0$. In addition, if broadcast firms find that instability in media value has a small marginal impact on costs (there is a low value of δ) they will produce a less diverse broadcast: $\partial\chi_i^*/\partial\delta < 0$. Third, as the marginal cost of average media quality increases, each station will optimally reduce the diversity of its offerings $\partial\chi_i^*/\partial\zeta > 0$.

Unfortunately, characterizing the welfare implications of these comparative statics is hampered by ambiguity in the response of the equilibrium average quality, a_i^*, to the parameters of the model. It will be more straightforward to contrast welfare outcomes under duopoly with those that emerge under monopoly. We now turn to this task.

2.4 Monopoly Broadcasting

Under a monopolist market structure, both individual stations are owned and operated by a single firm. The profits of the monopolist, π_M are the sum of the individual profits from each station:

$$\pi_M = \pi_1 + \pi_2 = 1 + .5\delta(b_1^2 + b_2^2) + .5\epsilon(\chi_1^2 + \chi_2^2) - \zeta(a_1 + a_2). \tag{11}$$

Consolidation of the two firms under monopoly erases the business stealing effect: the demand for media no long responds to the nature of broadcast content. As a result of this outcome monopoly profits are monotonically strictly increasing in the variance of each station's media value ($\partial\pi_M/\partial b_i > 0$) and decreasing in the expected value of broadcasts and diversity in media content ($\partial\pi_M/\partial a_i < 0, \partial\pi_M/\partial\chi_i > 0$). For this reason, the monopolist will decide to reduce, without limit,

[8] For a detailed proof of these results, see the Appendix

the average quality of its broadcast and the variety of content produced by each station. In addition, the monopolist will increase without limit the uncertainty which consumers face regarding the quality of media output.[9]

Within the assumptions of the model we have employed, these results suggest that, relative to monopoly, a duopoly market structure generates media content of higher average and less uncertain quality while simultaneously providing more diversity in media content. These results are driven by competition for audience on the part of independently owned broadcast stations. Given our approach to modelling consumer utility, competition will also generate greater consumer welfare. The impact of market structure on social welfare is not easily ascertained in our model since producer surplus increases without bound under monopoly as consumer utility decreases without bound. It is the clear positive predictions of the model, namely that the diversity of media coverage is declining in market concentration, which we will seek to test empirically.

3 Empirical Specification and Results

In order to empirically investigate whether market structure has an impact on the diversity of media output, we turn to two databases measuring the types of stories covered during evening news broadcasts. Our first database is maintained by the Local TV News Media Project at the University of Delaware and was originally gathered by the Project for Excellence in Journalism.[10] The broadcast news archive reports the content and length of approximately 10,600 individual news stories created by sixty stations in twenty designated market areas (DMAs) in 1998. The assignment of a station to a DMA is conducted by Nielson Media Research, which uses "proprietary criteria, testing methodologies and data to partition regions of the United States into geographically distinct television viewing ares, and then expresses them in unique, carefully defined regions that are meaningful to the specific business we conduct."[11] Each of the DMAs covered by our data, along with the size ranking of the DMA, is listed in Table **??**. Our sample of stations is drawn from the largest half of all broadcast markets in the United States. For this reason, our empirical results may not apply to smaller markets in more rural areas. Nevertheless, our sample contains a fairly heterogeneous group of markets and covers broadcast stations which reach large populations.

Our second database is collected by ADT Research and captures the content of national evening news broadcasts in the United States.[12] This information is available as a monthly time series from January of 1988 to May of 2003; we take an annual average of our monthly observations in order to match the frequency of our explanatory variables. While this source does not provide us with as much detail regarding the specific focus of news stories within each month (relative to our local database) we are able to determine whether the time allocated to a story is unique or somewhat redundant. This is a critical aspect of media coverage which we rely upon in order to quantify variety in the content of news broadcasts.

We employ two distinct, but related, measures of diversity. First, for all local broadcast content within a particular DMA, we count the total seconds of local news coverage that are unique to the three major broadcasters (ABC, CBS, and NBC) within the DMA as contributing to diversity. We refer to this measure as *relative* or *marginal station-level diversity*, since this measure captures each network's incremental contribution to the total amount of coverage of unique stories. Under

[9]A more general model might admit the possibility that consumers turn to non-broadcast media in response to poor performance by a monopolist. Such considerations are beyond the scope of this paper.

[10]http://www.localtvnews.org

[11]Federal Communications Commission document, letter from Nielsen Media Research to the Commission, April 3, 2003, pp. 98-206. Geographic continuity is a standard feature of all 210 DMAs except three.

[12]http://www.tyndallreport.com

this measure, if any two or more local news broadcasts cover the same story on the same day only the seconds beyond the collective average of the respective overlapping broadcasts are counted as adding to diversity.[13] Our database on national broadcasts allows us to carry out the same calculation.[14] We divide these "unique" seconds of coverage by the total broadcast length in order to arrive at our first measure of diversity. Summary statistics for our diversity measure, as well as all other variables used in the empirical analysis, are presented in the Appendix.

In Table **??** we present results from averaging our first diversity variable across the three stations in each of the twenty DMAs in our sample and across all stations for a given network. On average, news broadcasts in Louisville are the most diverse, with 92% of media content unique to a given station. In contrast, St. Louis has the lowest level of broadcast variety, with 34% of a given station's broadcast time devoted to stories which are covered by other networks. Market size also displays an ambiguous unconditional relationship with broadcast diversity. For example, the third smallest DMA (Evansville) has the fourth highest level of broadcast variety while the smallest DMA (Tallahassee) has the third lowest level of diversity. We also find that while stations affiliated with ABC and CBS are very similar in their choice of diversity (approximately 83% of broadcast time is unique), local NBC stations tend to choose a much lower level of diversity.

Figure **??** presents the time series behavior of diversity in national evening news broadcasts. On average, 41% of national news broadcasts in 1998 was devoted to unique coverage; this is approximately half of the diversity generated by the news broadcasters in our local sample in the same year (across all markets and stations 80% of local broadcast time was unique). In addition, the dispersion of national news broadcast diversity has declined in recent years. In the first half of the sample the standard deviation of national news broadcast diversity is 4.28 while in the second half the stand deviation declines to 1.62; a standard F-test rejects the hypothesis of an equal variance in diversity across all sixteen years.[15] We do not obtain a statistically significant coefficient on a linear time trend (separately estimated for each of the national evening news diversity variables). An augmented Dickey-Fuller test for a unit root in each station's diversity coverage rejects the null hypothesis of a unit root at a 1% level of significance.[16] These results suggest that there is no long-run positive or negative trend in the diversity of national evening news broadcasts. Thus, although the national networks are becoming more similar in the level of diverse content which each of them produce, the evidence suggests that this level of diversity is stable in the long run.

Our marginal station-level diversity measure may not adequately capture the collective output of diverse content by the broadcasters in a DMA since it is measured on a relative basis. In order to investigate the robustness of our findings, we use our local broadcast data to create a second measure of diversity that counts the total time devoted to all unique stories covered by the three networks. This variable, which measures each network's contribution to the total amount of news coverage in a market, is referred to as *total DMA diversity*. We do not use our national broadcast

[13]We do not explore intra-story diversity given the highly subject nature of this task.

[14]With our national data, for a given station we know the length of time devoted to stories which are covered by other networks, but we are not able to identify, for a given story, how much time is devoted to that story by other networks. In order to approximate our technique for measuring diversity at the local level, we sum the minutes of unique coverage with 1/3 of the minutes of coverage of stories covered by one other broadcaster and divide this total by the length of a broadcast.

[15]Three versions of Bartlett's generalized test also reject, at a 1% level of significance, the null hypothesis of equal variance.

[16]The augmented Dickey-Fuller test employs one lag of diversity and does not include a trend. Further evidence of stationarity in national broadcast diversity is given by a Kwiatkowski-Phillips-Schmidt-Shin test of the null hypothesis that each diversity series is level stationary; this null is not rejected at a 1% or 5% level of significance regardless of the lag order used in conducting the test. Since a Phillips-Perron test fails to reject the null of a unit root for ABC and CBS, we hesitate to conclude that diversity is incontrovertibly stationary.

data to create this variable due to limits on the size of the national sample.[17] The raw correlation between these two measures is .18, this suggests they may capture slightly different broadcaster behavior.

We employ two empirical specifications, one each for our local and national data, in order to ascertain the determinants of content variety in broadcast news. Both specifications implicitly assume that diversity in output is determined by three broad categories of factors: structural, market, and demographic. The sources of data for each of these factors are listed in the Appendix. Our model presented above suggests that the level of variety in broadcasting will fall as a market moves from duopoly to monopoly market structure. We begin by describing our technique for testing this hypothesis with the local broadcast data and the resulting empirical estimates.

We employ two measures of structure: the revenue Herfindahl-Hirschman Index (HHI) and the number of broadcast stations in the market ($NumStat$). Loosely, one can think of the HHI as reflecting the state of *actual* competition within a market while the number of firms reflects *potential* competition. In addition to the theoretical discussion in this paper, there are reasons to believe that ownership structure may influence diversity if the within-market stations are owned and operated by large broadcast networks. In this case, given the scale economies inherent in national program distribution, diverse output may become relatively more costly (although the output within any given DMA might still be "diverse" in one sense). Thus, we might expect that increasing concentration might lead to lower diversity. On the other hand, actual, emergent or potential competition might promote greater diversity in content (such as the type found by gs).

There are also reasons to believe that a host of local market conditions will affect the decision by broadcasters to produce unique content. We include in our analysis measures of total industry revenue (Rev) of all stations to capture the size of a market. If there are scale economies in the production of diverse news determined by the size of a market, this variable could influence variety in broadcast news. It is also possible that the affluence of a local market influences the interest in variety of news coverage: diversity may be a normal or luxury good. Simply, rising income allows consumers to indulge their "taste for diversity." To control for this possibility, we include in our specification a market's income per capita ($Income$). We also control for the cable penetration rate ($CablePen$) in our specification; this variable is meant to capture the extent to which consumers within a DMA have access to cable broadcasting in addition to over-the-air signals.[18] Ex-ante, we expect that as consumers have access to a larger number of channels through cable providers, broadcast firms may have incentives to diversify their respective outputs in order to counter new entry and a loss of audience. For a somewhat similar reason, we control for the computer ownership rate ($CompOwn$) in our specification. This variable is meant to proxy for access to additional sources of news content. If consumers can access broad news content via the internet, local broadcast stations may have an incentive to produce news that is more local in content (ie they may become more locally specialized), especially if internet news is broadly substitutable for local broadcast news. It is also possible that the two are complements, leading to a positive relationship between content diversity and computer ownership.

The model presented above predicts that, under a duopoly market structure, consumer preferences will alter the equilibrium level of diversity in media. In keeping with this finding, we include a number of demographic variables in our specification in order to capture the role of consumer characteristics in determining media variety. The first of these variables is population density ($PopDens$). If a densely situated population implies heterogeneity among consumers, we expect

[17] Calculating total diversity from the national broadcast data would leave us with only eleven observations. We are not optimistic that such a sample would allow us to successfully conduct our estimation.

[18] Ideally, we would also like to include satellite penetration in our analysis, unfortunately, this data was not available.

that the output of broadcast news might become more diverse in order to satisfy consumer interests. On the other hand, a large population which is concentrated in a small "footprint" may encounter a uniformity of events, thereby leading to uniformity in news coverage. For example, there is not much room for diverse perspectives on the weather in Manhattan. The same may not be true of a similarly sized population spread across a broader region, such as the greater Los Angeles metropolitan area. Our second demographic variable is the percentage of the population over 65 ($Ov65$). We hope to test if concentration of a DMA's population among the elderly causes news coverage to converge on topics of interest to that particular group, thereby reducing variety.[19]

The specification we employ for the local data is as follows:

$$\begin{aligned} Diversity_{ij} = \; & \beta_0 + \beta_1 \ln HHI_{ij} + \beta_2 \ln Rev_{ij} + \beta_3 CablePen_{ij} \\ & + \beta_4 \ln Income_{ij} + \beta_5 CompOwn_{ij} + \beta_6 \ln PopDens_{ij} + \beta_7 Ov65_{ij} + \epsilon_{ij} \end{aligned} \tag{12}$$

where $i = 1, 2, 3$ is an index of the stations and $j = 1, 2, \ldots 20$ is an index of markets. Estimation of (**??**) is carried out by Ordinary Least Squares with standard errors which are robust to heteroscedasticity; the results of this estimation are presented in the first four columns of Table **??**.

The first column of this table represents a baseline set of empirical estimates and uses the marginal station-level verion of our diversity measure as a dependent variable. The results in this column are broadly consistent with our prior expectations for the role of each of explanatory variable in determining broadcast news variety. Given that the negative coefficient on the HHI variable is significant at a 5% level, there is a prima fascia case to be made that market structure influences the diversity of the product offerings in broadcast news. More precisely, according to these results, increases in the HHI have a negative impact on diversity. Since we also find that the cable penetration rate has a significant positive relationship with diversity, we find preliminary evidence that broadcast news is broadly responsive to the presence of alternative programming choices available to potential viewers: competition from non-broadcast sources of media seems to have an impact on marginal station-level diversity. The negative and significant coefficient on total industry revenue yields a somewhat surprising prediction that large markets are associated with lower levels of media diversity. We find evidence that diversity responds strongly to per capita income within a market: higher levels of news diversity emerge in more affluent markets. In contrast we find that higher levels of computer ownership, population density and population over the age of 65 will cause broadcast news diversity to fall in a statistically significant manner.

In order to explore the robustness of these results, we substitute our total market measure of diversity as a dependent variable. The second and third columns of Table **??** present the estimation results with this new measure of diversity. The results in the second column suggest that none of the explanatory variables are related to total market diversity in a statistically significant manner. We are somewhat concerned that this result is driven by the relatively low degrees of freedom associated with this the total diversity variable (construction of this variable leaves us with twenty observations). In order to investigate this possibility, we present the coefficients which are estimated when average household income is dropped as an explanatory variable in equation (**??**). In this more parsimonious specification, the coefficient on HHI is once again negative and it is also significant at the 10% level. The same is true of total industry revenue. The remaining coefficients, including the coefficient on $CablePen$, are not statistically significant.

From these results, we conclude that the negative relationship between media diversity and market concentration/size is relatively robust to measuring diversity on either a marginal or total basis. The availability of cable alternatives seems to primarily drive marginal, rather than total,

[19]The opportunity cost of leisure / television media consumption is particularly low among this group. For this reason, media production may be particularly sensitive to this aspect of demographics.

diversity. One could also question whether the revenue HHI variable adequately captures the structure of a market. In column (4) we revert to the marginal station diversity measure as a dependent variable and we replace HHI with the number of broadcast stations in a market. The results in this column are broadly consistent with our baseline specification and suggest that more competition, in the form of a larger number of stations, leads to a statistically significant increase in news variety.

In order to further investigate the robustness of our findings, we turn to the data on national evening news broadcasts. Given the time series nature of this data, we need to employ a slightly different estimation framework, although our final specification is very close in spirit to equation (**??**). Given the stationarity of the national diversity series, we employ the annual growth rate of real national broadcast advertising revenue ($GrowRev$) since the level of advertising revenues has a clear trend. This variable should control for the impact of market size, if any, on national broadcast diversity. In addition, we use the growth rate of real GDP ($GrowY$) as an explanatory variable in order to estimate any effects of the business cycle on broadcast diversity. We can also test for persistence over time in broadcast news diversity by including a lag of diversity. Our specification for the national sample is:

$$\begin{aligned}\ln Diversity_{it} = \quad & \beta_0 + \beta_1 \ln HHI_t + \beta_2 \ln GrowRev_t + \beta_3 \ln CablePen_t \\ & + \beta_4 \ln GrowY_t + \beta_5 \ln CompOwn_t + \beta_6 \ln Ov65_t + \beta_7 \ln Diversity_{t-1} + \epsilon_{it}\end{aligned} \tag{13}$$

where $i = 1, 2, 3$ is an index of stations and t is an index of years. We use Feasible Generalized Least Squares (FGLS) to estimate the coefficients from (**??**) and allow for ϵ to have unequal variance across stations and first-order serial correlation.

Estimates of the coefficients in (**??**) are presented in the fifth column of Table **??**. These results are qualitatively entirely consistent with the coefficients obtained with the local broadcast data. In particular, we find that concentration displays a negative and significant relationship with national news broadcast variety while the cable penetration rate displays a positive and significant relationship with diversity. As was also true of the results obtained from the local broadcast data, the computer ownership rate and the share of the population over 65 are each related to diversity in a negative and significant manner. The estimated coefficient on the growth rate of real GDP is not statistically significant; we do not find evidence that national broadcast diversity is driven by national income or the business cycle. We obtain a positive and significant coefficient on the growth rate of advertising revenue, suggesting that an increase in the size of the national advertising market will tend to drive broadcast diversity higher. Finally, we find evidence of a high level of persistence in broadcast diversity: the coefficient on the lag of diversity is .73 and highly significant, implying that half of the effect of a shock to evening news diversity is still present after the passage of 2.2 years.

There is a distinct possibility that the results reported above are not reliable, since the level of broadcast news diversity could have an impact on industry structure and / or cable penetration. In other words, it is feasible that uniformity in news coverage may induce lower concentration and higher cable penetration rates due to viewer response. In the presence of such "reverse causality," standard OLS estimation can lead to biased coefficients. We are somewhat convinced that our OLS results are reliable given that our diversity measure focuses upon a narrow, albeit important, portion of broadcast content. Our explanatory variables are measured annually at the market level and are likely determined by factors broader than news broadcasts which are no longer than one hour in length.

Nevertheless, we further explore the robustness of our results to issues of endogeneity in our regressors. With the local broadcast data, our technique involves employing one year lag values of the HHI and $CablePen$ variables as instruments for the contemporaneous value of these variables. These values should be independent of the level of media diversity in the current year. There is only one circumstance in which these values would not serve as adequate instruments. If either of these variables are in any way forward-looking, for example cable subscriptions change now in anticipation of future changes in broadcast news diversity, this technique will fail to improve the performance of our estimator. We have a strong prior belief that this is unlikely the case, given that our diversity measure is derived from a small portion of broadcast media content.

The results from Instrumental Variables estimation of (**??**) are presented in the first three columns of Table **??**. The coefficient on the cable penetration rate increases from .47 in our baseline OLS estimates to .50 under IV estimation and remains statistically significant. This result suggests it is unlikely that our conclusion regarding the role of broad media competition in determining broadcast news diversity is driven by reverse causality. In contrast, we find that the coefficient on HHI declines in absolute value, from -16 to -5, when IV estimation is conducted. In addition, this coefficient is no longer statistically significant at conventional levels: there is some fragility in the relationship between structure and marginal diversity. The remaining coefficients are consistent with our previously reported OLS findings.

In the second column we use total market diversity as our dependent variable and obtain very imprecisely estimated coefficients. Once again, this could be driven by the small sample associated with the total diversity variable. In column (3) we drop income as an explanatory variable in order to regain some degrees of freedom and find that the HHI variable obtains a negative coefficient which is statistically significant at the 10% level. The relationship between total diversity and market structure is relatively robust. As was true of the OLS results, the cable penetration rate is not a significant predictor of total broadcast variety. Total industry revenue obtains a negative coefficient which is only marginally significant (p-value of .108). The remaining coefficients are not statistically significant at conventional levels; the same was true of our OLS results.

In summary, we find that in our local data, the cable penetration rate is an effective predictor of marginal broadcast variety under both OLS and IV estimation. In contrast, market concentration displays an inverse, statistically significant relationship with total market diversity but OLS estimates of this relationship may be influenced by endogeneity of structure. Our IV estimates may also be driven by weakness in our chosen instruments rather than endogeneity. Indeed, when we apply the same instrumenting framework to the national broadcast data, the resulting coefficients are very imprecisely estimated. The IV estimates of (**??**) required us to drop the FGLS assumptions of station-level heteroscedasticity and serial correlation in the errors.[20] This could also explain the overall lack of fit in the IV results. We adopt a slightly different approach in order to address reverse causality in the national broadcast results; rather than use lag values of structure and cable penetration as instruments we substitute these values for the contemporaneous values and use FGLS to estimate coefficients on the lags directly. Under the assumption that structure and cable penetration are minimally forward-looking with respect to broadcast diversity, this approach should yield results which are unaffected by reverse causality.

The coefficients we obtained from this specification are presented in column (4) of Table **??**. The coefficient on the lagged value of the HHI is negative and significant at a 10% level, it is also larger in absolute value relative to the coefficient on the contemporaneous measure of structure. While the coefficient on the lagged value of $CablePenn$ is positive, it is no longer significant at conventional levels. Thus, we do not have evidence that the coefficient on this variable is unaffected by endogeneity. The remaining coefficients are largely consistent with our prior findings, although the coefficients on $Ov65$ and the lag of diversity are no longer statistically significant. In summary,

[20]We did not have a readily available routine to estimate an FGLS version of an IV estimator.

we find that market structure is a fairly robust predictor of diversity in national evening news coverage.

4 Conclusion

The relationship between the structure of a market and the diversity of its product offering has been extensively explored by theorists, and these theories have generated competing hypothesis. In this paper, we developed a new model of variety in broadcast media markets. This model predicted that competition should enhance the level of variety in broadcast media markets. In addition, we employed unique data to generate two simple measures of diversity and explored the determinants of such diversity at both the local and national levels. The relevance of the model derives largely from the strategic interplay between competing firms, as well as the political-economic implications of variations in the diversity of news content. Because of ownership rules preventing merger to monopoly, we are not able to test the Steiner hypothesis directly.

Using a simple OLS framework, our preliminary findings suggest that market-level structure may influence the output of firms. Specifically, using the relative station-level diversity metric, we find that as the structure of a market becomes more concentrated, relative diversity of local news content is diminished. Importantly, this result is not robust to an instrumental variables specification. However, using the total market diversity metric, HHI is significant in OLS and robust to instrumental variable transformation. Since the total market diversity metric is arguably superior to the incremental metric as a measure of overall diversity, this result is useful - it suggests that total diversity within a DMA is sensitive to the level of concentration. Since we find that market structure plays an equally important role in determining product variety in national broadcasts, we are fairly confident in this finding.

Future research using this data might follow several plausibly enlightening extensions. First, ownership structure may be a significant influence on diversity - perhaps as important as overall concentration. Specifically, we wonder whether stations that are part of a national broadcast chain might "over-utilize" national broadcast feeds, since this option is relatively speaking, less expensive than gathering news individually. Since this option is not available to single-station owners, gathering local news is relatively less expensive. Providing the overlap between national stories and local news is modest (as might be expected for most DMAs), single-station owners might contribute more to diversity than owned-and-operated chain stations.

5 Appendix

5.1 Consumer Utility Maximization

Given the assumptions regarding the stochastic media production technology, the expected value and variance of media utility are:

$$E(R) = \int_{a_2-b_2}^{a_2+b_2} \int_{a_1-b_1}^{a_1+b_1} R \cdot g(r_1, r_2) dr_1 dr_2 \tag{14}$$

$$E[R - E(R)]^2 = \int_{a_2-b_2}^{a_2+b_2} \int_{a_1-b_1}^{a_1+b_1} [R - E(R)]^2 \cdot g(r_1, r_2) dr_1 dr_2. \tag{15}$$

By substituting these expressions into the consumer utility function (**??**) while employing the definition of the media "portfolio" and the pdf obtained from (**??**) we obtain the first order condition (**??**) above which characterizes maximization of consumer utility with respect to α.

5.2 Broadcaster Best Response Functions

Maximization of the profit functions (**??**) and (**??**) yields first-order conditions for station i which can be expressed in the following manner:

$$\frac{9\eta_i}{2\gamma K} - \zeta = 0 \tag{16}$$

$$-\frac{4\gamma\zeta\theta_i^2 b_1}{3\eta_i}\alpha_i + \delta b_i = 0 \tag{17}$$

$$\frac{\theta_i\theta_j}{\epsilon K} - \frac{2\alpha_i\theta_i\theta j}{\epsilon K} = \chi_i \tag{18}$$

$$3[(\theta_i b_i)^2 + (\theta_j b_j)^2] - 2\theta_i\theta_j(\chi_1 + \chi_2) = K \tag{19}$$

where $\alpha_1 = \alpha^*$ from (**??**) and $\alpha_2 = 1 - \alpha^*$. In order to obtain the best response functions (**??**)-(**??**), begin with (**??**) and solve for K. Use this solution, along with (**??**) to find α_i. Substitute the solutions for K and α_i into (**??**) in order to obtain the solution for χ_i presented in (**??**). Use these results, along with (**??**) to solve for the best response function (**??**). Finally, use these results along with the solution for α_i and the optimal value α^* from (**??**) to find the best response function (**??**).

5.3 Equilibrium

The Nash-Cournot equilibrium is obtained from the best response functions (**??**)-(**??**). It is straightforward to show that the equilibrium values for a and b are as follows:

$$a_i^* = \frac{1}{9\epsilon(\eta_i - \eta_j)}\left[\frac{2\gamma(2\gamma\zeta\theta_j^2 - 3\delta\eta_j)}{9\eta_j} - \frac{(2\gamma\theta_j^2)^2\zeta + 27\gamma\epsilon\eta_i B_j\theta_j^2 - 27\epsilon A_i\eta_i^3}{3\eta_i^2} + \frac{2\gamma\delta\theta_j^4}{\eta_i\theta_i^2}\right] \tag{20}$$

$$b_i^* = \left(\frac{B_i}{2} + \frac{2{\theta_i}^2\zeta\gamma}{27\epsilon\eta_j} - \frac{{\theta_i}^2\delta}{9{\theta_j}^2\epsilon}\right)^{0.5}. \tag{21}$$

From (**??**) we can obtain the following results:

$$\frac{\partial b_i^*}{\partial\delta} = .5b_i^{*-1}\left(\frac{-\theta_i^2}{9\theta_j^2\epsilon}\right) \tag{22}$$

$$\frac{\partial b_i^*}{\partial\eta_i} = .5b_i^{*-1}\frac{\partial B_i}{\partial\eta_i}. \tag{23}$$

Given the assumptions of the model, the first derivative is negative while the second derivative is positive, as described in the text above.

In addition, from (**??**) we have:

$$\frac{\partial\chi_i^*}{\partial\gamma} = \frac{2\zeta\theta_i\theta_j}{9\epsilon\eta_i} \tag{24}$$

$$\frac{\partial\chi_i^*}{\partial\delta} = \frac{-\theta_j}{3\epsilon\theta_i} \tag{25}$$

$$\frac{\partial\chi_i^*}{\partial\zeta} = \frac{2\gamma\theta_i\theta_j}{9\epsilon\eta_i} \tag{26}$$

The assumptions of the model imply these derivatives are positive, negative and positive, respectively.

5.4 Summary Statistics

Local Station-Level Specification					
Variable	Obs	Mean	Std Dev	Max	Min
$Diversity$	60	80.04	5.99	65.53	91.56
$\ln HHI$	60	7.69	0.25	7.14	8.18
$\ln Rev$	60	12.06	1.23	10.05	14.20
$CablePen$	60	66.65	7.32	52.00	79.00
$Income$	60	10.64	0.14	10.45	10.90
$CompOwn$	60	42.59	4.84	35.80	56.30
$\ln PopDens$	60	5.07	1.02	2.79	7.12
$Ov65$	60	12.97	1.64	9.93	17.22
$NumStat$	60	9.45	4.46	3.00	21.00

Local Market-Level Specification					
Variable	Obs	Mean	Std Dev	Max	Min
$Diversity$	20	62.48	10.86	35.47	85.83
$\ln HHI$	20	7.69	0.26	7.14	8.18
$\ln Rev$	20	12.06	1.25	10.05	14.20
$CablePen$	20	66.65	7.45	52.00	79.00
$\ln Income$	20	10.64	0.14	10.45	10.90
$CompOwn$	20	42.59	4.93	35.80	56.30
$\ln PopDens$	20	5.07	1.04	2.79	7.12
$Ov65$	20	12.97	1.67	9.93	17.22

National Specification					
Variable	Obs	Mean	Std Dev	Max	Min
$\ln Diversity$	36	4.03	0.07	3.88	4.15
$\ln HHI$	36	7.97	0.05	7.90	8.06
$\ln CablePen$	36	4.13	0.08	3.95	4.22
$\ln GrowRev$	36	4.62	0.05	4.54	4.71
$\ln GrowY$	36	4.64	0.01	4.60	4.65
$\ln CompOwn$	36	5.69	0.32	5.21	6.25
$\ln Ov65$	36	2.53	0.01	2.51	2.54

5.5 Data Sources

* BIA Financial Network's Media Access Database: Revenue information from this source was used to construct the HHI and Rev series. In addition, income per person ($Income$) was obtained from this source.

* Statistical Abstract of the United States (Various Issues): State-level information from this source was used for our $CablePen$, $CompOwn$, $PopDens$ and $Ov65$ series.

* Veronis, Suhler and Associates Communications Industry Report (Various Issues): We used information on revenue for the three major broadcast networks to calculate $GrowRev$ as well as the HHI variable used in the national analysis.

* Bureau of Economic Analysis: We used the National Income Accounts to calculate $GrowY$.

* Local TV News Media Project - University of Delaware: We used raw data from this source to construct our two measures of local news diversity ($Diversity$).

* Tyndall Report - ADT Research: We used raw data from this source to construct our measure of national broadcast news diversity ($Diversity$).

Table 1

Markets and DMA Ranks

DMA	Rank	DMA	Rank
New York	1	Buffalo	44
Los Angeles	2	Louisville	48
Chicago	3	Albuquerque	49
Boston	6	Jacksonville	52
Washington, D.C.	8	Wichita	65
Atlanta	10	Tucson	72
Seattle	12	Burlington	91
Minneapolis/St. Paul	14	Evansville	98
Pittsburgh	20	Lansing	107
St. Louis	21	Tallahassee	109

Table 2

Local News Diversity by Market and Network

Louisville	91.56
Wichita	89.63
Albuquerque	85.80
Evansville	85.64
Burlington	83.72
Jacksonville	83.19
Seattle	82.79
Lansing	82.69
Los Angeles	82.23
Boston	81.22
Atlanta	81.15
Tucson	80.42
New York	79.22
Pittsburgh	77.19
Buffalo	76.47
Wash DC	76.24
Chicago	76.11
Tallahassee	75.86
Minneapolis	70.14
St. Louis	65.53
ABC	85.17
CBS	82.37
NBC	65.53

Note: Results obtained from the Local TV News Media Project and are measured in 1998.

Table 3
OLS and GLS Results

	(1)	(2)	(3)	(4)	(5)
HHI (log)	- 16.81	-56.45	-56.82	-	-2.54
	(0.047)	(0.135)	(0.074)	-	(0.003)
Number of Stations	-	-	-	0.66	-
	-	-	-	(0.013)	-
Total Industry Revenue (log)	- 6.76	-12.533	-12.69	-5.81	-
	(0.002)	(0.212)	(0.087)	(0.000)	-
Growth Rate of Advertising Revenue (log)	-	-	-	-	0.36
	-	-	-	-	(0.058)
Cable Penetration Rate	0.47	-0.62	-0.62	0.37	2.94
	(0.000)	(0.211)	(0.200)	(0.001)	(0.048)
Average Household Income (log)	31.58	-1.20	-	31.92	-
	(0.002)	(0.974)	-	(0.000)	-
Growth Rate of real GDP (log)	-	-	-	-	-0.53
	-	-	-	-	(0.561)
Computer Ownership Rate	- 0.33	-0.53	-0.54	-0.41	-0.89
	(0.046)	(0.381)	(0.283)	(0.005)	(0.001)
Population Density (log)	- 3.91	4.74	4.68	-3.41	-
	(0.000)	(0.142)	(0.109)	(0.000)	-
% Population Over 65	- 1.18	0.60	0.61	-1.59	-9.10
	(0.015)	(0.782)	(0.777)	(0.003)	(0.021)
Lag of Diversity (log)	-	-	-	-	0.73
	-	-	-	-	(0.000)
R^2	.45	.38	.38	.44	-
Obs	60	20	20	60	33

Note: p-values in parentheses and in columns (1)-(4) are based upon White's heteroscedasticity-consistent standard errors. In columns (1) and (4) the dependent variable is the average number of seconds devoted to unique stories by a given station. In columns (2) and (3) the dependent variable is the average number of seconds devoted to unique stories by all stations within a DMA. All regressions include a constant (not reported). Feasible Generalized Least Squares assuming station-level heteroscedasticity and a common AR(1) process for the error term is used to obtain the results in column (5). The diversity measure and all explanatory variables used to obtain the coefficients in this column are in log form and measured at the national level.

Table 4

Robustness Results

Variable	(1)	(2)	(3)	(4)
HHI (log)	- 5.04	-55.92	-56.54	-2.63
	(0.610)	(0.162)	(0.094)	(0.058)
Total Industry Revenue (log)	- 4.06	-12.41	-12.64	-
	(0.098)	(0.232)	(0.108)	-
Growth Rate of Advertising Revenue (log)	-	-	-	0.36
	-	-	-	(0.017)
Cable Penetration Rate	0.50	-0.63	-0.62	1.11
	(0.000)	(0.220)	(0.208)	(0.441)
Average Household Income (log)	25.75	-1.51	-	-
	(0.022)	(0.966)	-	-
Growth rate of Real GDP (log)	-	-	-	-0.72
	-	-	-	(0.347)
Computer Ownership Rate	- 0.27	-0.53	-0.54	-0.59
	(0.100)	(0.355)	(0.274)	(0.004)
Population Density (log)	- 3.86	4.76	4.69	-
	(0.000)	(0.135)	(0.116)	-
% Population Over 65	- 1.39	0.60	0.61	-4.66
	(0.012)	(0.793)	(0.785)	(0.311)
Lag of Diversity (log)	-	-	-	0.06
	-	-	-	(0.626)
Obs	60	20	20	33

Note: p-values in parentheses are based upon White's heteroscedasticity-consistent standard errors. The results in columns (1) - (3) are obtained with Instrumental Variable estimation using 1997 HHI and $CablePen$ as instruments. In column (1) the dependent variable is the average number of seconds devoted to unique stories by a given station. In columns (2) and (3) the dependent variable is the average number of seconds devoted to unique stories by all stations within a DMA. Feasible Generalized Least Squares assuming station-level heteroscedasticity and a common AR(1) process for the error term is used to obtain the results in column (5). The diversity measure and all explanatory variables used to obtain the coefficients in this column are in log form and measured at the national level. HHI and $CablePen$ are lagged one period in this specification. All regressions include a constant (not reported).

Figure 1
National Evening New Diversity