Exploring the Dynamics of Power Ratios among U.S Radio Stations

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ABSTRACT This study explores the dynamics underlying the relationship between a radio station's share of audience and its share of market revenue, recognized by media analysts as a *power ratio*. This ratings to revenue comparison often serves as a diagnostic tool for evaluating a station's business performance. Relying on what the authors call a principle of parsimony in media buying, an analysis of power ratio data collected from over 1600 U.S radio stations revealed that as a radio station's share of audience increases, it subsequently earns a disproportionately greater share of market revenue and visa versa. Additionally, certain program formats serve as intervening variables. The article concludes with implications for station decision makers.

KEY WORDS: radio, advertising, audiences, ratings, power ratio

When evaluating the financial performance of a broadcast station, managers and investors often analyze *power ratios* to determine how efficiently ratings are converted to revenue. In more precise terms, a power ratio is calculated by dividing (a) the station's share of market revenue by (b) the station's overall share of audience (derived from either Arbitron ratings or Nielsen ratings). The general rule of thumb has been that a station earning a power ratio of one is performing adequately, capturing roughly its "fair share" of advertising revenue spent in the market (Duncan, 2002; Webster, Phalen & Lichty, 2000; BCFM, 1994).

However, when looking at the power ratios of scores of radio markets from around the country, this balance point is seldom achieved. Instead, these ratios vary considerably. The overriding purpose of this study was to search for any underlying regularities in the apparent randomness in the variability of power ratio values. An analysis of over 1600 commercial stations operating in 100 U.S markets was conducted using audience and financial data provided by Duncan's Radio Market Guide.

There has been no prior published academic work exploring this concept. Based on several principles of microeconomics and a working knowledge of the radio industry, the researchers suspected a possible threshold or "tipping point" in audience delivery that might result in exceptional revenue gains or losses. Aside from mere intellectual curiosity, there are some practical aspects surrounding this study. Keith (2004) reminds us that the business of broadcasting is the selling of audiences to advertisers. If such a threshold does exist, stakeholders in a station might expect a greater return on investment than what otherwise might be expected. Conversely, dropping below this threshold might foster unexpectedly severe consequences.

BACKGROUND AND LITERATURE REVIEW

Intuitively, one might believe that a station's share of market advertising revenue would be equivalent roughly to its share of market audience. This relationship has been defined by the broadcast industry as a *power ratio* or *conversion ratio*. Investors interested in purchasing radio properties often look at a station's power ratio to help estimate its market value (BCFM, 1994; Duncan, 2002; Webster, Phalen & Lichty, 2000). Additionally, station managers will look at power ratios to assess the productivity of a sales force (Warner & Buchman, 2004). Under both circumstances, the working assumption is that, regardless of the magnitude of a station's audience delivery, it should still earn its "fair share" of available advertising dollars. Mathematically, this balance would result in a power ratio of *one.* For example, a highly successful station earning a 50 percent share of audience would be expected to earn approximately 50 percent of all advertising revenue dedicated to that medium. Similarly, a lesser station attracting only 10 percent of the available audience would be expected to earn approximately 10 percent of all advertising revenue. As a consequence, despite a considerable disparity in earnings, both stations would exhibit highly similar power ratios, reinforcing the notion that revenue performance replicates audience performance. However, an examination of calculated power ratios from a broad variety of radio markets reveals a wide range of scores both above and below a baseline index of one. The researchers speculated that some underlying regularities might be found if the data were analyzed properly.

Audiences Sold as a Commodity

From a perspective of microeconomics, one can conceptualize broadcast audiences as a commodity for sale to advertisers. Typically, broadcast audiences are quantified into rating points, which are bought and sold in a competitive marketplace. In essence, each rating point contributes to the overall monetary value of a commercial. Using an analogy of a factory, stations use programming and marketing strategies to “manufacture” rating points. These transactions are dominated by the metrics of cost per thousand (CPM) and cost per point (CPP) delivered (Warner & Buchman, 2004; Radio Advertising Bureau; 2004, Sissors & Baron, 2002).

Continuing this line of thought, Case and Fair (1996) define *marginal revenue* as the added revenue that a firm takes in when it increases output by one additional unit. Typically there can be a threshold where the level of output begins to generate disproportionately greater revenue per unit. This can be a result of certain cost efficiencies (e.g., economies of scale) or marketing factors influencing consumer behavior. For broadcasters, the “unit of output” can be operationalized as an audience share point reported by a recognized ratings service such as Arbitron or Nielsen. This study proposes that changes in audience share contribute disproportionately to marginal revenue. That is, there is an audience threshold wherein one unit of audience share begins to generate more than one unit of revenue share.

Bigger is Better

Within the field of consumer behavior research, the notion of big brands having disproportionate advantages over small brands is not new. Marketing scholars, such as Smith and Basu (2002) and Hoeffler and Keller (2003) have proposed a share threshold beyond which brand dominance becomes deeply embedded within the brand decision-making heuristics of consumers. In this same vein, myriad studies dating back to the 1960s have confirmed the phenomenon of a “Double Jeopardy” effect where a brand earning a small market share will attract not only fewer customers, but also fewer loyalists in terms of repeat purchasing. Conversely, brands earning high market shares garner not only more individual customers but also greater brand loyalty (Ehrenberg, Goodhart & Barwise, 1990). This double jeopardy effect has also been found among radio and television audience ratings behavior (McDowell & Dick 2004; McDowell & Dick 2001). While this power ratio study does not address directly audience loyalty, it does substantiate the idea that at a certain point, popular consumer brands generate economic advantages that surpass what might be expected from a mere aggregate of customers. Dating back to the 1970s, media researchers examining newspaper circulation and revenue found evidence of an imbalance. For example, research conducted in Europe by Furhoff (1973) and Gustafsson (1978) found that newspapers with the largest circulation in a given market had advantages which enabled it to gain ground in both circulation and advertising, at the expense of papers with lower circulation and advertising revenues. Smaller publications became entrapped in a downward "circulation spiral" whereby fewer readers resulted in fewer advertisers which in turn, resulted in smaller marketing budgets intended to attract and retain readers. Later this theory was modified to incorporate percent household coverage (i.e. penetration) rather than gross circulation figures to predict newspaper performance. Gustafsson (1978) found that achieving 50 percent household market penetration allowed a newspaper to dominate a marketplace indefinitely. In this same vein, a crucial advantage of mere size is the ability to lower advertising rates and still prosper. Picard, et al. (1988) revealed several examples of dominant U.S newspapers that lowered ad rates so dramatically that competitors were forced out of business, thus enhancing the dominant publications' circulation and subsequently permitting their sales departments to *raise* ad rates within a marketplace devoid of any real competition. In recent years, phrases such as "tipping point" and "critical mass" have been introduced into our everyday vocabulary to denote a threshold whereby the consequences of an ever growing activity change abruptly.

There is ample empirical evidence that big consumer brands have an enhancing effect on consumer / audience behavior. Consequently, one can speculate a similar phenomenon occurring between radio stations and advertisers. That is, in attempting to sell commercial time to advertisers, big stations, with substantial output of audience share points, might garner disproportionate advantages over smaller stations exhibiting less audience output. In addition to the notions of customer loyalty already discussed, the researchers believed that an underlying buying heuristic, referred to in this study as the *rule of parsimony*, introduces a systematic bias that favors big stations.

Less is More: The Rule of Parsimony in Media Buying

Advertisers with substantial budgets tend to use advertising agencies or media buying firms to purchase advertising on various media. The majority of these companies makes use of proprietary computer software programs, such as Arbitron's Tapscan service, to analyze ratings data and recommended purchase strategies. These programs reconfigure Arbitron or Nielsen ratings into parsimonious "ranker" lists of stations that, in principle, deliver the greatest number of target audience members using the fewest number of stations. Typically *reach* and *frequency* calculations are introduced to satisfy advertiser needs. For example, an advertiser might set a market audience reach goal of 50 percent. Using this benchmark, Tapscan software will extract the top-ranked stations necessary to achieve this goal. Desired frequency of exposure also can be included in the calculation (Sissors & Baron, 2002; Tapscan, 2004). The term *yield management* is used often to describe the distillation of audiences, stations and commercial rates (Fox 1992; Warner & Buchman, 2004). According to Charles Bortnick, chief operating officer of Westwood One, the country's largest provider of radio network programming, rarely, if ever, do major advertisers buy commercial time on all stations in a market. Instead, only the top ranked stations in a market are chosen. Stations not making "the cut" are denied completely any portion of the budget. Where this cut occurs depends on several factors, including the number of stations in the market, the size of the advertising budget and the particular reach and frequency goals of the advertiser. Nonetheless, there is a general assumption among professional media buyers representing advertisers with substantial budgets that, over the long run, buying the top stations is the most cost-efficient means for reaching a desired audience (Personal communication with Charles Bortnick, November 6, 2003). We call this predisposed media buying strategy the *rule of parsimony* in that it helps explain the typically lopsided allocation of advertising dollars among competing radio stations in an individual market. For most radio markets, the distribution of advertising dollars among competing stations is not congruent with the distribution of audiences. Based on this theoretical premise one would predict plausibly that the revenue shares of these high-performing stations would outpace their respective audience shares, thus, forcing power ratios to exceed 1.00. Conversely, lesser-ranked stations that do not have access to these budget dollars would suffer exaggerated power ratios in the opposite direction. Although such findings would not offer absolute proof of this purchasing phenomenon they would offer persuasive circumstantial evidence.

For decades, the most accepted means of measuring radio audiences has been Arbitron ratings. For readers unfamiliar with these measures, the researchers recommend examining the company's annual report on methodology (Arbitron methodology, 2004) and a comprehensive book on ratings by Webster, Phalen and Lichty (2002).

Based on the above-mentioned theoretical premise and units of measure, the researchers proposed the following hypotheses and research question.

H1: Stations earn a share of revenue that is significantly different from their share of audience.

Assuming the results support the first hypothesis, the next step was to look at the functional relationship between audience and revenue. This led to the following hypothesis.

H2: As a radio station's share of audience increases, it will earn a disproportionately greater share of market revenue.

Finally, the researchers were curious about the possible intervening influence of program format on power ratios. The following research question was posed.

RQ1: Does program format affect the relationship between share of audience and share of market revenue?

METHODS

The raw data for this study were acquired from the *2002 Duncan Radio Market Guide*. Each year this proprietary subscriber-based business publication analyzes the audience and revenue performances of the top radio advertising revenue markets in the U.S. The Duncan Guide was especially applicable to this study because the publishers created a data set intended specifically to analyze competition. While using raw ratings data obtained from Arbitron, the Duncan report performs several recalculations. First, rather than rank radio markets by population size, Duncan's rankings are based on annual revenue spent on radio advertising. In addition, the Duncan report only includes commercial stations that compete for advertising within a local market. That is, listening data attributed to out-of-market stations that do not compete realistically for radio advertising dollars spent in a specific market are extracted from the database. Within this context, audience data for noncommercial stations, such as donation-based public broadcasting and religious outlets are also taken out of any calculations of audience share. What remains after this distillation process is a combined audience and financial database derived from what Duncan calls *viable stations*. This study conducted a census of viable radio stations included in the 2002 guide (N=1,637). One market, Bridgeport, Connecticut, was dropped from the study due to incomplete data. Data collected from each market included the market's revenue rank, population size and number of viable stations. Individual station data included audience share and revenue share. Station audience share was calculated from formulas provided by the guide. Share of market revenue was obtained by Duncan from several sources, including accounting firms, corporate annual reports and trade associations. Share of audience combined sweeps data for one year based on the broad Arbitron daypart of *Monday through Sunday 6:00 AM to Midnight, total persons 12 plus*.

Because of the above-mentioned recalculation of Arbitron market and station statistics, the Duncan Report prefers to use the term *conversion ratio* rather than power ratio to describe the relationship of ratings to revenue. Duncan asserts that its conversion ratios, which tend to be lower than conventional power ratios, provide a more realistic assessment of station performance in that only direct advertising competitors are evaluated. However, to avoid confusion among professionals and academics, this study retains the more familiar power ratio terminology.

The statistical analysis in this study sought to describe the relationship of the two variables that constitute power ratios—audience share and revenue (advertising) share. The analysis centered on a regression technique—using share of audience to predict share of revenue. While this form for regression (without time series data) actually tests for correlation rather than causality, it is reasonable to believe audience drives revenue. Additional regression analyses were performed to look for corollary effects of program format.

RESULTS

The data set included stations from the top 100 advertising revenue producing markets in the United States (N=1637). The dataset included Arbitron markets from one to 164 yet with an average market rank of 49.6 (indicating that the data was centered in the top 100 Arbitron markets). The average number of stations per market was 18 (s.d.= 5.2)[1] ranging from two and 34 viable competitors. The mean share of revenue for all participating stations was 5.6 (s.d.=4.6) with a corresponding mean share of audience of 5. 3 (s.d.=3.4). A Pearson's r ($r=0.88$, $p<0.000$) revealed a significant positive correlation between audience and revenue share.[2]

The first hypothesis, predicted a significant difference between share of revenue and share of audience. Unlike the correlation above, which tests for concurrent variance, the goal of the t-test is exact numerical differences. For these data, the t-test supported the conclusion that the data sets were different ($t=4.45$, $df=1635$, $p<0.000$). Hypothesis one is supported with evidence that indeed stations did not earn a share of revenue that is the same as their share of the audience.

With support for the first hypothesis, researchers moved to the second proposal (H2), which maintained that as a radio station's share of audience increases, it will earn a disproportionately greater share of market revenue. Hypothesis two was tested with a simple linear regression analysis in SPSS using "curve fit" to produce Table 1 and Figure 1. The result of the analysis supported the hypothesis. The regression equations explained 77 percent of the variance in revenue.

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[1] A regression analysis including "number of competitors" as a variable was performed. However, the result did not increase the explanatory value of the equation. Given that a regression using only number of stations yielded an unacceptable R-square (0.09), this variable was not pursued.

[2] We consider this correlation more fully in the discussion section.

Table 1: Regression Analysis of Audience Share to predict Revenue Share

Dependent variable: Revenue Share

Multiple R	.879
R Square	.772
Adjusted R Square	.772
Standard Error	2.216

Analysis of Variance:

	DF	**Sum of Squares**	**Mean Square**
Regression	1	27154.312	27154.312
Residuals	1635	8028.402	4.910

F = 5530.03 Significance F = 0.0000

Variables in the Equation

Variable	**B**	**SE B**	**Beta**	**T**	**Sig T**
AUDIENCE	1.184	.016	.879	74.364	0.000
(Constant)	-0.727.101		-7.191	0.000	

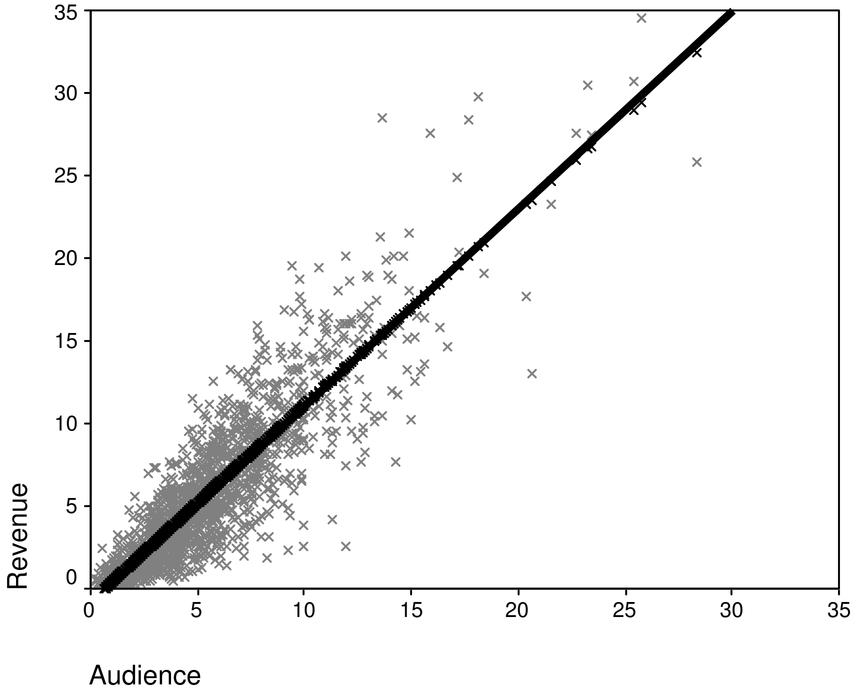
share (F = 5530, signf = 0.000). In addition, the slope of the regression line is greater than one as predicted (B=1.2, T=74.4, signf=0.000). Figure 1 displays the power of the linear relationship indicating a line that slopes at an angle greater than what would be expected by a direct relationship.

The next step was the research question.

> *RQ1:* Does program format affect the relationship between share of audience and share of revenue?

The same data set was divided into nine groups based on the stations' reported format. The unclassified or "other" group (n=38) was dropped from the analysis. Eight station formats were tested with the same analysis as above. The formats were based on traditional divisions in the United States radio market with sensitivity toward making testable groups (format n ranged from 126 to 271 stations). A summary of the results are displayed in Table 2. Three formats (Country, AC, and AOR) clearly followed the predicted model. A t-test confirmed a significant difference between audience and revenue share. The regression analysis resulted in a prediction line that exhibited a disproportionate advantage for high share stations and a corresponding disproportionate disadvantage for low share stations.

Figure 1: Curve Fit for Regression Equation



The t-test for two formats (CHR and News/Talk) did not reveal a significant difference between audience share and revenue share. Since H1 was not supported for these stations, it is not reasonable to consider the slopes of these two lines. Three formats (Black, Easy, and Ethnic) where supported by the t-test (however with negative t-values) but the beta values (0.93, 0.9, 1) indicated a slope that was less than acceptable for supporting the second hypothesis. One explanation for the failure of these formats to support the hypotheses is audience size. The concept would be that these are smaller audience stations so they are simply reflecting the behavior of the lower part of the regression line. Four of the five formats are low rated. However, CHR is the second largest format by mean audience share (6.3).

Black music stations have a relatively high mean audience share (5.14, only a little below the mean for all stations 5.34). The predicted regression equation suggests that as audience size for black stations gets larger, the relative share of revenue does not keep up. To a lesser extent the same can be said for Easy Listening stations.

Table 2. Regression Relationship by Format

Model Summary

Format	N	Audience Mean	t-test +	Adjusted R Square+	F+	Beta+
Relationship as predicted						
Country	153	7.57	5.5	.885	1166.7	1.31
Adult Contemporary	249	5.81	7.8	.765	810.3	1.28
Album Oriented Rock	271	5.43	8.7	.769	899.2	1.37
Slope too shallow						
Black	176	5.14	-10.1	.820	795.9	0.93
Easy Listening / Oldies	160	3.80	-6.8	.540	187.9	0.90
Hispanic / Ethnic	126	2.93	-3.2	.767	411.7	1.00
T-test did not show a difference						
Contemporary Hits Radio	224	6.29	0.6*	.752	677.5	1.16
News Talk Sports	240	3.67	1.5*	.781	855.5	1.11

+ Significance test performed – only failure noted.
* Statistic NOT significant at 0.01 level (two-tailed when appropriate)

DISCUSSION

Relying on what the authors call a principle of parsimony in media buying, an analysis of power ratio data collected from over 1600 U.S radio stations revealed that as a radio station's share of audience increases, it subsequently earns a disproportionately greater share of market revenue and visa versa. Figure 2 displays a detail of the regression equation from Figure 1 overlaid with a hypothetical "fair share" line based on audience share equaling revenue share. This demonstrates graphically the disproportionate gain or loss in revenue share revealed in our real world dataset.

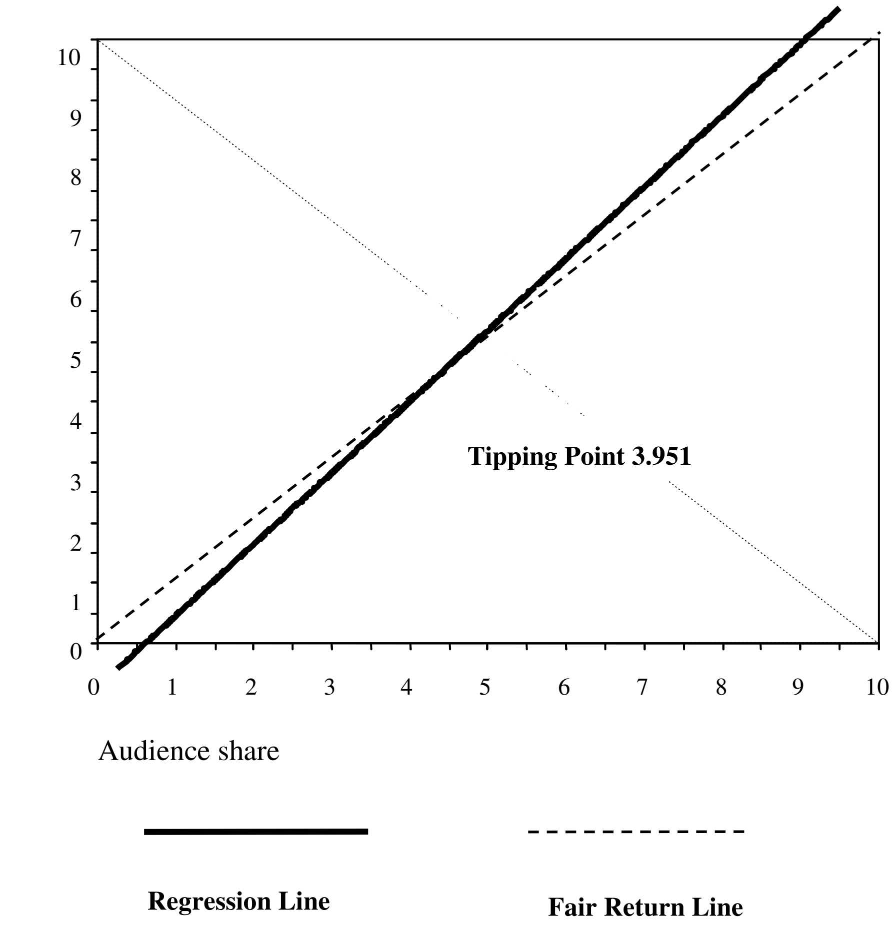
At first consideration, the audience share and revenue share revenue generated some apparently conflicting results. While the t-tests indicated the two data sets were different, the Pearson r and the regression indicated a strong relationship. The key to understanding this apparent conflict was a key question built into the study—all else being equal, does a station earn a revenue share equal to its audience share? The correlation indicated a strong shared variance (i.e., one variable rose or fell with the other). However, the correlation did not measure the functional relationship between these variables. The t-test indicated that the relationship was not one to one. The regression analysis gave much more information with a resultant equation of:

Revenue share = - 0.73 + 1.18 * Audience share

The line indicated by the regression equation predicted that an audience share of 1.0 yields a revenue share of 0.45. However, an audience share of 10.0 yields a revenue share of 11.1. The numbers were highly correlated but not the same.

Looking at all stations in aggregate, the so-called tipping point between disproportionate gain and disproportionate loss occurs at an audience share of 3.95[3] but there is substantial variability. There is no exact mathematical threshold that can be applied to all stations. It

Figure 2: Detail of Regression Line, Comparison of Predicted Regression Line and Fair Return Line



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[3] Based on the predicted equation Y = - 0.73 + 1.18 X, the tipping point is when Y and X are equal and produce a true equation.

should be emphasized that the findings from this study were an amalgam of hundreds of AM and FM stations offering a variety of program formats operating in a 100 different communities. Taking a broad stroke, the statistical findings do support the idea that any increase in audience share will result in a more than equal increase in revenue share and that this extra boost becomes ever more pronounced as the station rises in audience rankings.

Additionally, a station's program format was found to be a relevant intervening variable influencing this phenomenon as summarized in Table 2. In fact, only three formats representing less than half of all stations studied clearly exhibited the effect. The remaining formats produced ambiguous or even contrary results. In particular CHR and Black broke the assumed pattern. The most plausible explanation for these observed disparities is that these formats do not generate high-demand demographics. It is no secret that for advertisers, some audiences are more desirable than others. Certain age, sex and lifestyle attributes (such as the much-coveted 18 to 34 year old affluent young adult) can command a higher cost-per-thousand (CPM) advertising rate than a similar sized audience exhibiting less desirable attributes. Experiencing such a handicap, a station's share of market revenue can be relatively disappointing, causing its *power ratio* to lag behind other stations. These demand characteristics by advertisers can interact with the overarching principle of parsimony in media buying mentioned earlier.

Format differences also may simply be a function of audience size. The data supported the idea that stations audience size affects revenue production. This study did not control for audience share. Thus, formats with naturally different market conditions were compared. Looking back at Table 2, you can quickly observe that audience size is generally correlated with the slope of the line. Normally, this correlation would suggest a curved regression line. However, non-linear models were tested post-hoc with a poor increase in power (r-square increase of less than 0.002). A possible explanation is that undetected or low level heteroscedasticity[4] may be a cause of the differences. Additionally, CHR stations with the second highest audience share which did not demonstrate a significant difference between audience and revenue shares. Clearly, there is reason to believe that differences between formats are affected by both audience size and the economic value of the audience.

Limitations

There are several limitations to this study that can serve as worthwhile research topics in the future. First, it seems reasonable to speculate that

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[4] While tests for heteroscedasticity did not reveal an amount worth correcting, McDowell and Dick (2004) did find dramatic effects of heteroscedasticity in similar ratings data.

market size might have some influence on power ratios. It is a known fact that more advertising dollars are spent in large markets than in small markets but the resulting available advertising revenue *per station* is moderated by the fact that that large markets tend to have more competing media. Regrettably, the top 100 markets used in this study were selected according to advertising revenue, not population. Therefore, truly *small markets*, in terms of population, number of competitors or overall revenue production, were not included. It is entirely possible that power ratios derived from small market radio could yield different results than what we have here.

Another factor that was not included and worth investigating is the impact of consolidated ownership of radio stations within the same market. Many stations combine their selling strategies to "leverage" huge cost-effective media buys, where single-owned independent stations cannot compete on cost per thousand efficiencies. Large budget regional and national advertisers can take maximum advantage of these station group offerings.

A frustrating limitation to this study was the availability of only a very broad demographic and daypart, namely persons 12 plus listening Monday through Friday 6:00 AM to Midnight. As with our discussion of market size, it is entirely possible that a power ratio analysis of narrower time period and demographic categories would yield new knowledge not found in this broad-based study.

Of course there will always be exceptions to any rule and this study was no different. The researchers inevitably found a small handful of stations that defied the pervasive effect. For instance, several stations with tiny audience shares generated huge power ratios, indicating extraordinary revenues for a small operation. These "outlier" stations are worth investigating in detail. Overall, this work sets the stage for additional research addressing the not so simplistic dynamics between ratings and revenue.

Management Implications

For investors and managers, the findings of this study imply that, in general, as a station becomes more popular, it can expect to earn "bonus" revenue exceeding its share of audience. Of course station revenue should not be confused with station *profit*. "Winning the battle but losing the war" audience strategies must be avoided in which the possible burdensome cost of attracting a bigger share of audience cannot be justified relative to a predicted disproportionate increase in share of market revenue. For example, from a cost-benefit perspective, a common mistake made by radio and television stations is paying an extravagant broadcast licensing fee for a local sports franchise. No doubt, the games attract both audiences and advertisers but in terms of the bottom line, the station may barely recoup its investment. Conversely, looking at our data results, severe cost-cutting measures that inadvertently drive down audience shares may have an exaggerated negative impact on revenue. Using a reverse example, losing that sports franchise to a competitor may be the worst thing that could befall a station struggling for a brand identity.

Although the power of popularity cannot be denied, some businesses simply do not have the resources to compete directly with a dominant incumbent competitor. Dimmick (2003) poses the question: "How is it that media firms as well as entire industries exist and persist over time, despite what often seems to be intense competition for resources such as audiences and advertisers?" (p. ix). The answer is an ecology-based *niche theory* in which media firms, such as radio stations, adapt and evolve through their business environment. Within this context, niche similarity can lead to destructive competition, but niche *differentiation* can lead to coexistence and survival. That is, rather than competing head to head with all brands within a product category, niches are created to allow the brand to essentially sidestep potentially lethal direct confrontation. Of course to be successful, a niche must still be attractive to not only a targeted audience but also a targeted advertiser base that is willing to pay a premium for reaching this special audience. In these niche circumstances, power ratios might not be as dramatic compared to those of the market leaders, but the at least the smaller business has found a sanctuary where it can operate without fear of massive reprisals.

Although recognizing that the decades-old assumptions surrounding mass media have fragmented into the far more complex world of satisfying esoteric needs of niche audiences, the notion of niche still implies *small*. Appeasement maneuvers with bigger competitors may foster reassurance of market survival but also hamper economic growth for a media company. Inevitably most niche businesses are compelled to grow. As demonstrated by this power ratio study of radio stations, the disproportionate financial advantages of increasing audience share often can offset considerably the benefits of remaining a small but insolated niche player. Ultimately, size really does matter.

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