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**THE EFFECTS OF LOCAL RADIO STATION GROUP
OWNERSHIP ON STATION PERFORMANCE**

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Heather Elizabeth Polinsky

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THE EFFECTS OF LOCAL RADIO STATION GROUP OWNERSHIP
ON STATION PERFORMANCE

By

Heather Elizabeth Polinsky

A DISSERTATION

Submitted to
Michigan State University
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ABSTRACT

THE EFFECTS OF LOCAL MARKET RADIO STATION OWNERSHIP CONCENTRATION ON STATION PERFORMANCE

By

Heather Elizabeth Polinsky

The passage of the Telecommunication Act of 1996 eliminated national radio station ownership limits and considerably relaxed local station ownership caps compared to previous ownership restrictions. After the passage of this act a considerable number of radio station owners immediately moved to consolidate stations into local and national station groups. Media policymakers have been concerned that increases in media ownership consolidation and concentration not decrease market format diversity. However, past researchers of format diversity in the radio industry have not directly considered audience measurements in their investigations of the effect of station ownership concentration. This study uses station audience share as a measure of station performance to examine the effects of increases in ownership concentration between 1995 and 2000.

The results of this study find that the number of programming formats broadcasting in a market (market formats) is positively related to the number of radio stations serving the market (market stations) and that the percentage of market population listening to radio is positively related to the number of market stations. This study provides support for Rogers & Woodbury's (1996) argument that increases in radio ownership concentration will not affect the number of market formats or the size of a market's radio audience. A format's market audience share appears to be responsive to

the number of market stations broadcasting the format. These results suggest that increasing the number of stations expands the market radio more significantly than increasing the number of formats.

This study finds that all else equal, as local groups increased their numbers of stations from 1995 through 2000, stations in the groups become increasingly more efficient at attracting listeners than independent stations. These findings suggest a public interest benefit to station consolidation. Finally, this study finds that the length of time a station broadcasts in a market and the length of time a station programs the same format are statistically significant and positive predictors of station audience share, but the length of time a station is under the same ownership is not significantly related to station audience share.

TABLE OF CONTENTS

LIST OF TABLES	v
LIST OF FIGURES	viii
INTRODUCTION	1
CHAPTER ONE	
REVIEW OF LITERATURE	6
Radio Format Diversity and Local Market Structures	6
History of Radio Ownership Regulation	10
Effects of Ownership Concentration on Format Diversity	13
Audience Satisfaction in the Radio Market	16
Effects of Ownership Concentration on Station Performance	21
CHAPTER TWO	
METHODOLOGY	26
Ownership Concentration Effects on Market Formats, Stations and Audience	26
Group-Ownership Effects on Station Performance	32
Format, Broadcast and Ownership Consistency Effects on Station Performance	42
CHAPTER THREE	
DATA	47
CHAPTER FOUR	
RESULTS AND DISCUSSION	53
Ownership Concentration Effects on Market Formats, Stations and Audience	53
Group-Ownership Effects on Station Performance	67
Format, Broadcast and Ownership Consistency Effects on Station Performance	83
CHAPTER FIVE	
CONCLUSIONS	86
REFERENCES	92

LIST OF TABLES

TABLE 1	
Local Ownership Caps Set by the Telecommunications Act of 1996.....	12
TABLE 2	
Breakdown of Station Data by Year and Frequency Band.....	49
TABLE 3	
List of Markets Used to Estimate Equation (13).....	52
TABLE 4	
Two-Stage Least Squares Regression Results for Equations (3) and (4) estimating the factors affecting the number of market formats and the percentage of market radio listeners in 1995.....	59
TABLE 5	
Two-Stage Least Squares Regression Results for Equations (3) and (4) estimating the factors affecting the number of market formats and the percentage of market radio listeners in 1996.....	59
TABLE 6	
Two-Stage Least Squares Regression Results for Equations (3) and (4) estimating the factors affecting the number of market formats and the percentage of market radio listeners in 1997.....	60
TABLE 7	
Two-Stage Least Squares Regression Results for Equations (3) and (4) estimating the factors affecting the number of market formats and the percentage of market radio listeners in 1998.....	61
TABLE 8	
Two-Stage Least Squares Regression Results for Equations (3) and (4) estimating the factors affecting the number of market formats and the percentage of market radio listeners in 1999.....	62
TABLE 9	
Two-Stage Least Squares Regression Results for Equations (3) and (4) estimating the factors affecting the number of market formats and the percentage of market radio listeners in 2000.....	63

TABLE 10	
Partial Regression Results for the Within Format Effects Examined with Equations (5) presenting the significance of the number of station broadcasting a format on the market format audience for each sample year.....	66
TABLE 11	
Regression Results for Equation (6) Estimating the Effects of Group Size (linear and squared number of group stations variables) and Other Variables on Station Audience Share in 1995 and 1996.....	72
TABLE 12	
Regression Results for Equation (6) Estimating the Effects of Group Size (linear and squared number of group stations variables) and Other Variables on Station Audience Share in 1997 and 1998.....	73
TABLE 13	
Regression Results for Equation (6) Estimating the Effects of Group Size (linear and squared number of group stations variables) and Other Variables on Station Audience Share in 1999 and 2000.....	74
TABLE 14	
Regression Results for Equation (7) Estimating the Effects of Group Size (linear, squared and cubed number of group stations variables) and Other Variables on Station Audience Share in 1995 and 1996.....	76
TABLE 15	
Regression Results for Equation (7) Estimating the Effects of Group Size (linear, squared and cubed number of group stations variables) and Other Variables on Station Audience Share in 1997 and 1998.....	77
TABLE 16	
Regression Results for Equation (7) Estimating the Effects of Group Size (linear, squared and cubed number of group stations variables) and Other Variables on Station Audience Share in 1999 and 2000.....	78
TABLE 17	
Regression Results for Equation (12) Estimating the Effects of Group Size (spline variables) and Other Variables on Station Audience Share in 1995 and 1996.....	80
TABLE 18	
Regression Results for Equation (12) Estimating the Effects of Group Size (spline variables) and Other Variables on Station Audience Share in 1997 and 1998.....	81

TABLE 19	
Regression Results for Equation (12) Estimating the Effects of Group Size	
(spline variables) and Other Variables on Station Audience Share in 1999	
and 2000	82

TABLE 20	
Regression Results for Equation (13) examining the effects of the length of time	
a station has broadcast in a market, has broadcast the same format and has been	
owned by the current owner on station audience share in 2000	85

LIST OF FIGURES

FIGURE 1

Line Plot Representing the Relationship between Group Size (linear and squared number of group stations variables) and Station Share from Equation (6) Results.... 71

FIGURE 2

Line Plot Representing the Relationship between Group Size (linear, squared, and cubed number of group stations variables) and Station Share from Equation (7) Results..... 75

FIGURE 3

Line Plot Representing the Relationship between Group Size (spline variables) and Station Share from Equation (12) Results..... 79

INTRODUCTION

The level of ownership concentration in the broadcast industry has long been a concern for policymakers and station owners. Under the authority of Congress in 1927, the Federal Radio Commission was put in charge of broadcast regulation to preserve the public interest, and in 1934 the agency was expanded to the Federal Communications Commission (FCC). The FCC has historically operated under the assumption that local broadcast audiences are best served by access to the largest possible number of different owners supportable by available spectrum because diversity of ownership is assumed to translate to diversity of broadcast programming types or formats. During the first six decades of the radio industry, the FCC administered broadcast regulations under a public trustee model. This policy approach assumes that enforcement of radio station ownership limits will result in greater format diversity (Berry & Waldfogel, 1999; Glasser, 1984; Rogers & Woodbury, 1996). The FCC uses format diversity as one measure of the public interest. The FCC imposed limits on local and national station ownership to allow more owners to have access to the scarce broadcast spectrum resource and to restrict the market power and influence held by any one station owner.

In the 1980s, the FCC and Congress began to shift from the public trustee model of broadcast regulation to a marketplace model and the perceived need for stringent national and local market ownership limits began to wane. Under the marketplace model, policymakers trust market forces to provide the optimum ownership structure to serve the market audience with suitable format diversity. This logic led to the most liberal relaxation of station ownership limits to date through the passage of the

Telecommunications Act of 1996. The Telecommunications Act of 1996 eliminated national radio station ownership limits and considerably relaxed local ownership caps. After the passage of this act a considerable number of radio station owners immediately moved to consolidate stations into local and national station groups. The number of national commercial radio station owners decreased thirty-four percent from 5,133 owners in March, 1996 to 3,408 owners in March, 2002, yet the number of commercial radio stations saw a modest 5.4 percent increase during the same time period (Williams & Roberts, 2002).

The relaxation of local market ownership caps allows station ownership consolidation that some policymakers and industry representatives argue will allow local station groups to operate with greater efficiency through the sharing of station resources. (Albarran & Pitts, 2001; Berry & Waldfogel, 2001; Chambers, 2001; Ekelund, Ford, & Koutsky, 2000; Wirth, 2001). Station consolidation has led to increases in ownership concentration. Policymakers are concerned that increases in ownership concentration not decrease format diversity and are hopeful that increases in ownership concentration will increase in format diversity. Most past research finds as ownership concentration increases, market format diversity has remained statistically unaffected. (Berry & Waldfogel, 2001; Drushel, 1998; FCC, 2000, 2001; Rogers & Woodbury, 1996; Williams, Brown, & Alexander, 2002; Williams & Roberts, 2002). But, some researchers argue that there is statistical evidence of a weak effect indicating format diversity is increasing in smaller markets where ownership concentration is increasing (FCC, 2001; Williams & Roberts, 2002).

Empirical evidence supports the claim that increases in ownership concentration have not been detrimental to market format diversity. However, the effects of ownership concentration on station performance has received comparatively little attention (Drushel, 1998; Ekelund et al., 2000; Rogers & Woodbury, 1996). If there are efficiencies to ownership consolidation in the radio industry, then station group-ownership may result in increased station performance. These group efficiencies should result from sharing station personnel, services equipment and office space. Station groups that can share resources should be able to streamline costs and use these cost savings to develop higher quality programming which in turn should attract a larger potential audience (Albarran & Pitts, 2001; Compaine, 2000; Gomery, 2000; Wirth, 2001). This study uses audience size estimated by a commercial audience measurement service as a measure of station performance. Examining station audience provides further insight into the possible effects of increases in ownership concentration on a station's capacity to better serve the market audience.

Napoli (1997) suggests that most program diversity research is limited by considering 'diversity of exposure' to different program types without considering the 'diversity of consumption' of different program types. The diversity of programming available to audiences (format diversity) is what Napoli (1997) terms 'diversity of exposure,' and the mix of audience members that decides to watch or listen to particular program types is termed 'diversity of consumption.' Because media audiences can consume only those types of programs that are available, measures of these two concepts are interdependent. Napoli (1997) finds a high correlation between the percentages of network television program types available and the percentages of audience that chooses

to watch the different program types. Napoli (1997) concludes either network executives are highly attuned to audience preferences or the network audience watches television according to the programming available to them. Napoli (1997) suspects both processes are occurring in the network television industry.

As suggested by Napoli (1997), simply counting the radio formats available in a market is only a measure of the formats available to the market audience. This measure of format diversity does not consider market audience consumption of the available formats. A listener chooses which of the available stations to listen to by deciding which of the stations will best satisfy his or her format preferences. Counting the formats available to listeners assumes that listeners are aware of all the market format and station choices available to them. Listeners may not immediately be aware of all of their station or format choices; it may take time for listeners to find the station that best serves their preferences. Furthermore, listeners may not be responsive to more format choices. Having more format choices may not sway listeners from their primary format preference. Considering station audience as a measure of station performance provides further insight into the effects of changes in format availability and changes in ownership concentration on audience consumption of radio.

Chapter One reviews the prior research pertinent to this study. Chapter Two presents and describes the methods used to study three effects of local ownership concentration on station and market performance. The first section of Chapter Two presents the analytical framework for a study of the effects of local market ownership concentration on the relationships between the number of formats in a market (market formats), the number of stations in a market (market stations), and the size of the radio

audience in a market (market audience) . This investigation is a replication and extension of a study by Rogers & Woodbury (1996) who argued that increases in ownership concentration would not affect the number of market formats or the percentage of a market's population listening to the radio. They also examined the responsiveness of the audience for a format to changes in the number of other market formats available to listeners and number of stations broadcasting the different formats. They concluded that changes in the number of other market formats available to listeners and number of stations broadcasting the different formats had little effect on the audience choosing to listen to a particular format. The next section of Chapter Two describes the analytical framework employed for an investigation of the effects of local station group size on station performance. Local group size is measured by the number of stations in the group and is used to examine whether adding stations to a group improves station performance presumably through group efficiencies. The third section of Chapter Two presents the analytical approach employed to investigate the effects of the length of time a station has been broadcasting a signal in a market, the length of time a station has broadcast its current format, and the length of time a station has been under its current owner on station performance.

Chapter Three describes the data collected for these investigations. The results for these investigations are presented and discussed in Chapter Four and Chapter Five presents the conclusions from this study.

CHAPTER ONE

REVIEW OF LITERATURE

Radio Format Diversity and Local Market Structures

Broadcast policymakers have historically believed that greater diversity of ownership provides a greater amount of format diversity; therefore broadcast ownership policies have promoted competitive media market structures (Albarran & Pitts, 2001; Bates, 1993; Drushel, 1998; Ekelund et al., 2000; Gomery, 2000; Kattenmaker & Powe, 1994; Wirth, 2001). Theoretical and empirical research has scrutinized the effectiveness of competitive media markets at providing optimum format diversity to serve market audiences. Steiner (1952) suggests that monopoly station ownership could provide greater market format diversity, because a multi-station monopolist will not cannibalize the audience of one station by programming the same format on another one of its stations. Thus the monopolist, who owns a local group of stations, will program a different format on each of its market stations resulting in greater format diversity for a given number of stations (Steiner, 1952).

The amount of format diversity produced by a monopolist compared to competitive ownership with a constrained number of market stations is dependent on the distribution of audience format preferences. When market audience preferences are highly skewed toward one particular format, multiple owners in the competitive market will program this popular format. Competitive station owners maximize profits by attempting to capture the same listener preferences from a larger, majority taste audience instead of differentiating their formats to capture minority listener preferences that have a

smaller potential audience. Market format diversity decreases because multiple competitive radio stations are programming the same format. In this instance of highly skewed audience format preferences, a monopoly will produce a higher degree of format diversity with fewer stations than a competitive market structure.

On the other hand, when market listener preferences are more evenly distributed across multiple formats, the format diversity produced by competitive ownership should be equal to the format diversity produced by monopoly ownership with the same number of stations (Steiner, 1952). Because the market's audience is not skewed in favor of any one format, competitive station owners will attract similarly sized audiences with different formats. There is no benefit to multiple stations broadcasting one particular format until there are a large number of stations in the market. Competitive stations owners will not duplicate a format broadcast by another market station until doing so will attract a larger potential audience than broadcasting a unique format.

It is important to note that Steiner's program choice model demonstrates that monopoly provides equal or greater format diversity compared to competitive ownership with the same number of stations in the market, for most audience preference distributions. But, Steiner (1952) assumes that listeners will only consume one preferred program type and listeners will choose not to use the medium if their favorite program type is not available. This assumption is relaxed by Beebe (1977) who adds secondary audience preferences to the Steiner program choice model. If listeners will listen to other formats when their favorite format is not available, then Beebe's program choice model illustrates that in most cases of audience preference distributions, competitive ownership will provide as much if not more format diversity than monopoly ownership. The

monopolist will only program as many formats as it takes to get the vast majority of radio listeners in the market to tune into a station. If most listeners in a market will listen to one popular format when no others are available, then the monopoly owner will maximize profits by only broadcasting this popular format on one station in the market while leaving its remaining stations dark. Yet, with a competitive market in this situation, many stations in the market may duplicate this popular format because everyone in the market finds some appeal to this format. However, competitive owners in this situation are more likely to program other formats to appeal to the first choice preference of listeners in the market. Under Beebe's program choice model, competitive ownership creates more format diversity than the monopolist in most cases where secondary format preferences are considered.

Spence & Owen (1977) consider how cross-format variation in program costs and differences in advertiser valuations of format audiences affect a market's program offerings. Many formats that ought to be broadcast in a market on welfare grounds because they generate positive surplus are not broadcast because they do not produce enough advertising revenue to cover costs. Formats that are more expensive to produce are less likely to be programmed, regardless of market structure. Furthermore if the audience attracted by certain formats is not highly valued by advertisers, these formats will not generate sufficient revenues to cover costs and will not be programmed, regardless of market structure. The effects of market format losses due to high program costs or low advertiser valuation of format audiences may create social welfare losses because these audiences are left under served by radio stations. These social welfare losses are greater in media markets that are advertiser supported than media markets that

have some degree of consumer pay support (Spence & Owen, 1977). Media that depend on advertiser financial support will provide formats that best meet the advertiser's interests, not necessarily those that best address audience format preferences.

Many of the articles reviewed for this study are inspired by program choice models of the type developed by Steiner (1952) and Beebe (1977) (e. g. Berry & Waldfogel, 2001; Chambers, 2001; Williams et al., 2002; Williams & Roberts, 2002; Wirth, 2001). Like Steiner (1952) and Beebe (1977), empirical research on the radio industry has assumed (implicitly or explicitly) constant station program costs and constant advertising prices.

Many program choice models compare competitive and monopoly market structures. Program choice theory finds advantages and disadvantages to both monopoly and competitive market structures for providing greater format diversity depending on market conditions (Beebe, 1977; Owen & Wildman, 1992; Spence & Owen, 1977; Steiner, 1952). Proponents of the public trustee model for broadcast regulation have favored ownership policies that have maintained highly competitive local broadcast markets for most of the twentieth century believing this would produce the greatest format diversity. Proponents of the marketplace model of broadcast regulation point to program choice theory to question the effectiveness of a competitive market structure in providing greater format diversity than more concentrated markets (Aufderheide, 1999; FCC, 2000, 2001; Napoli, 2003). A monopoly market structure in the radio industry is legally prohibited by antitrust law and FCC regulation. However, policymakers have allowed station ownership consolidation to increase in radio markets because theory and empirical evidence does not support a claim that more concentrated markets result in less

format diversity (Drushel, 1998; Ekelund et al., 2000; FCC, 2000, 2001; Rogers & Woodbury, 1996; Williams et al., 2002; Williams & Roberts, 2002).

History of Radio Ownership Regulation

Local ownership caps were placed at one AM station and one FM station since the Communication Act of 1934¹ and national radio station ownership limits were formally placed at seven AM stations and seven FM stations (known as the Rule of Seven) in 1953.² Station ownership was limited in the early days of radio because of radio spectrum scarcity issues. More people wanted to own stations than the allotted spectrum would allow. Later, arguments for station ownership limits shifted to preserving a marketplace of ideas and preserving a competitive market structure (Aufderheide, 1999; Compaine, 2000; Gomery, 2000; Kattenmaker & Powe, 1994). The FCC shifted from the public trustee model of broadcast regulation to the marketplace model in the 1980s and began deregulating the broadcast industry. During this period of deregulation, the FCC relaxed national station ownership limits in 1984 from the Rule of Seven to the Rule of Twelve. Under the Rule of Twelve a station owner could own twelve AM stations and twelve FM stations nationally, but could still only own one AM station and one FM station in a single market (Drushel, 1998).

In the late 1980s and early 1990s, many industry observers described the radio broadcast industry as in financial trouble and debate over relaxing both local and national

¹ FM radio technology was introduced to the commercial radio market in 1933, before this local ownership caps were one AM station per owner (Orlik, 1997).

² The most stations a national network at that time owned were seven AM stations. The national limit was put in place to prevent the networks from increasing their station ownership (Drushel, 1998). Both the Rule of Seven and subsequent Rule of Twelve also applied to the radio and television station ownership. Under the Rule of Seven, one owner could own one AM station, one FM station and one TV station in a local market and no more than seven AM, seven FM and seven TV stations nationally.

ownership limits intensified. National and local ownership limits were seen as anticompetitive because they worked against natural market forces that would generate economic efficiencies and increase consumer welfare (Albarran & Pitts, 2001; Bates, 1993; Drushel, 1998; Ekelund et al., 2000; Gomery, 2000; Kattenmaker & Powe, 1994; Wirth, 2001). An FCC study observed that between 1989 and 1990 AM station profits decreased by fifty percent and FM station profits by thirty-three percent (as reported in Drushel, 1998). In 1992, under pressure from radio broadcasters, the FCC raised national ownership limits to eighteen AM stations and eighteen FM stations and relaxed local ownership caps to four stations (with no more than two stations in one frequency band) in markets with fifteen or more stations and to three stations (with no more than two stations in one frequency band) in markets with less than fifteen stations. In 1994, the FCC slightly increased national ownership limits to twenty AM and twenty FM (Drushel, 1998; Ekelund et al., 2000; Wirth, 2001).

According to a paper presented at the 1997 Broadcast Education Association Convention, “these policy changes unequivocally initiated a radio industry trend, with more than fifty percent of commercial radio stations engaging in some form of consolidation between 1992 and 1996” (Hagin, 1997 as quoted in Wirth, 2001, p.252). The logic for increasing station limits outside local markets was to increase station resource efficiency, so station group-owners could generate better quality programming in multiple markets. Stricter ownership caps were preserved inside local radio markets to maintain local competition and diversity of ownership voices which in turn was thought to increase format diversity. The 1992 and 1994 increases in local station ownership caps did not end the debate over further relaxation of local ownership caps.

Proponents of the marketplace model of broadcast regulation accomplished a policy victory with the passage of the Telecommunications Act of 1996. National station ownership limits were eliminated and local market ownership caps were considerably relaxed and set by the FCC according to the number of market stations:

Table 1

Local Ownership Caps Set by the Telecommunications Act of 1996

Commercial market stations	Station ownership cap
45 or more stations	8 stations with no more than 5 in one band
30 to 44 stations	7 stations with no more than 4 in one band
15 to 29 stations	6 stations with no more than 4 in one band
Fewer than 14	5 stations with no more than 3 in one band and not more than 50% of stations in the market

The Telecommunications Act of 1996 gives the FCC the authority to set ownership caps as it sees fit to serve the public interest but also mandates that the FCC periodically investigate whether changes in ownership concentration are detrimental to the public interest. The parameters of the public interest are also determined by the FCC as overseen by Congress (Aufderheide, 1999). Station group-owners that have purchased stations that would collectively control more than fifty percent of the local radio advertising revenue have been subject to antitrust review by the Department of Justice (Drushel, 1998; Ekelund et al., 2000; Gomery, 2000).

The elimination of national radio ownership limits has led to the creation of several large, national station groups with hundreds of stations across the country in

dozens of local markets ("Clearly, it's clear channel", 2000). Since the passage of the Telecommunications Act of 1996, ownership concentration levels have increased in local radio markets based on the Herfindahl-Hirschman Index (HHI) of market concentration (Drushel, 1998; Ekelund et al., 2000; FCC, 2000, 2001). The FCC has used format diversity as the primary measure of the public interest standard. Yet, most investigations find that increases in ownership concentration have not statistically affected market format diversity (Drushel, 1998; Ekelund et al., 2000; FCC, 2000, 2001).

In a 2003 report, the FCC began to consider outlet diversity and viewpoint diversity as a measure of the public interest. The FCC has acknowledged that having only a handful of owners controlling radio stations in a market might unduly limit the number of independent viewpoints expressed. Since only a few group-owners control most of the stations in many markets, if a group-owner decides not to carry local information or news, then market listeners' choices for local information sources are significantly decreased. However, program or format diversity is still a primary public interest standard for the FCC and was found to remain unaffected by increases in ownership concentration (FCC, 2003).

Effects of Ownership Concentration on Format Diversity

Because policymakers use local market format diversity as one measure of the contribution to the public interest by the radio industry, the FCC has been concerned that increases in ownership consolidation not reduce market format diversity. An FCC report in January, 2001 finds that the relaxation of radio market ownership restrictions by the Telecommunications Act of 1996 has indeed led to increases in radio station ownership

consolidation. The number of radio station owners declined by twenty-two percent between March, 1996 and March, 2000. However, the number of formats per local radio market has remained relatively constant despite the increase in local market HHI measures of ownership concentration. A couple of studies claim statistically weak evidence that increases in ownership concentration increase format diversity in smaller markets (FCC, 2001; Williams & Roberts, 2002). Rogers & Woodbury (1996) provide an explanation for why increases in ownership concentration may not have a significant effect on format diversity which is consistent with their own empirical findings.

Rogers & Woodbury (1996) find the number of market stations has a statistically significant positive effect on the number of market formats. Program choice theory posits that the number of formats present in a market should be positively correlated with the number of stations broadcasting in the market. When the number of stations is small, then the possible number of viable formats in the market is also constrained, regardless of the economic market structure or market audience characteristics. According to Rogers & Woodbury (1996), the best way to increase the number of formats offered in a market is to significantly increase the number of stations broadcasting in the market. Furthermore, Rogers & Woodbury (1996) find the percentage of the market audience listening to radio is positively related to the number of market formats. Rogers & Woodbury (1996) posit that more radio formats expand the number of people that find satisfying programming. But, it is also possible that stations program greater format diversity when there is a larger portion of the population that is willing to listen to the radio. These two conclusions are consistent with Napoli's (1997) argument that audiences listen in proportion to the programming available and station programmers are attuned to market

audience preferences. Rogers & Woodbury's (1996) finding does not identify causality in the relationship, but does show that markets with more radio formats have greater percentages of their populations listening to radio, all else equal.

Rogers & Woodbury (1996) argue that changes in ownership concentration should not affect radio market format diversity because changes in ownership concentration will not significantly change the number of stations broadcasting in a market, nor change the population characteristics of the market. When the number of market stations and audience characteristics remain fairly constant, format diversity should remain constant regardless of the market structure. Because the Rogers & Woodbury (1996) study was conducted on data before the passage of the Telecommunications Act of 1996 and before radio ownership concentration began to significantly increase, the question remains whether increases in local market ownership concentration affect the number of market formats or the percentage of the market's population listening to the radio. If Rogers & Woodbury (1996) are correct, adding a group ownership concentration variable to their equations using data after the passage of the Telecommunications Act of 1996 should not affect number of market formats or the percentage of a market's population listening to radio.

This study will replicate Rogers & Woodbury's (1996) equations with the addition of an ownership concentration variable. This study uses market data from 1995 through 2000 because this time period covers one year before the passage of the Telecommunications Act of 1996 through the height and decline of station sales that occurred after the passage of the Act. According to Change & Ki (2004), the majority of station sales occurring after the passage of Telecommunications Act of 1996 happened

between 1996 and 1998. Stations station sales significantly declined after 1998 (Chang & Ki, 2004). Conducting this investigation should help to clarify whether Rogers & Woodbury's (1996) argument that ownership concentration does not affect format diversity or audience size is correct.

Audience Satisfaction in the Radio Market

A station must be recognized as a facilitator of communication between the market's advertisers and consumers or audience, however radio audiences may not welcome radio advertising as it interrupts the programming they desire to listen to. Both advertisers and audiences demand a service from a radio station. The advertisers demand access to a sizable number of market consumers that will potentially buy their products and services. Advertisers generally determine the value of a station's audience by the number and demographics of the listeners. Consumers demand programming that satisfies their format preferences. Radio stations strengthen audience loyalty by differentiating their products through programming (or format) decisions. A radio station will attempt to gain a competitive edge over other market stations through format differentiation. A radio station adjusts its programming so the attracted audience is differentiated from other stations' audiences in size and demographics (Wildman & Cameron, 1982). Radio station product differentiation occurs with both the format being broadcast and the composition of audience that listens.

Program choice theory assumes stations know viewers'/listeners' preferences among program formats (Beebe, 1977; Owen & Wildman, 1992; Spence & Owen, 1977; Steiner, 1952). In reality, the true or actual distributions of market audience preferences

can never be known, which also means that the optimum format diversity for serving the preferences of the market's audience is also unknown. But, a sample of radio listeners' choices from the available market stations can be measured through commercial audience rating services. Most medium-to-large market radio stations make many of their business operating decisions based on the measured audience ratings for their radio markets.³ Station executives using audience ratings to make format decisions are not basing these decisions on audience preferences, but estimated audience choices. Effective radio sales executives can use station brand identity and reputation to entice advertisers to buy airtime (Ditingo, 1995; Norberg, 1996). However, audience ratings provide stations with a tangible measure for the value of station airtime. Radio station executives and radio advertisers have come to trust audience ratings as an objective measure of airtime value; therefore audience ratings are an accepted measure of the size and other characteristics of actual station audiences (Napoli, 2003).

Station programming that fails to generate enough advertising revenue to cover station operation and programming costs must be adjusted to create programming that advertisers will support. Competitive stations that have success attracting a large, lucrative audience that generates high advertising revenue may see their programming strategies mimicked by other stations in the market. Format duplication in competitive markets is predicted by program choice models. Steiner and Beebe program choice models assume constant program costs and advertiser value of radio listeners which easily translates to larger audiences generating larger station revenues and profits. These models also predict that competitive station owners will program a format with a large

³ Arbitron is the leading audience ratings service for radio. Arbitron routinely surveys audience listening habits in medium to large media markets, but only surveys smaller media markets upon the request of local stations (Arbitron Inc., 2002).

prospective audience until this audience has been divided into such small pieces that programming another format will generate higher profits. Stations that are successful attracting a large audience in a market should expect to see other stations in the market attempting to duplicate their success by programming the same format.

The Steiner and Beebe program choice models assume that listeners will value multiple offerings of the same program type as perfect substitutes, which means that consumers should receive the same benefit from listening to any station broadcasting an identical format. Because stations with identical programming formats are perfect substitutes in the Steiner and Beebe models, it is also assumed that the stations offering the same format will evenly split the portion of the audience that prefers to listen to that format (Beebe, 1977; Napoli, 1997; Owen & Wildman, 1992; Steiner, 1952). These assumptions simplify program choice models and make them more tractable, but these assumptions do not reflect actual media audience behavior (Berry & Waldfogel, 1999; Napoli, 1997). An examination of Arbitron ratings reveals that radio stations with the same formats in a market do not evenly split the audience choosing to listen to that format. In reality, stations broadcasting the same format are not perfect substitutes, yet this does not mean these stations do not have a degree of substitutability.

Broadcasting identical formats does not mean broadcasting identical program schedules. Radio stations differentiate their programming formats by using different on-air personalities and station imaging to give their stations a unique and identifiable sound with market listeners. These differences help a station create brand identity with market listeners that separates it from market competitors (Ditingo, 1995; Norberg, 1996). When considering music formats, radio stations also differentiate their programming by

choosing to broadcast different playlists of songs in the same genre of music. This has led to some formats (mainly music formats) splintering into fragmented forms of the original format category.

Berry & Waldfogel (2001) and Williams, Brown, & Alexander (2002) both investigate the overlap of new songs added to weekly playlists by stations programming fragmented formats as reported in radio industry trade journals. Both studies find that the majority of new songs that are added to station playlists each week are different for stations programming different format fragments. Both studies also find that there is a small degree of overlap between new song lists of fragmented formats under the same format category. For example, under the adult contemporary (AC) general format category, stations in the Hot AC and Soft AC fragments may not add identical lists of new songs to their playlists each week, but may have a song or two that appear on both lists each week.

Based on these results, one may conclude there is a very low degree of substitutability between fragmented forms of a general format category. However, both of these studies are limited by the fact that they only considered the new songs added by the stations each week. Stations only reveal the new songs added to playlists to trade journals, so these studies do not consider a comprehensive list of songs that were played on each station for the week. Stations do not only play new songs, but also program a significant amount of recurrent and older songs (Williams et al., 2002). Williams et al. (2002) speculate that if comprehensive playlists were considered, there would be a higher degree of substitutability between the fragmented formats of a common general format category than between different general format categories. A format substitutability

hypothesis is difficult to test because actual audience preferences are unknown. Audience ratings aggregate audience listening habits and do not follow the listening habits of individual listeners. Audience ratings do not reveal whether listeners of one station might also tune into another station with a similar format or tune into a station with a different format. Yet, if some degree of homogeneity between audiences in different radio markets is assumed, audience format substitutability can be examined through a comparison of audience listening choices between markets with different mixes of radio formats.

Rogers & Woodbury (1996) investigate what they term ‘within format’ effects and find that market format audiences are not responsive to changes in the number of stations broadcasting a format or to the number of stations broadcasting other formats. These results suggest that increasing the number of stations broadcasting a format does not expand the market audience for that format (Rogers & Woodbury, 1996). This unresponsiveness suggests a high degree of substitutability between stations that broadcast the same general format. Program choice theory predicts that increasing the number of stations broadcasting a format will not expand the audience choosing to listen to the format, because the audience listening to the format will treat all stations broadcasting the format as perfect substitutes.

Rogers & Woodbury (1996) find the number of other formats present in the market does have a significant negative effect on the market audiences for some formats. These results indicate that some format audiences are responsive to changes in format diversity but other format audiences are not. These findings are consistent with Beebe’s suggestion that secondary program preferences will affect market format diversity.

Certain formats will draw larger audiences when the number of market formats is smaller.

It is worth investigating whether adding a group ownership concentration variable to Rogers & Woodbury's (1996) within format equation has an effect on the responsiveness of market format audiences. If increases in ownership concentration have affected the number of formats available in the market, then there may also be an effect on the responsiveness of format audiences to changes in the number of market formats and to changes in the number of stations broadcasting the format. However, if Rogers & Woodbury (1996) are correct, increases in ownership concentration will not affect the number of market formats or the responsiveness of format audiences to changes in format availability.

Effects of Ownership Concentration on Station Performance

Few studies have specifically examined group-ownership effects on station performance. Ekelund, Ford, & Koutsky (2000) study the effects of ownership concentration on radio station sales prices. They utilize a regression model for which station sale price is a function of station characteristics (revenue, FCC classification, transmitter power wattage), market characteristics (market radio revenue, number of competing television stations, newspapers and cable penetration), local market concentration (Market HHI for revenue and rating shares), and ownership characteristics (number of station owned locally and nationally). Ekelund, Ford, & Koutsky (2000) test both a market collusion hypothesis and a station group efficiency hypothesis.

“If increases in market concentration increase the level of market power for all stations, then the concentration or collusion hypothesis is supported...if only large

firms (group owned) have higher profits, then higher profits reflect the superior efficiency of large firms” (Ekelund et al., 2000, p. 169).

Their measure for station market power is station sale price. Ekelund, Ford, & Koutsky (2000) find strong support for their efficiency hypothesis, and their collusion hypothesis receives only weak support but cannot be ruled out. The more stations a group owns the higher price they are willing to pay for stations, which supports the efficiency hypothesis. Increases in market concentration have a statistically weak effect ($p < .1$) on station sales price, which modestly supports their collusion hypothesis. Ekelund, Ford, & Koutsky (2000) conclude that increases in station sales prices are more likely a result of station group efficiencies associated with station group consolidation than a result of rising station value due to overall increases in local market concentration or collusion.

Many researcher posit that local station group-owners should benefit from resource efficiencies such as sharing station office space, personnel, airtime sales and station promotion strategies, and programming and production assets (Albarran & Pitts, 2001; Berry & Waldfogel, 2001; Chambers, 2001; Ekelund et al., 2000; Wirth, 2001). One result of sharing resources among a group’s stations is thought to be an increase in the quality of station programming (Albarran & Pitts, 2001; Chambers, 2001; Wirth, 2001). To date, radio research has not examined group-ownership effects on station audience as a measure of station performance. If group-ownership results in station performance efficiencies, then adding one more station to the group should result in larger audience for all stations in the group, all else equal. Examining the marginal effect of group size on station audience is one way to examine the effects of group ownership on station performance.

Other factors that may affect station audience and performance also need to be considered. Berry & Waldfogel (1999) examine the social inefficiencies of the free-entry condition of radio markets. This study tested the hypothesis, “if stations [with the same format] are identical, then listeners will be indifferent between stations, and entry will not expand the market” (Berry & Waldfogel, 1999, p. 402), which is based on Steiner’s (1952) assumption that stations broadcasting identical formats are perfect substitutes. Following this logic, if a new radio station enters the market and duplicates an existing format, then the new station should steal audience share from incumbent stations and not expand the market audience listening to radio. Berry & Waldfogel (1999) find that under a free-entry condition new entrants have little effect on the audience share of incumbents, whether the new entrants duplicate the formats of incumbent stations or enter the market with unique formats. Furthermore, a new station entering a local market has little to no effect on the percentage of radio listeners in the market and does not expand the audience listening to radio. According to these results, new station entrants attract insignificant audiences. In essence, this study questions whether there is any public interest benefit to adding new stations to a radio market. Berry & Waldfogel (1999) conclude that free-entry into radio markets causes a welfare loss because large fixed costs of entry make it difficult for new station entrants to recoup initial investments.

While Berry & Waldfogel’s (1999) initial conclusions may be correct, they do not consider that it may take time for stations to find an audience. New station entrants cannot immediately gain audience share because they need to build a brand image and reputation with a market audience (Albarran & Pitts, 2001; Ditingo, 1995; Gomery, 2000; Norberg, 1996). Listeners must become aware of a new station and make an effort to

listen to a new station. This process of growing listener awareness and adoption will take time. Therefore free-entry into a radio market may generate welfare gains if new station entrants are able to build loyal audiences that can generate enough advertiser revenue to cover costs. Incumbent stations in a market may have a natural advantage, because the potential station audience has greater awareness of their existence in the market. A larger share of the market audience is likely to be aware of and listen to a station the longer that station broadcasts in the market, all else equal.

Further support for a longitudinal component to station performance can be found by examining station format changes. Radio programming formats are not a static characteristic of radio stations. A station can change its format with minimal operational costs but with substantial costs to station reputation in the market and to station brand identity with the market audience. Stations do not take format changes lightly because they risk losing their current audience with no guarantee that the new format will recoup the lost audience. Romeo & Dick (2001) find:

“that format changes are often not an effective means of improving station performance. Larger radio groups have been more successful in using format changes to generate performance improvements at individual stations, but the data indicate that these groups make format changes only for stations whose performance is well below average, and tend to make changes at the time of purchase” (p. 25).

According to Romeo & Dick’s (2001) findings, the costs of format changes seem to be lower for stations in a larger station group, where the loss of station revenue from a format change can be supported by the profits of the other stations in the group.

However, regardless of station ownership circumstances, there are instances when station performance may be so poor that the risks involved in changing a station’s format seems no worse than remaining with the current format (Romeo & Dick, 2001). There is at least

a perceived, if not actual, benefit to broadcasting a particular format over a period of time to build audience trust and loyalty and in turn a larger station audience.

Conclusions can be drawn from both Berry & Waldfogel (1999) and Romeo & Dick (1999). Berry & Waldfogel's (1999) study presents evidence that station audience is affected by the length of time a station broadcasts in a market. Stations that have served a market longer tend to have larger audiences than other stations in the market. Romeo & Dick's (2001) study raises the possibility that station audience share is affected by the length of time a station broadcasts the same format. However, these hypotheses have not been empirically tested. Furthermore, a large number of stations changed ownership in the first years after the passage of the Telecommunications Act of 1996 (Chang & Ki, 2004). Anyone connected to the radio industry is aware that changes in station ownership are generally accompanied by changes in station personnel. The station personnel turnover after a change in station ownership may affect constancy of station programming. However, station ownership is not an obvious characteristic when listening to a station. In fact, most listeners do not know or care to know who owns a particular radio station; listeners are most interested in the station's programming or format (Ditingo, 1995; Norberg, 1996). The effect that the length of time an owner has owned a station on station audience size is not clear and should be tested. So, the research questions asked are: do the length of time a station has been broadcasting in a market, the length of time a station has been broadcasting its current format, and the length of time a station has been owned by its current owner, affect the size of the station's audience?

CHAPTER TWO

METHODOLOGY

Ownership Concentration Effects on Market Formats, Stations and Audience

This first set of equations replicates Rogers & Woodbury's (1996) study and adds an ownership concentration measure to their equations. These regression equations examine the responsiveness of the number of market formats to changes in the number of market stations, the responsiveness of market audience to changes in the number of market formats, and the responsiveness of market format audiences to changes in format availability. Rogers & Woodbury (1996) first tested two hypotheses, "(i) that the number of formats in a radio market is positively related to the number of stations, and (ii) that listenership or audience is positively related to the number formats" (p. 83), using the following functional relationships:

$$Formats = f(Stations, Pop, X), \text{ and} \quad (1)$$

$$PercentPop = g(Formats, X), \quad (2)$$

where, *Formats* represent the number of formats present in the market; *Stations* represents the number of stations broadcasting in the market; *Pop* represents the potential number of radio listeners in the market; *PercentPop* represents the percentage of the market population that listens to radio; and, *X* represents market demographic variables (percentage of market population that is African-American, percentage of market population that is Hispanic, per capita income and average population age for the market's population).

Considering program choice theory, the number of formats in a market should be a function of the number of market stations, the market population listening to the radio, and the format preferences of the audience. Differences among market populations are approximated by demographic variables that are presumed to approximate differences in market radio listener preferences. The percentage of the market population that listens to the radio (*PercentPop*) is a proxy for the market audience that finds desirable programming on the radio. Program choice theory predicts that the percentage of market population listening to the radio should be a function of the number of market formats. As the number of formats in the market increases, a larger audience should find programming that is compatible with their format preferences. The percentage of audience that uses radio may also be a function of the demographics of the market population.

In equation (1), the number of stations and the number of radio listeners explain the number of market formats and in equation (2), the number of market formats explains the percentage of the market audience listening to radio. Therefore the number of market formats is the dependent variable in equation (1) and is an independent variable in equation (2). Both equations (1) and (2) use an audience variable as an independent and dependent variable, but these audience variables are not the same measure of radio listeners. Equation (1) uses the number of radio listeners in the market, which is a function of market size, as an independent variable, but equation (2) divides the number of radio listeners by the total population to form the dependent variable for the second equation. The percentage of radio listeners is not a function of market size but a function of population characteristics and preferences for radio. The two equations are

simultaneous because the number of market formats and audience measures are used in these equations both endogenously and exogenously. Simultaneous equations by their nature present endogeneity. Two-stage least squares regression is a preferred method for correcting endogeneity in simultaneous equations (Kennedy, 1998).

Two-stage least squares regression employs instruments to correct endogeneity problems that arise when explanatory variables are correlated with the error term of a regression equation. Instruments are variables that are correlated with the explanatory variables but not with the error term of the regression equation. The first stage of a two-stage least squares regression creates instrumental variables by regressing the explanatory variables on the instruments. The instrumental variables resulting from the first stage are used as the independent variables in the second stage to estimate the original regression equation. These two stages correct for the endogeneity in the original equations (Kennedy, 1998; Wooldridge, 2003).

Rogers & Woodbury (1996) identified per capita income, percentage of the population that is African-American and percentage of the population that is Hispanic as market characteristics that should affect audience use of the radio medium. Rogers & Woodbury (1996) also included an average age of the market population variable in their equations, a variable that was not used in this replication because a consistent data source for all markets could not be found. The instruments used by Rogers & Woodbury (1996) are: the number of market formats, number of market stations, market population, market average income, percentage of market population that is African-American, percentage of market population that is Hispanic, market average radio station wage, and number of market FM stations. Market average radio station wage is not used as an instrument in

this replication, because a data source for this variable could not be found. However, results of the two-stage least square regression with the available 1995 data for this study are statistically similar to the results of the Rogers & Woodbury's (1996) study, which also uses 1995 data. Therefore, the available data for this replication of the Rogers & Woodbury's (1996) study are accepted as adequate.

Rogers & Woodbury (1996) argued that significant changes in ownership concentration due to the relaxation of ownership limits would not affect their findings. If so, increases in ownership concentration should not affect the number of market formats or percentage of population listening to radio. These hypotheses could not be tested by Rogers & Woodbury (1996) because their study was conducted on market data before the passage of the Telecommunications Act of 1996. This replication of the Rogers & Woodbury (1996) study determines whether changes in ownership concentration occurring after the Telecommunications Act of 1996 alters the basic relationships Rogers & Woodbury (1996) found with their study by adding a variable for local ownership concentration to their regression equations.

Two different measures of local ownership concentration are employed. First, the audience shares for all owners owning more than one station in a market are summed to calculate the first ownership concentration variable (*Group Mkt Share*). This provides a percentage of radio audience listening to group-owned stations in a market. The second ownership concentration variable (*Audience HHI*) is a sum of squares of all owner audience shares to construct an HHI for market ownership concentration. The ownership concentration variables are added to the two-stage least square regression equations used in the Rogers & Woodbury (1996) study.

Another change to the original Rogers & Woodbury (1996) equations adds a market station variable to equation (2), which tests the relationship between the percentage of the population listening to the radio and the number of formats present in the market. Without the inclusion of the number of market stations, the equation assumes that it is only the number of formats that expands the percentage of people that find satisfaction from radio. This also assumes that stations broadcasting similar formats are seen as perfect substitutes by listeners. If the format differentiation between stations broadcasting the same formats expands the audience, then the number of stations in the market will also predict the percentage of the market population that finds satisfying programming from radio.

These equations are estimated with data for each year from 1995 through 2000 to include variation in market ownership concentration since the passage of the Telecommunications Act of 1996. Each of the ownership concentration variables is run in a separate two-stage least squares regression for each data year. Rogers & Woodbury (1996) estimate the equations in double log form to account for possible nonlinearities. The same form is used in this study and the full specification of equations (1) and (2), respectively, are:

$$\begin{aligned}
 \ln(\text{Number of Mkt Formats}) = & \alpha + \beta_1 \ln(\text{Number of Listeners}) \\
 & + \beta_2 \ln(\text{Number of Mkt Stations}) + \beta_3 \ln(\text{Mkt Per Capita Income}) \\
 & + \beta_4 \ln(\text{Mkt \% African-American}) + \beta_5 \ln(\text{Mkt \% Hispanic}) \\
 & + \beta_6 \ln(\text{Mkt Ownership Concentration Measure})
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 \ln(\text{Percent of Mkt Listeners}) = & \alpha + \beta_1 \ln(\text{Number of Mkt Formats}) \\
 & + \beta_2 \ln(\text{Number of Mkt Stations}) + \beta_3 \ln(\text{Mkt Per Capita Income}) \\
 & + \beta_4 \ln(\text{Mkt \% African-American}) + \beta_5 \ln(\text{Mkt \% Hispanic}) \\
 & + \beta_6 \ln(\text{Mkt Ownership Concentration Measure}).
 \end{aligned} \tag{4}$$

This study also examines what Rogers & Woodbury (1996) called ‘within format’ effects. The within format effects equation examines the responsiveness of the audience listening to a specific format to changes in the number of stations broadcasting this format, changes in the number of other formats available in the market, and changes in the average number of stations broadcasting other formats in the market. Essentially, this equation is estimating the responsiveness of a format’s audience to changes in the format’s availability. The number of market formats is used as an independent variable in this equation; therefore this equation is simultaneous with equation (3). The same instruments used to correct for endogeneity between equations (3) and (4) are used in this two-stage least squares regression.

$$\begin{aligned}
\ln(\text{Mkt Audience Share for Format } X) = & \alpha \\
& + \beta_1 \ln(\text{Number of Other Mkt Formats}) \\
& + \beta_2 \ln(\text{Number of Mkt Stations with Format } X) \\
& + \beta_3 \ln(\text{Avg Number of Mkt stations for other formats}) \\
& + \beta_4 \ln(\text{Number of Mkt stations}) \\
& + \beta_5 \ln(\text{Mkt Per Capita Income}) \\
& + \beta_6 \ln(\text{Mkt \% African-American}) \\
& + \beta_7 \ln(\text{Mkt \% Hispanic}) \\
& + \beta_8 \ln(\text{Audience HHI})
\end{aligned} \tag{5}$$

Equation (5) is also run on data from each year from 1995 through 2000 to encompass variation in local market ownership concentration since the passage of the Telecommunications Act of 1996. Equation (5) is run on data for each of the general format categories: Adult Contemporary, Rock, Black, Country, Contemporary Hits, Oldies, Classical, Jazz, Easy Listening, Religious, News/Talk, and Hispanic. This requires running seventy-two two-stage least square regressions to test each of the twelve format categories over the six sample years. The ‘Other’ format category is not estimated because this is not a structured format with a specific target audience.

This equation tests format audience responsiveness to the number of stations broadcasting the format in the market. If increasing the number of market stations broadcasting a format has a positive relationship to the percentage of the market audience listening to the format, this indicates that multiple offerings of the same format are not perfect substitutes to market audiences. This counters one of the basic assumptions in the Stein er (1952), Beebe (1977) and other program choice models, but also indicates that listeners find satisfaction from more choices within a particular format.

Group-Ownership Effects on Station Performance

For this next set of regressions, a station's share of its market's audience is used as a measure of station performance. Station audience share is the estimated percentage of market listeners tuned to a particular station. The primary justification for using station audience share as a measure of station performance is the reasonable assumption that listeners choose to listen to the station from which they receive the most benefit and satisfaction (Napoli, 1997). Station audience share is a measure of station performance with a connection to social welfare and with a connection to the station's financial interests because station audience size is highly correlated with station revenue (Berry & Waldfogel, 1999). Advertisers want to reach the largest possible audience with their radio advertising message; therefore advertisers are generally willing to pay a higher price for access to a larger audience, all else equal. Given that the sum of all a market's stations' audience shares is constrained to one hundred percent, using station audience share compares a station's performance relative to all other stations broadcasting in the same market. Stations with larger audience shares are assumed to be providing more satisfying

programming compared to the stations with smaller audience shares in the same market. This study examines factors affecting the magnitude of station audience share.

Broadcast policymakers have been concerned that increases in ownership concentration not reduce local market format diversity because this has been the primary policy measure of social welfare and the public interest for radio programming (Berry & Waldfogel, 1999, 2001; Drushel, 1998; Ekelund et al., 2000; FCC, 2000, 2001; Williams et al., 2002; Williams & Roberts, 2002). There is evidence that increases in ownership concentration, measured by the HHI, have not affected local format diversity (Drushel, 1998; FCC, 2000, 2001), but to date the effects of ownership concentration on station audience share have not been investigated. The first question to be examined here is does the number of local stations owned by a group-owner (group size) affect station audience share, all else equal?

One result of station consolidation is expected to be resource sharing between local stations in a group (Albarran & Pitts, 2001; Berry & Waldfogel, 2001; Chambers, 2001; Ekelund et al., 2000; Wirth, 2001). Resource sharing is expected to improve the quality of station programming for all stations in the group, because the stations can pool their talent to produce more effective sales efforts, news, productions, and programming (Albarran & Pitts, 2001; Chambers, 2001; Wirth, 2001). If group efficiency translates into more effective programming, then does adding more stations to a group increase station audience share for all stations in the group, all else equal?

The first equation used to examine the relationship between station audience share and local group size uses the number of other stations in the group to measure group size. This relationship between group size and station audience share could be nonlinear.

There are several statistical methods to control for nonlinearity. This study begins by adding a squared variable for group size to test for nonlinearity in the relationship.

$$\text{Station Share} = \alpha + \beta_1 (\text{Group} - 1) + \beta_2 (\text{Group} - 1)^2 + \beta X + \varepsilon \quad (6)$$

where, *Station Share* is the station's audience share, *Group - 1* is the number of other stations in the group, *X* is the vector of other station, format and market variables that may effect station audience share, and ε is the error term. Group size is measured by the number of other market stations with the same owner as the station on the left side of the equation, *(Group - 1)*. If the owner of the station on the left side of the equation only owns this station in the market (an independent station), then *(Group - 1)* equals zero. The square of *(Group - 1)* is used to test the linearity the relationship. If the coefficients for linear and squared variables are both statistically significant then a nonlinear relationship is indicated. If equation (6) indicates a statistically significant nonlinear relationship, then employing a cubic variable in the equation tests for a more complex curvilinear relationship:

$$\begin{aligned} \text{Station Share} = \alpha + \beta_1 (\text{Group} - 1) + \beta_2 (\text{Group} - 1)^2 + \beta_3 (\text{Group} - 1)^3 \\ + \beta X + \varepsilon \end{aligned} \quad (7)$$

Group size is a continuous independent variable. If the relationship between a continuous independent variable and dependent variable has numerous points at which the curvilinear relationship changes direction or slope, these polynomial functions may not be adequate to effectively estimate the relationship (Marsh & Cormier, 2002).

Using a spline function is another method to estimate a curvilinear relationship between a continuous independent variable and a dependent variable. "Spline functions are a device for approximating the shape of a curvilinear stochastic function without the necessity of pre-specifying the mathematical form of the function" (Suits, Mason, &

Chan, 1978, p. 132). Spline functions are used to test for changes in slope at discrete intervals for an independent variable. The relationship investigated with a spline function can be specified with the following set of equations:

$$\begin{aligned}
 \text{Station Share} &= \alpha + \beta_1 (\text{Group}_1 - 1) + \beta X + \varepsilon, \text{ if } \text{Group} \geq 1 \text{ station} \\
 \text{Station Share} &= \alpha + \beta_2 (\text{Group}_2 - 1) + \beta X + \varepsilon, \text{ if } \text{group} \geq 2 \text{ stations} \\
 \text{Station Share} &= \alpha + \beta_3 (\text{Group}_3 - 1) + \beta X + \varepsilon, \text{ if } \text{group} \geq 3 \text{ stations} \\
 &\vdots \\
 \text{Station Share} &= \alpha + \beta_k (\text{Group}_k - 1) + \beta X + \varepsilon, \text{ if } \text{group} \geq k \text{ stations.}
 \end{aligned} \tag{8}$$

Each successive equation in equation set (8) estimates the linear relationship between group size and station audience share that results from adding one more station to the group from an independent station to the largest group size, while holding constant other variables that may affect station audience share. Comparing the coefficient estimates for each of the equations will give a sense of the changes occurring in the relationship at each level of group size.

Spline regression analysis provides a device for combining the equations in set (8) into one equation. A spline regression estimates linear approximations of the relationship between an independent variable and a dependent variable for given intervals of the independent variable. Points where the linear relationship may change are referred to as spline knots. Estimating the slope between each spline knot, or spline variable, produces a piecewise estimate of the shape of the curvilinear relationship between a continuous independent and a dependent variable with one equation (Marsh & Cormier, 2002).

Because the effects of group size on station audience share have not been previously tested and theory does not identify precise points where the relationship is likely to change, a spline variable for each group size two through nine or more stations is estimated. The spline variables for station group size are calculated by first creating a

dummy variable (D_k) for each level of group size. Each successive spline dummy variable removes the observations that have fewer stations than its threshold value (Marsh & Cormier, 2002). For example, D_3 , a dummy variable for a station group with three or more stations, would equal one if the station group has three or more stations and would equal zero if the station group has less than three stations. The spline variable is calculated by multiplying the dummy variables by the continuous independent variable (Marsh & Cormier, 2002; Suits et al., 1978). In this case, the spline variables are created by multiplying the number of the group's other stations, $(Group - 1)$, by the dummy variables. A dummy variable is not required for the first level (an independent station). The spline regression equation is specified as follows:

$$\begin{aligned} Station\ Share = & \alpha + \beta_1 (Group - 1) + \beta_2 [(Group - 1) D_2] \\ & + \gamma_2 [(Group - 1) D_2] + \beta_3 [(Group - 1) D_3] + \gamma_3 [(Group - 1) D_3] \\ & + \dots + \beta_8 [(Group - 1) D_8] + \gamma_8 [(Group - 1) D_8] + \beta X + \varepsilon, \end{aligned} \quad (9)$$

where γ is the error variance for adding each successive level of the continuous variable to the equation to combine the equations in set (8). Let $\beta_2 + \gamma_2 = \delta$, then:

$$\begin{aligned} Station\ Share = & \alpha + \beta_1 (Group - 1) + \delta_2 [(Group - 1) D_2] \\ & + \delta_3 [(Group - 1) D_3] + \dots + \delta_8 [(Group - 1) D_8] + \beta X + \varepsilon. \end{aligned} \quad (10)$$

In this case, the first level of station group size is an independent station, where $Group - 1 = 0$. Therefore, the independent station effect will be captured in the intercept of the regression equation and becomes the default case for the dummy variables used in the equation. Because there is no theoretical basis to indicate where the relationship between group size and station audiences may change, this spline regression equation uses all levels of station group size, two through nine or more. Using all levels of the continuous independent variable in the equation will result in multicollinearity. This is

corrected by removing one level as the default case. The regression equation is specified as follows:

$$\begin{aligned} \text{Station Share} = & \alpha + \beta_1 [(Group - 1) D_2] + \delta_2 [(Group - 1) D_3] \\ & + \dots + \delta_7 [(Group - 1) D_8] + \beta X + \varepsilon. \end{aligned} \quad (11)$$

The coefficient for the first variable in the model represents the slope from the intercept to the first level of the independent variable. The coefficient for each successive spline variable is a measure of the change in the slope from previous spine knot. A statistically insignificant coefficients indicates a slope that is not statistically different from the slope between the previous two spline knots. The coefficients of the spline regression can be used to plot an estimate of the relationship between the continuous independent variable and the dependent variable (Marsh & Cormier, 2002).

Spline variables will be calculated for each station group size allowed by the Telecommunications Act of 1996, two stations through eight stations. An additional spline variable accounts for stations groups that may be larger than the prescribed eight station limit (nine or more stations). There are instances where station groups in markets on the Mexican border have controlling interests in foreign stations that broadcast signals into American markets. These ownership interests in Mexican stations are not counted by the FCC against the cap and can set a group's station ownership over the eight station cap.⁴ There are also instances where station groups merge placing local station group operations above the eight station cap. The acquiring owner will typically take operational control of the acquired stations when the merger deal is settled, but will wait to sell off stations to comply with the eight station cap until after the merger has been

⁴ Canadian law prohibits foreign investment in or control of Canadian stations.

approved by the FCC.⁵ Controlling for these instances of ownership above the prescribed cap will reveal if there is a possible advantage to station ownership over the regulated cap.

Other variables could potentially affect station audience size and need to be controlled in these equations. These variables are represented by vector **X** in equations (5) through (11). The frequency band (AM or FM) of the station is represented by a dummy variable for AM stations. Although the AM band was the first frequency band of operation in the history of the radio industry, since the late 1970s FM stations have earned higher revenue and been more popular with radio audiences (Orlik, 1997). For these reasons, FM stations are expected to have larger audience shares than AM stations, all else equal. Since frequency band is suspected to affect station audience share, the percentage of stations in a group that broadcasts on the FM band is included in the equation. If FM stations have larger audience shares, then having a greater percentage of FM stations in a local group may affect the audience shares of other stations in the group. Therefore the percentage of FM stations in the group is included in the equation to examine whether stations part of a group with a higher percentage of FM stations have larger audience shares.

The FCC classifies AM stations by daytime and nighttime station transmitter wattage and classifies FM stations by tower height and transmitter wattage. These two sets of classifications are not comparable, because AM and FM signal waves have different propagation principles. Past radio research has incorrectly used station transmitter wattage to compare AM and FM stations (e.g. Berry & Waldfogel, 1999;

⁵ Informal conversations with station group managers, station group owners and a station broker indicate that it can take more than a year for the FCC to give final approval to station sales and station mergers.

Ekelund et al., 2000). AM station transmitter wattage determines how far the broadcast signal will travel but the distance is greatly affected by geographical terrain, climate and amount of sunlight. FM broadcast signal wave propagation is not as susceptible to differences in geographical terrain, climate and amount of sunlight as AM signal waves. Rather an FM station's signal coverage area is determined by both tower height and transmitter wattage. FM stations with a lower tower height must use higher transmitter wattage to cover the same area as an FM station with a higher tower height. (Orlik, 1997). Because of these differences between AM and FM signals, transmitter wattage does not provide an appropriate comparison between AM and FM station signal differences or FCC classification differences.

A station signal coverage area variable is a possible way to empirically control for signal differences between AM and FM stations related to FCC class. The station signal coverage area estimates the square mileage covered by the station's daytime signal. However, I found a signal coverage area variable has a statistically insignificant coefficient in the equations and was highly correlated with other independent variables, such as format variables and market size. Furthermore, the Durbin-Watson (*D-W*) statistic indicated heteroskedasticity when the signal coverage area variable was included in the equations. Station coverage area has a low correlation with station share⁶ and removal of the station coverage area variable from the equation decreased the R^2 statistic slightly, but improved the *Adjusted R*² statistic for the equations. Furthermore, removal of the station coverage area variable eliminated the multicollinearity and heteroskedasticity problems in the equations. Other studies have not used variables to approximate station class, beyond station band, when examining the effects on audience share (e. g. Romeo &

⁶ $r(16144) = .08, p < .001$, while controlling for data year

Dick, 2001); therefore this study only uses the AM station dummy variable to distinguish between stations in the two frequency bands.

This study uses dummy variables to represent thirteen general format categories listed by Arbitron: Adult Contemporary, Rock, Black, Country, Contemporary Hits, Oldies, Classical, Jazz, Easy Listening, Religious, News/Talk, Hispanic, and Other. Formats in the 'Other' category do not fit into another format category and are the default case. Stations under the same general format category are assumed to have a higher degree of substitutability between each other than with stations under different general format categories (Williams et al., 2002). Station format should have an effect on station audience share because some formats are more popular with listeners than other formats.

Market population is included in the equation to control for market size differences. Arbitron estimates the market population for persons over the age of twelve years. This is the population who radio advertisers feel are potential customers and whose radio habits the radio industry accepts as most important to monitor. The number of market stations is included in the equation. Adding more stations to a market, all else equal, should drive station audience shares downward as the potential audience is spread across more stations. Certain market variables, such as income, education and ethnicity may be indicators of the percentage of the population that is likely to listen to the radio (Berry & Waldfogel, 1999; Rogers & Woodbury, 1996). These variables are included in the equation to account for demographic differences among market populations that may affect station audience share. The spline regression equation with all independent variables is:

$$\begin{aligned}
\text{Station Share} = & \alpha + \beta_1 [(Group - 1) D_2] + \delta_2 [(Group - 1) D_3] \\
& + \delta_3 [(Group - 1) D_4] + \delta_4 [(Group - 1) D_5] + \delta_5 [(Group - 1) D_6] \\
& + \delta_6 [(Group - 1) D_7] + \delta_7 [(Group - 1) D_8] + \delta_8 [(Group - 1) D_9] \\
& + \beta_9 \% \text{ of group that is FM stations} + \beta_{10} \text{ AM station} \\
& + \beta_{11} \text{ Adult Contemporary Format} + \beta_{12} \text{ Rock Format} \\
& + \beta_{13} \text{ Black Format} + \beta_{14} \text{ Country Format} + \beta_{15} \text{ Contemp Hits Format} \\
& + \beta_{16} \text{ Oldies Format} + \beta_{17} \text{ Classical Format} + \beta_{18} \text{ Jazz Format} \\
& + \beta_{19} \text{ Standards/Easy List. Format} + \beta_{20} \text{ Religious Format} \\
& + \beta_{21} \text{ News/Talk Format} + \beta_{22} \text{ Hispanic Format} \\
& + \beta_{23} \text{ Number Mkt stations} + \beta_{24} \text{ Arbitron Mkt Population} \\
& + \beta_{25} \text{ Mkt Per Capita Income} + \beta_{26} \text{ Mkt \% college education} \\
& + \beta_{27} \text{ Mkt \% African-American} + \beta_{28} \text{ Mkt \% Hispanic} \quad (12)
\end{aligned}$$

Local radio market ownership concentration levels began to significantly increase after the passage of the Telecommunication Act of 1996 (Drushel, 1998; FCC, 2000, 2001). The height of station sales in the radio industry took place between 1996 and 1998 with the most station sales occurring in 1996 (Chang & Ki, 2004). The number of national station owners also decreased twenty-two percent between 1996 and 2000 (FCC, 2001). A separate regression analysis will be run on data for each year from 1995 through 2000, and a Chow test will be employed to determine whether the relationships tested by the equation are consistent across the sample years.

Equations (6), (7) and (12) are used to estimate the marginal effect of increasing the number of stations in its group on a station's audience share. These equations seek to find whether group efficiencies have a turning point at a specific number of stations. In other words, is there number of stations beyond which adding additional stations to a local group seems to stop increasing station performance or begin decreasing station performance?

Format, Broadcast and Ownership Consistency Effects on Station Performance

Generally station revenue and station audience size are highly and positively correlated (Berry & Waldfogel, 1999). Increasing station audience share, all else equal, should translate to higher advertising revenue for a station. A basic assumption is that station executives program their stations to attract the largest possible share of the audience willing to listen to their format to in turn generate the highest possible revenue. Changes in programming formats may take time to increase station performance. Romeo & Dick (2001) find that station format choice is important to attracting an audience and that changing a station's format can have an immediate negative effect on a station's audience share. Berry & Waldfogel (1999) find that new stations entering a market, regardless of format, do not immediately attract significant audiences. Considering the results of Romeo & Dick (2001) and Berry & Waldfogel (1999), station programming consistency over time may play a significant role in increasing station audience share.

A station must build a reputation in the market for a loyal audience to tune into its programming. Listeners likely prefer to listen to stations that they can trust to provide consistently satisfying programming. Audience loyalty takes time to establish. Adoption of innovation principles predict five stages that listeners deciding to listen to a different (or new) radio station will likely follow: knowledge, persuasion, decision, implementation, and confirmation (Rogers, 1995). First, the listener must have knowledge of the different station choices available. Second, the listener must be persuaded by some one or some occurrence to explore the different stations available to him or her. The listener must have some reason to change their radio habits to seek out a different station choice. Next, the listener decides to change the radio dial and tune into a

different station. Fourth, the listener compares the new choice to his or her preferences and either implements the new behavior or moves to another station. Lastly, the listener must confirm that the new station is a better choice compared to all known alternatives. If this confirmation is positive then the listener may change their radio listening loyalty to this different station.

There are many different reasons why listeners may change stations. Furthermore, different listeners will make station changes with different frequency. Devices, such as station preset buttons on car and home radios, make changing stations very easy, but these preset buttons must be set to a station. This assumes that listeners have knowledge of their available choices to set the buttons to stations they believe they will enjoy. Other radio set devices, such as 'seek' or 'scan,' allow listeners to cycle through the radio spectrum to stations that they might not otherwise be aware of. This investigation relies on the measurement of station audiences from Arbitron. This service depends on radio listeners to recall and report which stations the listener has listened to in a diary. Therefore, listeners that have some degree of loyalty to a station will report listening to that station in the diary. This does skew the audience measurement data toward stations which the listener has knowledge and recall, but also indicates the stations that the listener is likely to turn to first when the radio is turned on. Listener adoption and station audience loyalty are dynamic (Rogers, 1995). Listeners choose which station to listen to based on their preferences among different stations' programming.

Stations that have broadcast the same format for a longer period of time should have more time to build a larger, loyal audience that reports listening to the station.

Therefore, the longer a station has broadcast its current format, the greater the station's audience share, all else equal. A station's format may not be the only factor in a listener's radio station choice. Berry & Waldfogel (1999) find that new stations entering a radio market have little impact on the audience share of incumbent stations regardless of the format they broadcast. Listeners are more likely to be aware of a station and consider a station as a possible listening choice if the station has been broadcasting in the market for a longer period of time. Therefore, stations that have been broadcasting in the market for a longer period of time should also have a larger audience, all else equal. Radio stations generally do not promote or identify their station ownership to listeners, but anyone working in the radio industry will confirm that changes in station ownership are usually accompanied by changes in station personnel. These changes in personnel may impact the consistency of station operation which in turn may have an impact on the consistency of the station's programming. Length of time since an ownership change may therefore affect station audience share and should be tested.

Equations (6), (7), and (12) examine the effects of group size on station audience share. Assuming that the size of a station's group has an effect on station audience share, group size should also be included in this equation. Two measures of group size are included in this equation. First, Group size can be measured by the number of other stations in the group (Group-1) and, second, group size can be measured by the sum of the audience shares for the other stations in the group. This second group size variable, *Adjusted Group Share*, is calculated by summing all station audience shares for all other stations in the same local group as the station whose share is the dependent variable. Independent stations have an *Adjusted Group Share* equal to zero. Both of these variables

are included in the equation to examine whether group size affects the station's audience share.

There are other variables that affect station audience size that also need to be included in this equation. The frequency band of the station is controlled by a dummy variable for AM stations. FM stations are expected to have larger audience shares than AM stations, all else equal. Station coverage area (estimated square mileage of area reached by a station's daytime broadcast signal) was originally included in this equation to account for differences related to FCC station class. As with equations (6), (7), and (12), there were multicollinearity and heteroskedasticity problems when the station coverage area variable was included in the equation. Therefore, station coverage area was removed from this equation. Twelve dummy variables represent the twelve general format categories indexed by Arbitron: Adult Contemporary, Rock, Black, Country, Contemporary Hits, Oldies, Classical, Jazz, Easy Listening, Religious, News/Talk, and Hispanic. Formats that do not fit one of these categories are considered as 'Other' formats and are the default case. Format variables should affect the potential size of the station's audience because some formats are more popular with audiences than others.

Market population is included in the equation to control for differences in market size. Arbitron estimates the market population for persons over the age of twelve years. This is the population who radio advertisers feel are potential customers and whose radio use the radio industry has accepted as most important to monitor. Markets with more radio stations are likely to have stations with lower audience shares because more stations are vying for the same listeners' attention. The potential market audience is spread across

more stations. Income, education and ethnicity may influence the percentage of the population that listens to the radio and are included in the equation.

$$\begin{aligned}
 \text{Station Share} = & \alpha + \beta_1 \text{ Number of Years Owned by current owner} \\
 & + \beta_2 \text{ Number of Years Broadcasting in Market} \\
 & + \beta_3 \text{ Number of Years with Same format Category} \\
 & + \beta_4 (\text{Group-1}) + \beta_5 \text{ Adjusted Group Share} \\
 & + \beta_6 \text{ AM station} + \beta_7 \text{ Adult Contemporary Format} \\
 & + \beta_8 \text{ Rock Format} + \beta_9 \text{ Black Format} + \beta_{10} \text{ Country Format} \\
 & + \beta_{11} \text{ Contemp Hits Format} + \beta_{12} \text{ Oldies Format} \\
 & + \beta_{13} \text{ Classical Format} + \beta_{14} \text{ Jazz Format} \\
 & + \beta_{15} \text{ Standards/Easy List. Format} + \beta_{16} \text{ Religious Format} \\
 & + \beta_{17} \text{ News/Talk Format} + \beta_{18} \text{ Hispanic Format} \\
 & + \beta_{19} \text{ Arbitron Mkt Pop} + \beta_{20} \% \text{ of Pop listening to Mkt Stations} \\
 & + \beta_{20} \text{ Mkt Per Capita Income} + \beta_{21} \% \text{ College Education} \\
 & + \beta_{23} \text{ Mkt \% African-American} + \beta_{24} \text{ Mkt \% Hispanic} \\
 & + \beta_{25} \text{ Number of Mkt Stations} + \beta_{26} \text{ Number of Mkt Formats} \\
 & + \beta_{27} \text{ Mkt Ownership Concentration Measure.}
 \end{aligned} \tag{13}$$

Collecting data for the number of years a station has been broadcasting the same format, the number of years since station entry into the market, and the number of years with the same ownership for each station in a local market is time and labor intensive. To meet realistic goals for completing this investigation in a timely manner, the number of markets used to estimate this equation was reduced to fifteen (roughly 350 stations) from the year 2000.

CHAPTER THREE

DATA

Station audience share is the dependent variable for equations (6), (7), (12), and (13), and is used to calculate the format audience share used as the dependent variable in equation (5). Station audience share is calculated with station ratings data compiled by Arbitron, Inc. and reported in the *American Radio Report* published quarterly (Duncan, 1995-2000). Arbitron routinely collects quarterly ratings data (Spring, Summer, Fall and Winter) for roughly 100 radio markets ranging from the first to 130th largest markets by population (using 2000 rankings). Arbitron collects semi-annual ratings (Spring and Fall) for nearly 190 radio markets. Arbitron estimates the number of listeners for each station by average quarter hour (AQH) from 6:00 A.M. through midnight, Monday through Friday. AQH is an estimate of the average number of listeners that have reported tuning into a station for at least five minutes in each quarter hour during weekdays. A station's audience share is calculated by dividing the station's AQH by the estimated average number of market radio listeners on weekdays, or people using radio (PUR) (Arbitron Inc., 2002). Station AQH and market PUR figures are estimated by Arbitron, Inc. and reported in the *American Radio Report* (Duncan, 1995-2000).

Arbitron surveys a sample population from each target market. Each selected person is required to keep a diary of their listening habits for one week during a ratings period and return the diary to Arbitron. Arbitron reports ratings for stations that receive what they term a 'measurable' audience. For a station to have a measurable audience means that enough listeners reported tuning into the station for Arbitron to estimate an

audience rating for this station meeting the standard for statistical reliability. Stations that have no reported listeners or very few reported listeners according to the returned diaries do not receive an audience rating from Arbitron. Only stations with an audience rating from Arbitron are included in this study, which excludes stations in the target markets that do not attract enough listeners to receive an audience rating from Arbitron.

Data were collected from the Spring volume of the *American Radio Report* from 1995 through 2000. Each Spring volume reports ratings data for roughly 180 markets. As the markets decrease in population the percentage of rated stations from all stations located in the market area decreases because Arbitron has a smaller sample from which to estimate their station ratings. Therefore, this study uses medium to large markets with a population over 150,000 people of the age of twelve or above. Markets were selected for this study by first looking at the markets from the first through 150th ranked markets in the Spring 2000 volume of the *American Radio Report*. One hundred and thirty-one markets between the first and 150th ranked market were reported in this Spring volume. All of these markets were reported in the Spring volumes of the *American Radio Report* for 2000, 1999, 1998, 1997, 1996 and 1995. All of the markets in each data year had ratings for at least eighty percent of the stations reported to be broadcasting in the market by Arbitron. Unfortunately, Duncan Media Enterprises ended publication of the *American Radio Report* with the Winter 2001 issue, so this data is not available for investigations of the radio industry after the 2000 Arbitron annual cycle.

The *American Radio Report* also provides station format and ownership data for rated stations in markets routinely surveyed by Arbitron. There were a few instances where station format and ownership data are missing in the *American Radio Report* and are

supplemented with data from the *Broadcasting & Cable Yearbook* (Broadcasting & Cable, 1995-2000), an annual directory of radio and television station addresses with ownership and format information for most stations. Usable data were collected for a total of 16,145 stations in 131 markets across the six observation years. Table 2 breaks down the observed stations by data year and frequency band:

Table 2

Breakdown of Station Data by Year and Frequency Band

Data Year	FM Stations	AM Stations	Total
1995	1,652	925	2,577
1996	1,699	972	2,671
1997	1,732	964	2,696
1998	1,779	936	2,715
1999	1,814	926	2,740
2000	1,833	913	2,746
Total	10,509	5,636	16,145

There are nearly twice as many rated FM stations as AM stations in these markets. The number of rated stations in these 131 markets increased six percent from 1995 to 2000. Because the stations included in this data must attract a measurable audience according to Arbitron, one cannot assume that this increase in stations is solely the result of new stations entering these markets. This increase in stations only indicates that more stations attracted enough listeners to receive an audience rating from Arbitron in 2000 compared to 1995.

Market level data for the 131 markets were collected using the *American Radio Report* (Duncan, 1995-2000) the *Duncan's Radio Market Guide 1995 through 2000* (Duncan, 1996-2001). Some markets included in this study are geographically close to

larger metropolitan areas. These markets have considerably fewer stations than more isolated markets with the same populations. There are several reasons why these markets may have a smaller numbers of stations. Competition from the stations in the larger adjacent market may crowd out stations in the smaller market, or the FCC may have reserved more channels for the larger market leaving fewer stations for the smaller adjacent market. However, discovering the reasons behind the smaller number of stations in these markets is beyond the scope of this study. When these markets were removed from the dataset, there was little change to the statistical results of the regression analyses, so these markets were kept in the data set.

Station ownership does consolidate in this dataset for each year from 1995 through 2000. There are 1,043 different owners in the 1995 dataset; 1,030 different owners in 1996; 866 different owners in 1997; 784 different owners in 1998; 744 different owners in 1999; and 682 different owners in 2000. In this dataset the number of owners in these 131 markets decreases by thirty-five percent from 1995 to 2000. Average market ownership concentration does increase in this dataset each year until 2000. Using the Herfindahl-Hirschman Index (HHI) for market ownership concentration of station owner audience shares, the average local market HHI for 1995 is 949.48. The average HHI rises to 1,179.98 in 1996, and to 1,415.72 in 1997. The average HHI increases more slowly in 1998 to 1,488.20, and appears to level off in 1999 to 1,519.01, and is virtually unchanged in 2000 at 1,521.52. These data show that station ownership did consolidate and that market ownership concentration did increase and appears to have leveled off in the sample markets during the observation period for this study.

There are eleven instances where station groups are over the 8 station local ownership cap prescribed by the Telecommunications Act of 1996; two instances in 1997, four instances in 1998, three instances in 1999, and two instances in 2000. Jacor, which was acquired by Clear Channel in 1998, reached the eight station cap in 1996 in San Diego, California. In 1997, the station group acquired controlling interests in two stations located in Tijuana, Mexico that broadcast into the San Diego market. The Jacor/Clear Channel group in the San Diego market accounts for four of these over local cap instances. The other seven instances were caused by group-owner station acquisitions. The acquiring group-owners took control of stations to be acquired placing the group above the cap before the Spring survey period and the *American Radio Report* reported the stations as under the ownership of the acquiring owner. After the merger was officially approved by the FCC, which was after the Spring Arbitron survey period, these group-owners sold stations to remain in compliance with the ownership cap. These eleven instances are reflected in equation (12) by a spline variable for station groups with nine or more stations to see if these groups benefited for an additional boost in station audience share.

Equation (13) employs station data for only fifteen markets because of the complexity of tracking station format over ten years and collecting broadcast operation start dates and ownership acquisition dates. A list of fifteen random numbers was generated and matched to the list of market ranks by population in 2000. Format data for stations in these fifteen markets were collected from 1990 until 2000 resulting in a number of years with the same format variable with values ranging from one to ten years. The primary source for the format data is the *American Radio Report*. When format data

were missing in the *American Radio Report* they were supplemented by format data from the *Broadcasting & Cable Yearbook*. The broadcast operation start date and owner acquisition date are reported in the 2000 edition of the *Broadcasting & Cable Yearbook*. The dataset from these fifteen markets includes 255 FM stations and 132 AM stations for a total of 387 stations. The following table lists the fifteen markets with some descriptive data:

Table 3

List of Markets Used to Estimate Equation (13)

Market	2000 Market Rank	Number of Rated Market Stations
Atlanta	11	24
Baton Rouge	84	19
Dallas-Fort Worth	6	36
Grand Rapids	66	23
Greensboro-Winston Salem	43	21
Greenville-Spartanburg	60	18
Louisville	54	26
Minneapolis-Saint Paul	17	21
New York	1	30
Norfolk	38	23
Pittsburgh	22	24
Raleigh-Durham	48	20
Sacramento	27	28
San Antonio	32	32
Syracuse	78	19

CHAPTER FOUR

RESULTS AND DISCUSSION

Ownership Concentration Effects on Market Formats, Stations and Audience

The first set of regressions estimates equations (3), (4) and (5) to replicate the Rogers & Woodbury (1996) study. This replication adds group ownership concentration variables to the equations to test Rogers & Woodbury's (1996) prediction that increases in ownership concentration would not affect the number of market formats or the percentage of the market population listening to radio. Rogers & Woodbury (1996) find that the number of formats present in a market is positively related to the number of market stations, and the percentage of the market population listening to the radio is positively related to the number of market formats. Two different ownership concentration variables are used in equations (3), (4) and (5). The first ownership concentration variable (*Group Mkt Share*) sums the group-owner audience shares of all market owners with more than one station. The second ownership concentration variable (*Audience HHI*) is an HHI for all owner audience shares, or a sum of squares for all station owner audience shares in the market.

Equation (3) examines the effects of the number market stations and the number of market radio listeners on the number of market formats, while controlling for market demographic variables and ownership concentration. Equation (4) examines the effects of the number of market formats and the number of market stations on the percentage of the market population listening to radio, while controlling for market demographic variables and ownership concentration. All of the two-stage least squares regressions used to

estimate equations (3) and (4) were statistically significant (see Tables 4 through 9 on pages 59-64). *Adjusted R²* statistics for regressions testing equation (3) range from .67 to .80, and *Adjusted R²* statistics for the regressions testing equation (4) range from .65 to .71. Chow Tests reveal no statistically significant differences between the estimated relationships in equation (3) for the sample years regardless of the ownership concentration variables used in the equation. Chow Tests reveal statistically significant differences between the estimated relationships in equation (4) for the sample years when the first ownership concentration variable is used in the equation (*Group Mkt Share*), $F(6, 780) = 12.80, p < .05$; and when the second ownership concentration variable is used in the equation (*Audience HHI*), $F(6, 780) = 9.51, p < .05$. The Chow Test results indicate that equation (3) testing the responsiveness of the number of market formats appears to be less susceptible to longitudinal changes in the data, than equation (4) testing the responsiveness to changes in the percentage of market radio listeners.

The number of stations in the market is a significant positive predictor of the number of market formats in all but one of the regressions. The number of stations coefficient was not significant in the 1998 sample year when the equation included the *Group Mkt Share* ownership concentration variable. This insignificant result for the number of stations coefficient in this one equation is most likely due to statistical noise in the data for this sample year, since this variable is significant in all of the other regressions. Therefore, the Rogers & Woodbury hypothesis that the number of market stations is positively related to the number of market formats is supported by these data.

The number of stations was added to equation (4) and is a significant positive predictor of the market radio audience across all of the sample years, regardless of the

ownership concentration variable used in the equation. However, when holding the number of stations constant in this model, the number of market formats is not a statistically significant predictor of the market audience. The number of market formats is a statistically significant and positive predictor of the market radio audience when the number of stations is not included in the model, which is consistent with Rogers & Woodbury's (1996) findings. All else equal, markets with a larger number of stations have a larger number of formats, and a larger number of stations also expands the percentage of the market population that listens to the radio.

Rogers & Woodbury (1996) find the number of market listeners to be a significant positive predictor of the number of market formats. In this replication, the number of radio listeners is not consistently a statistically significant positive predictor of the number of market formats across all sample years. This change in significance from the original study may be caused by the addition of the ownership concentration variables, longitudinal changes in the data or statistical noise. Regardless of the ownership concentration variable used in the equation, the number of market radio listeners was not a statistically significant predictor of the number of market formats in 1999 and 2000. Although causality cannot be determined with the analysis used in the study, the results do indicate that the number of market formats may not consistently be responsive to the radio audience size across all sample years.

The ownership concentration variables added to the equations (*Group Mkt Share* and *Audience HHI*) are not consistently statistically significant throughout the sample years. When the ownership concentrations variables are statistically significant in equation (3), there is a positive effect on the number of formats. But, when the ownership

concentration variables are statistically significant in equation (4), there is a negative effect on the market audience. Increases in local market ownership concentration can have a positive effect on the number of market formats, but can have a negative effect on percentage of market radio listeners. However, these results are not conclusive since the effects of ownership concentration are not consistent across all of the equations.

Rogers & Woodbury (1996) find the percentages of market population that is African-American and Hispanic to be statistically significant predictors of the number of formats and do not find market per capita income, the percentage of market population that is African-American, nor the percentage of market population that is Hispanic to be significant predictors of market radio audience. This replication finds per capita income, percentage of the population that is African-American and percentage of the population that is Hispanic are statistically significant and positive in both equations, but the statistical significance is not consistent across all the equations and sample years. Market per capita income, the percentage of market population that is African-American, and the percentage of market population that is Hispanic are variables used to describe characteristic differences between market populations. These market characteristic variables do not have a consistent statistical effect on the number of market formats or the percentage of a market's population that listens to radio in this study.

According the results of this investigation, Rogers & Woodbury's (1996) hypotheses receive further support. There is a positive relationship between the number of market stations and the number of formats and a positive relationship between the number of formats and the percentage of market listeners. However, when the number of market stations is included in equation (4), the relationship between the number of market

formats and the percentage of market listeners is not significant, but the relationship between the number of market stations and the percentage of market listeners is statistically significant and positive. This indicates that diversity of stations may be more important to listeners than just having diversity of formats. Rogers & Woodbury (1996) also argue that increases in ownership concentration variables would not affect the number of market formats or the percentage of listeners. This investigation provides inconclusive evidence that this argument is correct. Ownership concentration variables did have a statistically significant affect in some of the regressions.

TABLE 4

Two-Stage Least Squares Regression Results for Equations (3) and (4) estimating the factors affecting the number of market formats and the percentage of market radio listeners in 1995

1995	Equation (3) Format Model			Equation (4) Audience Model		
<i>Variable</i>	B	SE B	Beta	B	SE B	Beta
<i>(Constant)</i>	1.26	0.53		-2.45	2.45	
<i>ln(# Mkt Formats)</i>				0.73	0.44	0.15
<i>ln(# Mkt Listeners)</i>	0.06	0.03	0.28			
<i>ln(# Mkt Stations)</i>	0.26	0.08	0.46 ^b	1.86	0.28	0.68 ^a
<i>ln(Per Capita Income)</i>	-0.08	0.05	-0.10	0.62	0.22	0.16 ^b
<i>ln(% Afro-Amer Pop)</i>	0.03	0.02	0.17 ^c	0.14	0.07	0.14 ^c
<i>ln(Hispanic Pop)</i>	0.02	0.01	0.1	0.12	0.06	0.14
<i>ln(Group Mkt Share)</i>	0.06	0.04	0.13	-0.07	0.17	-0.03
Model Statistics	<i>Adj R</i> ² = .67 <i>F</i> (6,124) = 45.75 ^a			<i>Adj R</i> ² = .70 <i>F</i> (6,124) = 50.82 ^a		
<i>Variable</i>	B	SE B	Beta	B	SE B	Beta
<i>(Constant)</i>	0.99	0.59		0.98	2.59	
<i>ln(# Mkt Formats)</i>				0.79	0.42	0.16
<i>ln(# Mkt Listeners)</i>	0.07	0.03	0.36 ^c			
<i>ln(# Mkt Stations)</i>	0.25	0.08	0.43 ^b	2.00	0.24	0.73 ^a
<i>ln(Per Capita Income)</i>	-0.08	0.05	-0.10	0.47	0.21	0.12 ^c
<i>ln(% Afro-Amer Pop)</i>	0.03	0.02	0.15 ^c	0.11	0.07	0.11
<i>ln(Hispanic Pop)</i>	0.02	0.01	0.11	0.06	0.06	0.07
<i>ln(Audience HHI)</i>	0.05	0.03	0.13	-0.37	0.13	-0.18 ^b
Model Statistics	<i>Adj R</i> ² = .67 <i>F</i> 6,124() = 44.50 ^a			<i>Adj R</i> ² = .72 <i>F</i> (6,124) = 56.09 ^a		

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

TABLE 5

Two-Stage Least Squares Regression Results for Equations (3) and (4) estimating the factors affecting the number of market formats and the percentage of market radio listeners in 1996

1996	Equation (3) Format Model			Equation (4) Audience Model		
	B	SE B	Beta	B	SE B	Beta
<i>(Constant)</i>	1.14	0.48		-2.65	2.60	
<i>Ln(# Mkt Formats)</i>				0.86	0.50	0.18
<i>Ln(# Mkt Listeners)</i>	0.05	0.02	0.24 ^c			
<i>Ln(# Mkt Stations)</i>	0.29	0.07	0.51 ^a	1.68	0.31	0.64 ^a
<i>Ln(Per Capita Income)</i>	-0.07	0.05	-0.09	0.67	0.23	0.17 ^b
<i>Ln(% Afro-Amer Pop)</i>	0.03	0.01	0.13 ^c	0.17	0.07	0.17 ^c
<i>Ln(Hispanic Pop)</i>	0.02	0.01	0.13	0.11	0.06	0.14
<i>Ln(Group Mkt Share)</i>	0.07	0.04	0.15	-0.11	0.19	-0.05
Model Statistics	<i>Adj R</i> ² = .73 <i>F</i> (6,124) = 58.47 ^a			<i>Adj R</i> ² = .65 <i>F</i> (6,124) = 42.01 ^a		
<i>Variable</i>	B	SE B	Beta	B	SE B	Beta
<i>(Constant)</i>	0.93	0.51		-0.14	2.61	
<i>Ln(# Mkt Formats)</i>				1.01	0.49	0.21 ^c
<i>Ln(# Mkt Listeners)</i>	0.07	0.03	0.34 ^b			
<i>Ln(# Mkt Stations)</i>	0.27	0.06	0.49 ^a	1.73	0.27	0.66 ^a
<i>Ln(Per Capita Income)</i>	-0.08	0.05	-0.10	0.57	0.22	0.15 ^c
<i>Ln(% Afro-Amer Pop)</i>	0.02	0.01	0.11	0.16	0.07	0.16 ^c
<i>Ln(Hispanic Pop)</i>	0.02	0.01	0.13	0.06	0.06	0.08
<i>Ln(Audience HHI)</i>	0.05	0.02	0.15 ^c	-0.33	0.11	-0.20 ^b
Model Statistics	<i>Adj R</i> ² = .72 <i>F</i> (6,124) = 57.23 ^a			<i>Adj R</i> ² = .67 <i>F</i> (6,124) = 45.85 ^a		

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

TABLE 6

Two-Stage Least Squares Regression Results for Equations (3) and (4) estimating the factors affecting the number of market formats and the percentage of market radio listeners in 1997

1997	Equation (3) Format Model			Equation (4) Audience Model		
<i>Variable</i>	B	SE B	Beta	B	SE B	Beta
<i>(Constant)</i>	0.84	0.64		-14.10	3.29	
<i>Ln(# Mkt Formats)</i>				0.69	0.56	0.15
<i>Ln(# Mkt Listeners)</i>	0.04	0.02	0.18			
<i>Ln(# Mkt Stations)</i>	0.31	0.06	0.58 ^a	1.58	0.32	0.62 ^a
<i>Ln(Per Capita Income)</i>	-0.05	0.06	-0.04	1.77	0.30	0.30 ^a
<i>Ln(% Afro-Amer Pop)</i>	0.03	0.01	0.13 ^c	0.16	0.07	0.15 ^c
<i>Ln(Hispanic Pop)</i>	0.02	0.01	0.11	0.16	0.06	0.19 ^c
<i>Ln(Group Mkt Share)</i>	0.10	0.04	0.19 ^b	-0.09	0.22	-0.04
Model Statistics	<i>Adj R</i> ² = .80 <i>F</i> (6,124) = 89.07 ^a			<i>Adj R</i> ² = .69 <i>F</i> (6,124) = 50.28 ^a		
<i>Variable</i>	B	SE B	Beta	B	SE B	Beta
<i>(Constant)</i>	0.92	0.66		-11.47	3.39	
<i>Ln(# Mkt Formats)</i>				0.82	0.54	0.17
<i>Ln(# Mkt Listeners)</i>	0.05	0.02	0.25 ^c			
<i>Ln(# Mkt Stations)</i>	0.34	0.06	0.62 ^a	1.66	0.30	0.65 ^a
<i>Ln(Per Capita Income)</i>	-0.07	0.07	-0.05	1.63	0.30	0.28 ^a
<i>Ln(% Afro-Amer Pop)</i>	0.02	0.01	0.09	0.16	0.07	0.15 ^c
<i>Ln(Hispanic Pop)</i>	0.02	0.01	0.08	0.11	0.06	0.14
<i>Ln(Audience HHI)</i>	0.04	0.02	0.12	-0.27	0.12	-0.16 ^c
Model Statistics	<i>Adj R</i> ² = .79 <i>F</i> (6,124) = 84.59 ^a			<i>Adj R</i> ² = .71 <i>F</i> (6,124) = 52.97 ^a		

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

TABLE 7

Two-Stage Least Squares Regression Results for Equations (3) and (4) estimating the factors affecting the number of market formats and the percentage of market radio listeners in 1998

1998	Equation (3) Format Model			Equation (4) Audience Model		
<i>Variable</i>	B	SE B	Beta	B	SE B	Beta
<i>(Constant)</i>	1.29	0.70		-14.09	3.26	
<i>Ln(# Mkt Formats)</i>				1.26	0.49	0.25
<i>Ln(# Mkt Listeners)</i>	0.08	0.02	0.38			
<i>Ln(# Mkt Stations)</i>	0.13	0.07	0.25	1.53	0.30	0.59
<i>Ln(Per Capita Income)</i>	-0.10	0.07	-0.08	1.73	0.29	0.29
<i>Ln(% Afro-Amer Pop)</i>	0.03	0.01	0.17	0.11	0.07	0.11
<i>Ln(Hispanic Pop)</i>	0.02	0.01	0.14	0.12	0.07	0.15
<i>Ln(Group Mkt Share)</i>	0.14	0.04	0.32	-0.21	0.23	-0.10
Model Statistics	<i>Adj R</i> ² = .73 <i>F</i> (6,124) = 60.71 ^a			<i>Adj R</i> ² = .70 <i>F</i> (6,124) = 52.45 ^a		
<i>Variable</i>	B	SE B	Beta	B	SE B	Beta
<i>(Constant)</i>	1.15	0.74		-12.20	3.45	
<i>Ln(# Mkt Formats)</i>				1.31	0.47	0.26
<i>Ln(# Mkt Listeners)</i>	0.08	0.02	0.42			
<i>Ln(# Mkt Stations)</i>	0.19	0.06	0.36	1.53	0.26	0.59
<i>Ln(Per Capita Income)</i>	-0.10	0.07	-0.08	1.61	0.30	0.27
<i>Ln(% Afro-Amer Pop)</i>	0.03	0.01	0.13	0.11	0.07	0.11
<i>Ln(Hispanic Pop)</i>	0.02	0.01	0.11	0.10	0.07	0.12
<i>Ln(Audience HHI)</i>	0.07	0.02	0.22	-0.23	0.13	-0.14
Model Statistics	<i>Adj R</i> ² = .72 <i>F</i> (6,124) = 58.06 ^a			<i>Adj R</i> ² = .71 <i>F</i> (6,124) = 53.57 ^a		

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

TABLE 8

Two-Stage Least Squares Regression Results for Equations (3) and (4) estimating the factors affecting the number of market formats and the percentage of market radio listeners in 1999

1999	Equation (3) Format Model			Equation (4) Audience Model		
<i>Variable</i>	B	SE B	Beta	B	SE B	Beta
<i>(Constant)</i>	1.29	0.70		-11.65	3.30	
<i>Ln(# Mkt Formats)</i>				0.53	0.46	0.11
<i>Ln(# Mkt Listeners)</i>	0.04	0.02	0.17			
<i>Ln(# Mkt Stations)</i>	0.27	0.07	0.49	1.87	0.30	0.74
<i>Ln(Per Capita Income)</i>	-0.04	0.07	-0.03	1.59	0.29	0.28
<i>Ln(% Afro-Amer Pop)</i>	0.03	0.01	0.14	0.14	0.07	0.14
<i>Ln(Hispanic Pop)</i>	0.03	0.01	0.18	0.14	0.07	0.17
<i>Ln(Group Mkt Share)</i>	0.11	0.05	0.22	-0.38	0.25	-0.15
Model Statistics	<i>Adj R</i> ² = .71 <i>F</i> (6, 124) = 54.08 ^a			<i>Adj R</i> ² = .69 <i>F</i> (6, 124) = 48.97 ^a		
<i>Variable</i>	B	SE B	Beta	B	SE B	Beta
<i>(Constant)</i>	0.72	0.78		-9.72	3.60	
<i>Ln(# Mkt Formats)</i>				0.50	0.45	0.11
<i>Ln(# Mkt Listeners)</i>	0.04	0.03	0.17			
<i>Ln(# Mkt Stations)</i>	0.33	0.06	0.61	1.80	0.26	0.71
<i>Ln(Per Capita Income)</i>	-0.03	0.07	-0.03	1.46	0.31	0.26
<i>Ln(% Afro-Amer Pop)</i>	0.02	0.01	0.11	0.16	0.07	0.16
<i>Ln(Hispanic Pop)</i>	0.03	0.01	0.15	0.13	0.07	0.15
<i>Ln(Audience HHI)</i>	0.04	0.03	0.12	-0.26	0.13	-0.15
Model Statistics	<i>Adj R</i> ² = .70 <i>F</i> (6, 124) = 52.59 ^a			<i>Adj R</i> ² = .69 <i>F</i> (6, 124) = 49.27 ^a		

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

TABLE 9

Two-Stage Least Squares Regression Results for Equations (3) and (4) estimating the factors affecting the number of market formats and the percentage of market radio listeners in 2000

2000	Equation (3) Format Model			Equation (4) Audience Model		
	B	SE B	Beta	B	SE B	Beta
<i>Variable</i>						
<i>(Constant)</i>	0.01	0.72		-11.74	3.56	
<i>Ln(# Mkt Formats)</i>				0.01	0.50	0.00
<i>Ln(# Mkt Listeners)</i>	0.00	0.02	0.00			
<i>Ln(# Mkt Stations)</i>	0.40	0.07	0.72 ^a	1.91	0.36	0.79 ^a
<i>Ln(Per Capita Income)</i>	0.05	0.07	0.04	1.65	0.32	0.29 ^a
<i>Ln(% Afro-Amer Pop)</i>	0.04	0.01	0.18 ^b	0.14	0.08	0.14
<i>Ln(Hispanic Pop)</i>	0.03	0.01	0.15 ^c	0.15	0.07	0.18 ^c
<i>Ln(Group Mkt Share)</i>	0.06	0.05	0.12	-0.27	0.26	-0.12
Model Statistics	<i>Adj R</i> ² = .76 <i>F</i> (6, 124) = 69.74 ^a			<i>Adj R</i> ² = .65 <i>F</i> (6, 124) = 41.22 ^a		
<i>Variable</i>	B	SE B	Beta	B	SE B	Beta
<i>(Constant)</i>	0.10	0.77		-7.72	3.91	
<i>Ln(# Mkt Formats)</i>				0.04	0.49	0.01
<i>Ln(# Mkt Listeners)</i>	0.00	0.02	0.01			
<i>Ln(# Mkt Stations)</i>	0.44	0.06	0.79 ^a	2.02	0.31	0.84 ^a
<i>Ln(Per Capita Income)</i>	0.05	0.07	0.04	1.41	0.33	0.25 ^a
<i>Ln(% Afro-Amer Pop)</i>	0.04	0.01	0.16 ^b	0.14	0.07	0.13
<i>Ln(Hispanic Pop)</i>	0.02	0.01	0.13	0.09	0.07	0.11
<i>Ln(Audience HHI)</i>	0.02	0.03	0.05	-0.38	0.15	-0.23 ^c
Model Statistics	<i>Adj R</i> ² = .76 <i>F</i> (6, 124) = 69.06 ^a			<i>Adj R</i> ² = .66 <i>F</i> (6, 124) = 42.88 ^a		

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

Equation (5) examines the responsiveness of market format audience share to changes in the number of stations broadcasting the format in a market, to changes in the number of other market formats and to changes in the average number of stations broadcasting other market formats. Rogers & Woodbury (1996) termed this responsiveness a ‘within format’ effect. All of the two-stage least squares regressions testing equation (5) are statistically significant with *Adjusted R*² statistics ranging from .16 to .86. There is a wide variation in the statistical significance of the variable coefficients in the equations, but there is one basic statistically significant trend in the results.

Table 10 (on page 67) presents the beta weight coefficient results and statistical significance for the number of stations broadcasting the format in the market (*Stations in Format*) and the number of other formats present in the market (*Other Formats*) in equation (5) with the *Audience HHI* variable used for the ownership concentration variable (results were similar when the *Group Mkt Share* ownership concentration variable is used in the equation). In the majority of the regressions, the number of stations broadcasting a format has a statistically significant, positive effect on a format’s audience share. The Black and Hispanic format audiences were not statistically responsive to the number of stations broadcasting these formats, but the other format audiences appear to be responsive to changes in the number of stations broadcasting them. As the number of stations broadcasting these formats increases the percentages of radio listeners to these formats also increases, all else equal. These results are not consistent with the assumptions made in Steiner and Beebe program choice models. The Steiner and Beebe program choice models assume that stations broadcasting the same format are perfect

substitutes. As more stations broadcast the same format in the market, the stations are assumed to share the audience that prefers to listen to this format and not expand the audience that listens to this format. These results are more consistent with the observations of Napoli (1997) who finds increases in program type availability increases program type consumption in the network television industry. These results also suggest that stations that broadcast the same format are not perfect substitutes to market audiences. The availability of more choices (stations) within a format entices more listeners to listen to a format.

The other variables in equation (5) were not found to be consistently and statistically significant for most formats. Format audiences were not consistently responsive to the number of other market formats or the average number of stations broadcasting other formats, with the exception of the News/Talk Format. These results indicate that changes in the number of other formats do not to affect the share of the audience choosing to listen to a particular format, in most cases. However, as the number of formats increase, the audience listening to the News/Talk format appears to expand. There were some formats that were responsive to market characteristic variables. For instance, as the percentage of market population that is African-American increased, Black format audiences increased. The same results were found with the Hispanic format audiences and percentage of population that is Hispanic. Rogers & Woodbury (1996) were not specific in describing the results of their “within format” effect investigation, but they did report a low occurrence of significance of coefficients in their equations. This investigation finds that the size of most format audiences is responsive to the number of stations broadcasting a format.

TABLE 10

Partial Regression Results for the Within Format Effects Examined with Equations (5) presenting the significance of the number of station broadcasting the format and number of other formats in the market on the market format audience for each sample year

Format Tested		Beta Weight Coefficients for Each Sample Year					
<i>Adj R² Range</i> for all years	<i>Variable</i>	1995	1996	1997	1998	1999	2000
Adult Contemporary Formats							
.36 - .51	<i>Stations in Format</i>	0.51	0.63 ^a	0.51 ^b	0.45 ^b	0.56 ^b	0.22
	<i>Other Formats</i>	-0.03	0.03	-0.51	-0.45	-0.31	-0.74
Rock Formats							
.47 - .56	<i>Stations in Format</i>	0.56 ^c	0.72 ^b	0.55 ^b	0.36	0.44 ^b	0.60 ^b
	<i>Other Formats</i>	-0.61	-0.11	-0.51	-0.90 ^c	-0.61	-0.43
Black Formats							
.69 - .77	<i>Stations in Format</i>	0.06	0.06	0.07	0.03	0.08	0.12
	<i>Other Formats</i>	-0.89	-0.67	-0.65 ^c	-0.78 ^c	-0.49	-0.56 ^c
Country Formats							
.53 - .58	<i>Stations in Format</i>	0.45	0.61	0.54 ^b	0.58 ^c	0.31	0.51 ^b
	<i>Other Formats</i>	-0.66	-0.15	-0.17	0.01	-0.60	-0.18
Contemporary Hits Formats							
.30 - .46	<i>Stations in Format</i>	0.58 ^a	0.66 ^a	0.71 ^a	0.91 ^a	0.83 ^a	0.81 ^a
	<i>Other Formats</i>	0.49	-0.38	0.27	0.94	0.63	0.71
Oldies Formats							
.22 - .38	<i>Stations in Format</i>	1.27 ^b	0.77 ^a	0.79 ^a	1.05 ^a	0.64 ^a	0.68 ^a
	<i>Other Formats</i>	1.98	0.36	0.46	1.35	0.13	0.24
Classical Formats							
.61 - .74	<i>Stations in Format</i>	0.82 ^a	0.79 ^a	0.78 ^a	0.81 ^a	0.74 ^a	0.76 ^a
	<i>Other Formats</i>	-1.43 ^c	-0.33	0.17	-0.25	-0.04	-1.17 ^b
Jazz Formats							
.68 - .80	<i>Stations in Format</i>	.89 ^a	0.83 ^a	0.81 ^a	0.75 ^a	0.86 ^a	0.84 ^a
	<i>Other Formats</i>	0.55	0.44	0.09	0.06	0.58 ^b	0.28
Standards/Easy List Formats							
.31 - .47	<i>Stations in Format</i>	0.52 ^c	0.57 ^b	0.75 ^a	0.53 ^b	0.86 ^a	0.85 ^a
	<i>Other Formats</i>	-0.25	-0.23	0.18	0.11	1.04 ^c	1.03 ^c
Religious Formats							
.45 - .63	<i>Stations in Format</i>	0.30	0.67 ^a	0.89 ^a	0.63 ^a	0.77 ^a	0.80 ^a
	<i>Other Formats</i>	-0.93	-0.03	0.47	-0.10	0.29	0.19
News/Talk Formats							
.13 - .37	<i>Stations in Format</i>	0.66 ^c	1.40 ^a	1.07 ^a	0.99 ^a	1.01 ^a	1.05 ^a
	<i>Other Formats</i>	0.66	2.67 ^b	1.65 ^b	1.38 ^b	1.67 ^b	1.23 ^c
Hispanic Formats							
.55 - .73	<i>Stations in Format</i>	0.08	-0.35	0.29	0.10	0.14	0.08
	<i>Other Formats</i>	-0.06	-0.72	-0.17	0.06	-.30	-0.31

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

Group-Ownership Effects on Station Performance

Tables 11 through 13 (on pages 73-75) present results for equation (6), with a linear and quadratic group size variable representing the number of other stations with the same owner in the market (*Group-1*), and Tables 14 through 16 (on pages 77-79) present results for equation (7), which adds a cubic group size variable to equation (6). These results reveal that the relationship between the number of stations in the group and station audience share is curvilinear (see Figure 1 on page 72 and Figure 2 on page 76). The equation (6) regressions for each sample year from 1995 through 2000 are statistically significant with *Adjusted R*² statistics ranging from .29 to .35. The Chow Test statistic is significant, $F(22, 16139) = 10.56, p < .05$, indicating statistically significant differences between the estimated relationships across sample years. The coefficients for the linear and squared group size variables are significant at a greater than ninety-nine percent confidence level and have a positive and negative sign, respectively, for each sample year. The statistical significance and sign of the linear and squared group size variable coefficients in the equation (6) results indicate the relationship between the number of stations in the group and station audience share is parabolic in shape (Wooldridge, 2003), as shown in Figure 1 on page 72.

The regression results for equation (7) (Tables 14 through 16 on pages 77-79) are also statistically significant for each sample year with *Adjusted R*² statistics ranging from .30 to .36. The Chow Test statistic is significant, $F(23, 16139) = 9.19, p < .05$, indicating statistically significant differences between the estimated relationships across the sample years. The coefficients for the linear, squared, and cubed group size variables were significant at a greater than ninety-nine percent confidence level and had a positive,

negative and positive sign respectively for each sample year. As indicated by Figure 2 on page 76, station audience share increases with each additional station in the group; the increases in station audience share decrease in magnitude as the group gets larger, all else equal. Adding the cubed variable for the number of stations in the group changes the estimated relationship between the number of stations in the group and station audience size from a parabolic shape in the equation (6) results to a concave shape in the equation (7) results. Using higher power polynomial functions may indicate that the curvilinear relationship between group size and station share has even more changes or bends as the number of stations in the group increases; therefore, using a spline regression method is appropriate to estimate this curvilinear relationship between station share and group size. Figure 3 (page 80) plots the results of the spline variable coefficients for equation (12) for each sample year 1995 through 2000. All of the spline regressions were statistically significant with *Adjusted R*² statistics ranging from .29 to .38 (see Tables 17 through 19 on pages 81-83). The Durbin-Watson (*D-W*) statistics for all of the regressions were close to the 2.00 mark which does not indicate autocorrelation or heteroskedasticity problems in the data. Chow Test statistics reveal statistically significant differences between relationships estimated by equation (12) across all sample years, $F(32, 16144) = 7.54, p < .05$, indicating that there are statistically significant differences between the relationships estimated for each observation year. Therefore, an assumption can be made that there are longitudinal changes in the underlying relationships. Looking at the Figures 1 through 3 shows that the lines representing the relationship between station share and group size for each sample year rise on the graph from 1995 through 1997 or 1998 and then fall during 1999 and 2000. All else equal, adding stations to a local radio group increases audience

share for all stations in the group. However, the incremental effect of an additional station on the average share for stations in a group decreases in magnitude as the group gets larger.

In all of the regression results for equations (6), (7), and (12), the AM station dummy variable and the percentage of FM stations in the group are statistically significant and negative predictors of station audience share, all else equal. When holding the other variables in the equation constant, FM stations consistently have significantly higher audience shares than AM stations in all sample years. Because the FM frequency band is generally considered to be the more popular band with radio listeners, this finding makes intuitive sense. However, owning a larger percentage of FM stations in a group has a negative effect on station audience share. Although FM stations generally have higher audience shares than AM stations, owning a large percentage of FM stations appears to decrease station audience share, all else equal.

Different formats have positive and statistically significant coefficients in both equations in different years indicating that the format of a station does have a systematic impact on station audience share, all else equal. The Contemporary Hits format is the only radio programming format that was a statistically significant and positive predictor of station audience share in all of the equations across all sample years. The Black and Country formats have a statistically significant and positive coefficient in more than half of the equations run in this set of regressions. One could surmise from these results that the Contemporary Hits, Black and Country formats may be more popular formats with radio audiences during these sample years.

The number of market stations has a statistically significant and negative effect on station audience share, all else equal. It stands to reason that adding more stations to a market would have a negative impact on station audience share, all else equal. Station audience share should decrease as more stations are vying for the same audience attention, thereby splitting the available audience into smaller pieces. The other market characteristic variables for the most part were not significant predictors of station audience share. In a few of the years, per capita income had a statistically significant negative relationship with station audience share, but this relationship was not consistent across all sample years.

FIGURE 1

Line Plot Representing the Relationship between Group Size (linear and squared number of group stations variables) and Station Share from Equation (6) Results

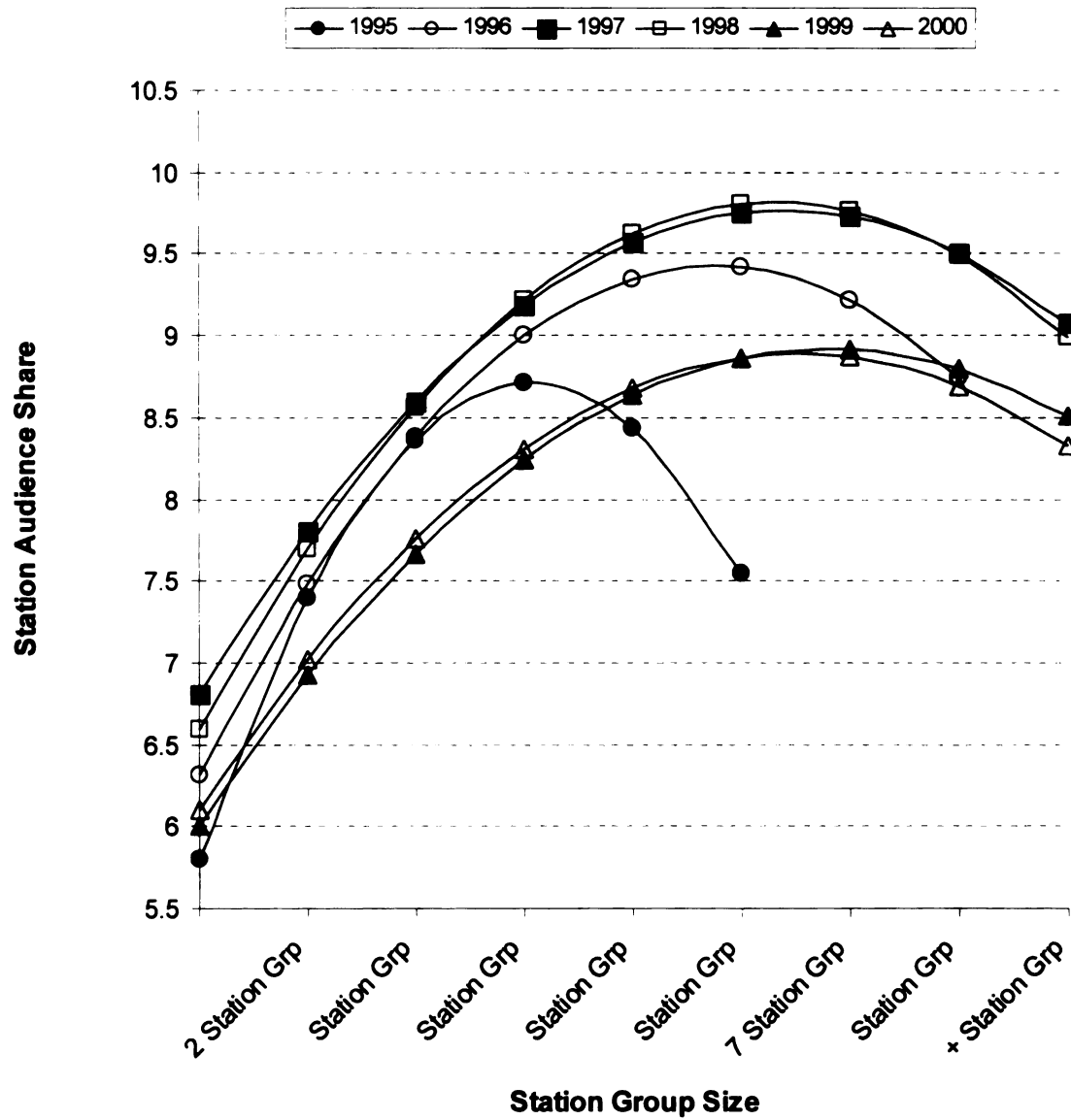


TABLE 11

Regression Results for Equation (6) Estimating the Effects of Group Size (linear and squared number of group stations variables) and Other Variables on Station Audience Share in 1995 and 1996

	1995			1996		
<i>Variables</i>	B	SE	Beta	B	SE B	Beta
<i>(Constant)</i>	5.80	0.71		6.32	0.73	
<i>No. of Other Grp Stations</i>	2.21	0.19	0.71 ^a	1.44	0.12	0.70 ^a
<i>No. of Other Grp Stations</i> ²	-0.31	0.04	-0.53 ^a	-0.14	0.02	-0.48 ^a
<i>% of FM Stations in Group</i>	-0.01	0.00	-0.08 ^b	-0.01	0.00	-0.10 ^a
<i>AM Freq Band</i>	-2.89	0.21	-0.42 ^a	-2.82	0.21	-0.42 ^a
<i>Adult Contemp</i>	1.36	0.58	0.13 ^c	1.28	0.61	0.12 ^c
<i>Rock</i>	0.76	0.58	0.08	0.55	0.61	0.06
<i>Black</i>	2.20	0.60	0.17 ^a	1.38	0.61	0.11 ^c
<i>Country</i>	2.14	0.58	0.22 ^a	1.59	0.60	0.17 ^b
<i>Contemp Hits</i>	2.15	0.60	0.16 ^a	1.94	0.63	0.14 ^b
<i>Oldies</i>	0.31	0.59	0.03	0.07	0.62	0.01
<i>Classical</i>	0.75	0.79	0.02	0.02	0.77	0.00
<i>Jazz</i>	-0.02	0.68	0.00	-0.57	0.68	-0.03
<i>Standards</i>	1.29	0.60	0.10 ^c	0.83	0.61	0.06
<i>Religious</i>	0.08	0.59	0.01	-0.32	0.61	-0.03
<i>News/Talk</i>	2.03	0.58	0.22 ^b	1.38	0.60	0.15 ^c
<i>Hispanic</i>	0.61	0.61	0.04	0.11	0.62	0.01
<i>Number of Mkt Stations</i>	-0.09	0.01	-0.17 ^a	-0.10	0.01	-0.20 ^a
<i>Arbitrom Mkt Population</i>	0.00	0.00	-0.01	0.00	0.00	0.00
<i>Mkt Per Capita Income</i>	0.00	0.00	-0.03	0.00	0.00	-0.04
<i>% College Education</i>	-0.01	0.01	-0.01	0.00	0.01	0.00
<i>% African American</i>	0.01	0.01	0.02	0.01	0.01	0.03
<i>% Hispanic</i>	0.00	0.00	0.00	0.00	0.00	0.01
	<i>Adj R</i> ² = .29			<i>Adj R</i> ² = .32		
Model Statistics	<i>F</i> (22,2554) = 49.17 ^a			<i>F</i> (22,2648) = 57.65 ^a		
	<i>D-W</i> = 1.95			<i>D-W</i> = 1.90		

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

Regression Results for Equation (6) Estimating the Effects of Group Size (linear and squared number of group stations variables) and Other Variables on Station Audience Share in 1997 and 1998

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

TABLE 13

Regression Results for Equation (6) Estimating the Effects of Group Size (linear and squared number of group stations variables) and Other Variables on Station Audience Share in 1999 and 2000

	1999			2000		
<i>Variables</i>	B	SE	Beta	B	SE B	Beta
<i>(Constant)</i>	6.00	0.64		6.10	0.64	
<i>No. of Other Grp Stations</i>	1.09	0.08	0.84 ^a	1.10	0.08	0.89 ^a
<i>No. of Other Grp Stations</i> ²	-0.09	0.01	-0.59 ^a	-0.09	0.01	-0.65 ^a
<i>% of FM Stations in Group</i>	-0.01	0.00	-0.10 ^a	-0.01	0.00	-0.08 ^a
<i>AM Freq Band</i>	-2.24	0.19	-0.36 ^a	-2.11	0.19	-0.35 ^a
<i>Adult Contemp</i>	0.84	0.50	0.09	0.66	0.51	0.07
<i>Rock</i>	0.61	0.50	0.07	0.32	0.50	0.04
<i>Black</i>	1.25	0.51	0.12 ^c	0.91	0.51	0.09
<i>Country</i>	1.26	0.50	0.14 ^c	0.95	0.50	0.10
<i>Contemp Hits</i>	2.23	0.52	0.19 ^a	1.91	0.52	0.17 ^a
<i>Oldies</i>	0.03	0.51	0.00	-0.12	0.52	-0.01
<i>Classical</i>	0.40	0.67	0.01	0.20	0.67	0.01
<i>Jazz</i>	-0.74	0.57	-0.04	-0.57	0.59	-0.03
<i>Standards</i>	0.51	0.51	0.04	0.45	0.51	0.04
<i>Religious</i>	-0.12	0.50	-0.01	-0.49	0.50	-0.05
<i>News/Talk</i>	0.98	0.49	0.12 ^c	0.54	0.49	0.07
<i>Hispanic</i>	0.06	0.50	0.01	-0.22	0.51	-0.02
<i>Number of Mkt Stations</i>	-0.09	0.01	-0.20 ^a	-0.09	0.01	-0.21 ^a
<i>Arbitrom Mkt Population</i>	0.00	0.00	0.00	0.00	0.00	0.01
<i>Mkt Per Capita Income</i>	0.00	0.00	-0.04	0.00	0.00	-0.04
<i>% College Education</i>	-0.01	0.01	-0.03	-0.01	0.01	-0.02
<i>% African American</i>	0.01	0.00	0.03	0.01	0.00	0.02
<i>% Hispanic</i>	0.00	0.00	0.01	0.00	0.00	0.01
	<i>Adj R</i> ² = .34			<i>Adj R</i> ² = .35		
Model Statistics	<i>F</i> (22,2717) = 66.28 ^a			<i>F</i> (22,2723) = 66.68 ^a		
	<i>D-W</i> = 1.91			<i>D-W</i> = 1.90		

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

FIGURE 2

Line Plot Representing the Relationship between Group Size (linear, squared, and cubed number of group stations variables) and Station Share from Equation (7) Results

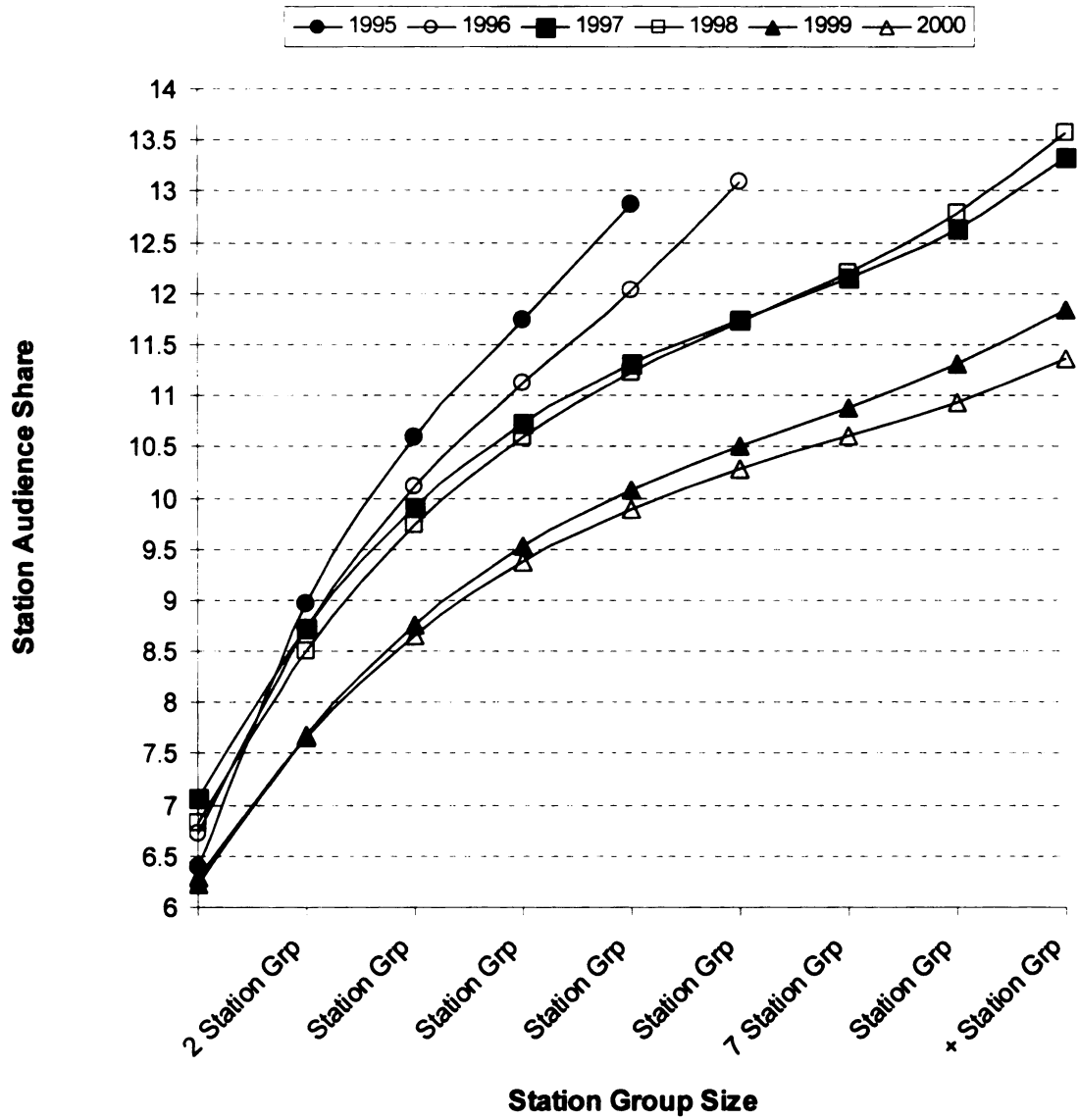


TABLE 14

Regression Results for Equation (7) Estimating the Effects of Group Size (linear, squared and cubed number of group stations variables) and Other Variables on Station Audience Share in 1995 and 1996

	1995			1996		
<i>Variables</i>	B	SE	Beta	B	SE B	Beta
<i>(Constant)</i>	6.39	0.72		6.72	0.73	
<i>No. of Other Grp Stations</i>	3.99	0.45	1.29 ^a	2.90	0.31	1.41 ^a
<i>No. of Other Grp Stations</i> ²	-0.82	0.12	-1.40 ^a	-0.51	0.08	-1.79 ^a
<i>No. of Other Grp Stations</i> ³	0.08	0.02	0.37 ^a	0.04	0.01	0.67 ^a
<i>% of FM Stations in Group</i>	-0.01	0.00	-0.08 ^b	-0.01	0.00	-0.10 ^a
<i>AM Freq Band</i>	-2.92	0.21	-0.42 ^a	-2.83	0.21	-0.42 ^a
<i>Adult Contemp</i>	1.30	0.58	0.13 ^c	1.20	0.61	0.11
<i>Rock</i>	0.71	0.58	0.07	0.52	0.61	0.05
<i>Black</i>	2.16	0.60	0.16 ^a	1.32	0.61	0.11 ^c
<i>Country</i>	2.12	0.58	0.22 ^a	1.55	0.60	0.16 ^c
<i>Contemp Hits</i>	2.12	0.60	0.16 ^a	1.90	0.62	0.14 ^b
<i>Oldies</i>	0.25	0.59	0.02	0.01	0.62	0.00
<i>Classical</i>	0.70	0.78	0.02	-0.02	0.77	0.00
<i>Jazz</i>	-0.07	0.68	0.00	-0.55	0.68	-0.03
<i>Standards</i>	1.27	0.60	0.09 ^c	0.78	0.61	0.06
<i>Religious</i>	0.08	0.59	0.01	-0.32	0.60	-0.03
<i>News/Talk</i>	2.03	0.58	0.22 ^a	1.34	0.59	0.15 ^c
<i>Hispanic</i>	0.56	0.61	0.04	0.09	0.61	0.01
<i>Number of Mkt Stations</i>	-0.09	0.01	-0.17 ^a	-0.10	0.01	-0.20 ^a
<i>Arbitrom Mkt Population</i>	0.00	0.00	-0.01	0.00	0.00	0.01
<i>Mkt Per Capita Income</i>	0.00	0.00	-0.03	0.00	0.00	-0.04
<i>% College Education</i>	0.00	0.01	-0.01	0.00	0.01	-0.01
<i>% African American</i>	0.01	0.01	0.02	0.01	0.01	0.03
<i>% Hispanic</i>	0.00	0.00	0.00	0.00	0.00	0.01
	<i>Adj R² = .30</i>			<i>Adj R² = .33</i>		
Model Statistics	<i>F(23,2553) = 48.17^a</i>			<i>F(23,2647) = 56.79^a</i>		
	<i>D-W = 1.97</i>			<i>D-W = 1.92</i>		
^a <i>p</i> < .001 ^b <i>p</i> < .01 ^c <i>p</i> < .05						

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

TABLE 15

Regression Results for Equation (7) Estimating the Effects of Group Size (linear, squared and cubed number of group stations variables) and Other Variables on Station Audience Share in 1997 and 1998

	1997			1998		
<i>Variables</i>	B	SE	Beta	B	SE B	Beta
<i>(Constant)</i>	7.07	0.76		6.81	0.72	
<i>No. of Other Grp Stations</i>	2.24	0.20	1.47 ^a	2.27	0.22	1.67 ^a
<i>No. of Other Grp Stations</i> ²	-0.32	0.04	-1.76 ^a	-0.32	0.04	-2.01 ^a
<i>No. of Other Grp Stations</i> ³	0.02	0.00	0.59 ^a	0.02	0.00	0.65 ^a
<i>% of FM Stations in Group</i>	-0.01	0.00	-0.10 ^a	-0.01	0.00	-0.12 ^a
<i>AM Freq Band</i>	-2.61	0.20	-0.40 ^a	-2.50	0.19	-0.39 ^a
<i>Adult Contemp</i>	0.41	0.61	0.04	0.75	0.59	0.08
<i>Rock</i>	0.03	0.61	0.00	0.18	0.58	0.02
<i>Black</i>	1.22	0.61	0.10 ^c	1.30	0.59	0.12 ^c
<i>Country</i>	0.95	0.60	0.10	1.15	0.58	0.12 ^c
<i>Contemp Hits</i>	1.68	0.63	0.13 ^b	1.91	0.60	0.16 ^b
<i>Oldies</i>	-0.21	0.62	-0.02	-0.32	0.59	-0.03
<i>Classical</i>	-0.42	0.75	-0.01	0.25	0.74	0.01
<i>Jazz</i>	-1.05	0.67	-0.05	-0.78	0.64	-0.04
<i>Standards</i>	0.38	0.61	0.03	0.43	0.59	0.04
<i>Religious</i>	-0.60	0.60	-0.05	-0.24	0.58	-0.02
<i>News/Talk</i>	0.78	0.60	0.09	0.87	0.57	0.11
<i>Hispanic</i>	-0.35	0.61	-0.03	0.04	0.59	0.00
<i>Number of Mkt Stations</i>	-0.10	0.01	-0.20 ^a	-0.10	0.01	-0.21 ^a
<i>Arbitrom Mkt Population</i>	0.00	0.00	0.00	0.00	0.00	0.02
<i>Mkt Per Capita Income</i>	0.00	0.00	-0.07 ^b	0.00	0.00	-0.07 ^c
<i>% College Education</i>	0.00	0.01	0.00	0.00	0.01	0.00
<i>% African American</i>	0.01	0.01	0.02	0.00	0.01	0.01
<i>% Hispanic</i>	0.00	0.00	0.01	0.00	0.00	0.00
	<i>Adj R² = .33</i>			<i>Adj R² = .36</i>		
Model Statistics	<i>F(23,2672) = 59.61^a</i>			<i>F(23,2691) = 66.00^a</i>		
	<i>D-W = 1.86</i>			<i>D-W = 1.96</i>		

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

TABLE 16

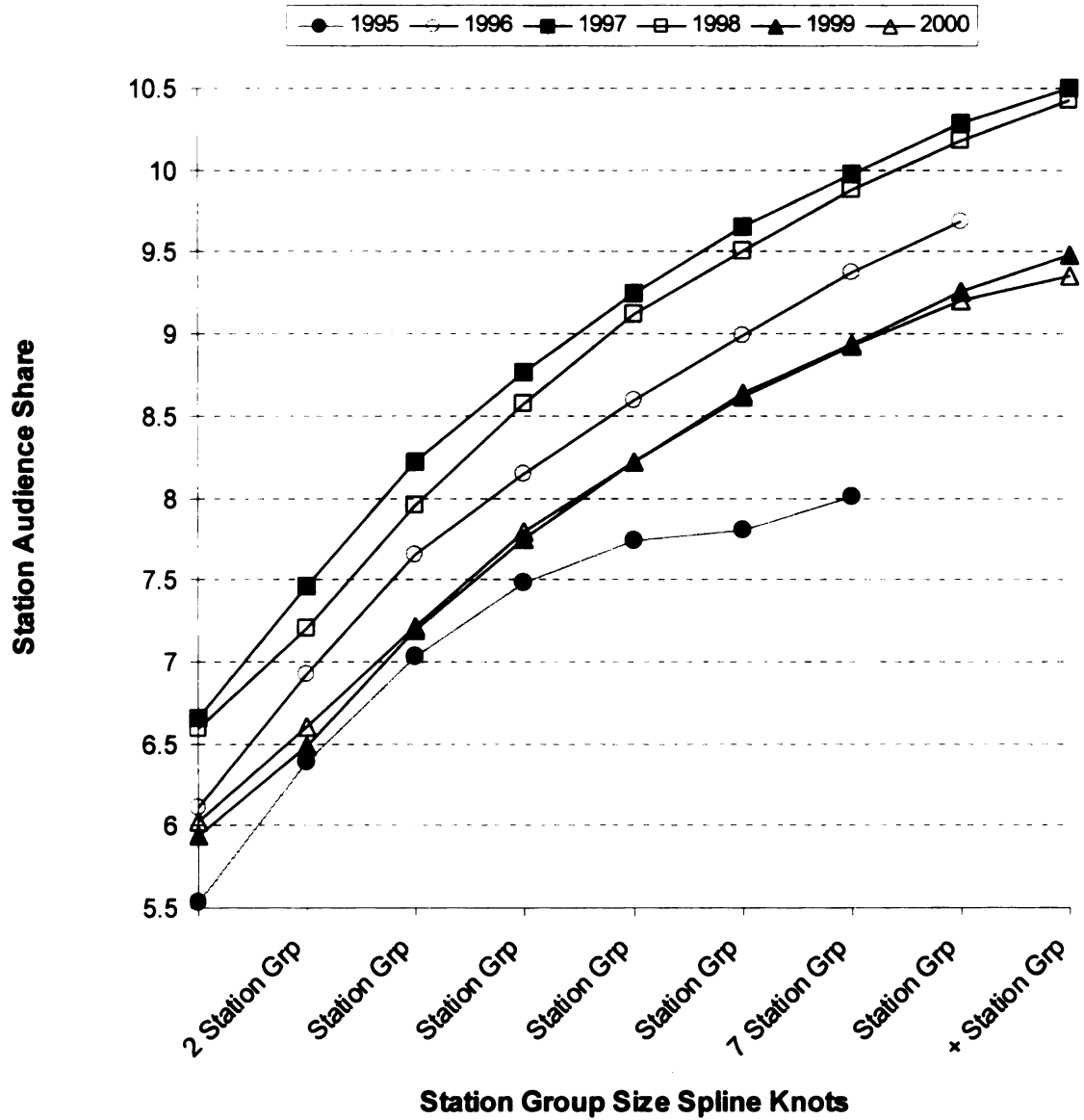
Regression Results for Equation (7) Estimating the Effects of Group Size (linear, squared and cubed number of group stations variables) and Other Variables on Station Audience Share in 1997 and 1998

<i>Variables</i>	1999			2000		
	B	SE	Beta	B	SE B	Beta
<i>(Constant)</i>	6.23	0.64		6.29	0.64	
<i>No. of Other Grp Stations</i>	1.92	0.18	1.48 ^a	1.79	0.18	1.44 ^a
<i>No. of Other Grp Stations</i> ²	-0.26	0.03	-1.74 ^a	-0.23	0.04	-1.65 ^a
<i>No. of Other Grp Stations</i> ³	0.01	0.00	0.57 ^a	0.01	0.00	0.50 ^a
<i>% of FM Stations in Group</i>	-0.01	0.00	-0.10 ^a	-0.01	0.00	-0.09 ^a
<i>AM Freq Band</i>	-2.25	0.19	-0.36 ^a	-2.10	0.19	-0.34 ^a
<i>Adult Contemp</i>	0.71	0.50	0.08	0.56	0.51	0.06
<i>Rock</i>	0.49	0.50	0.06	0.23	0.50	0.03
<i>Black</i>	1.14	0.50	0.11 ^c	0.81	0.51	0.08
<i>Country</i>	1.17	0.50	0.13 ^c	0.88	0.50	0.10
<i>Contemp Hits</i>	2.11	0.51	0.18 ^a	1.83	0.52	0.17 ^a
<i>Oldies</i>	-0.08	0.51	-0.01	-0.18	0.52	-0.02
<i>Classical</i>	0.35	0.66	0.01	0.19	0.67	0.01
<i>Jazz</i>	-0.79	0.57	-0.04	-0.61	0.59	-0.03
<i>Standards</i>	0.42	0.51	0.03	0.34	0.51	0.03
<i>Religious</i>	-0.14	0.50	-0.01	-0.53	0.50	-0.05
<i>News/Talk</i>	0.87	0.49	0.11	0.44	0.49	0.06
<i>Hispanic</i>	-0.05	0.50	0.00	-0.28	0.50	-0.03
<i>Number of Mkt Stations</i>	-0.09	0.01	-0.20 ^a	-0.10	0.01	-0.21 ^a
<i>Arbitrom Mkt Population</i>	0.00	0.00	0.01	0.00	0.00	0.01
<i>Mkt Per Capita Income</i>	0.00	0.00	-0.05	0.00	0.00	-0.05
<i>% College Education</i>	-0.01	0.01	-0.03	-0.01	0.01	-0.02
<i>% African American</i>	0.01	0.00	0.03	0.01	0.00	0.03
<i>% Hispanic</i>	0.00	0.00	0.01	0.00	0.00	0.00
<i>Model Statistics</i>						
	<i>Adj R</i> ² = .35			<i>Adj R</i> ² = .35		
	<i>F</i> (23,2716) = 65.05 ^a			<i>F</i> (23,2722) = 64.93 ^a		
	<i>D-W</i> = 1.92			<i>D-W</i> = 1.91		

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

FIGURE 3

Line Plot Representing the Relationship between Group Size (spline variables) and Station Share from Equation (12) Results



Regression Results for Equation (12) Estimating the Effects of Group Size (spline variables) and Other Variables on Station Audience Share in 1995 and 1996

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

Regression Results for Equation (12) Estimating the Effects of Group Size (spline variables) and Other Variables on Station Audience Share in 1997 and 1998

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

Regression Results for Equation (12) Estimating the Effects of Group Size (spline variables) and Other Variables on Station Audience Share in 1999 and 2000

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

Format, Broadcast and Ownership Consistency Effects on Station Performance

Equation (13) examines the effects of the length of time since a station began broadcasting in the market, the length of time a station has broadcast its current format, and the length of time a station has been owned by its current owner, on station audience share. Two regressions using one of the two ownership concentration variables (*Group Mkt Share* or *Audience HHI*) were run. The *Group Mkt Share* ownership concentration variable sums the group-owner audience shares of all market owners with more than one station, and the *Audience HHI* ownership concentration variable is an HHI for all owner audience shares, or a sum of squares for all station owner audience shares in the market. Both regressions are statistically significant with an *Adjusted R*² of .51 (See Table 20 on page 90). The Durbin-Watson statistics for both equations do not indicate any autocorrelation or heteroskedasticity problems.

The number of years broadcasting in the market and number of years broadcasting the same format were both significant positive predictors of station audience share, regardless of the ownership concentration variable used in the equation. This supports the assumption that it takes time for an audience to find a station and that it takes time for a station to build audience loyalty, all else equal. The number of years with the same owner was not a significant predictor of station audience share. Because ownership is not thought to be a salient station characteristic with listeners, it makes sense that this does not appear to affect station audience share. It does not matter who owns a station; as long as this station has been broadcasting in the market with the same format over a longer period of time, the station has a better chance of attracting a larger audience share, all else equal.

The number of other stations in the group and group audience share for other stations in the group (*Adjusted Group Share*) are added to equation (13) to control for group size effects on station audience share. The number of stations in the group has a statistically significant and positive effect on station audience share, all else equal. This result is consistent with the Group-Ownership Effect regressions (equations (6), (7), and (12)). However, the *Adjusted Group Share* variable for group size does not statistically affect station audience share. All else equal, adding more stations to the group increases station audience share, but increasing the audience share of the other stations in the group does not affect station audience share.

Controlling for all variables in the equation, AM station band, market population and number of market stations are statistically significant negative predictors of station audience share, regardless of the ownership concentration variable used in the equation. In this set of regressions, as with the Group-Ownership Effect regressions (equations (6), (7), and (12)), FM stations have larger station audience shares than AM stations, all else equal. These results provide further support for the assertions that FM stations are more popular with radio audiences than AM stations. As the number of market stations increases, station audience share decreases, all else equal. As the number of market stations increases, the station audience share should decrease as market radio listeners are divided among a greater number of stations. As the population of people over the age of twelve years in a market increases, station audience share decreases, all else equal. All else equal, the format of the station does not have a significant effect on station audience share. The market population characteristic variables and the ownership concentration variables are not significant predictors of station audience share in these equations.

Regression Results for Equation (13) examining the effects of the length of time a station has broadcast in a market, has broadcast the same format and has been owned by the current owner on station audience share in 2000

^a $p < .001$ ^b $p < .01$ ^c $p < .05$

CHAPTER 5

CONCLUSIONS

This study supports Rogers & Woodbury's (1996) hypotheses "(i) that the number of formats in a radio market is positively related to the number of stations, and (ii) that listenership or audience is positively related to the number formats" (p. 83). However, when the number of market stations is added to equation (4), support for the second hypothesis changes. All else equal, radio audience (percentage of the market population listening to radio) is positively related to the number of market stations with statistical significance but is not affected by the number of market formats. This indicates that that diversity of station choices may be more significant to increasing radio listeners than increasing diversity of formats. Radio audience may expand from a larger selection of stations regardless of the number formats. This assertion is further supported by the results of the 'within format' effect equation (5) results. As more stations broadcast within a particular format, most format audiences under investigation also expand (with the exception of the Black and Hispanic format audiences). Having more choice within a format seems to attract more listeners to the format, in most cases. These results question the viability of diversity of formats as a measure of the public interest, if the public interest is defined as the percentage of the market population that finds satisfying programming from radio.

Rogers & Woodbury's (1996) further argued that increases in ownership concentration would not affect these relationships, but this replication did not find conclusive support for this argument. The ownership concentration variables do not have

consistent statistical significance in the equations used to replicate Rogers & Woodbury (1996), but were significant in a few of the regressions. Increases in the ownership concentration had a statistically positive effect on the number of formats in a market in some of the regressions. However, increases in the ownership concentration had a negative effect on the percentage of market population listening to radio in some of the regressions. Increases in the ownership concentration may have a positive impact on the number of formats present in a market, but increases in ownership concentration may be driving radio audience away from radio. Further research should investigate the effect of ownership concentration on the number of formats and the size of market radio audiences, since this investigation did not yield clear results.

Rogers & Woodbury (1996) find a statistically significant positive relationship between the number of radio listeners and the number of market formats, yet while positive, this relationship is not statistically significant for all years in this replication and was not significant for either of the last two sample years. This may be an indication that the responsiveness of the number of market formats to changes in the size of the market audience may be disappearing. This could mean that smaller markets (by population) may be gaining the same format diversity as larger markets. Previous research found weak statistical significance for an increase in format diversity in smaller markets after the passage of the Telecommunications Act of 1996 (FCC, 2001; Williams & Roberts, 2002). Further study on a later time period should be conducted on the responsiveness of market format diversity to changes in the radio audience to ascertain if these results are indicating the beginning of a trend or are unique to these observation years.

Rogers & Woodbury (1996) do not report a statistically significant relationship between the number of stations broadcasting a particular format and the percentage of market audience listening to this format. However, this replication of their within format effect investigation finds format audience size to be responsive to the number of stations broadcasting the format. These results counter program choice theory assumptions and support Napoli's (1997). According to Napoli's (1997) results, there should be a high correlation between the percentages of radio formats available and the percentages of the radio audience that choose to listen the different formats. As more stations are broadcasting a particular format, more listeners should report listening to the format. This argument assumes that every station broadcasting the same format is to some degree differentiated from every other station broadcasting the format. Format audiences are not statistically affected by the number of other formats present in a market. These findings suggest that stations within the same format category are not perfect substitutes.

Future research on format fragmentation and the expansion of radio format audiences should be conducted. Although it is difficult to get a comprehensive record of station content to compare and contrast differences in station programming, it appears that radio audiences find a degree of difference between stations under the same format category. These differences also appear to be expanding the format audiences. Furthermore, increasing the number of stations in the market appears to increase the percentage of market population listening to radio more significantly than increasing the number of formats. Future research on format diversity should also consider the number of stations broadcasting the formats and not just the number of formats present in the market.

The results of this study support a station group efficiency hypothesis with respect to station performance. As group-owners add more stations to their groups, the group-owners appear to realize efficiencies that increase station audience shares. The results of this study indicate that local station consolidation does appear to provide radio audiences with more satisfying programming; however the increases in station share decrease in magnitude with each additional station. Therefore, this investigation finds audience benefits from station consolidation. Further research should consider other possible measures of group size and station performance to see if an efficiency hypothesis can be found for other measures of group ownership and station performance.

One limitation of this group efficiency investigation is that station profit data is not considered; therefore financial economic efficiencies cannot be explored.

Unfortunately, there are sources for station revenue available, but not station costs.

Station performance is approximated by station audience, which has been found to be highly correlated with station revenue (Berry & Waldfogel, 1999). However this does not indicate a correlation with station profit. If it costs more to produce quality station programming to attract larger audiences, then increasing station revenue with a larger audience is not necessarily increasing profits. A great deal of radio research assumes constant programming prices and/or advertising rates (e. g. Berry & Waldfogel, 1999; Drushel, 1998; Ekelund et al., 2000; Steiner, 1952), because the data to relax these assumptions are not available. Despite these limitations, if one assumes that controlling for station frequency band and format controls for some differences in program cost and advertiser valuation of station audiences, then this investigation does support the

hypothesis that, all else equal, adding more stations to a group improves station performance.

Future research should be conducted on station data from after 2000 to see if the shape of the relationship between group size and station audience share changes from the results found by this investigation. Station groups may be able to further increase station performance efficiencies as more time passes since the significant increase in station consolidation after the passage of the Telecommunications Act of 1996. Five years may not be enough time for station groups to realize the full potential of group ownership efficiencies.

Regardless of ownership consolidation, the number of years a station has served its market and the number of years a station has been broadcasting its current format are positive predictors of station audience share. The length of time a station remains with the same owner does not appear to affect station audience share. Therefore it does not matter how long a station is owned by the same owner. What is more important to increasing audience share is that the station broadcast in the market over a longer period of time and that the station's format remain consistent over a longer period of time compared to other stations in the market.

Stations new to a market and stations that change their formats clearly have a disadvantage in attracting radio listeners and it will take time for these stations to gain a larger audience. Radio stations that gain audience loyalty are more likely to keep audience loyalty over time if they do not change their formats, all else equal. Stations that change their formats will suffer significant loss of audience that can be recouped with format consistency over time, which is consistent with the finding of Romeo & Dick

(2001). The results of this study also indicate that FM stations have an advantage over AM stations when it comes to audience share. Ownership consolidation has created group owner efficiencies that increase station audience, but station programming consistency is also important to increasing station audience share, all else equal.

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