Consolidation and Advertising Price in Local Radio Markets

Keith Brown and George Williams

I. Introduction

With the wave of radio mergers following the 1996 Telecommunications Act, the radio market has captured more attention from observers and policymakers. Specifically, observers and policymakers wish to understand the causes and consequences of consolidation in radio markets. Combining the Service Quality Analytics Data (SQAD) with data from BIA and the Bureau of Economic Analysis, we analyze the effect of consolidation on the price of radio advertising. Because the SQAD data derives exclusively from the records of national and regional advertising agencies, it only includes the local radio advertising purchases made through these advertising agencies, and does not include data on local radio advertising purchases made by actual local businesses. We find that increases in both local and national concentration following the Act increased advertising prices for local radio. While the increases stemming from local concentration likely stem from increased market power for local radio owners, the increases in radio advertising prices resulting from increased national concentration may or may not stem from the simple exercise of market power. When we examined markets where the local share of national conglomerate owners grew more quickly over time, we found that these markets actually charged lower prices for local radio advertising to national and regional advertising agencies.

The 1996 Act made two major regulatory changes in radio. First, the 1996 Act increased the amount of radio stations that a single radio owner could possess in any given locality. Under the 1996 Act, a single owner can own up to 8 radio stations in a market with 45 or more commercial radio stations, 7 radio stations in a market with 30-44 radio stations, 6 radio stations in a market with 15-29 radio stations, and five stations in markets with less than 15 radio stations. Second, the 1996 Act eliminated all caps on national ownership, replacing the old cap of 20 FM stations and 20 AM stations. This paper specifically addresses and estimates the effects of these changes on the prices paid by national and regional advertising agencies for advertising time in local radio markets. Even if we could fully apprehend the effects of radio consolidation on the prices paid by all types of advertisers for all types of radio advertising, the economic welfare implications of consolidation in radio markets would still be unclear, because advertisers are not the only customers in radio markets. Listeners also consume radio, and listeners may not like advertising. To the extent that listeners dislike advertising, and to the extent radio stations use market power to charge advertisers higher prices by restricting the amount of advertising time, then listeners may in fact benefit from the radio stations' exercise of market power over advertisers. Becker and Murphy (1993) contend that media consumers in any advertiser-supported media market dislike the advertising carried by that media, because the advertiser must compensate the media consumer with free programming in order to get the media consumer to view or listen to the advertising. Therefore, if market power by radio owners leads to higher advertising prices paid by radio advertisers, then radio listeners may in fact benefit from the resulting decline in the amount of advertising.

II. Literature Review

Consolidation in media markets effects economic welfare in many disparate ways. Berry and Waldfogel (2001) studied the effects of consolidation on format diversity in radio markets, finding that consolidation increased the number of formats available to listeners. Romeo and Dick (2001) contend that a radio station's chosen format represents a significant sunk cost, indicating that concentration within a local radio market's format may be meaningful for antitrust analysis.

Radio consolidation may also impact the advertising market. The Department of Justice has expressed specific interest in understanding the effects of recent radio mergers on advertising rates. From a theoretical perspective, the impact of consolidation on radio markets allows us to explore the implications of recent theory. Anderson and Coate (2000) contend that firms in advertiser-supported media markets have two potential sources of market power; market power over listeners/viewers and market power over advertisers. In fact, Anderson and Coate point out, these two different sources of market power counteract each other when determining the amount of advertising in the market. To the extent a media firm has market power over listeners/viewers (and if listeners/viewers dislike advertising), then the firm will air more ads, because listeners/viewers do not have close media substitutes and therefore cannot avoid advertising. On the other hand, to the extent a media firm has market power over advertisers, then the firm will air less advertising in order to extract higher prices from advertisers.

Past empirical work on radio advertising includes Ekelund, Ford, and Jackson (1999), who estimate the own-price elasticity of radio advertising in order to determine

whether radio advertising constitutes a distinct local market for antitrust analysis. EFJ find that radio advertising does indeed constitute an antitrust market. Ekelund, Ford, and Koutsky (2000) estimate the sale price of radio stations as a function of concentration. If local concentration raises market power for radio stations, then it should raise the expected profits of each radio station, which should raise the equilibrium sale price of each radio station. EFK find no strong relationship between the sale price of radio stations and local concentration.

In other work on media advertising substitutability, Silk, Klein, and Berndt (2002) employ simultaneous equations to analyze the cross-price elasticity for national advertising on eight different types of media. SKB mainly find that national advertising on different media are weak substitutes for each other. Seldon, Jewell, and O'Brien (2000) analyze the cross-substitutability of print media, television, and radio for beer advertisers, finding a very high degree of substitutability. McCullogh and Waldon (1998) estimate the substitutability between national spot and network television advertising, finding weak substitutability between the two.

III. Data and Methodology

Thus far, no researcher has, to our knowledge, yet done a solid panel estimation of the relationship between consolidation and the local radio advertising price following the 1996 Act. In addition, no researcher has, to our knowledge, yet examined the direct effect of national consolidation on local radio advertising price. We fill this gap with a panel data set which tracks real-dollar advertising rates, the number of stations, local concentration measures (including the local Herfindahl Index and the number of owners),

population, real income, and national concentration for 214 different markets from the 1st Quarter of 1996 (when Congess passed the Telecommunications Act) to the 1st Quarter of 2001. This panel allows us to track consolidation's effect on advertising rates.

We create our data set by combining Service Quality Analytics Data (SQAD) data with BIA data and data from the Bureau of Economic Analysis. The SQAD data derives from participating national and regional advertisers, who report the price of their local advertising buys for a given radio market. The prices for each local buy for each local market are then averaged together, giving a single advertising price for each radio market. One primary virtue of SQAD data is that SQAD advertising rates are actual rates paid by advertisers for spots on local radio stations in each market, and are not derived from rate cards. We take the SQAD CPMs (cost of reaching 1,000 listeners aged 18-49) and merge these data with data on local market concentration, national market concentration, population, and per capita personal income within each market. This generates a panel covering 214 local radio markets over a five year period, from 1995-2000. We match our 1st Quarter SQAD advertising rates in a given year to the BIA and BEA data from the year before, because SQAD rates are determined by contract negotiations during previous quarters. For example, contracts negotiated by the final quarter of 1995 determine the SQAD advertising rates paid for the 1st Quarter of 1996. Therefore, in our specification, the 1st Quarter 1996 SQAD advertising price is a function of market concentration and demographic variables during 1995. Because our first SQAD rates are determined by 1995 pre-Act market conditions, the 1996 Act itself provides exogenous variation.

We recognize the limits of our data. Our advertising prices are aggregated by market and they only reflect the prices reported by national and regional advertising agencies for purchases of local radio advertising time. However, this data are, to our knowledge, the only data on radio advertising prices that do not rely on rate cards, but instead reflect the actual prices paid for actual advertising.

We employ both two-way market fixed-effects and one-way market fixed-effects. Using panel data confers serious benefits in any empirical analysis. Thanks to panel data methodology, we can use so-called fixed effects to adjust for many things that cannot be observed. Market fixed-effects adjust for unseen idiosyncrasies in a given market (a popular DJ whose commercial testimonials are unusually effective, for instance) that affects the local radio advertising price. Including time fixed-effects adjusts for any idiosyncratic event that happens to all local radio markets simultaneously at a given point in time. Because the 1996 Act was exactly such an event, we employ econometric specifications that include time fixed-effects in order to evaluate the effect of the Act itself, and we employ specifications that do NOT include time fixed-effects in order to evaluate the effect the Act's new regulatory regime had on radio advertising rates. We use population-weighted least squares as our regression methodology.

IV. The Variables and Descriptive Statistics

Because we want to analyze the effects of both national and local consolidation on advertising prices, we include both local and national Herfindahl indices (hereafter referred to "HHI"). We derive local HHIs for each market in each year by summing the squares of each owner's revenue market share in a market during a given year. This

gives us a measure of concentration in the local market. This allows us to partially evaluate the effects of local consolidation stemming from the 1996 Act's changes to the local ownership rules. We derive national HHIs by summing the squares of each owner's national revenue market share. This gives the level of concentration across all stations in all markets. Including the national HHI allows us to test whether eliminating the national ownership cap had any effect on the prices paid by national and regional advertisers for local radio advertising. Note that the national HHIs are the same for all markets during each year. These two measures grew significantly from 1995 to 2000, reflecting the consolidation in the radio industry during this period. In addition, we also include the raw number of owners in each local market, in order to see whether price collusion becomes easier to coordinate as local markets become consolidated among fewer owners. Including the number of owners with the local HHI may allow us to distinguish the market-power effects of local consolidation (local HHI) from the collusive effects of local consolidation (number of owners in a local market). We also create a new variable, called *local-national*, which reflects the degree to which a local market contains large national radio firms. We create this variable by multiplying each owner's local market share by that owner's national market share and summing across all owners within each market in each time period. For example, if a market has 10 local owners each with 10% local market share and 1% national market share in 1999, the value of *local-national* in that market would be .01 in the year 1999. If that same local market then has 10 owners each with 10% local market share and 10% national market share in 2000, then the value of *local-national* would be .1 in the year 2000, a 1000% percent increase from 1999. Using *local-national*, we can see whether changes in presence of national conglomerates

have any effect on the price of local radio advertising. Absent this variable, we would have no way of distinguishing the behavior of a locally owned station from the behavior of, say, a Clear Channel or Viacom-owned station in a local market.

Finally, we adjust for important demographic factors by including the per capita income and population for each market in each year covered by our study. Other demographic factors, such as age or racial composition, most likely do not vary over time and thus may not have significance in a fixed-effects panel approach.

The data lends itself to a good birds-eye description of radio trends over the last five years. The simple chart below lists the average number of owners, number of stations, number of formats, average Cost-per-thousand (CPM) listeners aged 18-49, and the average population for each market.

Table One

The Radio Market 1995-2000

	Local HHI	**National HHI**	**Owners**	**Consumer Price Index**	**Average Population – weighted CPM (1st Quarter of following year)**
1995	2102.64	125.46	17.2	152.4	First Quarter 1996 - 6.2
1996	2151.24	191.38	16.5	156.9	First Quarter 1997 - 6.9
1997	2666.07	286.73	14.9	160.5	First Quarter 1998 - 7.8
1998	2860.73	621.39	14.0	163.0	First Quarter 1999 - 8.8
1999	2965.35	780.68	13.3	166.6	First Quarter 2000 - 10.1
2000	3084.03	1052.67	12.7	172.2	First Quarter 2001 - 11.2
Total % Change 1996 - 2001	47%	739%	-26%	13%	81%

As these descriptive statistics show, the radio market consolidated considerably during the 1995-2000 period. The local HHI rose by 47% and the national HHI rose by 739%. In addition, the price charged by radio stations to advertisers increased by 81%, which indicates that the increased consolidation may have led to an increase in advertising prices. The charts below illustrate this point.

Chart One: CPM and CPI

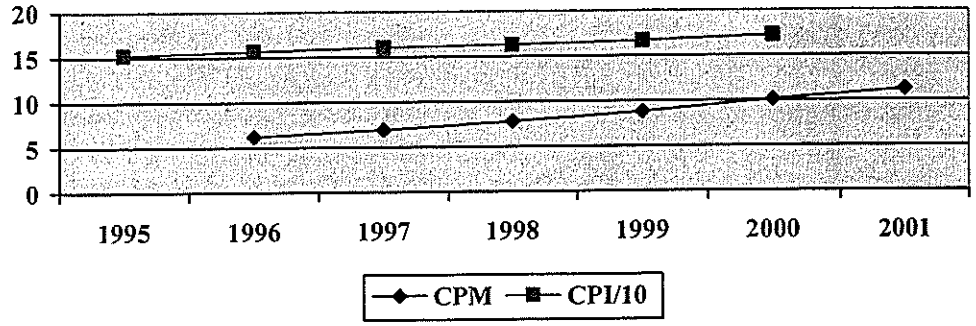
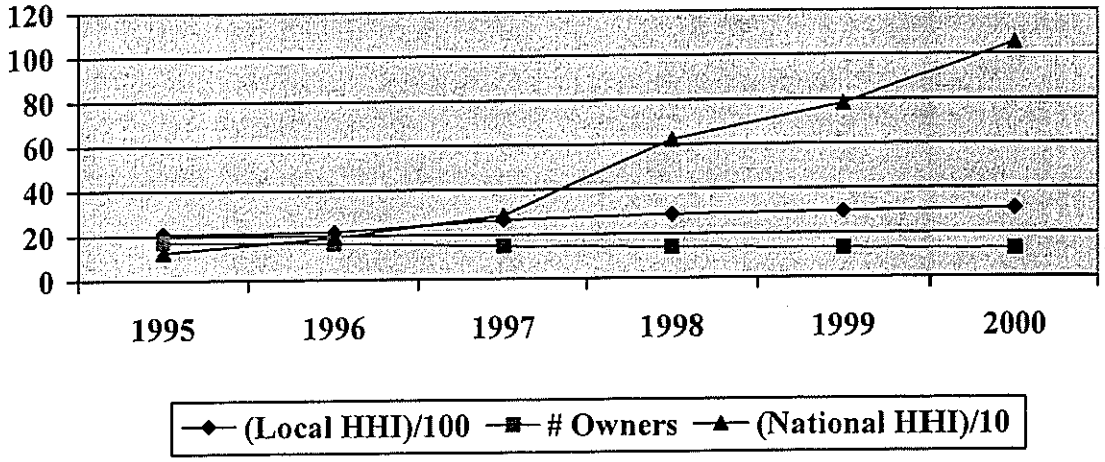


Chart Two: Local and National Concentration



V. Econometric Specification and Estimation

We estimate a panel of 214 radio markets over 5 years, using fixed-effects panel regression. This gives 6 observations for each market (1995, 1996, 1997, 1998, 1999, and 2000), for a total of 1284 observations. Since there may be unobserved heterogeneity across markets, we use fixed-effects panel regression. (Hausman tests between the fixed-effects and random-effects panel regression estimates confirm our expectation of unobserved heterogeneity across radio markets.) Advertising prices for the 1st Quarter of 1996 were negotiated in the final quarter of 1995, before the passage of the 1996 Telecommunications Act. Therefore, the 1996 Telecommunications Act provides us with a source of exogenous variation, so that changes in the advertising price and changes in the market structure coincide with our first observation. We divide the CPM by the Consumer Price Index to obtain the inflation-adjusted advertising price.

We wish to examine the effects of national concentration on the price of advertising. However, national concentration is the same across all markets at any given point in time. Therefore, we cannot estimate the effects of national concentration in a two-way fixed-effects panel setting, because controlling for any and all changes that impact all markets simultaneously automatically eliminates national concentration, because national concentration is precisely such a change. Therefore, we estimate two models. The first model is a one-way fixed effects model that controls for unobserved heterogeneity across markets and includes national concentration. The second is a two-

way fixed-effects model that controls for heterogeneity across markets and across time periods and excludes national concentration. We estimate both models log-linearly[1].

Model 1: For market i during time-period j, where $i=1...214$, and $j=1...6$.

$$Ln(AdpriceforMorningDriveTime)_{ij} = \beta_0 + \beta_1(\ln realincome)_{ij} + \beta_2(\ln population)_{ij} + \beta_3(\ln localHHI)_{ij} + \beta_4(\ln nationalHHI)_{ij} + \beta_5(\ln numberofowners)_{ij} + \beta_6(\ln local-national)_{ij} + \Lambda_i + \varepsilon_{ij}$$

Model 2: For market i during time-period j, where $i=1...214$, and $j=1...6$.

$$Ln(AdpriceforMorningDriveTime)_{ij} = \beta_0 + \beta_1(\ln realincome)_{ij} + \beta_2(\ln population)_{ij} + \beta_3(\ln localHHI)_{ij} + \beta_4(\ln numberofowners)_{ij} + \beta_5(\ln local-national)_{ij} + \Lambda_i + \Gamma_j + \varepsilon_{ij}$$

[1] When we examined two-sided Box-Cox transformations, the log-log model could not be rejected at even a

Table 2 below displays the estimation results, not including the estimates for each of the 214 market dummy variables.

Table 2:
The Effects of Consolidation on Local Radio Advertising Prices
(T-statistics in Parentheses)

	Model 1 – One-way fixed-effects	Model 2 – Two-way fixed-effects
	Ln(Price of Radio Advertising during Morning Drive-time)	Ln(Price of Radio Advertising during Morning Drive-time)
Ln(Population)	-.18* *(- 1.94)*	-.17** *(- 1.96)*
Ln(Real Income)	.61*** *(8.45)*	.55*** *(8.02)*
Ln(Local HHI)	.02* *(1.67)*	.04*** *(3.84)*
Ln(National HHI)	.18*** *(23.45)*	-
Ln(# of Owners)	-.08*** *(3.18)*	-.03 *(- 1.15)*
Ln(Local-National)	-.02*** *(- 4.65)*	-.02*** *(- 5.29)*
Constant	-3.18*** *(- 2.75)*	-4.06*** *(- 3.79)*
F-statistic	150.67***	171.38***
Adjusted R-squared	.96	.97
N	1284	1284

(*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level)

VI. Interpretation of the Results

The coefficient on *population* is significantly negative in both models, indicating that increases in population lower the value of reaching an individual listener. This may indicate that part of the value of local radio advertising may be the ability to reach all the listeners in a given market (achieving "saturation"), so that increases in the amount of potential listeners decreases the value of reaching an individual listener. Silk, Klein, and Berndt discuss the role that advertising agencies play in coordinating advertising across mediums. To the extent radio advertising does not reach an entire market, then the advertising agency may have to employ other media. To the extent these other media

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10% significance level.

also reach viewers otherwise reached by radio, the advertising agency's demand for radio time may decline. Not surprisingly, the coefficient on *realincome* is positive and significant, indicating that advertisers prefer markets with wealthier listeners.

The results indicate that increases in local concentration modestly increase the price paid for local advertising by national and regional advertising agencies. In both models, an increase in the local HHI causes a small but statistically significant increase in the price of local radio advertising. A doubling of the HHI in a given market would raise the local advertising price by 2% according to the first model and 4% according to the second model. This indicates that local concentration increases the market power of radio stations over national and regional advertisers in the local radio advertising market. The two models do have differing implications in exactly how concentration leads to higher advertising prices. The first model (hereafter model one) implies that a change in the number of owners has an important effect on advertising price relative to a change in the local HHI, indicating that increased collusion among radio owners resulting from concentration may be a more important factor in increasing local radio advertising prices than the unilateral exercise of market power by radio owners. The second model (hereafter model two) implies, however, that that an increase in the local HHI drives the higher advertising prices resulting from increases in local concentration, indicating that the unilateral exercise of market power by radio owners may be the important factor in increasing local radio advertising prices. The coefficient on # *of owners* isn't even statistically significant in model two.

Example: Assume that the Hypothesisville local radio market has four owners, each with 25% market share. This yields a local HHI of 2500. Two of these owners wish

to merge. If the merger is permitted, Hypothesisville's local radio market would have three owners, one owner with a 50% market share and two other owners each with a 25% market share. This would increase local HHI from 2500 to 3750, an increase of 50%, and would decrease the number of local owners from 4 to 3. According to model one, this 50% increase in local HHI would increase the price of advertising by 1%, while the 25 percent decrease in the number of owners would increase the price of advertising by 2%, for a total increase of 3%. According to model two, the 50% increase in local HHI would increase the advertising price by 2%, while the 25% decline in the number of owners would increase the advertising price by approximately 1%, for a total of approximately 3%. Thus, both models would predict a similar increase in advertising price from the merger in this particular case, but model one implies that most of the increase could derive from greater collusion while model two implies that most of the increase would derive from the unilateral exercise of increased market power.

In model one, *National HHI* is positive and significant, indicating that increases in national concentration raise the advertising price. In model two, there is no coefficient on *National HHI* because National HHI cannot be included in a two-way fixed-effects model. In both models, however, the coefficient on *local-national* is negative and significant, indicating that the local radio advertising prices charged to national and regional advertising agencies declines when a larger share of a local market belongs to owners with larger national market shares.

Thus the hypothesis that national concentration increased radio advertising prices through an increase of market or bargaining power for radio firms may not be consistent with the data. After all, if market power were the explanation, then an advertising agency

would experience a lower price in markets not dominated by large national radio firms, because these firms wouldn't have market power over the advertising agency.

One possible hypothesis is that national and regional advertisers pay a premium for local advertising time on stations owned by large conglomerates because of transactions cost savings. When dealing with large national conglomerates, these advertising agencies may be able to make a large number of local buys in a single transaction, possibly saving on the cost of negotiating. The radio conglomerate captures part of these transactions savings through higher advertising prices. Where multiple conglomerates compete with each other in the same local market, these national and regional advertising agencies may reap the benefits of competition.

Another possible explanation is that large national conglomerates do have increased market power thanks to concentration, but can more effectively price discriminate in local markets where they have greater market power, and national and regional advertisers have a higher elasticity of demand for advertising in any given local market. Therefore, national and regional advertisers pay less in local markets dominated by national conglomerates. Both of these explanations indicate that local businesses and local advertising agencies may pay higher prices for radio advertising as a result of national consolidation, though we cannot confirm this as we do not have data for the prices paid by local businesses or local advertising agencies for local radio advertising.

Using our model, we can generate the predicted values for advertising prices for each market. The mathematical forms of the models we have estimated are:

Model One: $Adprice = e^{-3.18+MarketDummy} population^{-.18} realIncome^{.61} LocalHHI^{.02}$
$NationalHHI^{.18} Owners^{-.08} LocalNational^{-.02}$

Model Two: $Adprice = e^{-4.06+MarketDummy+TimeDummy} population^{-.17} realIncome^{.55} LocalHHI^{.04}$
$Owners^{-.03} LocalNational^{-.02}$

Let us use the Phoenix, Arizona radio market in the year 2000 as an example. In 2000 Phoenix, Arizona had a population of 1,414,000, a per capita income of 27,564.11[2], a local HHI of 1,412.84, a National HHI of 1052.67[3], 28 owners, and a local-national measure of .06. Phoenix's market dummy coefficient in model one is .04. Plugging these into model one gives a predicted advertising price of 8.05 per CPM for Phoenix in the year 2000. For model two, all values stay the same except Phonix's market dummy is now -.04 and the time dummy for the year 2000 is .40. Plugging these into model two gives a predicted price of 8.01. The actual price of a CPM in Phoenix during the year 2000 was 8.7. Thus the models perform reasonably well in predicting advertising prices. We could also use the models to predict the effects of a radio merger on prices charged to national and regional advertising agencies for local radio advertising.

Conclusion

We have estimated the effects of consolidation on local radio advertising prices charged to national and regional advertising agencies. The 1996 Telecommunications Act provided a source of exogenous variation that allowed us to estimate the effect of concentration on local advertising rates. This study represents a unique attempt to estimate the effect of concentration on the price of local radio advertising. We also

[2] With a CPI of 172.2, this gives a real income of 160.07.
[3] The National HHI is .105267 in the data set. I adjust for this in calculation.

incorporate the effects of national consolidation, another first. Overall, we find that local and national consolidation appear to increase the prices paid by national and regional advertising agencies for local radio advertising. At the local level, the explanation appears to be that consolidation does create more market power, by allowing the exercise of increased unilateral market power and possibly by facilitating collusion. At the national level, it is quite possible that national consolidation led to higher advertising prices by allowing advertising agencies to save on transactions costs by dealing with a single radio firm with stations all over the country. Thus, national consolidation may have been advantageous from the perspective of national and regional advertisers.

Again, the advertising market is not the only market in radio. Radio listeners also comprise an important group of consumers, whose interests may not be the same as those of advertisers. In fact, if listeners dislike advertising, then the reduced quantity of advertising resulting from radio firms' exercise of market power may actually benefit listeners. Future studies should examine listener data in these 214 markets during this time period, to see if higher prices charged to advertisers led to greater listenership. This would give researchers and policymakers a more complete explanation regarding the effects of local and national consolidation in the radio industry.

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