ESSAYS ON REGULATION OF MEDIA, ENTERTAINMENT, AND TELECOMMUNICATIONS

by

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To my grandfathers,

Anthony DiCola and Patrick J. McCarthy.

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Chapter 1

Introduction

Economic conditions and government regulations can promote, discourage, support, shape, or distort both corporate and individual decisions about culture, communication, and creativity. The media, entertainment, and telecommunications industries demonstrate these economic and legal effects most directly and vividly. When the structure of the radio industry changes such that a single companyonce limited to owning forty stationscomes to control over twelve hundred stations, the resulting evolution implicates more than just industrial-organization economics. Will larger companies play jazz less often? If so, how will jazz musicians respond in their compositions and song selections? Should the employment of news reporters decline as a result of media mergers, issues beyond labor markets arise. How might political discourse change? What happens when newsrooms contain fewer people's perspectives and attitudes? And if copyright law prohibits sampling, more than legal doctrines will change. Will law confine the creative possibilities of hip-hop, electronic, or other sample-based music? Does expanding intellectual property rights with the music industry in mind affect the fields of technology, science, or literature?

With this dissertation I hope to contribute economic, statistical, and legal analysis to the debates over important questions like those I have mentioned above. Quantifying media ownership concentration and measuring its effects provides necessary context to policy discussions. Describing the complexities of the legal environment does the same. But alongside my economic and legal analysis of the regulation of the media, entertainment, and telecommunications industries, I also recognize the perspectives and concerns of those in other disciplines. A quantitative economic model can shed light on, but cannot produce definitive answers to, questions about how regulation affects, and how it should seek to affect, creativity and communication. My interdisciplinary approach aims to fit my economic and legal analysis like a puzzle piece into broader discussions.

More specifically this dissertation uses the radio industry and the recorded music industry as primary examples of how government regulates communication and entertainment industries in the United States. I am particularly interested in how changes in media regulation and copyright law have affected the programming choices of media companies; the situations of media, entertainment, and telecommunications workers; and the creative and communicative options available to musicians. I examine two specific sets of policies. First, and most extensively, I study the easing of longstanding restrictions on the number of radio stations a single corporation may own. Second, I address the effects of tightened restrictions on music sampling, that is, the use of other creators' sound recordings to construct new musical works.

Until the mid-1980s, control of the radio industry had been diffuse because of limits on both national and local ownership of radio stations. Gradually, Congress and the Federal Communications Commission (FCC) began to ease those restrictions, culminating in the Telecommunications Act of 1996, which eliminated the national cap of forty stations per company and raised the local cap from a maximum of four stations per company to eight. These regulatory changes provide an opportunity to measure, in a statistically valid way, the causal effect of increasing ownership consolidation. To implement a limit on local radio ownership, the FCC had to define the geography of a local market. In other words, the agency must determine whether the "Detroit radio market" includes Detroit within its city limits, the entirety of southeastern Michigan, or some other geographic area. In 1992, the FCC had changed its method for market definition to a complicated formula based on how each radio stations signal coverage areathe geographic area reached by the signal coming from that stations broadcast toweroverlaps with other stations' areas. This formula permitted ownership to consolidate to different extents in different cities because of differences in geographic features (for example lakes, peninsulas, and mountains) and the resultantly different patterns in the placement of broadcast towers. In econometric terminology, this situation presents a plausible "natural experiment"an opportunity to isolate non-market factors that manipulated consolidation, so that one can measure the market effects of consolidation separately from the effects of those outcomes feeding back into consolidation. I focus on how consolidation affects programming variety; overall radio listenership; and the employment levels and wages of disk jockeys, news reporters, and broadcast technicians.

Copyright law has recently altered its restrictions on musicians who wish to engage in sampling, the use of other creators' sound recordings to construct new musical works. These restrictions include recent judicial decisions like Bridgeport Music v. Dimension Films (6th Circuit, 2005), which found copyright infringement in the unauthorized use of a two-second sample used in the background of a song. More generally, expansions in copyright law, such as the 1976 Copyright Act's expansion of the exclusive right "to prepare derivative works," have made direct creative borrowing more expensive and occasionally impossible.

In this dissertation I explore several legal and economic issues implicated by this policy problem, including copyright law's discrimination between certain categories of creation, labor-economic choices presented to musicians who consider sampling, and various approaches to reform. Systematic data on sampling activity and sample-licensing fees are not currently available, making statistical analysis infeasible. Given that limitation, this paper outlines an economic model to highlight the fact that the creations of others are a key input into new creations. The model thus illustrates certain key tradeoffs between providing incentives to create and promoting access to creative works, not just for the public but for other musicians to use as inputs.

Chapter 2

FCC Regulation and Increased Ownership Concentration in the Radio Industry

2.1 Introduction

For decades Congress has set a limit on the number of radio stations that one company can own within a local radio market. But for more than eight years after Congress's most recent statute dealing with radio ownership limits,[1] policymakers, researchers, and the general public did not know the answer to a deceptively simple question: "How many radio stations may one company own in one city?" If it is an important policy to limit the concentration of ownership of the public airwaves, then how could radio policy be so opaque? And how could the FCC enforce such a policy? On the other hand, if radio-ownership limits have outlived their usefulness (say, because of the proliferation of new communications technologies), how could anyone be sure of that obsolescence if the limits themselves remain unknown?

To work toward a better understanding of radio policy over the last decade, this

[1] Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56.

paper outlines a methodology for determining the FCC's local radio ownership limits. The paper reports the calculated ownership limits for only the 100 largest metropolitan areas in the U.S., but the study covers 289 metropolitan areas. Calculating the FCC's radio ownership limits allows for an analysis of how radio firms responded to that policy. As it happens, in almost no metropolitan areas do radio firms' station holdings equal or exceed the limits, suggesting that constraints other than government regulation are at play.

Another important finding I document in the paper is that FCC radio policy varied considerably from city to city—much more so than researchers or policymakers have previously understood. While that variation is curious in and of itself, it is also useful variation for a statistically minded researcher. Because the variation relates to the historical placement of radio towers and the complex geometry of how radio stations' signal coverage areas intersect—that is, because the variation is not related to market forces—the FCC's regulation of radio could provide a natural experiment to study the effects of increased ownership concentration.

I find that the calculated local ownership limits are strongly correlated with measures of ownership concentration, justifying the use of radio policy since 1996 as a sort of experiment. The results from that experiment suggest that increased concentration, isolated from other market phenomena, causes an increase in nominal programming variety, as measured by programming format names, as well as an increase in advertising revenue. At the same time, I find that increased concentration has no effect on the amount of news programming on the radio. But I also estimate that increased concentration has no effect on radio listening and to push some listeners from commercial to noncommercial stations.

The story of radio regulation, particularly the FCC's contribution to it, and the resulting increase in ownership concentration has more than just economic lessons. Radio policy itself continues to be controversial, as the FCC continues to review its media ownership rules as of this writing. My findings help to explain what one can and cannot conclude about the FCC's quasi-antitrust regime for media based on the recent history of radio. Moreover, the recent history of radio regulation provides a case study for administrative law, particular questions regarding the administrative process. At first blush, the FCC's extra-permissive regulations on radio firms seem like strong evidence for public choice or capture theory, but the reality is more complex, especially because the FCC itself has closed the loophole of sorts that I study in this paper.

Section 2.2 provides a brief overview of the competing theories regarding media concentration. Section 2.3 describes the relevant statutes and regulations that govern radio-ownership policy. Section 2.4 explains how to calculate the local ownership limit under the FCC regulations that were in place from 1992 to 2004 and reports the results. Section 2.5 concerns the relationship between the local ownership limits and ownership concentration. Section 2.6, in turn, concerns the relationship between ownership concentration and various radio outcomes like programming variety, exploiting the natural experiment created by the FCC's implementation of the local ownership limit. Section 2.7 discusses the legal and policy implications. Section 2.8 concludes.

2.2 Media Concentration

This section briefly outlines the two major perspectives in the debate over media concentration. Both perspectives contain multiple theories and variations. For the purposes of this paper, what matters is that the two theories make opposite predictions about the effect of increased concentration of radio-station ownership.

2.2.1 Critiques of Media Concentration

Critics of media concentration often argue that concentration leads to more homogeneous programming. A simple economic theory of the negative effects of media concentration might focus on the cost side. Firms that own multiple radio stations may find it less costly to offer the same or at least similar programming on all of their stations. More developed critiques focus on the likelihood of monopolistic or oligopolistic media firms to adequately serve as government watchdogs or to reflect a diverse array of viewpoints.[2] Many theories are possible; what they have in common is a prediction that ownership concentration will frustrate the goal of diverse programming.

Previous research has found that common ownership of radio stations in different metropolitan areas leads to more similar playlists on music stations.[3] Such evidence focuses on particular radio firms rather than market-wide effects, as this paper does. The rationale for limiting concentration is to produce better results for the radio listeners in a given market; more diverse offerings from a particular firm are merely a means to that

[2] *See, e.g.*, C. EDWIN BAKER, MEDIA MARKETS, AND DEMOCRACY 176–77 (2002) (describing liberal pluralist critiques of media concentration).

[3] *See* ANDREW SWEETING, TOO MUCH ROCK AND ROLL? STATION OWNERSHIP, PROGRAMMING, AND LISTENERSHIP IN THE MUSIC RADIO INDUSTRY (working paper, Jan. 15, 2006).

end.

Important parts of the case for media-ownership regulation, however, do not concern outcomes in media markets. For instance, many critiques of media concern language, discourse, and meaning, rather than measurement of economic variables.[4] Many critics of media concentration value diversity of ownership in and of itself.[5] For those subscribing to such theories, this paper's analysis (in Section 2.5) of whether FCC regulation led to increased ownership concentration will hold the most interest. But this paper will also test (in Section 2.6) whether media concentration leads to poor market-wide outcomes.

2.2.2 Economic Theories of Concentration's Effects

The most famous and influential theory about the benefits of media concentration comes from Peter Steiner's famous 1952 paper.[6] Comparing the U.S. model of mandating a market structure of monopolistic competition by limiting station ownership to the U.K. model of state-run monopoly, Steiner argued (somewhat counter-intuitively) that monopoly would provide more variety in programming.

A numerical example best illustrates Steiner's point. Suppose that a small town has only five radio stations, by decree of the FCC, which restricts radio licenses. And suppose that the five most popular programming formats are Country, Rock, Talk, Adult Contemporary, and Sports, which have 100, 60, 40, 25, and 10 listeners associated with

[4] *See*, *e.g.*, NEIL POSTMAN, AMUSING OURSELVES TO DEATH: PUBLIC DISCOURSE IN THE AGE OF SHOW BUSINESS (1985).

[5] Andrew Jay Schwartzman et al., *The Legal Case for Diversity in Broadcast Ownership*, *in* THE FUTURE OF MEDIA: RESISTANCE AND REFORM IN THE 21ST CENTURY 149-161 (Robert McChesney et al., eds. 2005).

[6] Peter O. Steiner, *Program Patterns and Preferences, and the Workability of Competition in Radio Broadcasting*, 66 Q.J. ECON. 194 (1952).

them, respectively. A monopolist who owns all five stations will offer all five formats. But consider instead a market with two competitors. Competitors would rather split the Country format two ways (garnering 50 listeners each) than offer the Talk format (garnering 40 listeners). Similarly, the competitiors would rather split the Rock listeners (30 listeners each) than offer Adult Contemporary (25 listeners). The competitors would only offer three formats on their five stations, with duplication in Country and Rock. Thus, Steiner argued, monopoly serves consumer welfare in broadcast industries better than competition does. See Appendix A for a more formal description of Steiner's model.

Another theory would relate to Hotelling's model of product differentiation or Downs's theory of the median voter.[7] The basic idea there is a race to the middle—two competitors considering a spectrum of programming choices both choose the "median" programming format, in some not-wholly-defined sense. A monopolist, on the other hand, would spread out its programming offerings across the spectrum. Other economic incentives, however, could come into play. A monopolist might prefer to shut down some outlets to save money. Or a monopolist might make its offerings more similar to deter new entrants from seizing the middle of the spectrum. This more complicated story, echoed in more detailed theoretical works,[8] suggests that incentives for radio firms to offer diverse programming point in opposite directions. This reinforces the need to measure what happens and test the theories.

[7] Steven T. Berry and Joel Waldfogel, *Do Mergers Increase Product Variety? Evidence from Radio Broadcasting*, 116 Q.J. ECON. 1009 (2001).

[8] *See*, *e.g.*, Simon P. Anderson & Stephen Coate, *Market Provision of Broadcasting: A Welfare Analysis*, 72 REV. ECON. STUD. 947 (2005).

2.2.3 The Need for a Policy Experiment

Both detractors and supporters of media concentration have generally lacked quantitative evidence that allows for sound causal inference. By that I mean that ownership concentration is an economic variable simultaneously determined along with other economic variables, such as programming choices. Econometricians refer to this problem as endogeneity bias or simply endogeneity. Without a way to isolate concentration and manipulate it independently, it is not possible to know whether increased concentration causes changes in programming or vice versa. One contribution of this paper is to provide a causal test of the competing theories of media concentration's harms and benefits.

Statistical considerations, or even quantitative considerations more generally, will not and should not dominate the policy debate over media concentration. As noted above, many of the critiques of media concentration, especially, find cause for alarm in media concentration in and of itself. Others, like Ronald Coase, find fault with the institution of media regulation itself.[9] But a test of whether increased concentration causes harms or benefits in terms of various market outcomes has value: first, to answer questions for those who do focus on outcomes; and, second, to refine our understanding of how media markets operate, allowing for more nuanced critiques of concentration or regulation. The next four sections lay the groundwork for and describe the results of the test I propose in an attempt to meet those objectives.

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[9] R.H. Coase, *The Federal Communications Commission*, 2 J.L. & ECON. 1 (1959) (questioning the FCC's scarcity rationale for limiting station licenses and suggesting a tie to censorship).

2.3 FCC Regulation of Radio Ownership Since 1992

Economic theories like Steiner's, along with a general trend toward relaxing regulation of industry, led to a legislative and administrative overhaul of radio regulation beginning in the 1980s. These changes eliminating many regulations, such as the Fairness Doctrine, and relaxed many others, such as the restrictions on media ownership.

This paper focuses on the Local Radio Ownership Rule, which sets a numerical limit on the number of commercial AM and FM stations one company can own in a "radio market." Before 1992, that limit was 2 stations in each market. In 1992, the FCC increased that limit to 3 stations (in markets with less than 15 stations) or 4 stations (in all other markets), with the additional restriction that no firm could own 50 percent of the stations in a market.[10] Later, Congress increased the limit even further. But before I reach that part of the story, I have to explain how the FCC defines a "radio market" for purposes of the local radio ownership limit.

2.3.1 The Signal Contour Market Definition

The FCC chose a new, technical, and complicated method of defining radio markets in 1992. To see this, one can start by considering a straightforward method. The Arbitron Company surveys radio listeners and provides the industry with quarterly or biannual ratings. To do so, Arbitron divides the country into "Arbitron markets," which roughly correspond to metropolitan areas. Arbitron assigns each station to one home market. Firms in the industry use the ratings within Arbitron markets to measure themselves and

[10]FCC, "Revision of Radio Rules and Policies," 57 Fed. Reg. 42,701 (Sept. 16, 1992).

to help sell their airtime to advertisers.

The FCC could have applied the local radio ownership limits to Arbitron markets. The rule would involve straightforward statements like the following: “These 23 stations make up the Wichita, Kansas ‘market’ for purposes of the local radio ownership rule. So, under the law, one company can own 4 out of those 23 stations.”

But the FCCs method of market definition was not so simple. Instead, the FCC considered each station to be a member of multiplesometimes hundreds ofdistinct markets, based on each stations broadcast coverage areas, or“signal contours.” A cluster of stations with mutually overlapping signal contours defined a “radio market” for purposes of the FCC’s application of the local radio ownership limits. For example, if stations A, B, C, and D had overlapping signal contours, but their area of intersection did not intersect any other stations’ signal contours, then the cluster A–B–C–D constituted a radio market. The FCC would then apply the numerical limits on ownership to those radio markets. I refer to markets defined in this way as “merger-scrutinized clusters” or “FCC-clusters” to differentiate them from Arbitron markets. (See Appendix B for a more formal explanation.)

Two-sentence explanations would not suffice under the signal-contour market definition. This method requires analyzing the 23 stations in Wichita, for example, based on the peculiar geometry of the 23 stations’ signal contours. One must determine which stations signal contours overlap with which other stations signal contours, and in what specific ways. (Think of a giant Venn diagram, with circles representing the radio stations broadcast areas for a given signal strength.)

The regulation applying to any given group of stations took the form of a series of constraints like the following:“in the merger-scrutinized cluster made up of stations A, B, C, and D, one company may own two stations”; “in the merger-scrutinized cluster made up of stations A, B, E, F, G, and H, one company may own three stations”; and so on. The stations in a given metropolitan area, rather than being subject to a single, easily understandable constraint on radio-station ownership, would instead be subject to potentially hundreds of constraints. Only an expert engineering firm, using geographic signal-contour maps for every relevant station in the area, could discern what the local ownership limits were in each city.

Radio firms can take advantage of the signal-contour market definition, where it results in a more permissive local ownership limit, by purchasing particular stations within a given city or metropolitan area. That is the main way radio firms can use the system strategically. Firms cannot change the wattage or antenna direction of their stations at will; the FCC controls that process as part of its station-licensing regime. During the period I study in this paper, fewer than 250 stations, or less than 2 percent of all stations, underwent a “major adjustment to a license” according to the FCC’s engineering database. So radio firms are left to use mergers and acquisitions to optimize their station holdings.

2.3.2 Details Allowing More Mergers

Two additional details of the signal-contour market definition are important. First, to define a signal contour, one must pick a particular signal-strength for which to draw the contour line on a map. Like contour maps of mountains showing rings of particular altitude, radio stations' signal-coverage areas have many signal contours. The FCC chose a particularly strong signal strength—70 decibel units, or dBUs—to apply the signal-contour market definition. The stronger the signal, the smaller the area contained within the contour, just as the highest altitude of a mountain is the smallest circle on a map.

Second, to apply the sliding scale of the local ownership limit (as of 1992, to apply a limit of 3 versus 4), one must know the "size" of the radio market—how many stations are in it (under the 1992 rules, to determine whether there are more or less than 15 stations in the market). A simple method for calculating size would be to make size equal to the number of stations making up the merger-scrutinized cluster. But the FCC counted size differently. Under the signal-contour market definition, the size of a merger-scrutinized cluster includes every station that intersects at any point with the stations in the cluster. But, despite the size calculation, the local ownership limit only applies to the stations that define the cluster (hence the term "merger-scrutinized cluster").

For example, suppose station A in cluster A–B–C–D intersects 12 other stations that were not members of that particular cluster. Suppose further that B, C, and D only intersect each other and station A. Then the "size" of cluster A–B–C–D would be 16, or 4 plus 12. In that example, under the 1992 local ownership rule, instead of an ownership limit of 1 station (less than 50 percent of 4 stations), cluster A–B–C–D would have an ownership limit of 4 stations, since the market has a "size" of 16 stations. Under the

FCC's method of calculating size, one company could own all 4 stations: A, B, C, and D.

While the signal-contour market definition is arcane and might make one's head ache, that is part of the point. The bottom line is that, in 1992, the FCC implemented its newly relaxed local radio ownership limits in a highly complex manner—with important consequences. Details like the 70-dBU contour and the odd manner of calculating a cluster's "size" translated the relaxed local ownership limits into what seems like an even more permissive regulation on radio companies. The results presented in Section 2.4 will bear out that impression.

2.3.3 The Telecommunications Act of 1996

The Telecommunications Act brought major changes to radio regulation and the structure of the radio industry. Most dramatically, it completely eliminated the National Radio Ownership Rule, which had previously limited radio firms to 40 stations nationwide, with small exceptions for ethnic-minority-owned firms. This opened up the possibility for truly national radio firms. At its peak in 2002, Clear Channel Communications (the largest radio firm) came to own 1240 stations—31 times the previous maximum allowed.

Congress also relaxed the local radio ownership limit in 1996, instituting the sliding scale described in Table 2.1. The total cap and the AM and FM sub-caps apply simultaneously—that is, no firm can exceed any part of the local ownership limit in a radio market.

Eliminating the national cap also affected local markets, since regional and national companies no longer faced restrictions on additional markets in which they could purchase stations. As a result, a wave of mergers and acquisitions, transactions large and small, followed the Telecommunications Act of 1996.[11]

Despite the elimination of the national limit and the relaxation of the local limit, it is something of a misnomer to call the recent changes in radio policy "deregulatory." The FCC continues to control entry into the radio industry. With the FCC allowing only 100 to 200 new full-power radio stations nationwide each year, incumbent radio firms benefit from the entry-restrictions that remain.

2.3.4 The Interaction Between Ownership Limits and Market Definition

Congress stepped into the arena of radio regulation with the Telecommunications Act of 1996, specifying new numerical limits for station ownership in a local radio market. But Congress did not define the term "radio market," leaving the FCC to determine the actual substance of the government's restrictions on ownership concentration in the radio industry. The FCC used its signal-contour market definition to apply the changes to the local radio ownership limit contained in the Telecommunications Act of 1996.

But the signal-contour market definition is highly complex and, in practice, unpredictable. The signal-contour method treated seemingly similar cities, with similar numbers of radio stations, in very different ways, giving one city a relatively stringent limit and another city a relatively lax one. Moreover, the signal-contour method, when the local ownership limits increased, affected different cities differently. In other words,

[11] *See generally* PETER DICOLA, FALSE PREMISES, FALSE PROMISES: A QUANTITATIVE HISTORY OF OWNERSHIP CONSOLIDATION IN THE RADIO INDUSTRY (2006) *at* http://www.futureofmusic.org/research/radiostudy06.cfm.

the signal-contour market definition interacted with the increased local ownership limits to make it unpredictable how and where the effective limits on radio ownership would increase and by how much relative to other cities. In 1995, on the eve of the Telecommunications Act, radio policy already differed from city to city for reasons related to the geometry of radio stations' signal-coverage area. But in 1996, with the passage of the Telecommunications Act, radio policy changed in even more complex and unpredictable ways.

2.3.5 Closing the Loophole, with Grandfathering

After a few years with the signal-contour market definition and the relaxed local ownership limits of the Telecommunications Act, the FCC began to see administrative cases like *In re Applications of Pine Bluff Radio*.[12] In that case, Seark Radio was about to acquire 3 new stations such that it would own or control 6 out of the 11 stations in or near Pine Bluff, Arkansas. Bayou Broadcasting challenged the proposed transaction, on the ground that no firm could own more than half the stations in a market. Yet, under the signal-contour market definition, Pine Bluff was actually split into 6 markets—and in a way that allowed Seark to own 6 stations legally. (Figures 2.1 through 2.4 provide signal-contour maps of the relevant radio stations and the 3 FCC-markets of Pine Bluff.)

Pine Bluff and other instances of seemingly odd results under the signal-contour market definition led the FCC to begin considering a move to the Arbitron market definition.[13] In September 2004, the FCC finally made the switch to using Arbitron markets.

[12] 14 FCC Rcd. 6594 (1999).

[13] *See* FCC, "Notice of Proposed Rulemaking: Broadcast Services; Radio Stations, Television Stations," 65 Fed. Reg. 82,305 ¶¶2–4 (Dec. 28, 2000).

But in doing so the FCC grandfathered the station holdings of radio firms that had taken advantage of the signal-contour market definition to exceed the current limits, applied using Arbitron's market definition.[14]

2.4 Calculating the FCC's Limits on Local Radio Ownership

This section applies the local ownership limits using the signal-contour market definition, translating those regulations into understandable numerical limits on radio-station ownership.

2.4.1 A Puzzle

Immediately after the Telecommunications Act of 1996, the signal-contour market definition had not made its presence felt. But by 2002, radio companies appeared to exceed the local ownership rule—if one (mistakenly)thought that "radio market" meant "Arbitron market." For instance, in the Los Angeles Arbitron market, Clear Channel briefly owned 18 stations, far more than the apparent limit of 8 stations (for a market with 45 or more stations). In the Raleigh-Durham market, a company called Curtis Media owned 10 stations, when the apparent limit was 7. But these firms' station holdings were not in violation of FCC regulation. Rather, the market definition was more complicated.

Previous studies applied the local radio ownership limits using Arbitron markets rather than the FCC-clusters of the signal-contour market definition. One prominent study acknowledges the FCC's use of the signal-contour method, but applies the Arbi-

[14] *See* James R.W. Bayes et al., "Third Circuit Court of Appeals Revisits Earlier Decision on Media Ownership Rules," MASS MEDIA UPDATE, October 2004, *at* http://www.wileyrein.com/publications.cfm?sp̄articles&id4̄48.

tron method, suggesting that the Arbitron method will tend to "overstate" the number of stations in each market.[15] The authors called their method of using Arbitron markets as proxies for FCC-clusters the "policy band" approach, since all major markets fell into one of four "policy bands"—those with local ownership limits of 8, 7, 6, or 5 stations, depending on the number of stations in the Arbitron market.

Unfortunately, one cannot easily make a comparison between Arbitron markets and FCC-clusters, because of the fundamental differences in the two methods of market definition. While the Arbitron method places each station into one and only one market, the signal-contour method places each station in potentially hundreds of merger-scrutinized clusters. As this section will show, sometimes the "policy band" method is close to the signal-contour method, and sometimes it is not. Whether the signal-contour market definition results in more or less permissive regulation depends on the specific geometry of stations' signal-coverage areas and on the specific parameters chosen by the FCC (e.g., the 70-dBU contour).

2.4.2 Data and Methodology

To implement the signal-contour market definition, I used geographic information systems (GIS) data purchased from Radio-locator.com. There are approximately 10,000 commercial radio stations in the U.S. (See Figure 2.5.) The signal-coverage areas of U.S. radio stations form a nearly seamless web across the entire U.S. (See Figure 2.6) Calculating the pattern of intersections among 10,000 irregular polygons is not possible computationally using ArcGIS spatial-analysis software (it bumps up against memory

[15] Berry & Waldfogel, *supra*, at 1016 & n.19.

limits). As a result, it is necessary to break the country's radio stations into groups.

It is convenient to start with a group of commercial stations that make up an Arbitron market. This can lead to some confusion—applying the signal-contour method to the *group of stations* that Arbitron defines as a "market"—but it is a necessary approach because most industry statistics like ratings and listenership are compiled using Arbitron markets. First, I would calculate all the FCC-clusters of which those stations are members. Then, by applying the rules of the signal-contour market definition, I can determine how many stations that group one company can own under the signal-contour market definition.

Consider the Arbitron market for Ann Arbor, Michigan, which contains 7 radio stations. (See Figure 2.7.) First, I determine the set of stations that intersect those stations. The particular pattern of the intersections among those stations will determine how many FCC-clusters involve the 7 Ann Arbor stations—in this case, 44 clusters. (See Table 2.2)

Next, for each cluster, I calculate how many other stations intersect at least one station within the cluster. This determines the "size" of the cluster. Once each cluster has been sized, I take the size of the cluster, compare it to the sliding scale of the local ownership rule, and apply the appropriate limits. Since the rule has three parts—the total limit, the FM limit, and the AM limit—each cluster gives rise to three distinct constraints that restrict the number of stations each radio firm can own.

Figures 2.8, 2.9, and 2.10 display a particular cluster, number 26, which includes 2 Ann Arbor stations, WDEO-AM and WTKA-AM. Eight other stations make up the cluster. But the size of the cluster is 196, because the 10 stations in Ann Arbor cluster

26 intersect themselves as well as 186 other stations not in the cluster. Using the scale of the local radio ownership rule (as of 1996), this means that one firm can own a total of 8 out the 10 stations in the cluster, and up to 5 AM or 5 FM stations. Even though cluster 26 is relatively small, it is treated as being a very large "radio market." Here one can observe the consequences of all the details of the FCC's signal-contour market definition.

Finally, once all the constraints for all the clusters have been calculated (in the case of Ann Arbor, 132 constraints, or 3 times 44), I set up a constrained maximization problem. I assume a hypothetical radio company that wishes to maximize the number of stations it owns among a group of stations (in particular, a group of stations that make up an Arbitron market, so that I can translate back to market statistics). The maximum number of stations one firm can own, subject to all the constraints, is what I call the "effective local ownership limit."

2.4.3 Results

For the stations in the 100 largest Arbitron markets (as well as Ann Arbor, to continue with the illustration), Table 2.3 reports the number of FCC-clusters that involve those stations. For the biggest markets, the numbers become quite large as the density of radio towers increases and the geometry of the signal-coverage areas becomes more complex.

The specific numbers for each Arbitron market are interesting in themselves, since the complexity of the signal-contour geometry is not obvious. But, more importantly, Table 2.3 conveys two key messages. First, the signal-contour market definition is much more complex than simply drawing a boundary around a metropolitan area. Second, the signal-contour market definition varies a great deal in complexity from city to city.

Table 2.4 reports the effective local ownership limits in 1995 (just before the Telecommunications Act) and 1996. It also provides the "policy band" limits for comparison. For instance, in Chicago, the policy band limit—which, again, was not the law—increased from 4 to 8 stations from 1995 to 1996 because of the Telecommunications Act. But, using the signal-contour method, the effective local ownership limit actually increased from 32 to 49 stations.

Chicago is an extreme example of how the Arbitron and signal-contour market definitions diverge, since the Chicago metropolitan area has the largest number of licensed commercial stations. But Table 2.4 shows that it is not unique in the following sense. Among the stations making up almost every Arbitron market, the *regulatory* market definition, based on signal contours, results in a higher local ownership limit than the Arbitron market definition would have.

On average, across all 289 Arbitron markets for which I calculated the results of the signal-contour market definition, the effective local ownership limit increased from 8.49 to 12.9 stations. (Figure 2.11 displays this increase graphically.) The policy band approach would put that increase at 3.57 to 5.65 stations, understating the local ownership limits by almost 60 percent.

2.4.4 Testing Possible Adjustments

Table 2.5 tests an assumption made in calculating the effective limits. I assumed a hypothetical radio firm that wished to maximize the number stations it owned among the stations in a given Arbitron market. But what if radio firms actually sought to maximize the wattage of the stations they owned, or the population reached by the stations they owned? Table 2.5 displays the results of adjusting the hypothetical radio firm's objective in this way, and compares it to the original, station-maximizing assumption.

The results are often similar but sometimes result in a much lower effective limit. But I maintain the original assumption throughout the rest of the paper's analysis because the effective limits calculated with an assumption of station-maximization are more correlated with radio firms' actual holdings: a correlation of 0.593, compared to 0.553 for wattage-maximization and 0.489 for population-maximization. One explanation for this might be that radio conglomerates, sought to maximize their station holdings.

Table 2.6, on the other hand, reflects a different kind of thought experiment. As described in subsection 2.3.2, the FCC made two important choices when designing the signal-contour market definition: (1) it chose the particular contour of 70 dBUs and (2) it chose to define an FCC-cluster's "size" as the total number of stations intersected by the cluster (including itself), rather than simply the number of stations in the cluster. Table 2.6 shows what the effective local ownership limits *would have been* had the FCC chosen a different contour, a different "size"-counting method, or both.

The results show that the FCC chose a particular permissive *version* of the signal-contour method. For example, using a 60-dBU contour and a simpler "size"-counting method would have given Atlanta an effective local ownership limit of 36 stations rather than 46 stations (comparing the fourth column to the first).

But the point of Table 2.6 goes beyond the continuing story of how the FCC chose to allow even more concentration of radio ownership through its market-definition method. It also shows that the signal-contour method is not predictable, because it depends on the complex geometry of a set of radio stations' signal-coverage areas. This unpredictability provides some of the rationale for using the local radio ownership limit, as implemented with the signal-contour market definition, as a natural experiment.

2.5 Firms' Response to Regulation

As the examples mentioned above suggest, radio firms took advantage—at least to some extent—of the signal-contour market definition. By 2004, at least one radio firm's holdings exceeded those that would have applied (hypothetically) under an Arbitron market definition in 104 different Arbitron markets. This Section discusses how radio firms behaved in response to the change in the local radio ownership limit, as applied with the signal-contour market definition, contained in the Telecommunications Act of 1996.

2.5.1 Comparing Radio Firms' Station Holdings to the Regulatory Limit

Figure 2.12 displays the difference—for each of the 289 Arbitron markets studied—between the effective local ownership limit and the number of stations owned by the firm with the most stations. What the graph shows is that, in 1995, only a handful of radio firms met or exceed the local ownership limit.[16] By 2000, after the 1996 increase in the local ownership limit, even fewer radio firms met the limit (only two) and no firms exceeded the limit.

This surprising result demonstrates that radio firms took some, but not full, advantage of the signal-contour market definition and the FCC's permissive implementation of radio-ownership limits. Subsection 2.7.1 below discusses the implications of this result in more detail.

2.5.2 A Natural Experiment

The signal-contour market definition had a different application in each metropolitan area in the U.S., because it depended on the idiosyncratic geometry of each metropolitan areas radio stations and how their signal coverage areas happened to overlap with each other. Because part of the increase in concentration was caused by the oddities of a regulation that were unrelated to market forces, this facilitates a rigorous causal test of the effects of increased concentration of media ownership. Such a test is highly desirable for policy purposes, given the difficulty of sorting out the effects of regulatory policies from the effects of businesses and consumers actions, let alone random events.[17]

The first step in such a test—the first-stage regression, in econometric terms—is to estimate a regression of increased ownership concentration on the effective local radio ownership rule. Table 2.7 shows a cross-tabulation of that relationship, also controlling

[16] Some firms may have purchased stations in excess of the limit in anticipation of the Telecommunications Act, and either received a waiver from the FCC or were not detected in time for it to matter.

[17] See *supra* subsection 2.2.3 for a discussion of why a simple regression of market outcomes like programming variety on ownership concentration is likely to be invalid.

for the FCC's granting of additional full-power, commercial licenses in certain Arbitron markets. Table 2.7 suggests that the change in the effective local radio ownership limit from 1995 to 1996 had a positive effect on ownership concentration, as measured by the holdings of the largest radio firm with respect to each Arbitron market.

To measure the change in the effective ownership limit, I use the change from 1995 to 1996—the "overnight" effect of the Telecommunications Act interacting with the signal-contour market definition—to leave out any effects of market forces. But I measure the changes in other variables from Fall 1995 to Fall 2000, starting before the change in the local ownership limits and giving the change time to play out in the form of mergers and new business strategies.

Table 2.8 reports summary statistics. Table 2.9 displays the results of the first-stage regression, first in levels and then in changes. I find a strong relationship between the effective ownership limits and concentration. In the simplest specification, in the fourth column of Table 2.9, I find that an increase of 1 station in the effective limit results in the largest firm in the market owning approximately 0.3 more stations, with a 95% confidence interval of approximately 0.22 to 0.38. The effect is statistically significant at the 1% level. The regression also shows, unsurprisingly, that an increase in the number of licensed stations is correlated with a greater number of stations owned by the largest firm.

That the estimated response of firms to a more permissive regulation is not one-for-one accords with the analysis of Figure 2.12. Firms took advantage of the loophole, and tended to take more advantage where the loophole was bigger. But, perhaps for the reasons hypothesized in the previous subsection, radio firms did not exploit the signal-contour market definition to its absolute fullest, at least not within 5 years of the Telecommunications Act.

I report the specification in the fifth column, adding two other control variables, because I hypothesized that an increase in noncommercial stations or an increase in per capita income might affect some of the outcome variables discussed in the next section. Neither variable is statistically significant, causing the first stage to lose some strength, but the results of the next section were not much affected by the choice between the simpler specification and the specification adding those two variables. The sixth column adds demographic variables (in levels, since the changes over five years would be tiny), but they had little explanatory power and I left them out of the analysis of the next section.

2.6 Effects of Increased Concentration

This section represents the culmination of this paper's descriptions of the idiosyncracies of the signal-contour market definition, which I argue resulted in a natural experiment in increased consolidation. I try to exploit the strong results of the first-stage regression to estimate the effects of concentration on: format variety, amount of news programming, advertising revenue, commercial versus noncommercial ratings, and listenership.

2.6.1 Format Variety

The first column of Table 2.10 reports the two-stage least squares estimates for the effect of increased concentration on the variety of programming formats available in each market (using the effective local ownership limit that I calculated as an instrument). I find support for Peter Steiner's theory that increased concentration can lead to greater programming variety, estimating an increase of 0.8 programming formats available in a market for every 1-station increase in the holdings of the largest firm within the market.

This suggests that concentration provides a benefit for consumers, but the finding comes with a caveat. An increase in the number of format *names* has occurred over the time period in question. For example, to "Lite Adult Contemporary" and "Soft Adult Contemporary," the industry has added "Bright Adult Contemporary." It seems doubtful that "Bright" provides a truly different set of songs or other programming than "Lite" or "Soft." But it is possible that radio firms are providing new combinations and nuances that radio listeners desire. If the firms with the greatest number of stations were more likely to coin new format names, that would cast doubt on whether increased concentration truly increases variety.

Ideally, one could find additional measures of programming variety. Programming formats do not provide a fine-grained or ideal measure of programming variety. Unfortunately, historical data on playlists or network programming are not available, to my knowledge, dating back to 1995 (that is, before the Telecommunications Act). Without that kind of historical reach, data are not useful to take advantage of the natural experiment studied in this paper. Until further research can be done, the evidence supports

Steiner's theory.

2.6.2 News Programming

I also measured the amount of stations (or fractions of stations, reflecting stations that split their broadcast day among different formats) offering news, information, or business and financial news. As I report in the second column of Table 2.10, I found no effect, positive or negative, of concentration on the amount of news programming offered, at least over the period from 1995 to 2000. Concentration within local markets does not appear to cause a decrease in news programming. In other words, the large radio station groups generally continued to offer news as one among a portfolio of formats as of 2000.

This measure does not speak to the quality of news programming. Radio news is notorious for "rip and read" news broadcasts that piggyback on newspaper headlines.[18] And the situation may have changed in the last seven years, as National Public Radio gains prominence and as radio news adopted an arguably diminished role in providing news and public affairs information. But my estimates show that concentration did not, in the short term, cause a decrease in the amount of news programming.

2.6.3 Advertising Revenue

With restrictions on entry and increasing concentration, one would predict that radio firms could exert some market power and charge higher advertising prices, offer more

[18] In a separate chapter of my dissertation, I document the decreases in employment of news reporters correlated with increased concentration.

advertising time, or both—all leading to an increase in advertising revenue. Moreover, Steiner's theory suggests that larger station groups can garner more listeners with their wider array of programming, and thus one would expect them to gain more advertising revenue. The third column of Table 2.10 finds just such a result, suggesting that a one-station increase in the largest firm's station holdings results in an additional $34 million in advertising revenue market-wide. The market-wide measure includes any effect on firms with increased holdings that are not the largest within the market, to allow the local ownership limit to be assessed at the level of Arbitron markets rather than individual firms.

2.6.4 Commercial versus Noncommercial Ratings

Local commercial ratings share measures the percentage of radio listeners who are listening to radio stations based in that market, as opposed to (1) radio stations in neighboring markets and (2) noncommercial stations. I estimate that a one-station increase in the largest firm's holdings causes a decrease of 1.2 ratings points in local commercial share. To the extent that this does not reflect a trend toward listening to commercial stations in neighboring markets, this might reflect a greater shift toward noncommercial radio in Arbitron markets with more consolidated commercial sectors. But this result is not particularly robust to alternative specifications of the time period; the Arbitron ratings data seem stable from 1996 onward, but the pre-1996 data appear less reliable.

2.6.5 Listenership

I measure listenership as the average percentage of the population listening to radio at a given time. As the summary statistics in Table 2.8 show, radio listenership was in decline, even from 1995 to 2000 (it has declined even more since, although 95 percent of the population still listens to radio at some point during the week, according to Arbitron). I estimate that concentration has zero effect on listenership, with a confidence interval of 0.2 percentage points in either direction.

This results suggests that the increase in programming variety caused by the FCC allowing larger station groups to exist has not helped radio retain listeners. Perhaps the remaining radio listeners' preferences are more fully satisfied, but, contrary to Steiner's theory, wider variety has not garnered more listeners. Taken together with the other results, this suggests that the increase in advertising revenue caused by increased concentration is either the result of either more intensely satisfied listeners or increased market power in the local market for radio advertising, but it does not appear to be the result of radio having more listeners.

2.7 Legal Implications

The story of radio in the 1990s provides important knowledge about media regulation. But the unique characteristics of this regulatory episode also allow for analysis that sheds light on more general questions of law and economics, antitrust, and administrative law.

2.7.1 Law and Economics

Law and economics has a general concern with how firms and individuals respond to legal rules. It is surprising to find that the effective local ownership limit only appears to bind in 2 out of the 289 major metropolitan areas. Radio firms took some, but not full, advantage of the FCC's permissive implementation of the local radio ownership rule. One economic theory would have suggested that, in a market without free entry (that is, where regulation protects incumbent firms), each station owned provides profits—making ownership of the maximum number of stations possible very desirable. This would be especially so if economies of scale existed.

What can explain such a result? Radio firms may have encountered non-regulatory constraints, such as competition for stations among regional or national consolidators or credit constraints after radio firms engaged in an unprecedented series of mergers. Another possibility is that radio firms were able to exploit economies of scale up to a point, but experienced diminishing returns or even experienced diseconomies of scale. A final conjecture is that radio firms might have wanted to avoid public or regulatory awareness of the signal-contour market definition's highly permissive effects. By taking some advantage of what amount to a loophole in the limits specified by the Telecommunications Act, but not taking too much advantage, the radio firms may have delayed the eventual outcome: the FCC closing the loophole, as it did in 2004.

Further research into the administrative process that created this whole episode in radio policy may lend support to one or more of these hypotheses. At this point, however, it is important to note the general point that, while firms do respond to regulations, the magnitude or elasticity of their response remains an empirical question for law-and-economics. The holdings of the largest radio firm increased by only 0.3 stations in response to a one-station increase in the effective ownership limit; this presents a new set of questions about how radio regulation and market forces interact in the radio industry, and more generally about how firms respond to regulation.

2.7.2 Quasi-Antitrust Law for Media

In appellate cases challenging its media-ownership decisions, the FCC has consistently failed to justify its specific decisions.[19] Why is the local radio ownership limit for stations with 45 stations or more eight stations—why not seven or nine? The estimates of this paper could be used to calibrate a better-justified local radio ownership rule. Suppose that the FCC could come up with rough weights on the importance of lower advertising prices, the number of listeners, the number of programming formats offered in each market, and so on. Table 2.10 provides estimates of how changes in the station holdings of radio firms will affect those variables. From there, given rough weights on its various objectives, the FCC could at least begin to provide the courts for a rationale.

2.7.3 Administrative Process

Radios experience with the FCCs method of market definition, interacting with Congresss actions to relax the restrictions on local radio ownership in the Telecom Act, provide a case study to examine where the administrative process worked well and where

[19] *See*, *e.g.*, Prometheus Radio Project v FCC, 373 F.3d 372 (3d Cir. 2005); Fox Television Stations v. FCC, 280 F.3d 1027 (D.C. Cir. 2002).

it failed. The signal-contour market definition provides a case study to test four leading theories of the administrative process.[20]

On the score of transparency, the FCCs signal-contour market definition fails badly. It prevented most policy makers, let alone the general public, from understanding the limits in place on radio ownership. On the other hand, the FCC eventually took action to change its method of market definition, which had benefited industry but had still escaped the notice of the general public, given its arcane nature. In 2004, the FCC switched to a much less permissive, and much easier to understand, method of specifying how many stations one company can own within a metropolitan area. (Admittedly, it did so while grandfathering the effects of the signal-contour market definition.) This presents a puzzle about the administrative process. If media firms have captured the FCC, then why did the FCC reverse course on the market-definition issue? If the rule-making process was so broken, how did it repair itself? Future work will explore these question in more detail.

2.8 Conclusion

After the Telecommunications Act of 1996, neither the public nor policymakers had the basic facts about radio regulation. This paper attempts to provide those facts, and uncovers some surprising results about FCC radio policy and how radio firms responded to regulation. The FCC crafted a highly permissive market definition, allowing an even greater increase in concentration than Congress allowed in the Telecommunications Act

[20] *See* Steven P. Croley, *Theories of Regulation: Incorporating the Administrative Process*, 98 COLUM. L. REV. 1 (1998).

of 1996. Radio firms took some advantage of this loophole, but stopped short of taking full advantage. Using the episode as a natural experiment in increased concentration, I find strong evidence that increased concentration leads to increased programming variety and advertising revenue. But concentration does not appear to increase listenership, perhaps a more important measure of consumer welfare.

The story of the FCC's signal-contour market definition rebuts some parts of the critique of media concentration, particularly the hypothesis of increasingly homogenous programming within markets. Meanwhile, some aspects of Steiner's theory (though not increased listenership) found confirmation. But the paper's most surprising finding might be that radio regulation did not bind radio firms. That finding cuts both ways for the competing theories of media regulation. For the critics of media regulation, it rebuts their contention that the local radio ownership rule shackled radio companies and prevented them from exploiting economies of scale. But for the proponents of media regulation, the results suggest that—at least during the period studied from 1995 to 2000—enough competition may have existed among radio firms to prevent them from taking full advantage of the market-definition loophole and monopolizing local markets.

Having the facts about the local radio ownership rule suggests that many tacit assumptions in the debate over radio consolidation (including some of my own prior contributions) have been mistaken. The market-definition loophole has now been closed, although grandfathered. But the story of radio regulation since the 1990s is of more than historical interest, and not just because radio remains viable, so far, in the face of new technologies. The administrative process at the FCC displayed weaknesses in spawning an opaque and surprisingly permissive regulation made more permissive with every parameter chosen. But it has also displayed some strength, perhaps, by involving the public more in recent years and in closing the market-definition loophole. In future work, I plan to use radio regulation as a case study in the administrative process. Ideally, that work will have general implications about administrative law and will also contribute toward further improvements at the FCC, which has many more issues to face in the coming years.

Appendix 2.A: The Steiner Model of Radio Firms' Programming Choices Under Monopoly and Competition

Assume fixed preferences L_i for each programming format P_i. Assume further that the cost of offering any programming format is fixed at c.[21] The programming formats are ranked according to their associated listener base:

$$L_1, L_2, L_3, \ldots L_j, L_k \ldots$$

where L_j is the least popular format that *is* offered while L_k is the most popular format that is *not* offered. Then consumer welfare is given by:

$$\sum_{i=1}^{j} L_i$$

In words, consumers are better off when more programming formats are offered, since more of them have their programming preferences satisfied.

The FCC sets the number of stations n that are available in the market, where n is less than the number of possible programming formats I. Let x_i be the number of stations already choosing to offer format P_i when a radio firm chooses its format. Assume that stations offering the same programming format split the listeners equally. The game proceeds as follows. Stations enter the market in some sequence, choosing their format P_i to maximize:

$$\frac{L_i}{x_i + 1}$$

Under competition, in which each station is owned and controlled by a different firm, duplication occurs in equilibrium whenever $\frac{L_i}{2} > L_k$ for some $i \leq j$. Under monopoly,

[21]This means that the potential cost savings of offering homogenous programming across stations are essentially assumed away in Steiner's model to make a point about the demand side of the market.

on the other hand, duplication never occurs. Therefore, monopoly is weakly preferred to competition for all possible values of the L_i and n and is strongly preferred for many possible values of the L_i and n.

Appendix 2.B: Formal Specification of Signal-Contour Market Definition

Local radio markets as defined by the FCC—"merger-scrutinized clusters"—are based on the signal coverage areas of radio stations. These coverage areas must be defined for a particular "signal contour," i.e. one can only define a coverage area for a particular signal strength. So the FCC's method of market definition is often known as the signal-contour approach. It proceeds in six steps:

1. We start by defining the set of radio stations with coverage areas $\{S_1 \dots S_n\}$ to which the signal-contour market definition will apply. The FCC chose to apply their market definition across the entire U.S., without recognizing sub-boundaries such as states or metropolitan statistical areas (MSAs).[22]

2. We determine the full set of intersections over all stations' coverage areas such that

$$S_1 \cap S_2 \cap \cdots \cap S_i \neq \emptyset \quad \text{and} \quad S_1 \cap S_2 \cap \cdots \cap S_i \cap S_j = \emptyset \quad \forall S_j$$

   In a sense, we want the maximal intersections of coverage areas. For each intersection in this set, we call the stations making up the intersection the "merger-scrutinized cluster." Note that each station S_i can be part of multiple maximal intersections and thus part of multiple cluster.

3. We determine, for each merger-scrutinized cluster, the set of all stations that intersect one of the stations that define the cluster. We can this the "sizing set."

[22]This step may seem obvious, but we will want to vary this step to actually calculate the effect of the FCC market definition.

4. The cardinality of the sizing set determines the “size” of each market for purposes of applying the sliding scale of the local radio ownership limit.

5. We apply the local ownership cap to each defining set, based on the cardinality of its sizing set and the applicable local ownership limit.

6. The cap is applied *only* to the stations in the merger-scrutinized cluster (hence the name). It is *not* applied to the sizing set.

This method of market definition presents problems because in some ways, overlapping with more stations makes the limits stricter, but in other ways, overlapping with more stations (in a particular way) makes the limits looser.

Figure 2.1: Pine Bluff Area Radio Stations

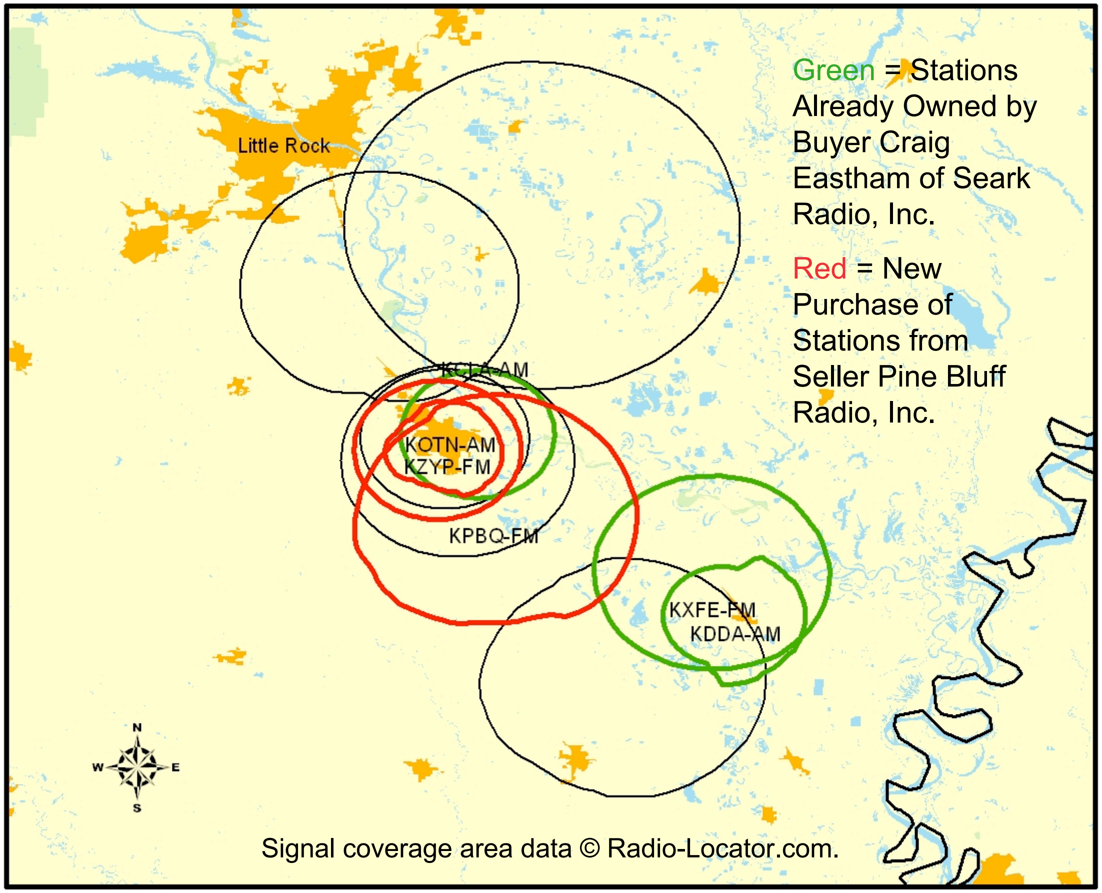

Figure 2.2: One Pine Bluff FCC-Market

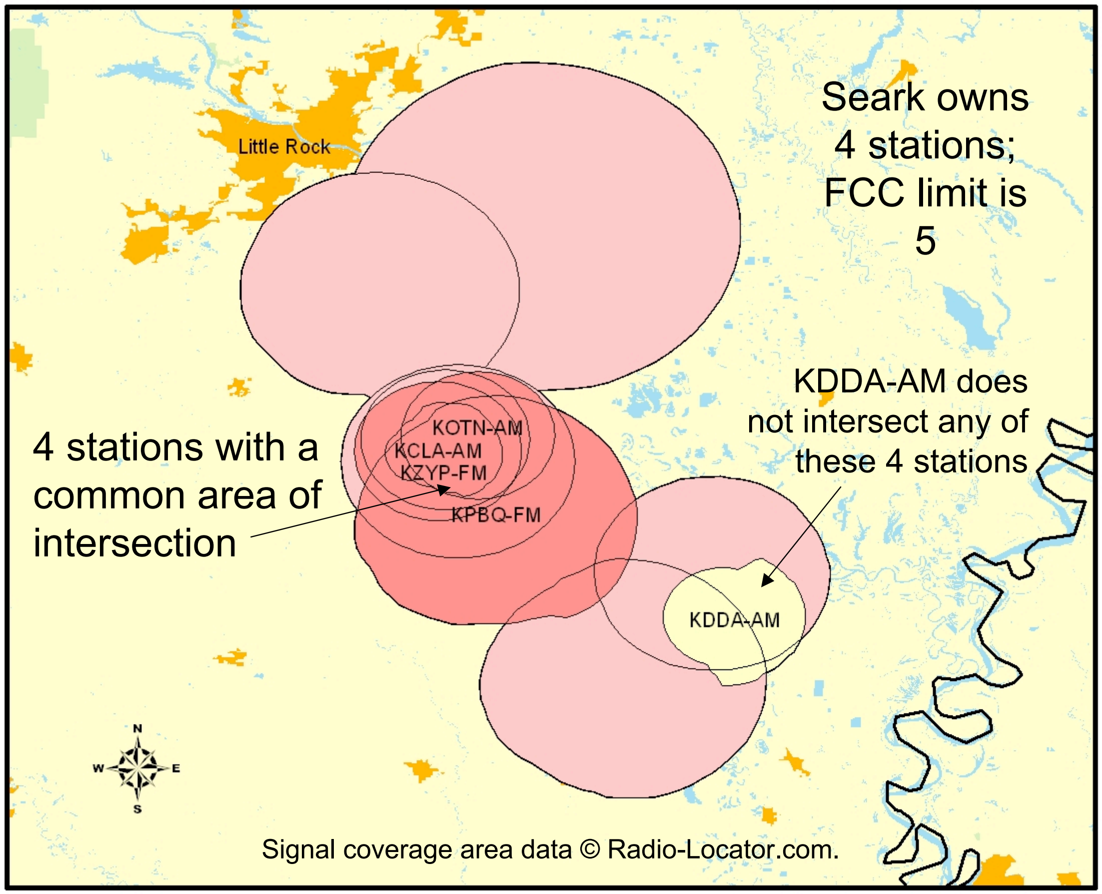

Figure 2.3: A Second Pine Bluff FCC-Market

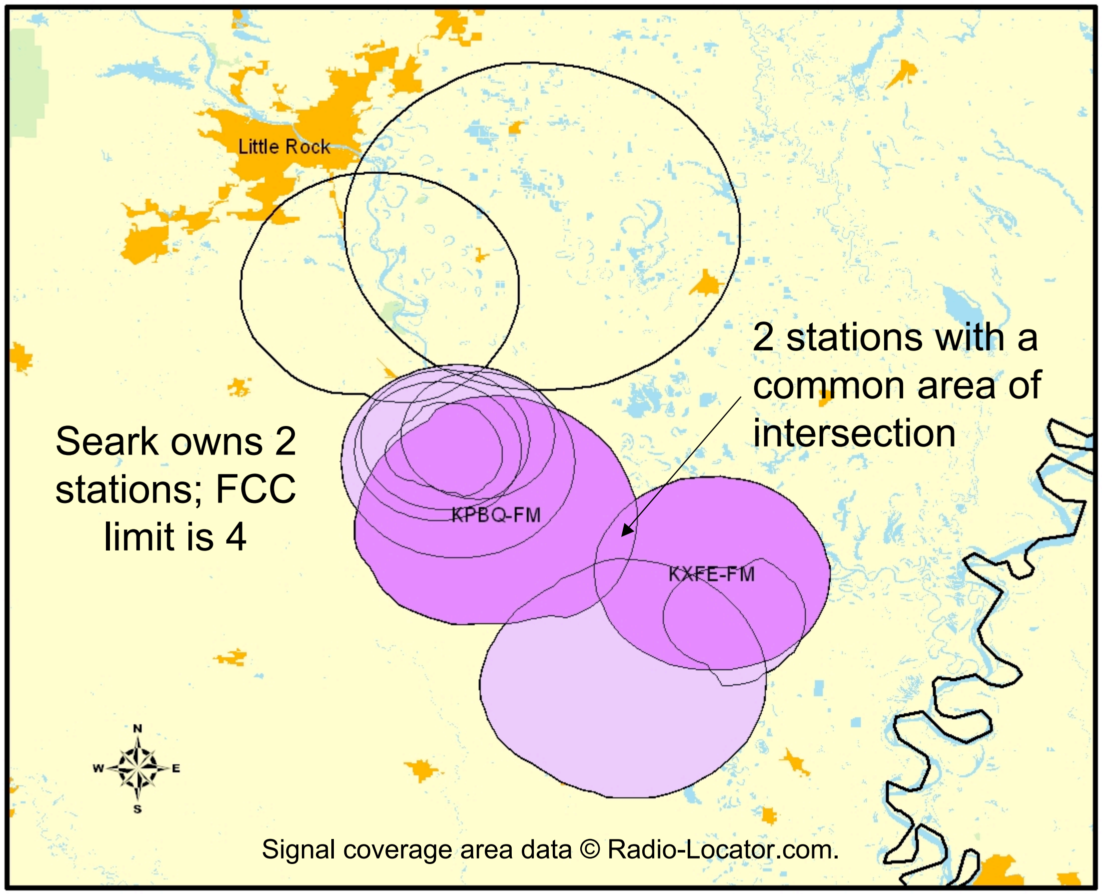

Figure 2.4: The Third Pine Bluff FCC-Market

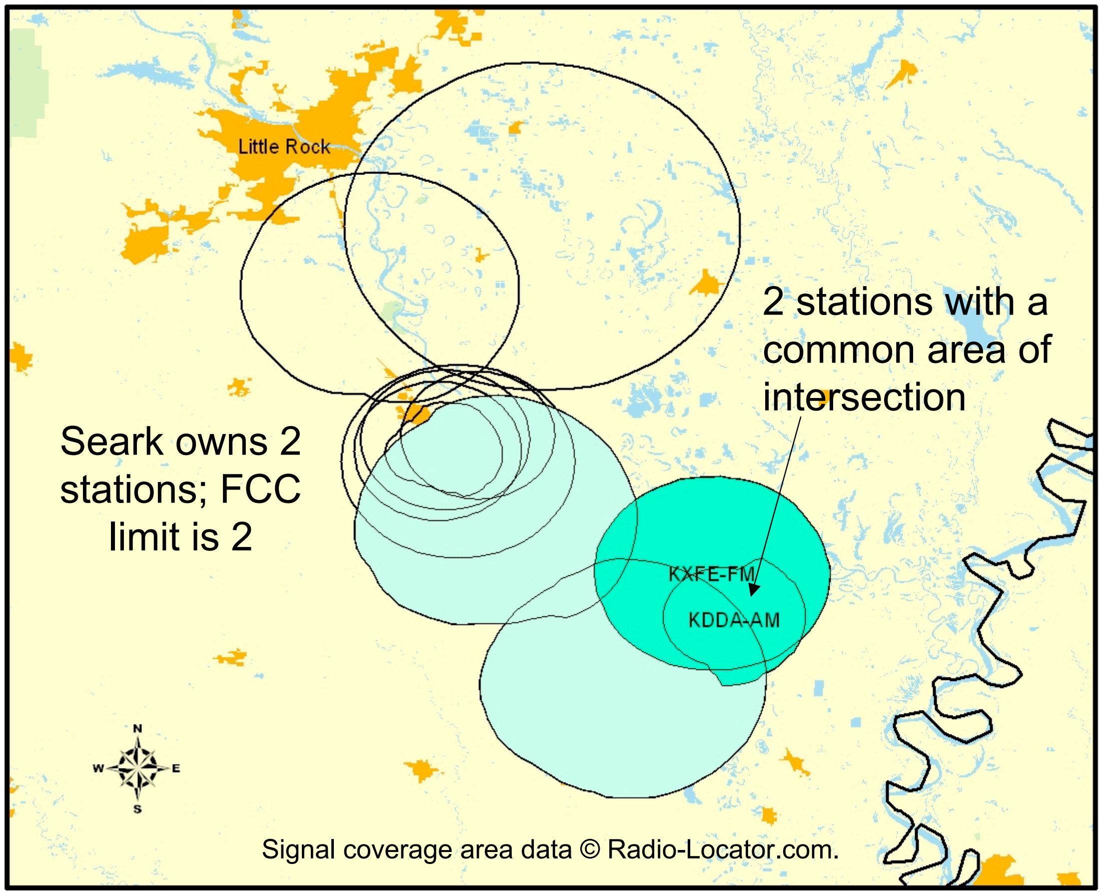

Figure 2.5: Locations of U.S. Full-Power Radio Towers

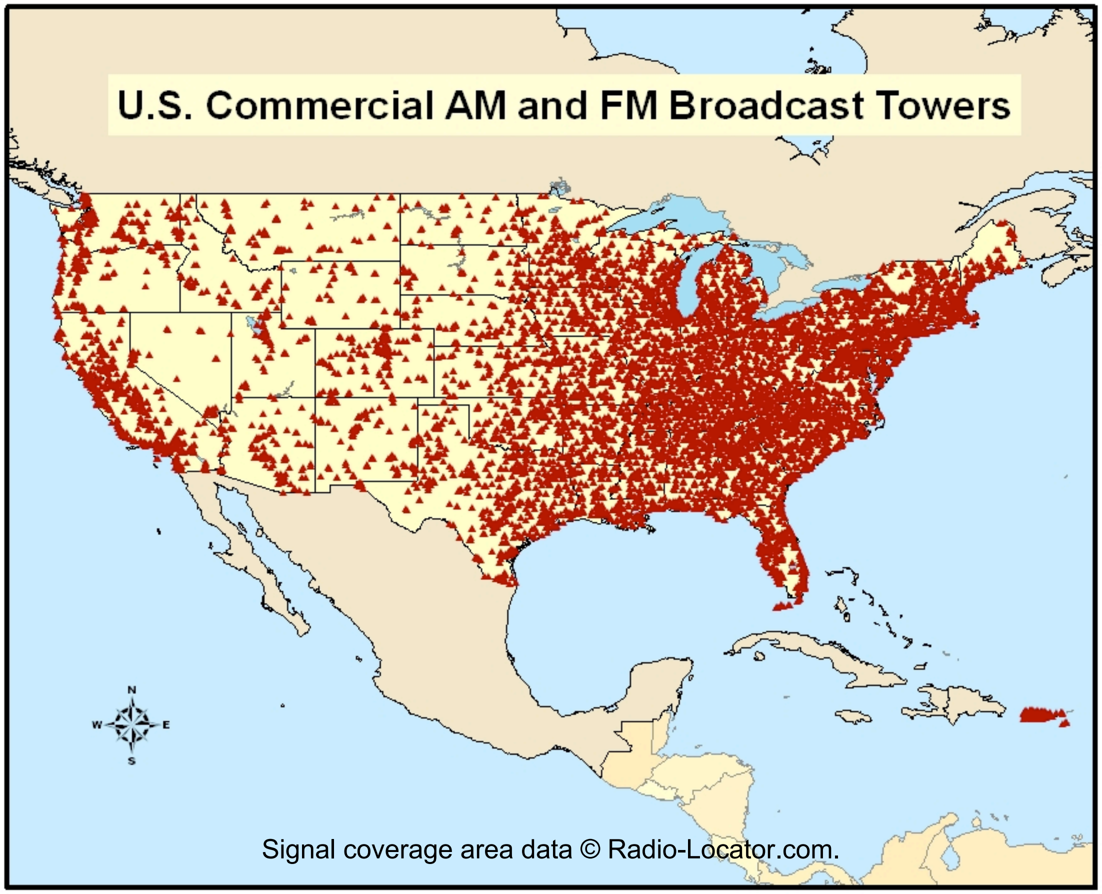

Figure 2.6: Signal Coverage Areas of U.S. Full-Power Radio Stations

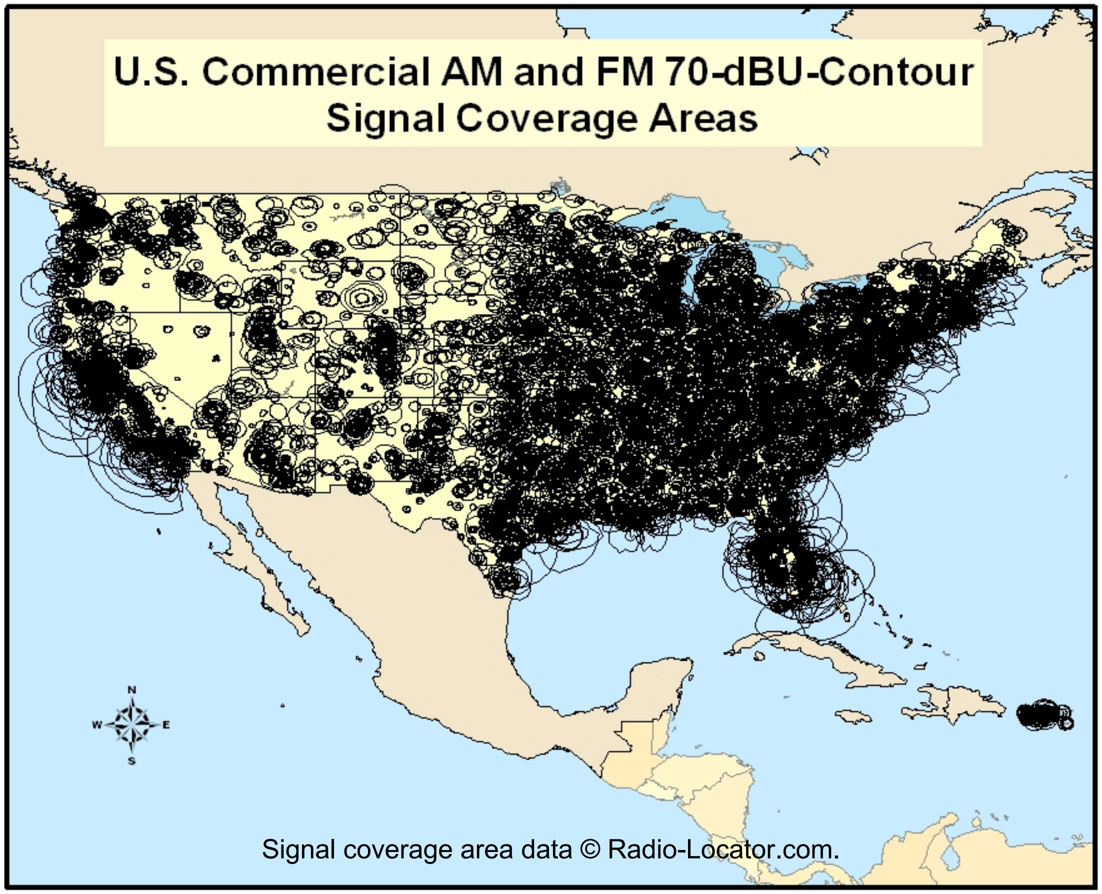

Figure 2.7: Signal Coverage Areas of Ann Arbor Stations

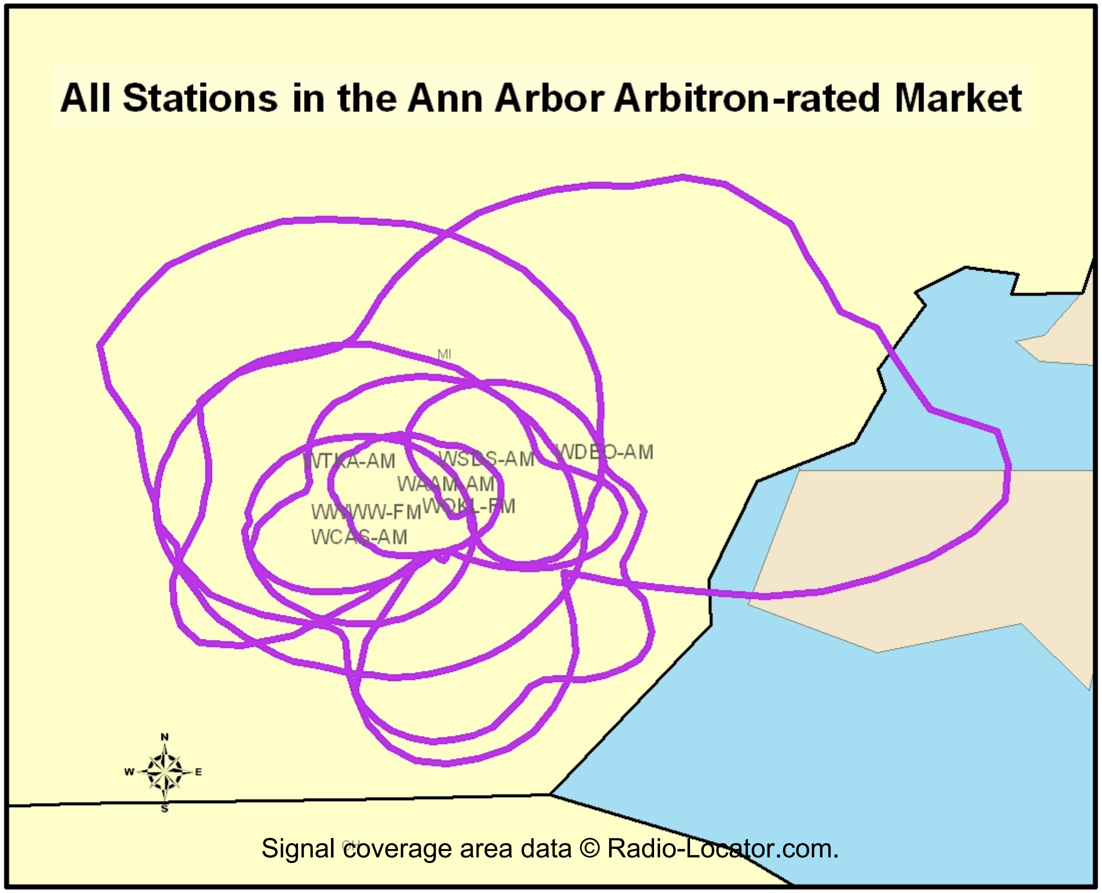

Figure 2.8: Ann Arbor FCC-Cluster #26

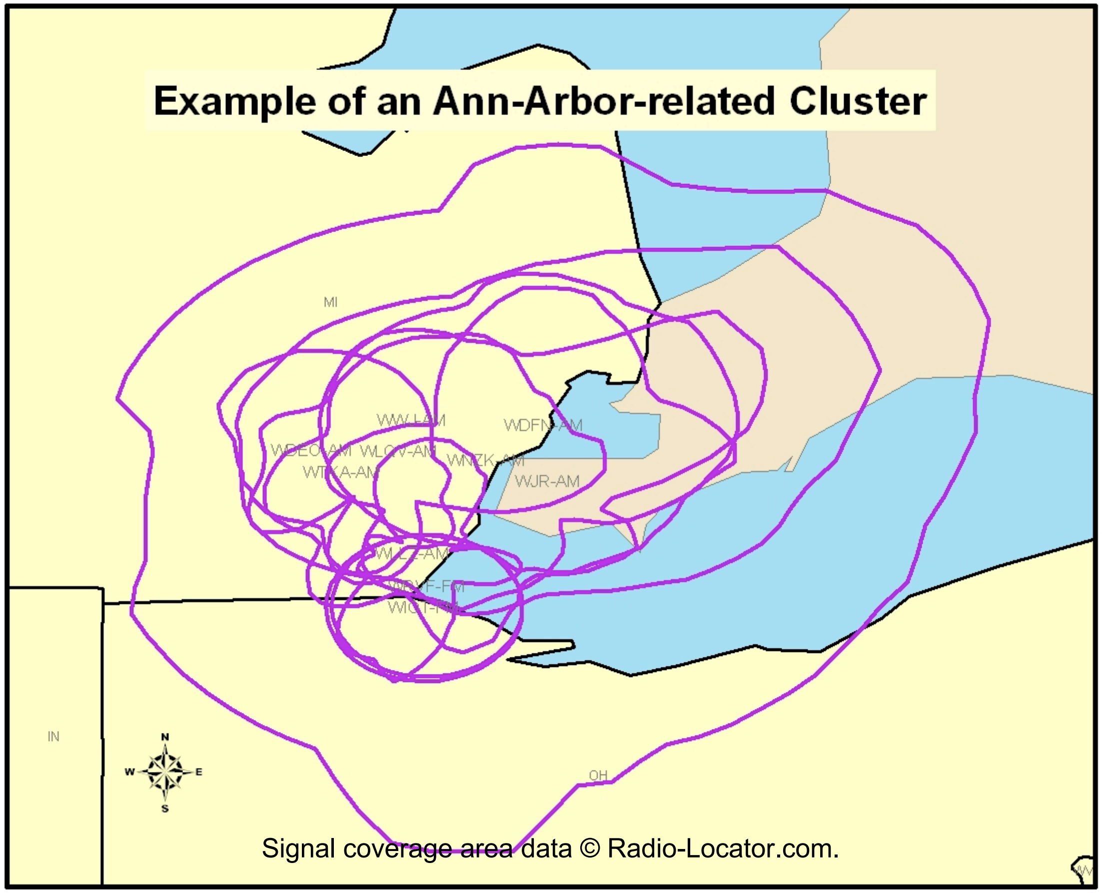

Figure 2.9: Area Where Cluster #26’s Ten Stations Intersect

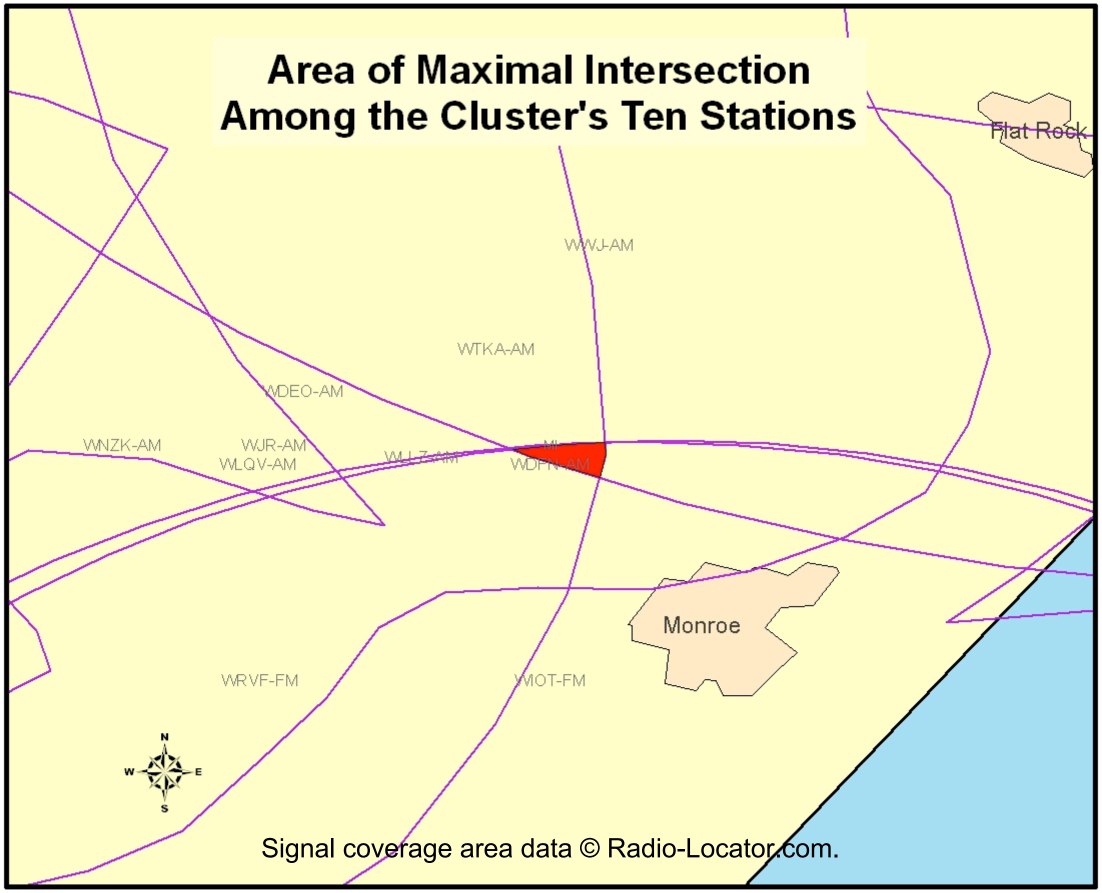

Figure 2.10: Signal Coverage Areas of the 196 Stations Intersecting Cluster #26

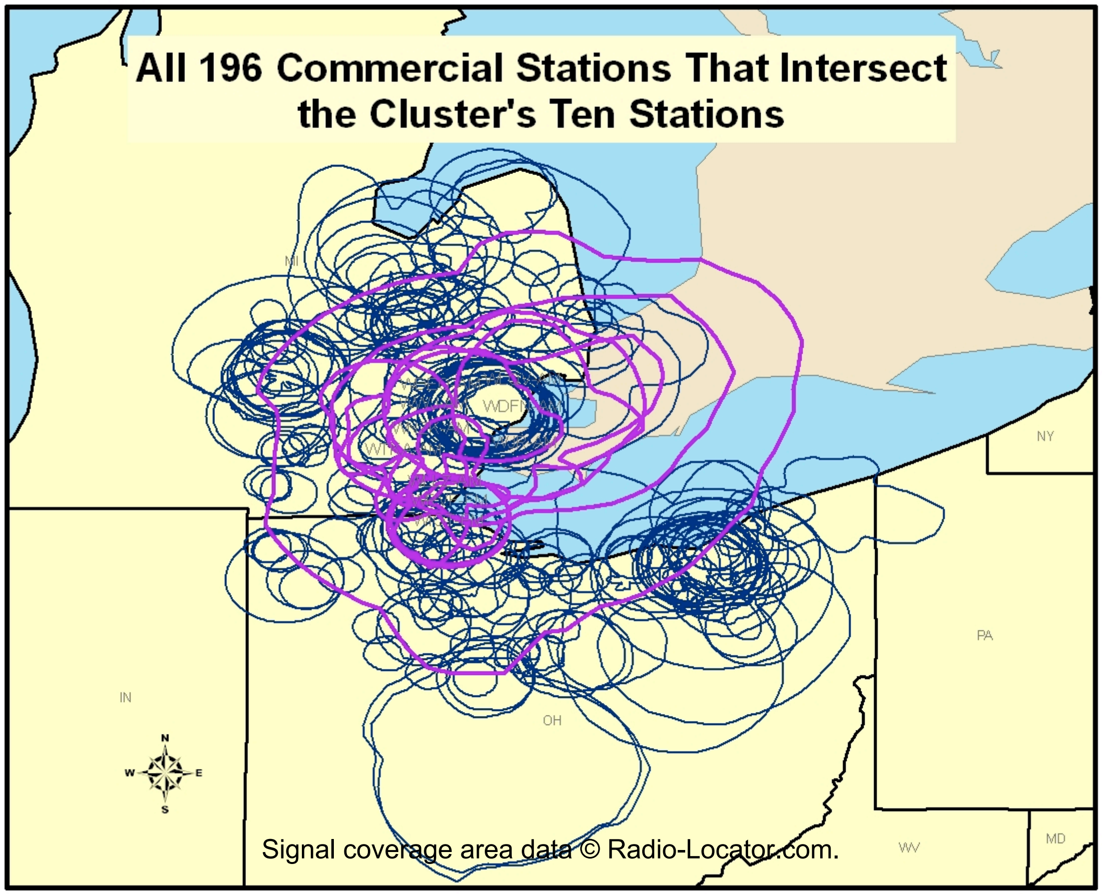

Figure 2.11: Effective FCC Ownership Limit, 1995 and 1996

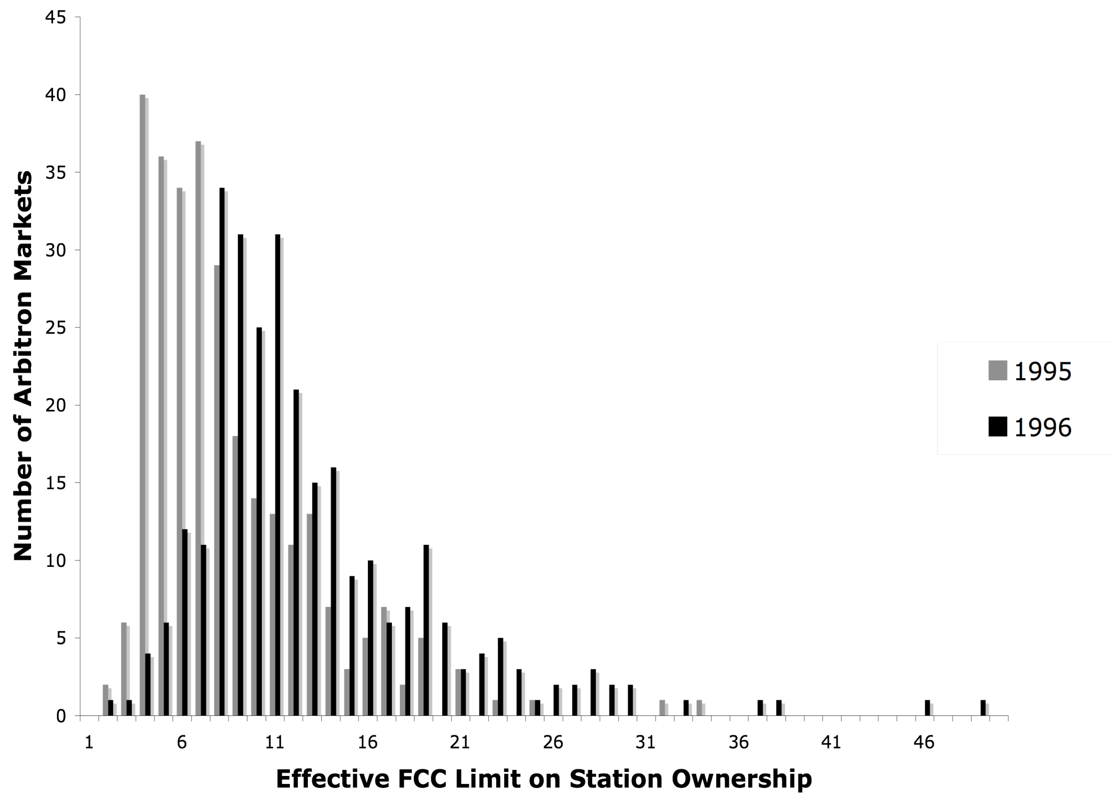

Figure 2.12: Comparing Station Holdings to the Effective FCC Ownership Limit

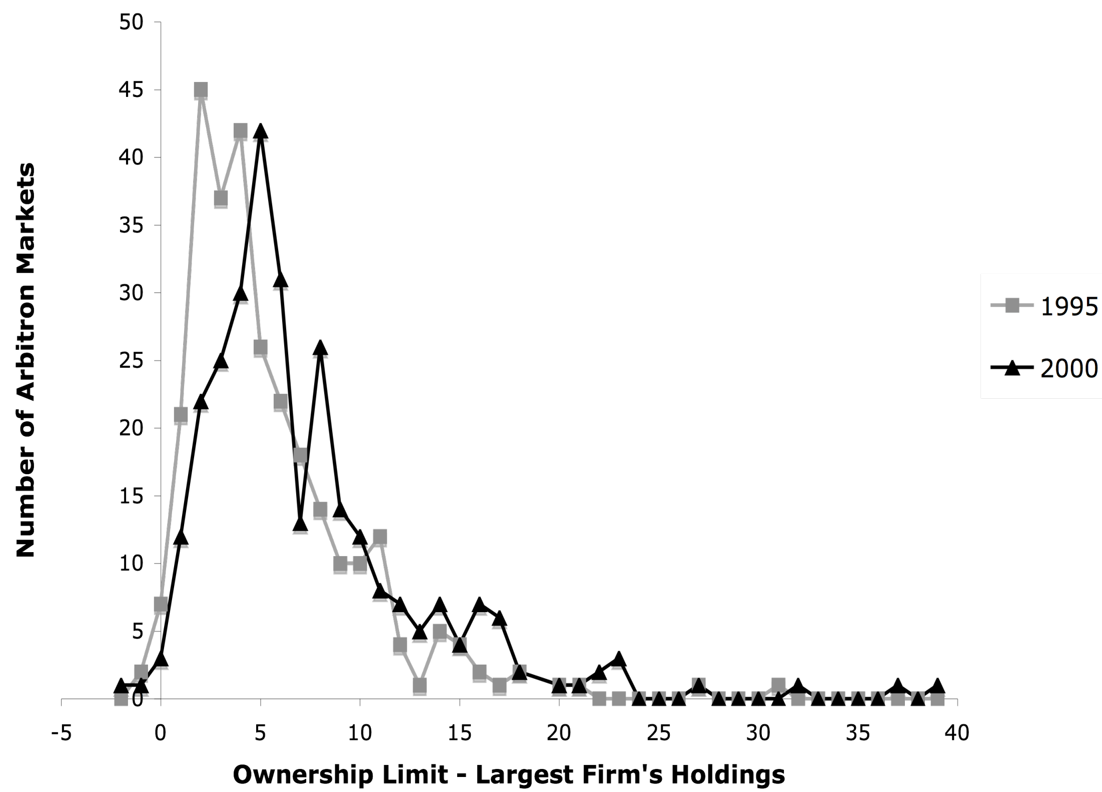

Table 2.1: The Local Radio Ownership Rule as of 1996

In a market with . . .	**One firm can own . . .**	**And . . .**
45 or more stations	8 stations total	5 AM or FM
30 to 44 stations	7 stations total	4 AM or FM
15 to 29 stations	6 stations total	4 AM or FM
10 to 14 stations	5 stations total	3 AM or FM
8 or 9 stations	4 stations total	3 AM or FM
6 or 7 stations	3 stations total	3 AM or FM
4 or 5 stations	2 stations total	2 AM or FM
2 to 3 stations	2 stations total	1 AM or FM
1 station	1 station total	1 AM or FM

Table 2.2: The Forty-Four FCC-Clusters With Ann-Arbor-Market Stations

FCC-Cluster	List of Merger-Scrutinized Stations (i.e., Stations with a Unique Area of Overlapping Broadcast Signals) That Define the FCC-Cluster	Merger-Scrutinized Stations	Intersecting Stations	Size of FCC-Cluster
1	**WAAM-AM**, WCAR-AM, WCHB-AM, WCSX-FM, **WDEO-AM**, WDFN-AM, WDRQ-FM, WDTJ-FM, WDVD-FM, WGPR-FM, WJLB-FM, WJR-AM, WKQI-FM, WKRK-FM, WLLC-FM, WLLZ-AM, WLQV-AM, WMGC-FM, WMKM-AM, WMUZ-FM, WMXD-FM, WNIC-FM, WNZK-AM, WOMC-FM, WRIF-FM, **WSDS-AM**, **WTKA-AM**, WVMV-FM, WWJ-AM, WXDX-AM, WXYT-AM, WYCD-FM	32	164	196
2	WCAR-AM, WCHB-AM, WCSX-FM, **WDEO-AM**, WDFN-AM, WDRQ-FM, WDTJ-FM, WDVD-FM, WGPR-FM, WJLB-FM, WJR-AM, WKQI-FM, WKRK-FM, WLLC-FM, WLLZ-AM, WLQV-AM, WMGC-FM, WMKM-AM, WMUZ-FM, WMXD-FM, WNIC-FM, WNZK-AM, WOMC-FM, WQBH-AM, WRIF-FM, **WSDS-AM**, **WTKA-AM**, WVMV-FM, WWJ-AM, WXDX-AM, WXYT-AM, WYCD-FM	32	164	196
3	**WAAM-AM**, WCAR-AM, WCHB-AM, WCSX-FM, **WDEO-AM**, WDFN-AM, WDRQ-FM, WDTJ-FM, WDVD-FM, WJLB-FM, WJR-AM, WKQI-FM, WKRK-FM, WLLC-FM, WLLZ-AM, WLQV-AM, WMGC-FM, WMKM-AM, WMUZ-FM, WNIC-FM, WNZK-AM, WOMC-FM, WRIF-FM, **WSDS-AM**, **WTKA-AM**, WVMV-FM, WWJ-AM, **WWWW-FM**, WXDX-AM, WXYT-AM, WYCD-FM	31	165	196
4	WCAR-AM, WCHB-AM, WCSX-FM, **WDEO-AM**, WDFN-AM, WDRQ-FM, WDTJ-FM, WDVD-FM, WEXL-AM, WGPR-FM, WJLB-FM, WJR-AM, WKQI-FM, WKRK-FM, WLLC-FM, WLLZ-AM, WLQV-AM, WMGC-FM, WMKM-AM, WMUZ-FM, WMXD-FM, WNIC-FM, WNZK-AM, WOMC-FM, WQBH-AM, WRIF-FM, WVMV-FM, WWJ-AM, WXDX-AM, WXYT-AM, WYCD-FM	31	165	196
5	WCAR-AM, WCHB-AM, WCSX-FM, **WDEO-AM**, WDFN-AM, WDMK-FM, WDRQ-FM, WDTJ-FM, WDVD-FM, WEXL-AM, WGPR-FM, WJLB-FM, WJR-AM, WKQI-FM, WKRK-FM, WLLC-FM, WLQV-AM, WMGC-FM, WMKM-AM, WMUZ-FM, WMXD-FM, WNIC-FM, WNZK-AM, WOMC-FM, WQBH-AM, WRIF-FM, WVMV-FM, WWJ-AM, WXDX-AM, WXYT-AM, WYCD-FM	31	165	196
6	WCHB-AM, WCSX-FM, **WDEO-AM**, WDFN-AM, WDMK-FM, WDRQ-FM, WDTJ-FM, WDVD-FM, WEXL-AM, WGPR-FM, WJLB-FM, WJR-AM, WKQI-FM, WKRK-FM, WLLC-FM, WLQV-AM, WMGC-FM, WMUZ-FM, WMXD-FM, WNIC-FM, WNZK-AM, WOMC-FM, WPON-AM, WQBH-AM, WRIF-FM, WVMV-FM, WWJ-AM, WXDX-AM, WXYT-AM, WYCD-FM	30	166	196

Table 2.2 (continued)

FCC-Cluster	List of Merger-Scrutinized Stations (i.e., Stations with a Unique Area of Overlapping Broadcast Signals) That Define the FCC-Cluster	Merger-Scrutinized Stations	Intersecting Stations	Size of FCC-Cluster
7	WCHB-AM, WCSX-FM, **WDEO-AM**, WDFN-AM, WDMK-FM, WDRQ-FM, WDTJ-FM, WDVD-FM, WEXL-AM, WGPR-FM, WJLB-FM, WJR-AM, WKQI-FM, WKRK-FM, WLLC-FM, WLQV-AM, WMGC-FM, WMUZ-FM, WMXD-FM, WNIC-FM, WNZK-AM, WOMC-FM, WPHM-AM, WQBH-AM, WRIF-FM, WVMV-FM, WWJ-AM, WXDX-AM, WXYT-AM, WYCD-FM	30	166	196
8	WCAR-AM, WCHB-AM, WCSX-FM, **WDEO-AM**, WDFN-AM, WDRQ-FM, WDTJ-FM, WDVD-FM, WGPR-FM, WJLB-FM, WJR-AM, WKQI-FM, WKRK-FM, WLLC-FM, WLQV-AM, WMGC-FM, WMUZ-FM, WMXD-FM, WNIC-FM, WNZK-AM, WOMC-FM, WPON-AM, WQBH-AM, WRIF-FM, WVMV-FM, WWJ-AM, WXDX-AM, WXYT-AM, WYCD-FM	29	167	196
9	WCAR-AM, WCHB-AM, WCSX-FM, **WDEO-AM**, WDFN-AM, WDRQ-FM, WDTJ-FM, WDVD-FM, WJLB-FM, WJR-AM, WKQI-FM, WKRK-FM, WLLC-FM, WMGC-FM, WMUZ-FM, WNIC-FM, WNZK-AM, WOMC-FM, WPON-AM, WQBH-AM, WRIF-FM, **WTKA-AM**, WVMV-FM, WWJ-AM, WXDX-AM, WXYT-AM, WYCD-FM	27	169	196
10	**WAAM-AM**, WCHB-AM, WCSX-FM, **WDEO-AM**, WDFN-AM, WDRQ-FM, WDTJ-FM, WDVD-FM, WJR-AM, WKQI-FM, WKRK-FM, WLQV-AM, WMGC-FM, WMUZ-FM, WNIC-FM, WNZK-AM, WOMC-FM, WPON-AM, WRIF-FM, **WSDS-AM**, **WTKA-AM**, WVMV-FM, WWJ-AM, **WWWW-FM**, WXYT-AM, WYCD-FM	26	170	196
11	WCAR-AM, WCHB-AM, WCSX-FM, **WDEO-AM**, WDFN-AM, WDRQ-FM, WDTJ-FM, WDVD-FM, WJLB-FM, WJR-AM, WKQI-FM, WKRK-FM, WLQV-AM, WMGC-FM, WMUZ-FM, WNIC-FM, WNZK-AM, WOMC-FM, WPON-AM, WRIF-FM, **WSDS-AM**, **WTKA-AM**, WVMV-FM, WWJ-AM, WXYT-AM, WYCD-FM	26	170	196
12	WCHB-AM, WCSX-FM, **WDEO-AM**, WDFN-AM, WDRQ-FM, WDTJ-FM, WDVD-FM, WFDF-AM, WJR-AM, WKQI-FM, WKRK-FM, WMGC-FM, WNZK-AM, WOMC-FM, WPON-AM, WWJ-AM, WXYT-AM, WYCD-FM	18	185	203
13	WAAM-AM, WCHB-AM, **WDEO-AM**, WDFN-AM, WJR-AM, WKQI-FM, WLLZ-AM, WLQV-AM, WMUZ-FM, WNZK-AM, WQKL-FM, **WSDS-AM, WTKA-AM**, WWJ-AM, **WWWW-FM**, WXDX-AM, WXYT-AM	17	179	196
14	WCWA-AM, **WDEO-AM**, WDFN-AM, WDMN-AM, WIOT-FM, WJR-AM, WKKO-FM, WLLZ-AM, WLQV-AM, WNZK-AM, WRVF-FM, WSPD-AM, WTOD-AM, WTWR-FM, WVKS-FM	15	181	196
15	**WDEO-AM**, WDFN-AM, WDMN-AM, WIOT-FM, WJR-AM, WKKO-FM, WLLZ-AM, WLQV-AM, WNZK-AM, WRVF-FM, WSPD-AM, **WTKA-AM**, WTOD-AM, WVKS-FM	14	182	196

Table 2.2 (continued)

FCC-Cluster	List of Merger-Scrutinized Stations (i.e., Stations with a Unique Area of Overlapping Broadcast Signals) That Define the FCC-Cluster	Merger-Scrutinized Stations	Intersecting Stations	Size of FCC-Cluster
16	**WAAM-AM**, **WCAS-AM**, WCHB-AM, **WDEO-AM**, WDFN-AM, WJR-AM, WLLZ-AM, WLQV-AM, WNZK-AM, **WQKL-FM**, **WSDS-AM**, **WTKA-AM**, WWJ-AM, **WWWW-FM**	14	182	196
17	**WDEO-AM**, WDFN-AM, WDMN-AM, WIOT-FM, WJR-AM, WKKO-FM, WLLZ-AM, WLQV-AM, WNZK-AM, WRVF-FM, WSPD-AM, **WTKA-AM**, WTOD-AM, WTWR-FM	14	182	196
18	WCHB-AM, WCXI-AM, **WDEO-AM**, WDFN-AM, WFDF-AM, WJR-AM, WKQI-FM, WKRK-FM, WNZK-AM, WPON-AM, WSNL-AM, **WTKA-AM**, WWJ-AM, WXYT-AM	14	189	203
19	WCHB-AM, **WDEO-AM**, WDFN-AM, WDRQ-FM, WFDF-AM, WJR-AM, WKQI-FM, WKRK-FM, WNZK-AM, WPON-AM, WSNL-AM, **WTKA-AM**, WWJ-AM, WXYT-AM	14	189	203
20	WCHB-AM, **WDEO-AM**, WDFN-AM, WDRQ-FM, WJR-AM, WKQI-FM, WKRK-FM, WNZK-AM, WOMC-FM, WPON-AM, WSNL-AM, **WTKA-AM**, WWJ-AM, WXYT-AM	14	187	201
21	WCHB-AM, **WDEO-AM**, WDFN-AM, WDRQ-FM, WFDF-AM, WJR-AM, WKQI-FM, WKRK-FM, WNZK-AM, WOMC-FM, WPON-AM, WSNL-AM, WWJ-AM, WXYT-AM	14	189	203
22	WCHB-AM, **WDEO-AM**, WDFN-AM, WJR-AM, WNZK-AM, WPON-AM, WSNL-AM, **WTKA-AM**, WWJ-AM, **WWWW-FM**, WXYT-AM	11	190	201
23	WFMK-FM, WITL-FM, WJIM-FM, WJR-AM, WJXQ-FM, WKAR-AM, WKHM-AM, WMMQ-FM, **WTKA-AM**, WVIC-FM	10	211	221
24	WCHB-AM, WCXI-AM, **WDEO-AM**, WDFN-AM, WHMI-FM, WJR-AM, WNZK-AM, WSNL-AM, **WTKA-AM**, WWJ-AM	10	191	201
25	WCHB-AM, WCRZ-FM, WCXI-AM, **WDEO-AM**, WDFN-AM, WFDF-AM, WJR-AM, WNZK-AM, WSNL-AM, WWJ-AM	10	193	203
26	**WDEO-AM**, WDFN-AM, WIOT-FM, WJR-AM, WLLZ-AM, WLQV-AM, WNZK-AM, WRVF-FM, **WTKA-A**M, WWJ-AM	10	186	196
27	WDFN-AM, WIOT-FM, WJR-AM, WLLZ-AM, WLQV-AM, WNZK-AM, WRVF-FM, **WTKA-AM**, WWJ-AM, WXDX-AM	10	186	196
28	WCHB-AM, **WDEO-AM**, WDFN-AM, WJR-AM, WLQV-AM, WNZK-AM, WOMC-FM, WSNL-AM, WWJ-AM, WXYT-AM	10	191	201
29	WFMK-FM, WILS-AM, WITL-FM, WJIM-FM, WJR-AM, WJXQ-FM, WKAR-AM, WMMQ-FM, **WTKA-AM**	9	209	218
30	**WDEO-AM**, WDFN-AM, WDMN-AM, WJR-AM, WLLZ-AM, WLQV-AM, WNZK-AM, **WTKA-AM**, WWWW-FM	9	187	196
31	WFMK-FM, WITL-FM, WJIM-FM, WJR-AM, WKAR-AM, WMMQ-FM, **WTKA-AM**, WVFN-AM	8	209	217

Table 2.2 (continued)

FCC-Cluster	List of Merger-Scrutinized Stations (i.e., Stations with a Unique Area of Overlapping Broadcast Signals) That Define the FCC-Cluster	Merger-Scrutinized Stations	Intersecting Stations	Size of FCC-Cluster
32	WDFN-AM, WFMK-FM, WITL-FM, WJIM-FM, WJR-AM, WKAR-AM, WMMQ-FM, **WTKA-AM**	8	209	217
33	WDFN-AM, WFMK-FM, WHMI-FM, WITL-FM, WJIM-FM, WJR-AM, WKAR-AM, **WTKA-AM**	8	209	217
34	WFMK-FM, WHMI-FM, WITL-FM, WJIM-FM, WJR-AM, WKAR-AM, **WTKA-AM**, WVFN-AM	8	209	217
35	WABJ-AM, **WCAS-AM, WDEO-AM**, WDFN-AM, WJR-AM, WNZK-AM, **WTKA-AM, WWWW-FM**	8	188	196
36	WCHB-AM, **WDEO-AM**, WDFN-AM, WJR-AM, WKAR-AM, **WTKA-AM**, **WWWW-FM**	7	210	217
37	WCHB-AM, WDFN-AM, WHMI-FM, WJR-AM, WKAR-AM, **WTKA-AM**, **WWWW-FM**	7	210	217
38	WCHB-AM, WDFN-AM, WHMI-FM, WJR-AM, WKAR-AM, WSNL-AM, **WTKA-AM**	7	215	222
39	WABJ-AM, WDFN-AM, WJR-AM, WLEN-FM, WNZK-AM, **WTKA-AM**, **WWWW-FM**	7	189	196
40	WABJ-AM, **WDEO-AM**, WDFN-AM, WJR-AM, WLEN-FM, WNZK-AM, **WTKA-AM**	7	189	196
41	WABJ-AM, **WDEO-AM**, WDFN-AM, WJR-AM, WNZK-AM, **WTKA-AM**, WTOD-AM	7	189	196
42	WABJ-AM, **WDEO-AM**, WDFN-AM, WDMN-AM, WJR-AM, WNZK-AM, **WTKA-AM**	7	189	196
43	WDFN-AM, WJR-AM, WKAR-AM, WKHM-AM, **WTKA-AM**, **WWWW-FM**	6	211	217
44	WABJ-AM, **WDEO-AM**, WDFN-AM, WJR-AM, WLEN-FM, **WWWW-FM**	6	190	196

Table 2.3: Number of FCC-Clusters by Arbitron Market

Rank	Abritron Market Name	Stations Included in Arbitron Market	FCC-Clusters Involving the Market's Stations
1	New York	41	206
2	Los Angeles	72	275
3	Chicago, IL	86	222
4	San Francisco	48	368
5	Dallas - Ft. Worth	57	125
6	Philadelphia	43	142
7	Washington, DC	47	135
8	Boston	62	196
9	Houston-Galveston	56	118
10	Detroit	39	179
11	Atlanta, GA	65	126
12	Miami-Ft. Lauderdale-Hollywood	43	155
13	Puerto Rico	78	113
14	Seattle-Tacoma	54	66
15	Phoenix, AZ	43	33
16	Minneapolis - St. Paul	45	71
17	San Diego	29	82
18	Nassau-Suffolk	23	83
19	St. Louis	50	98
20	Baltimore, MD	31	129
21	Tampa-St. Petersburg-Clearwater	42	120
22	Denver - Boulder	38	94
23	Pittsburgh, PA	50	109
24	Portland, OR	40	42
25	Cleveland	29	124
26	Cincinnati	32	141
27	Sacramento, CA	35	230
28	Riverside-San Bernardino	25	106
29	Kansas City	33	119
30	San Jose	14	172
31	San Antonio, TX	39	102
32	Milwaukee - Racine	33	194
33	Middlesex-Somerset-Union, NJ	5	39
34	Salt Lake City - Ogden	43	19
35	Providence-Warwick-Pawtucket, RI	29	106
36	Columbus, OH	31	74
37	Charlotte-Gastonia-Rock Hill	41	104

Table 2.3 (continued)

Rank	Abritron Market Name	Stations Included in Arbitron Market	FCC-Clusters Involving the Market's Stations
38	Norfolk-Virginia Beach-Newport News	33	38
39	Orlando	33	138
40	Indianapolis, IN	29	75
41	Las Vegas, NV	29	18
42	Greensboro-Winston Salem-High Point	38	131
43	Austin, TX	29	78
44	Nashville	46	103
45	New Orleans	32	114
46	Raleigh - Durham, NC	39	129
47	W. Palm Beach-Boca Raton	26	257
48	Memphis	39	94
49	Hartford-New Britain-Middletown	27	64
50	Buffalo-Niagara Falls, NY	25	35
51	Monmouth-Ocean, NJ	11	37
52	Jacksonville, FL	34	117
53	Rochester, NY	31	38
54	Oklahoma City	28	52
55	Louisville, KY	35	104
56	Richmond, VA	26	23
57	Birmingham, AL	36	85
58	Dayton, Ohio	28	65
59	Westchester, NY	8	66
60	Greenville-Spartanburg, SC	37	141
61	Albany-Schenectady-Troy	43	68
62	Honolulu	28	2
63	McAllen-Brownsville-Harlingen, TX	22	17
64	Tucson, AZ	27	22
65	Tulsa, OK	31	83
66	Grand Rapids, MI	28	58
67	Wilkes Barre - Scranton	37	63
68	Fresno	37	76
69	Allentown - Bethlehem	17	48
70	Ft. Myers-Naples-Marco Island	31	291
71	Knoxville, TN	36	85
72	Albuquerque, NM	36	22
73	Akron, OH	9	90
74	Omaha - Council Bluffs	22	63
75	Wilmington, DE	13	58
76	Monterey-Salinas-Santa Cruz	30	127

Table 2.3 (continued)

Rank	Abritron Market Name	Stations Included in Arbitron Market	FCC-Clusters Involving the Market's Stations
77	El Paso, TX	20	10
78	Harrisburg-Lebanon-Carlisle, PA	24	66
79	Syracuse, NY	27	44
80	Sarasota - Bradenton, FL	10	66
81	Toledo, OH	26	53
82	Springfield, MA	18	30
83	Baton Rouge, LA	21	65
84	Greenville-New Bern-Jacksonville	39	75
85	Little Rock, AR	36	66
86	Gainesville - Ocala, FL	25	50
87	Stockton, CA	9	91
88	Columbia, SC	23	40
89	Des Moines, IA	24	101
90	Bakersfield, CA	30	34
91	Mobile, AL	25	41
92	Wichita, KS	23	46
93	Charleston, SC	26	41
94	Spokane, WA	26	20
95	Daytona Beach, FL	11	47
96	Colorado Springs, CO	22	28
97	Madison, WI	27	68
98	Johnson City-Kingsport-Bristol	31	102
99	Lakeland-Winter Haven, FL	11	31
100	Melbourne-Titusville-Cocoa, FL	13	74
145	Ann Arbor, MI	7	44

Table 2.4: Hypothetical Limits vs. Actual Limits on Local Radio-Station Ownership

Rank	Abritron Market Name	Stations Included in Arbitron Market	"Policy Band" Limit, 1995 (HYPO-THETICAL)	Calculated Station Limit, 1995	"Policy Band" Limit, 1996 (HYPO-THETICAL)	Calculated Station Limit, 1996
1	New York	41	4	6	7	11
2	Los Angeles	72	4	18	8	29
3	Chicago, IL	86	4	32	8	49
4	San Francisco	48	4	12	8	20
5	Dallas - Ft. Worth	57	4	19	8	28
6	Philadelphia	43	4	15	7	18
7	Washington, DC	47	4	17	8	23
8	Boston	62	4	25	8	37
9	Houston-Galveston	56	4	16	8	24
10	Detroit	39	4	12	7	17
11	Atlanta, GA	65	4	34	8	46
12	Miami-Ft. Lauderdale-Hollywood	43	4	6	7	11
13	Puerto Rico	78	4	21	8	38
14	Seattle-Tacoma	54	4	17	8	25
15	Phoenix, AZ	43	4	10	7	17
16	Minneapolis - St. Paul	45	4	21	7	28
17	San Diego	29	4	7	6	12
18	Nassau-Suffolk	23	4	11	6	19
19	St. Louis	50	4	17	8	23
20	Baltimore, MD	31	4	9	6	13
21	Tampa-St. Petersburg-Clearwater	42	4	11	7	16
22	Denver - Boulder	38	4	7	7	10
23	Pittsburgh, PA	50	4	23	8	30
24	Portland, OR	40	4	10	7	17
25	Cleveland	29	4	9	7	14

Table 2.4 (continued)

Rank	Abritron Market Name	Stations in Arbitron Market	"Policy Band" Limit, 1995	Calculated Limit, 1995	"Policy Band" Limit, 1996	Calculated Limit, 1996
26	Cincinnati	32	4	13	7	16
27	Sacramento, CA	35	4	14	7	20
28	Riverside-San Bernardino	25	4	12	6	19
29	Kansas City	33	4	8	7	13
30	San Jose	14	3	4	6	8
31	San Antonio, TX	39	4	10	7	15
32	Milwaukee - Racine	33	4	11	7	17
33	Middlesex-Somerset-Union, NJ	5	2	5	3	5
34	Salt Lake City - Ogden	43	4	7	7	14
35	Providence-Warwick-Pawtucket, RI	29	4	13	6	21
36	Columbus, OH	31	4	16	7	24
37	Charlotte-Gastonia-Rock Hill	41	4	17	7	29
38	Norfolk-Virginia Beach-N. News	33	4	9	7	14
39	Orlando	33	4	11	7	13
40	Indianapolis, IN	29	4	11	6	15
41	Las Vegas, NV	29	4	5	6	10
42	Greensboro-Winston Salem-H.P.	38	4	13	7	23
43	Austin, TX	29	4	10	6	15
44	Nashville	46	4	19	8	28
45	New Orleans	32	4	8	7	13
46	Raleigh - Durham, NC	39	4	16	7	27
47	W. Palm Beach-Boca Raton	26	4	8	6	14
48	Memphis	39	4	13	7	18
49	Hartford-New Britain-Middletown	27	4	12	6	18
50	Buffalo-Niagara Falls, NY	25	4	7	6	11
51	Monmouth-Ocean, NJ	11	3	6	5	11

Table 2.4 (continued)

Rank	Abritron Market Name	Stations in Arbitron Market	"Policy Band" Limit, 1995	Calculated Limit, 1995	"Policy Band" Limit, 1996	Calculated Limit, 1996
52	Jacksonville, FL	34	4	8	7	16
53	Rochester, NY	31	4	15	7	20
54	Oklahoma City	28	4	8	6	12
55	Louisville, KY	35	4	14	7	19
56	Richmond, VA	26	4	9	6	14
57	Birmingham, AL	36	4	13	7	21
58	Dayton, Ohio	28	4	11	6	18
59	Westchester, NY	8	3	6	3	8
60	Greenville-Spartanburg, SC	37	4	17	7	26
61	Albany-Schenectady-Troy	43	4	19	7	30
62	Honolulu	28	4	4	7	6
63	McAllen-Brownsville-Harlingen	22	4	9	6	12
64	Tucson, AZ	27	4	6	6	11
65	Tulsa, OK	31	4	11	7	16
66	Grand Rapids, MI	28	4	9	6	13
67	Wilkes Barre - Scranton	37	4	19	7	27
68	Fresno	37	4	11	7	20
69	Allentown - Bethlehem	17	4	8	6	13
70	Ft. Myers-Naples-Marco Island	31	4	11	7	17
71	Knoxville, TN	36	4	14	7	22
72	Albuquerque, NM	36	4	7	7	13
73	Akron, OH	9	3	4	4	8
74	Omaha - Council Bluffs	22	4	4	6	8
75	Wilmington, DE	13	3	9	5	13
76	Monterey-Salinas-Santa Cruz	30	4	8	7	14
77	El Paso, TX	20	4	5	6	7

Table 2.4 (continued)

Rank	Abritron Market Name	Stations in Arbitron Market	"Policy Band" Limit, 1995	Calculated Limit, 1995	"Policy Band" Limit, 1996	Calculated Limit, 1996
78	Harrisburg-Lebanon-Carlisle, PA	24	4	13	6	18
79	Syracuse, NY	27	4	13	7	18
80	Sarasota - Bradenton, FL	10	3	5	5	9
81	Toledo, OH	26	4	13	6	19
82	Springfield, MA	18	4	9	6	15
83	Baton Rouge, LA	21	4	6	6	10
84	Greenville-New Bern-Jacksonville	39	4	21	7	33
85	Little Rock, AR	36	4	15	7	20
86	Gainesville - Ocala, FL	25	4	13	6	22
87	Stockton, CA	9	3	5	4	9
88	Columbia, SC	23	4	8	6	12
89	Des Moines, IA	24	4	10	6	13
90	Bakersfield, CA	30	4	9	7	13
91	Mobile, AL	25	4	10	6	14
92	Wichita, KS	23	4	8	6	11
93	Charleston, SC	26	4	10	6	14
94	Spokane, WA	26	4	6	6	9
95	Daytona Beach, FL	11	3	7	5	10
96	Colorado Springs, CO	22	4	4	6	8
97	Madison, WI	27	4	14	6	20
98	Johnson City-Kingsport-Bristol	31	4	16	7	23
99	Lakeland-Winter Haven, FL	11	3	7	5	11
100	Melbourne-Titusville-Cocoa, FL	13	3	5	5	10
145	Ann Arbor, MI	7	3	4	3	7

Table 2.5: Alternative Objectives of Radio Firms

Rank	Abritron Market Name	Maximize Number of Stations Owned	Maximize Wattage	Maximize Population Reached
1	New York	11	9	8
2	Los Angeles	29	20	12
3	Chicago, IL	49	26	26
4	San Francisco	20	12	14
5	Dallas - Ft. Worth	28	21	19
6	Philadelphia	18	15	13
7	Washington, DC	23	19	20
8	Boston	37	29	31
9	Houston-Galveston	24	21	16
10	Detroit	17	11	12
11	Atlanta, GA	46	40	39
12	Miami-Ft. Lauderdale-Hollywood	11	10	10
13	Puerto Rico	38	29	N/A
14	Seattle-Tacoma	25	15	16
15	Phoenix, AZ	17	15	17
16	Minneapolis - St. Paul	28	20	19
17	San Diego	12	12	11
18	Nassau-Suffolk	19	19	19
19	St. Louis	23	19	18
20	Baltimore, MD	13	12	13
21	Tampa-St. Petersburg-Clearwater	16	14	15
22	Denver - Boulder	10	10	9
23	Pittsburgh, PA	30	26	24
24	Portland, OR	17	13	13
25	Cleveland	14	12	13
26	Cincinnati	16	15	15
27	Sacramento, CA	20	19	17
28	Riverside-San Bernardino	19	19	18
29	Kansas City	13	13	11
30	San Jose	8	8	8
31	San Antonio, TX	15	14	10
32	Milwaukee - Racine	17	12	14
33	Middlesex-Somerset-Union, NJ	5	5	5
34	Salt Lake City - Ogden	14	12	11
35	Providence-Warwick-Pawtucket, RI	21	18	18
36	Columbus, OH	24	17	22
37	Charlotte-Gastonia-Rock Hill	29	22	24
38	Norfolk-Va. Beach-Newport News	14	13	13

Table 2.5 (continued)

Rank	Abritron Market Name	Maximize Number of Stations Owned	Maximize Wattage	Maximize Population Reached
39	Orlando	13	11	9
40	Indianapolis, IN	15	13	13
41	Las Vegas, NV	10	10	10
42	Greensboro-Winston Salem-High Pt.	23	21	19
43	Austin, TX	15	11	11
44	Nashville	28	16	22
45	New Orleans	13	13	10
46	Raleigh - Durham, NC	27	24	23
47	W. Palm Beach-Boca Raton	14	9	12
48	Memphis	18	16	15
49	Hartford-New Britain-Middletown	18	16	14
50	Buffalo-Niagara Falls, NY	11	10	10
51	Monmouth-Ocean, NJ	11	11	11
52	Jacksonville, FL	16	10	12
53	Rochester, NY	20	18	20
54	Oklahoma City	12	11	10
55	Louisville, KY	19	15	16
56	Richmond, VA	14	10	13
57	Birmingham, AL	21	14	17
58	Dayton, Ohio	18	15	15
59	Westchester, NY	8	8	8
60	Greenville-Spartanburg, SC	26	21	21
61	Albany-Schenectady-Troy	30	27	28
62	Honolulu	6	6	6
63	McAllen-Brownsville-Harlingen, TX	12	8	10
64	Tucson, AZ	11	9	11
65	Tulsa, OK	16	15	13
66	Grand Rapids, MI	13	13	13
67	Wilkes Barre - Scranton	27	25	24
68	Fresno	20	15	19
69	Allentown - Bethlehem	13	12	13
70	Ft. Myers-Naples-Marco Island	17	16	17
71	Knoxville, TN	22	16	17
72	Albuquerque, NM	13	12	13
73	Akron, OH	8	8	8
74	Omaha - Council Bluffs	8	8	8
75	Wilmington, DE	13	13	13
76	Monterey-Salinas-Santa Cruz	14	13	14

Table 2.5 (continued)

Rank	Abritron Market Name	Maximize Number of Stations Owned	Maximize Wattage	Maximize Population Reached
77	El Paso, TX	7	7	7
78	Harrisburg-Lebanon-Carlisle, PA	18	16	16
79	Syracuse, NY	18	16	17
80	Sarasota - Bradenton, FL	9	9	9
81	Toledo, OH	19	17	19
82	Springfield, MA	15	14	14
83	Baton Rouge, LA	10	10	9
84	Greenville-New Bern-Jacksonville	33	32	28
85	Little Rock, AR	20	16	19
86	Gainesville - Ocala, FL	22	17	21
87	Stockton, CA	9	9	9
88	Columbia, SC	12	12	12
89	Des Moines, IA	13	11	10
90	Bakersfield, CA	13	12	13
91	Mobile, AL	14	13	12
92	Wichita, KS	11	12	11
93	Charleston, SC	14	14	15
94	Spokane, WA	9	8	8
95	Daytona Beach, FL	10	10	10
96	Colorado Springs, CO	8	8	8
97	Madison, WI	20	18	19
98	Johnson City-Kingsport-Bristol	23	18	17
99	Lakeland-Winter Haven, FL	11	11	11
100	Melbourne-Titusville-Cocoa, FL	10	10	11
145	Ann Arbor, MI	7	7	7

Table 2.6: Alternative Parameters for the FCC's Market Definition

Rank	Abritron Market Name	70 dBU Contour	60 dBU Contour	70 dBUs, Alternative Size Count	60 dBUs, Alternative Size Count
1	New York	11	10	10	9
2	Los Angeles	29	21	27	22
3	Chicago, IL	49	39	45	35
4	San Francisco	20	16	19	15
5	Dallas - Ft. Worth	28	22	25	20
6	Philadelphia	18	17	17	19
7	Washington, DC	23	19	22	19
8	Boston	37	34	32	31
9	Houston-Galveston	24	20	22	19
10	Detroit	17	16	16	16
11	Atlanta, GA	46	38	40	36
12	Miami-Ft. Lauderdale-Hollywood	11	10	11	10
13	Puerto Rico	38	27	33	25
14	Seattle-Tacoma	25	21	22	18
15	Phoenix, AZ	17	15	15	15
16	Minneapolis - St. Paul	28	22	23	20
17	San Diego	12	10	11	8
18	Nassau-Suffolk	19	19	14	15
19	St. Louis	23	21	20	19
20	Baltimore, MD	13	10	12	10
21	Tampa-St. Petersburg-Clearwater	16	14	15	14
22	Denver - Boulder	10	10	9	9
23	Pittsburgh, PA	30	26	26	23
24	Portland, OR	17	14	15	13
25	Cleveland	14	12	12	10
26	Cincinnati	16	14	14	13
27	Sacramento, CA	20	16	19	15
28	Riverside-San Bernardino	19	15	16	14
29	Kansas City	13	12	11	12
30	San Jose	8	8	7	7
31	San Antonio, TX	15	14	14	12
32	Milwaukee - Racine	17	13	15	12
33	Middlesex-Somerset-Union, NJ	5	5	5	5
34	Salt Lake City - Ogden	14	11	12	10
35	Providence-Warwick-Pawtucket, RI	21	18	16	15
36	Columbus, OH	24	17	22	14
37	Charlotte-Gastonia-Rock Hill	29	23	23	19
38	Norfolk-VA Beach-Newport News	14	11	11	10

Table 2.6 (continued)

Rank	Abritron Market Name	70 dBU Contour	60 dBU Contour	70 dBUs, Alternative Size Count	60 dBUs, Alternative Size Count
39	Orlando	13	13	14	15
40	Indianapolis, IN	15	13	13	12
41	Las Vegas, NV	10	8	8	7
42	Greensboro-Winston Salem-H. Pt.	23	18	19	16
43	Austin, TX	15	11	13	12
44	Nashville	28	24	26	22
45	New Orleans	13	8	11	7
46	Raleigh - Durham, NC	27	19	22	17
47	W. Palm Beach-Boca Raton	14	9	11	8
48	Memphis	18	18	16	16
49	Hartford-New Britain-Middletown	18	15	17	13
50	Buffalo-Niagara Falls, NY	11	9	9	8
51	Monmouth-Ocean, NJ	11	11	7	8
52	Jacksonville, FL	16	11	14	11
53	Rochester, NY	20	18	16	16
54	Oklahoma City	12	11	10	9
55	Louisville, KY	19	16	17	14
56	Richmond, VA	14	11	12	9
57	Birmingham, AL	21	17	18	16
58	Dayton, Ohio	18	12	15	10
59	Westchester, NY	8	8	7	7
60	Greenville-Spartanburg, SC	26	23	22	19
61	Albany-Schenectady-Troy	30	23	23	18
62	Honolulu	6	7	6	6
63	McAllen-Brownsville-Harlingen, TX	12	10	11	8
64	Tucson, AZ	11	10	9	7
65	Tulsa, OK	16	14	14	12
66	Grand Rapids, MI	13	11	11	9
67	Wilkes Barre - Scranton	27	22	19	18
68	Fresno	20	12	17	11
69	Allentown - Bethlehem	13	13	10	10
70	Ft. Myers-Naples-Marco Island	17	14	15	12
71	Knoxville, TN	22	16	20	14
72	Albuquerque, NM	13	10	10	9
73	Akron, OH	8	8	6	6
74	Omaha - Council Bluffs	8	8	6	6
75	Wilmington, DE	13	11	8	8
76	Monterey-Salinas-Santa Cruz	14	13	11	12

Table 2.6 (continued)

Rank	**Abritron Market Name**	**70 dBU Contour**	**60 dBU Contour**	**70 dBUs, Alternative Size Count**	**60 dBUs, Alternative Size Count**
77	El Paso, TX	7	7	7	7
78	Harrisburg-Lebanon-Carlisle, PA	18	15	15	13
79	Syracuse, NY	18	16	14	15
80	Sarasota - Bradenton, FL	9	8	7	7
81	Toledo, OH	19	17	16	14
82	Springfield, MA	15	13	12	11
83	Baton Rouge, LA	10	9	8	7
84	Greenville-New Bern-Jacksonville	33	29	26	23
85	Little Rock, AR	20	16	18	15
86	Gainesville - Ocala, FL	22	16	15	14
87	Stockton, CA	9	8	7	6
88	Columbia, SC	12	10	10	8
89	Des Moines, IA	13	11	11	9
90	Bakersfield, CA	13	11	10	9
91	Mobile, AL	14	12	12	10
92	Wichita, KS	11	9	9	7
93	Charleston, SC	14	11	12	9
94	Spokane, WA	9	8	8	6
95	Daytona Beach, FL	10	10	8	8
96	Colorado Springs, CO	8	8	6	8
97	Madison, WI	20	17	17	15
98	Johnson City-Kingsport-Bristol	23	19	18	17
99	Lakeland-Winter Haven, FL	11	8	10	7
100	Melbourne-Titusville-Cocoa, FL	10	9	8	7
145	Ann Arbor, MI	7	7	5	6

Table 2.7: Local Ownership Limit vs. Largest Firm's Holdings

Change in Licensed Commercial Stations, 1995-2000

Change in Calculated Limit on Station Ownership	**0**	**1**	**2**	**3**	**4**	**5**		**12**	**Row TOTAL**
0	0.33 (n = 6)								0.33 (n = 6)
1	0.43 (n = 7)	0.5 (n = 2)				4.0 (n = 1)			0.80 (n = 10)
2	1.9 (n = 13)	1.4 (n = 7)	2.0 (n = 4)	2.8 (n = 5)	2.0 (n = 1)				1.9 (n = 30)
3	2.1 (n= 17)	2.7 (n = 18)	1.6 (n = 5)	3.3 (n = 7)	2.5 (n = 2)				2.4 (n = 49)
4	1.6 (n = 33)	2.9 (n = 28)	1.9 (n = 14)	2.4 (n = 5)	5.0 (n = 1)				2.2 (n = 81)
5	2.7 (n = 18)	3.0 (n = 14)	3.4 (n = 13)	2.6 (n = 5)	3.0 (n = 1)	3.0 (n = 1)			3.0 (n = 52)
6	2.5 (n = 4)	2.8 (n = 8)	4.3 (n = 3)	4.0 (n = 4)					3.2 (n = 19)
7	4.0 (n = 7)	2.3 (n =3)	3.7 (n = 3)	2.5 (n = 2)					3.4 (n = 15)
8	3.0 (n = 1)	3.5 (n =4)	4.3 (n = 3)	3.0 (n = 4)					3.5 (n = 12)
9	4.0 (n = 1)		3.5 (n = 2)		4.0 (n = 1)	5.0 (n = 1)			4.0 (n = 5)
10		3.0 (n = 1)							3.0 (n = 1)
11		6.7 (n = 3)							6.7 (n = 3)
12	1.0 (n = 2)	7.0 (n = 1)			4.0 (n = 1)				3.3 (n = 4)
17		7.0 (n = 1)						7.0 (n = 1)	7.0 (n = 2)
Column TOTAL	2.0 (n = 109)	2.9 (n = 90)	2.8 (n = 47)	3.0 (n = 32)	3.3 (n = 7)	4.0 (n = 3)		7.0 (n = 1)	2.6 (n = 289)

Note: Cross-tabulation of the change in calculated local ownership limit against the change in the largest firm's holdings, by Arbitron market, controlling for the change in licensed commercial stations.

Table 2.8: Summary Statistics for Variables Used in Regressions

Variable	**Mean**	**Standard Deviation**	**(Min, Max)**
Calculated Local Radio Ownership Limit, 1995	8.49	4.69	(2, 34)
Calculated Local Radio Ownership Limit, 1996	12.9	6.65	(2, 49)
Change in Limit, Before & After Telecom Act	4.45	2.40	(0, 17)
Licensed Commercial Stations, 1995	20.9	13.0	(2, 87)
Licensed Commercial Stations, 2000	22.1	13.4	(2, 92)
Change in Commercial Stations, 1995-2000	1.16	1.33	(0, 12)
Stations Owned by Market's Largest Firm, Fall 1995	3.00	0.966	(1, 6)
Stations Owned by Market's Largest Firm, Fall 2000	5.58	1.98	(1, 13)
Change in Largest Firm's Holdings, 1995-2000	2.58	1.72	(-2, 10)
Format Variety, Fall 1995	13.9	5.60	(4, 32)
Format Variety, Fall 2000	16.1	6.46	(4, 37)
Change in Format Variety, 1995-2000	2.19	2.69	(-6, 16)
News-Format Station-Equivalents, Fall 1995	1.30	1.06	(0, 5.2)
News-Format Station-Equivalents, Fall 2000	1.39	1.19	(0, 8.7)
Change in News-Format Station-Equivs., 1995-2000	0.0966	0.945	(-2.7, 6.1)
Advertising Revenue, 1995 ($ million)	28.3	57.6	(0.05, 513)
Advertising Revenue, 2000 ($ million)	47.3	106	(0.25, 927)
Change in Advertising Revenue, 1995-2000 ($ m)	19.0	49.0	(-1.46, 413)
Local Commercial Stations' Ratings Share, 1995	71.2	20.9	(9, 92.4)
Local Commercial Stations' Ratings Share, 2000	71.0	20.5	(11.2, 92.2)
Change in Local Comm. Stations' Share, 1995-2000	-0.257	4.04	(-12.6, 13.1)
Mean Percentage of People Listening to Radio, 1995	16.4	1.01	(13.4, 18.9)
Mean Percentage of People Listening to Radio, 2000	15.1	0.931	(12.3, 18.2)
Change in Listenership, 1995-2000	-1.32	0.735	(-3.7, 1.2)

Table 2.9: Explaining Ownership Concentration

Outcome Variable:	Stations Owned by Market's Largest Firm, 2000	Stations Owned by Market's Largest Firm, 2000	Stations Owned by Market's Largest Firm, 2000	Change in Stations Owned by Market's Largest Firm, 1995-2000	Change in Stations Owned by Market's Largest Firm, 1995-2000	Change in Stations Owned by Market's Largest Firm, 1995-2000
Calculated Radio Ownership Limit, 1996	-0.0142 (0.0235)	-0.0108 (0.0234)	-0.035 (0.026)	–	–	–
Licensed Commercial Stations, 2000	0.111*** (0.0117)	0.123*** (0.0123)	0.139*** (0.0147)	–	–	–
Licensed Nonommercial Stations, 2000	–	-0.0666** (0.0276)	-0.0657** (0.0294)	–	–	–
Per Capita Income ($k), 2001	–	-0.0361 (0.0256)	-0.0562 (0.0373)	–	–	–
Change in Calculated Radio Ownership Limit, 1995-1996	–	–	–	0.292*** (0.0389)	0.278*** (0.0404)	0.241*** (0.0436)
Change in Licensed Commercial Stations, 1995-2000	–	–	–	0.213*** (0.0701)	0.209*** (0.0708)	0.164** (0.0750)
Change in Licensed Nonommercial Stations, 1995-2000	–	–	–	–	0.122 (0.117)	0.157 (0.117)
Change in Per Capita Income, 1996-2001	–	–	–	–	0.0200 (0.0833)	0.00399 (0.0851)
Demographics (Age, Gender, Race) as of 2001	No	No	Yes	No	No	Yes
Constant	3.31*** (0.180)	3.97*** (0.467)	7.62 (32.8)	1.03*** (0.192)	1.03*** (0.205)	-61.3* (35.7)
No. of Obs.	289	285	285	289	285	285
R-Squared	0.508	0.521	0.558	0.229	0.223	0.279
F-Statistic	147	76.2	19.8	42.4	20.1	6.09

*** Denotes significance at the 1% Level, ** denotes 5% level, * denotes 10% level.

Table 2.10: Concentration's Effect on Radio-Market Outcomes

Outcome Variable:	Change in Format Variety, 1995-2000	Change in News-Format Stations, 1995-2000	Change in Advertising Revenue ($m), 1995-2000	Change in Local Commercial Ratings Share, 1995-2000	Change in Listenership, 1995-2000
Change in Stations Owned by Market's Largest Firm, 1995-2000 [Instrumented by Change in Local Ownership Limit, 1995-1996]	0.802*** (0.277)	0.133 (0.0956)	34.3*** (6.19)	-1.17** (0.524)	-0.00186 (0.0967)
Change in Licensed Commercial Stations, 1995-2000	0.318** (0.156)	0.174*** (0.0539)	-10.3*** (3.86)	0.465 (0.287)	0.00599 (0.548)
Change in Licensed Nonommercial Stations, 1995-2000	0.0112 (0.220)	-0.101 (0.0757)	-1.02 (5.03)	0.134 (0.393)	0.0519 (0.0712)
Change in Per Capita Income, 1996-2001	-0.0156 (0.155)	0.0128 (0.0533)	-1.54 (3.54)	-0.741*** (0.275)	-0.0411 (0.0575)
Constant	-0.274 (0.636)	-0.419* (0.219)	56.5*** (14.1)	3.07** (1.36)	-1.31*** (0.279)
No. of Obs.	262	262	268	173	155
R-Squared	N/R	0.0392	N/R	N/R	0.0067
F-Statistic	8.13	6.98	8.49	3.10	0.31

*** Denotes significance at the 1% Level, ** denotes 5% level, * denotes 10% level. "N/R" = Not Reported by Stata.

Chapter 3

Sequential Musical Creation and Sample Licensing

3.1 Musical Appropriation, Borrowing, and Reference

Sampling is the musical practice of using fragments of existing sound recordings by other musicians (called "samples") as part of a new piece of music.[1] Digital technology has made sampling much less costly and has contributed to sampling's proliferation as a musical practice, playing a significant role in genres like hip-hop, electronic, and art music. Sample-based music has enjoyed enormous commercial and critical success. But copyright law presents obstacles to sampling and other forms of sequential creation. Copyright law recognizes two types of copyrights in music, protecting both (1) musical compositions and (2) sound recordings, which are often recordings of particular renditions of copyrighted compositions. Both kinds of copyrights can be implicated by a single sample, meaning that sampling often requires two separate licenses. Obtaining such licenses can be costly–or even impossible, when copyright holders refuse to deal. In this chapter, I develop an economic model of sequential musical creation to inves-

[1] *See* MARK KATZ, CAPTURING SOUND: HOW TECHNOLOGY HAS CHANGED MUSIC138-41 (2004).

tigate the optimal design of copyright law for handling the creation of sample-based works.

Many musical practices involve borrowing, appropriating, or taking from preexisting musical works; sampling is not unique in this regard. The long-common practice of quotation involves taking a short phrase from a prior composition and working it into a new composition. Quotation differs from sampling because it does not copy part of an existing sound recording to make its reference, but it too involves borrowing from prior material. "Covers" are re-recordings of musical compositions that other musicians have recorded previously. Cover artists can tailor the composition to their own styles and make their own arrangements, but only up to a point. Less literal forms of borrowing occur all the time when musicians allude to previous music, adopt another musician's style, or work in a genre developed by countless previous musicians. Most importantly, almost all music uses basic building blocks like notes, scales, chords, compositional forms, and instruments. Only the rarest of musical works fails to use techniques of appropriation, borrowing, or reference.[2] Thus, all musical innovation involves combination and recombination of many elements, along with the addition of new elements, to produce a unique creation. But copyright law contains stark differences in how it treats the various modes of musical borrowing. As Section 3.2 describes, the recent *Bridgeport* case has staked out a new extreme in the disfavored treatment of sampling under U.S. copyright law.

Economically, musicians' production functions use existing musical works as in-

[2]*See*, *e.g.*, JOANNA DEMERS, STEAL THIS MUSIC: HOW INTELLECTUAL PROPERTY LAW AFFECTS MUSICAL CREATIVITY 31-70 (2006).

puts of production.[3] Section 3.3 explores the implications of assuming that samplers negotiate with licensors for the use of existing works, based on the sample-licensing negotiations that occur in the music industry. The parties' inability to write contracts before production that allow both licensors and licensees to cover their costs results in what the patent literature calls the division-of-profit inefficiency. Circumstances exist in which either samplers' or samplees' incentive constraints result in their music not being created. This illustrates how copyright's regime for sampling can backfire when it attempts to maximize copyright holders' incentives rather than providing a balance between copyright holders and subsequent users.[4] When the sample-based work is not created, the copyright holder in the existing work receives no licensing revenue, harming the creators of existing works that the stronger copyright regime was supposed to help. The final subsection of Section 3.3 extends the model to the multiple-licensor setting, to capture the situation in which sample-based songs are collages of many complementary samples.

Copyright law's regime governing musicians' use of existing music plays a large role in what existing music can enter the production process, when licenses become necessary, and how much licenses (and the licensing process) cost. The particular institutions and relationships involved in licensing negotiations will also play a significant role. By specifying a formal model of how law, institutions, and incentives interact in

[3]For a model focused on complete duplication that also recognizes that creative works are inputs to subsequent creative works, see WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 71-84 (2003).

[4]*Cf.* JESSICA LITMAN, DIGITAL COPYRIGHT 77–86 (2001) (describing the shift in copyright's overarching rationale from a bargain between creators and the public to an attempt to maximize creators' incentives).

the context of sample licensing, this paper aims to provide systematic understanding of the economic forces at work. Ideally, such modeling could someday result in a model with both testable predictions and measurable variables—a tall order in the copyright context. In the meantime, studying the incentives involved in sample licensing might allow for a better design for copyright's handling of sequential musical creation.

3.2 Copyright's Regime for Sequential Musical Creation

This section provides some background in music copyright. It also explains the statutory provisions and judicial opinions that govern musical appropriation, borrowing, and reference in general, and sampling in particular.

3.2.1 Copyright Basics

As mentioned above, two kinds of copyrights potentially apply to any song or other piece of music: a sound recording copyright[5] and a musical composition copyright.[6] In popular songs, and most classical and jazz pieces, the sound recording is a particular recorded rendition of an underlying musical composition, which includes the melody, chords, rhythm, structure, and lyrics. The two copyright holders in a song may be identical but often they are distinct. For example, Bob Dylan often records his own compositions, but the Byrds also recorded versions of many of his compositions.

[5]Sound recordings are defined as "a series of musical, spoken, or other sounds [except for movie soundtracks] . . . regardless of the nature of the material objects . . . in which they are embodied." 17 U.S.C. §101 (2000). They were not protected under federal law until 1971. Sound Recordings Act, Pub. L. No. 140, 85 Stat. 39 (1971).

[6]The copyright code uses the term "musical work," but does not define it except to say that lyrics are included. 17 U.S.C. §102(a)(2) (2000).

Recording artists often transfer their sound recording copyrights to record labels in return for financing and marketing their works, as well as advance and royalty payments. Composers and songwriters generally sign contracts with publishers to administer their copyrights, splitting the revenue. In addition, many composers belong to one of the performing rights organizations, ASCAP, BMI, or SESAC. These organizations administer blanket licenses for radio stations, concert venues, and others to perform their members' songs publicly.[7] In the models below, I will treat the sound recording copyright holders and the musical composition copyright holders in existing works as single entities. In reality such agents are more complex, but I assume that their profit-maximizing incentives are aligned sufficiently for the analysis to be meaningful.

Musical compositions come with five exclusive rights: reproduction, distribution, preparation of derivative works (such as adaptations and translations), performance, and display. Sound recordings come with the same first three rights, a performance right limited to certain online performances (*i.e.*, leaving out performances on traditional AM and FM radio), and no display right.[8]

Using a sample often involves infringing exclusive rights in both a copyrighted composition and a copyrighted sound recording. This is because taking a fragment of a sound recording necessarily means using the part of the composition underlying that fragment. For instance, using a sample of Marvin Gaye and Tammi Terrell singing "Ain't no mountain high enough / Ain't no valley low enough" means not only using a

[7] For a primer on the music industry, see generally DONALD S. PASSMAN, ALL YOU NEED TO KNOW ABOUT THE MUSIC BUSINESS (2000).

[8] 17 U.S.C. §106 (2000).

recording of Gaye's and Terrell's voices singing those lines, but also using the melody, harmony, and rhythm that make up the lines in the composition. A single action can infringe multiple rights at once; sampling often does so. Using a sample can constitute a reproduction. It can also constitute a derivative work, because taking a fragment of an existing work and placing it into a sound collage is a form of adaptation. Additionally, sampling can also implicate the copyright holders' distribution and performance rights if the sample-based song is marketed to the public, played live, or played on radio or television).

The foregoing discussion uses conditional language ("can infringe"; "might infringe") to address whether a sample actually infringes a composition, sound recording, or both. The conditional verb tense is necessary for three sets of reasons. First, not all compositions and recordings are subject to copyright protection. For example, some sound recordings pre-date federal or state copyright protection. Other copyrights may have existed at one time, but later expired because of copyright's limited duration or because the copyright was not renewed at a time the law still required renewal.[9] Moreover, copyright owners can voluntarily put works into the public domain, meaning that the public can use them freely.

Second, a sample might *not* infringe because even currently valid copyrights are subject to limitations and exceptions. For instance, courts have recognized a "de minimis" threshold, meaning that using very small portion of a copyrighted work will not

[9]Copyright is also limited in time, expiring 70 years after an author's death. 17 U.S.C. §302(a) (2000). Copyrights lasts for 95 years after publication (or 120 years after creation, whichever comes first) for a "work for hire," meaning a work either commissioned or performed by an employee within the scope of employment. *Id.* §§101, 302.

necessarily constitute infringement.[10] Another important limitation on copyright protection is the fair use doctrine, which gives infringement defendants an affirmative defense for activities "such as criticism, comment, news reporting, teaching, ... scholarship, or research."[11] Many other limitations to copyright, both broad and narrow, exist in the copyright code and in case law, but these are the most important provisions for the model in this chapter.

The third and final reason a sample may not infringe a copyright would be a failure on a copyright-infringement plaintiff's part to demonstrate that the sample-based song is "substantially similar" to the plaintiff's recording or composition. Some infringement cases involve identical copies of an entire work. But many other infringement cases involve things that come close but are not identical—the idea being that altering a minuscule detail of a copyrighted work should not exonerate a brazen copier. Courts do not require a complete, perfect copy for infringement. Instead, courts adjudicate claims for infringement of the reproduction and derivative-works rights based on the substantial similarity test.[12] Because sampling is a unique form of musical borrowing, one treatise writer has developed a modified concept of substantial similarity called "fragmented literal similarity" to handle sampling cases in which "the similarity [between two parties' works], although literal, is not comprehensive—that is, the fundamental substance, or skeleton or overall scheme ... has not been copied; no more than a line, or a paragraph, or a page or chapter of the copyrighted work has been appropriated."[13] The treatise

[10]See Judge Newman's discussion in Ringgold v. Black Entertainment Television, 126 F.3d 70. 74-76 (2d Cir. 1997) (declining to find the defendant's use de minimis).

[11]17 U.S.C. §107 (2000).

[12]*See* JULIE E. COHEN ET AL., COPYRIGHT IN A GLOBAL INFORMATION ECONOMY 353-94 (2002).

[13]NIMMER ON COPYRIGHT §13.03[A][2] (2005).

provides “no easy rule of thumb” but advises courts to consider the sample both quantitatively and qualitatively with respect to the “*plaintiff's*” work.[14] The cases in the next subsection will illustrate how that doctrine applies in the sampling context.

The dual nature of music copyright—splitting the rights in music into composition copyrights and sound recording copyrights—means that the number of necessary licenses is generally at least double the number of sampled songs. The limited nature of copyright means that samplers will often, but not always, require a license to use existing works. In particular, samplers are free to use works that were never copyrighted and works whose copyrights have expired. Samplers may also engage in non-infringing uses of copyrighted works without permission or a license, but such uses may be difficult, uncertain, and costly to identify. In the models of this chapter, non-infringing uses or works not under copyright have a licensing fee of zero, but they may come with information costs to verify their status as non-infringing.

3.2.2 Sampling Case Law

Digital technology and the rise of hip-hop led to an increase in sampling activity among musicians in the 1970s and 1980s. By the 1980s, copyright owners began to file lawsuits, many of which settled out of court. In 1991, *Grand Upright Music v. Warner Brothers Records* was the first published judicial opinion to establish that sampling was copyright infringement.[15] Rapper Biz Markie admitted to sampling the song “Alone Again (Naturally)” by Gilbert O'Sullivan. Judge Kevin Duffy's opinion famously opened with the

[14] *Id.* (emphasis in original).
[15] 780 F. Supp. 182 (S.D.N.Y. 1991).

phrase "Thou shalt not steal," and found that Biz Markie's sample infringed O'Sullivan's composition copyright.[16] Although the opinion lacked a thorough analysis of copyright law, the case signaled to the music industry that samples should be cleared to avoid an infringement lawsuit.

More lawsuits ensued.[17] Each sampling case is decided based on the specific facts and context.

Three particularly prominent sampling cases—one about fair use, two about the de minimis threshold—illustrate the difficulties of discerning the boundary between infringing and non-infringing samples.

The Supreme Court addressed a sampling-related dispute that began when rap group 2 Live Crew sampled parts of Roy Orbison's "Pretty Woman." The Court held that a parody—even a commercial parody for which permission was sought and then denied—could be a fair use of the composition it mocked.[18] The Court also suggested that other, non-parodic, "transformative uses" could qualify as fair use.[19] But subsequent case law has not established anything like the (relatively) safe harbor that parody enjoys.

A unique and interesting case arose after the Beastie Boys sampled a three-note

[16] *Id.* at 182.

[17] *See*, *e.g.*, Williams v. Broadus, 99 Civ. 10957 (MBM), 2001 U.S. Dist. LEXIS 12894 (S.D.N.Y. August 27, 2001) (holding that a genuine factual issue existed whether plaintiff Marley Marl's song, which sampled Otis Redding's "Hard to Handle," was itself an unauthorized derivative work, which would exonerate defendant Snoop Dogg for sampling Marley Marl's song); Fantasy, Inc. v. La Face Records, No. C 96-4384 SC ENE, 1997 U.S. Dist. LEXIS 9068 (N.D. Cal. June 24, 1997) (dismissing the plaintiff's complaint for creating an unauthorized derivative work because the sampled recording, made in 1971, predated federal protection for sound recordings, which did not occur until 1972); Jarvis v. A&M Records, 827 F. Supp. 282 (D.N.J. 1993) (denying summary judgment for defendant group C&C Music Factory because it might have infringed by sampling a qualitatively important keyboard part and short but qualitatively important lyrical phrases from a song by plaintiff composer Boyd Jarvis).

[18] Campbell v. Acuff-Rose Music, Inc., 510 U.S. 569, 581-85 (1994).

[19] *Id.* at 579.

melodic phrase—C, D-flat, C, played on the flute over an overblown background C—from Newton's composition "Choir."[20] The Beastie Boys had licensed the sound recording from Newton's record label. But they had not licensed the underlying composition from Newton himself, who owned the publishing rights. The Ninth Circuit affirmed the district court's holding that the Beastie Boys' use was de minimis, applying an ordinary observer interpretation of that exception to infringement.[21] The court held that the three notes were " 'a common building block tool.' that 'has been used over and over again by major composers in the 20th century.' "[22]

Two years later, *Bridgeport Music, Inc. v. Dimension Films* held that no de minimis threshold applied to sound recordings.[23] "100 Miles and Runnin'," a song by N.W.A., sampled two seconds from a guitar solo of the George Clinton song "Get Off Your Ass and Jam." The two-second sample was a recording of three notes from a single chord played in rapid succession (what musicians call an arpeggio). "100 Miles and Runnin' " was used in the movie *I Got the Hook-Up* without a synchronization license for the sound recording.[24] The court read Section 114(b) of the copyright code, which explicitly excludes "entirely . . . independently created" works from the reach of the reproduction and derivative-works rights of sound recording copyrights,[25] to imply the converse: that any work not entirely independently created infringes.[26] The end result

[20]Newton v. Diamond, 388 F.3d 1189, 1191 (9th Cir. 2003).

[21]*Id.* at 1193 ("To say that a use is de minimis because no audience would recognize the appropriation is thus to say that the use is not sufficiently significant.").

[22]*Id.* at 1196 (quoting testimony defendants' expert Dr. Lawrence Ferrara).

[23]410 F.3d 792 (6th Cir. 2005). In other words, the court held that, for sound recordings, the de minimis threshold is zero.

[24]The musical composition had received a synchronization license. *Id.* at 796.

[25]17 U.S.C. §114(b) (2000).

[26]*Bridgeport*, 410 F.3d at 800.

is that in the Sixth Circuit (Tennessee, Kentucky, Ohio, and Michigan) there is no de minimis threshold for the infringement of copyrighted sound recordings. Or, as put it: "Get a license or do not sample."[27] The court allowed for the possibility of fair use but did not rule on that issue.[28] While other circuits may reject this approach in the future, *Bridgeport* has effectively become the law of the land for the time being. Since most recordings are marketed nationwide, infringement plaintiffs will generally have the opportunity to file in the Sixth Circuit.

The copyright policy of *Bridgeport*, along with other cases holding that sampling can be copyright infringement, motivates this chapter's analysis. Should copyright holders enjoy a strong property right in samples—small fragments of larger works? Or would it be more efficient for copyright law treat some samples as too small to infringe?

3.3 A Model of Sequential Musical Creation

This section explores the assumption that samplers negotiate with licensors for the use of existing works, rather than taking input prices as given from a market for samples. The prevailing music-industry practice is to negotiate sample licenses on a case-by-case basis. Although some copyright owners offer a menu of licensing fees, with licenses available to all comers at a certain price, most copyright owners engage in individual negotiations with would-be samplers.

[27] *Id.* at 801.
[28] *Id.* at 805.

3.3.1 Setting up the model

Suppose that a new piece of music requires using a digital sample of one existing piece of copyrighted music. Assume that the new derivative work will have no value without incorporating the sample.[29] In addition, assume that the new piece of music definitely infringes both the composition and sound recording copyrights in the sampled piece of music. If the sampler failed to obtain licenses from both copyright holders, then he or she would be found liable and his or her payoff would be significantly negative. Thus, without licenses the new work will not be produced.

The original, sampled work would yield value to consumers of v, which reflects the combined value of its recording and underlying composition (experienced as a unified whole by listeners). The composer and recording artist of the existing work must both make their contributions for the existing work to have value; if either declines to produce her contribution, the existing work has zero value and is not created. The new, sample-based work has a value to consumers of q. The creator of the sample-based song is both composer and recording artist for that song.

Musicians have fixed costs of production, which include the costs of capital (e.g. recording equipment) and labor (e.g. session musicians), and zero variable costs. The fixed costs of production to specific to each of the three works are: c_{DW} for the new, sample-based work; c_{SR} for the preexisting sound recording; and c_{MC} for the preexisting musical composition.

The optimal marginal cost of information once it has been created is (very close to)

[29]The assumption that the derivative work loses all its value without the sample will be relaxed later in the chapter.

zero, but copyright law allows copyright owners to maintain a price for their goods that is meaningfully greater than zero. The parameters describing the consequences of this feature of copyright law are as follows: Copyright holders can collect revenue equal to a fraction π of their works' value to consumers. Society experiences deadweight loss l every period a work is under copyright. Both π and l are functions of the duration of copyright and the social discount rate, but making that explicit does not affect the model's basic implications.

Thus, the total social value will be positive for each work under the following conditions [the "positive social value conditions"]:

- For the new, sample-based song: $q\,(1-l) - c_{DW} > 0$
- For the existing, sampled song: $(v+q)\,(1-l) - c_{MC} - c_{SR} - c_{DW} > 0$

The goal of the model is to demonstrate that even when these positive social value conditions hold, one or both songs might not be created. This is true even with perfect information, risk-neutrality of all agents, and zero transaction costs (all of which the model assumes).

3.3.2 Division of profit: The source of inefficiency

What will drive the model's results are two key facts together with insights about bargaining, credible threats, and backward induction. First, sampling may occur long after the sampled work is created. The sampler's identity is not known when the original, sampled work is created, making an ex ante agreement impossible. If the sampler stands to make profits but the sampled musicians would fall short (looking ahead to sales of their work and the Nash-bargaining outcome of licensing negotiations), there is no way the sampler can promise to give the sampled musicians a better deal—the sampler doesn't know he wants to be a sampler yet, because the original work doesn't exist yet.

Second, if the original work exists and the sampler chooses to sample it, the sampler does not know a license is necessary until after sinking her costs of producing her sample-based song. This stems from the institutional details of musical production. A musician often does not know what sample is desired until she spends the studio time to create a song with that sample. This makes licensing before creation of the sample-based work very rare. Given that, if the sampler stands to fall short of making a profit (looking ahead to sales of her work and the Nash-bargaining outcome of licensing negotiations), there is no way for the sampler to make a credible threat not to create the sample-based song—if licensing negotiations have started, the sampler's production costs are already sunk.

The model presented here is an adaptation of a model by Green and Scotchmer that focused on the patent context, particularly the issue of patents for basic research.[30] In the context of sequential innovation, where basic research may lead to commercially valuable products, a danger exists that—without patent protection—basic researchers will not have sufficient incentives for their research. This can occur even when that basic research and all the commercially marketable products it would lead to would

[30] See Jerry Green & Suzanne Scotchmer, *On the Division of Profit in Sequential Innovation*, 26 RAND J. ECON. 20 (1995), particularly the presentation in SUZANNE SCOTCHMER, INNOVATION AND INCENTIVES135-42 (2004).

have net positive social value.

The contribution of this chapter is to demonstrate that the problem is reciprocal. Not only can the absence of intellectual property protection endanger the creation of upstream works, the presence of intellectual property protection can endanger the creation of downstream works. When society would benefit from both works, the incentives of both copyright owners of sampled works and the musicians who sample matter.

The game play proceeds as follows:

1. The values of all variables are known and taken as given.

    - Consumer demand determines the value of each work, v and q.
    - Music production technology and the idiosyncrasies of each work determine the cost, c_{XX}, to each musician.
    - The parameters π and l are commonly known.
    - Only the identity of the sampler is not known to the creators of the sampled work.

2. The composer of the original work decides whether to create the composition.

3. The recording artist of the original work decides whether to make the recording.

4. If either the composition or the recording is not created, the original work will not exist and the game ends. If the original work does exist, the sampling musician decides whether to create the sample-based work.

5. If the sample-based work exists, then the sampler must obtain two licenses, one from the composer and one from the recording artist, or else the sample-based work cannot be released commercially and garner revenue.

Solving the model requires backward induction and thus starts with the fifth and last step: licensing negotiations. Bargaining among the sampler and the samplees takes place according to the three-person licensing game described in Appendix A. As a result of bargaining, the parties split $q\pi$ roughly $\frac{1}{3}, \frac{1}{3}, \frac{1}{3}$, the Nash solution. As Appendix A shows, the Nash result is approximated as the negotiating parties' subjective (commonly held) discount factor approaches unity.

At the fourth step, the sampling musician decides whether to produce her song or not. She will do so whenever the revenue she can collect exceeds the licensing fees she must pay and her production costs:

$$q\pi < \left(\frac{2q}{3}\right)\pi - c_{DW}$$

Thus, society will lose out on sample-based works that have positive social value when:

$$q\,(1-l) - c_{DW} > 0 \qquad \textbf{but} \qquad \left(\frac{q}{3}\right)\pi < c_{DW}$$

In other words, when the sampler's one-third share of the profit from the derivative work is not great enough to cover the fixed costs of producing the work, then the derivative work will not be produced.

This is partly a result of the three-way split of the derivative work's profits. But at its root, it is a result of the institutional setting; samplers typically do not seek out licensors until their sample-based works have already been created. This makes the case of ex ante licensing, more relevant in the patent context of Scotchmer and Green, unusual in this context. Only ex post licensing is realistic in the music industry, when songs generally have to be created and heard to be evaluated. If ex ante licensing were possible, then the costs as well as the revenues of the derivative work could be shared among the original sound recording copyright holder, the original musical composition copyright holder, and the sampler.

At the third step, the recording artist of the sampled work decides whether to record the composition, if it exists. The compulsory license for cover versions compositions gives the recording artist of the sampled work leverage to pay the composer a fixed fraction $m < \frac{1}{2}$ of the sampled work's revenue. The composer does worse than the two-person Nash-bargaining result of $\frac{1}{2}, \frac{1}{2}$. As mentioned above, a recording artist can cover a composition without the composer's permission if it has been commercially released once. But this compulsory license for second, third, and *nth* versions has historically influenced the licensing fee for the first recording of a composition as well. If a composer refused to grant the recording artist a license to be the first to record a composition, the recording artist would merely have to wait until another artist recorded the song, at which point the recording artist could immediately take advantage of the compulsory license. Thus, in music-industry practice, composers typically receive the current statutory rate as a royalty on sales of recordings.[31]

Thus, at the third step, the recording artist decides whether the fraction $(1 - m)$ of

[31] *See* 17 U.S.C. §115(a)(2); *see also* Passman, *supra*. The current rate is 9.1 cents per copy sold or 1.75 cents per minute, whichever is greater. U.S. Copyright Office, Mechanical License Royalty Rates (May 30, 2006), *at* http://www.copyright.gov/carp/m200a.html (last visited May 17, 2009).

the revenue $v\pi$ from the sampled work is sufficient to cover her costs c_{SR}. At the second step, the composer decides whether the fraction m of the revenue $v\pi$ from the sampled work is sufficient to cover her costs c_{MC}.

Steps two and three determine whether any music is produced at all. If the composer and recording artist of a work cannot cover their costs through sales of their own song plus licensing fees from the song that samples theirs, they will not produce. The social value of the original, sampled work includes the value of the new, sampling work that depends on it. Society will lose out on two works that collectively have positive social value when:

$$(v+q)(1-l) - c_{MC} - c_{SR} - c_{DW} > 0 \qquad \textbf{but} \qquad \left[(1-m)\,v + \frac{q}{3}\right]\pi < c_{SR}$$

or:

$$(v+q)(1-l) - c_{MC} - c_{SR} - c_{DW} > 0 \qquad \textbf{but} \qquad \left(mv + \frac{q}{3}\right)\pi < c_{MC}$$

The logic of these equations is similar. If one of the original creators cannot cover its costs—even with the help of receiving one-third of the revenue from the derivative work—then neither the original nor the derivative work will be produced.

Two inefficiencies are possible. The creators of either the prior, sampled work or the later, sampling work could fail to meet their incentive constraints. It might seem counter-intuitive that inefficiency could arise from a perfect information, zero-transaction-cost model with no uncertainty and risk-neutral agents. The driving force of the inefficiency is that musicians sink their costs before negotiating licenses, whether for samples of or samples used in their work. Viewed from another angle, the source of the inefficiency is the timing of the agents' actions. The sequence of events means that a single piece of information is missing when production occurs: the identity of the licensor or licensee they will need to negotiate with to authorize the use of a sample.

3.3.3 Comparing two copyright regimes

The preceding subsection describes the inequality conditions that determine when socially desirable works will not be created. Those conditions resulted in part from the assumption that the sample infringed the original work's copyright. Making the opposite assumption, that the sample does not infringe the original work's copyright, would alter the conditions for inefficiency as follows. Inefficiency would occur whenever any one of the following pairs of inequalities holds:

$$q\,(1-l) - c_{DW} > 0 \qquad \textbf{but} \qquad q\pi < c_{DW}$$

$$(v+q)\,(1-l) - c_{MC} - c_{SR} - c_{DW} > 0 \qquad \textbf{but} \qquad (1-m)\,v\pi < c_{SR}$$

$$(v+q)\,(1-l) - c_{MC} - c_{SR} - c_{DW} > 0 \qquad \textbf{but} \qquad mv\pi < c_{MC}$$

Each pair of inequalities has a positive social value conditions and an incentive constraint; there is one pair for each musician in the model, as in the previous subsection. The only difference is that the licensing-fee terms, $\frac{q}{3}\pi$, have been eliminated.

Switching to a regime in which samples do not receive copyright protection tilts the likelihood toward the sampling musician being able to meet her incentive constraint. In particular, society gains sample-based derivative works—relative to the copyright regime—whenever $\frac{q\pi}{3} < c_{DW} < q\pi$ and the recording artist and composer of the original work can meet their incentive constraints without licensing fees, *i.e.*, $(1-m)\,v\pi >$

c_{SR} and $mv\pi > c_{MC}$. When these conditions hold, a no-copyright regime produces two works whereas the copyright-in-samples regime produces only one work, the original song. That is the marginal benefit of eliminating copyright in samples.

At the same time, moving to a no-copyright regime means it is less likely that the sampled musicians will meet their incentive constraint. Under this regime, society loses original works—relative to the copyright regime—whenever $(1-m)\,v\pi < c_{SR} < \left[(1-m)\,v\pi + \frac{q\pi}{3}\right]$ or $mv\pi < c_{MC} < \left[mv\pi + \frac{q\pi}{3}\right]$, provided that the sampling artist can still afford the cost of production while paying licensing fees *i.e.*, $\frac{q\pi}{3} > c_{DW}$. When these conditions hold, a no-copyright regime produces no works at all, because at least one of the creators of the original work cannot meet her incentive constraint. Those lost works are the cost of shifting away from copyright protection for samples. Under these same conditions, the regime with copyright in samples would foster the production of both works.

Which regime is more efficient, copyright or no copyright in samples, depends on the distributions of the random variables v, q, c_{MC}, c_{SR}, and c_{DW}, as well as the parameters π, l, and m. The specifics of these distributions and parameters determine whether the value of the works gained outweighs the value of the works lost; in general, either regime *could* be more efficient.

Here is an example where a no-copyright regime is more efficient than a copyright-in-samples regime. Let $\mathbf{U}(a,b)$ denote the uniform distribution over the interval $[a,b]$ and assume the following:

- $v \sim \mathbf{U}(0,4)$

- $c_{MC} \sim \mathbf{U}(0, 0.9)$
- $c_{SR} \sim \mathbf{U}(0, 0.9)$
- $q \sim \mathbf{U}(0, 4)$
- $c_{DW} \sim \mathbf{U}(0, 2)$
- $\pi = 0.5$
- $l = 0.25$
- $m = 0.5$

Under these assumptions, the no-copyright regime is superior approximately 13.6 percent of the time, with derivative works of mean value 1.11 being lost. The total gain to having no copyright in samples is thus 0.151 on average (13.6 percent times 1.11). Also under the above assumptions, the copyright-in-samples regime is superior 6.59 percent of the time, with original and derivative works of combined mean value 2.24 being lost. The total loss from having no copyright in samples is thus 0.148 on average. The gain to switching to the no-copyright regime exceeds the cost. The no-copyright regime is more efficient under the above assumptions.

The above is just one example of what might happen in the sequential innovation context between a sampling musician and the musicians she samples. It proves, by counterexample, that copyright protection for samples can be less efficient than having no copyright protection for samples. This is true even in the absence of transaction costs, uncertainty, risk-aversion, imperfect information, externalities, or other market imperfections. The only barriers to efficiency are the timing of production and the necessity of sinking one's production costs before one can grant or obtain a license to sample.

3.3.4 Extension: Multiple samples within one derivative work

A straightforward way to extend the model from the single-sample to the multiple-sample case is to approximate the result of n-way bargaining with the Nash solution: each party receives $\frac{1}{n}$ of the bargaining surplus. In the model, the parties are bargaining over the returns to the sample-based work, $q\pi$. With one sample, each party received $\frac{q\pi}{3}$, because there were three parties at the bargaining table: the original composer, the original recording artist, and the sampling musician. With two samples, there would be five parties at the bargaining table (two original composers, two original recording artists, and the sampling musician). In general, each licensor and the sampling musician will receive:

$$\frac{q\pi}{2n+1} \quad \text{where} \quad n \quad \text{is the number of samples}$$

Taking the limit of this expression, we see:

$$\lim_{n\to\infty} \quad \frac{q\pi}{2n+1} = 0$$

As the number of samples increases, the sampling musician's revenue approaches zero. Each licensor's licensing revenue also approaches zero (meaning that each licensor's incentive constraint approaches what it would be if the sample-based work did not exist).

This simple extension of the model captures a kernel of truth about the real world of sample licensing. In practice, musicians who use multiple samples per song—creating, say, a collage of twenty or more existing songs—cannot hope to obtain the necessary licenses without pushing their revenue to zero or less.[32]

3.4 Extension: Adjustment to sample length is possible

The model of the previous section assumes that the entire value q of the downstream work depends on its sample of the upstream work. In that context, one can only compare two extremes of copyright law: copyright protection for samples or no such copyright protection. In this section, I extend the model such that: (a) only a fraction of the downstream work's value depends on the sample and (b) the fraction of value that does depend on the sample is proportional to the sample's length in time. This allows investigation of a third policy option: copyright protection for samples with limitations and exceptions.

The de minimis threshold for copyright infringement embodies the idea that some uses of existing music are so small that the law should not recognize them as violations. It was the subject of the recent *Bridgeport* decision, which ruled that no de minimis threshold exists for sound recordings analogous to that for compositions. The de minimis threshold lends itself straightforwardly to quantitative modeling. Another important limitation on copyright, fair use, involves a larger set of considerations and would require a richer set of variables to analyze. But one consideration in fair use analysis is the quantity used of the original work, meaning that a model of the de minimis threshold

[32]The possibility of licensing fees that exceed the sales revenue of the sample-based work could be captured with a model where each sample has its own market with a market-determined (rather than bargaining-determined) price. In a market-based model, nothing would constrain the samples from exceeding sales revenue.

takes one step in the direction of modeling fair use.

Instituting such a threshold allows the law some breathing room, which could have important benefits in terms of samplers' incentives and in terms of avoiding the transaction costs of licensing. The de minimis threshold will also have the consequence of providing some samplers with the incentive to shorten their samples, to take advantage of copyright law's choice to limit its own reach.

3.4.1 Revising the model

Suppose that copyright subsists in any fraction [measured in time] of a musical work $\overline{y} \in (0,1)$. Each sampler, in the one-sample set up, will have a desired sample length y^*. The new, sample-based work has an associated loss function $L(y)$ which measures the proportional loss in value from adjusting the length of a sample downward from y^*. This loss function has the form:

$$L(y) \equiv \left(\frac{y^* - y}{y^*}\right)^{\frac{1}{\lambda}}$$

with $y^* * \in (0,1)$ denoting the desired sample length and $\lambda \in (1, \Lambda)$ for some large, finite Λ parameterizing the degree of distaste for moving away from the most desired sample. Higher λ means more distaste for deviations from the optimum. As a consequence of this functional form, $L(y) \in (0,1)$.[33] There is an implicit—and admittedly imperfect, since it puts the qualitative dimension of sample choice aside—assumption that shorter samples contribute less to the value of the derivative work, and thus it is most desirable to decline to compensate the tiniest samples.

[33]I assume that the licensor never wishes to grant (and the licensee never wishes to use) a larger sample than desired. Thus, there is no need for a quadratic, i.e. two-sided, loss function.

Given this loss function, the commercial value of the new, sample-based work is now $q \cdot [1 - L(y)]$. Under what circumstances will the musician reduce the sample and avoid the licensing fees? Whenever $q \cdot [1 - L(y)] \geq \frac{q}{3}$ (the musician's approximate share of the profits after licensing)—that is, whenever $L(y) \leq \frac{2}{3}$. The y that makes this equation hold with equality will depend on the sampler's particular parameters y^* and λ, and implicitly depends on the equilibrium of the three-person bargaining game.

As a result of making the sampler's decision problem more flexible, we now have three cases:

1. The sampler need neither license nor adjust he sample, because $y^* < \overline{y}$. If the sampler's desired sample length is below the de minimis threshold of copyright law, the sampler will earn $q\pi - c_{DW}$ whenever that expression is positive. The only danger of social loss is whether $\frac{q\pi}{3}$ was needed to incentivize the preexisting sound recording or musical composition.

2. The sampler can alter the sample, even though $y^* \geq \overline{y}$, to make the chosen $y < \overline{y}$. In this case, all we need for the sample-based work to be created is:

$$q \cdot [1 - L(y)]\pi \geq c_{DW}$$

   For this to be true, we need y^* to be between $\overline{y}$ and $(\frac{1}{1-(\frac{2}{3})^{\lambda}})\overline{y}$. [To see this, set $L(\overline{y}) = \frac{2}{3}$.] Again, the harm to social welfare involves any original, sampled works for which $\frac{q\pi}{3}$ was needed to incentivize the preexisting sound recording or musical composition.

3. The sampler would rather license than alter the sample because $y^* > \overline{y}$ and

$L(\overline{y}) > \frac{2}{3}$. Then the original inequalities hold from the simplest case above (the case without adjustment of samples).

3.4.2 Three different copyright regimes

Determining the optimal level of $\overline{y}$ requires an analysis of what works are gained or lost to society under different scenarios, corresponding to different levels of $\overline{y}$. In each of the three scenarios, there are up to to three cases to analyze, corresponding to different ranges of the sampler's value of y^* in relation to $\overline{y}$. Throughout the discussion, I mean to refer to works with positive social value.[34]

No copyright over derivative works. This corresponds to $\overline{y} = 1$. Under that condition, any value of y^* puts us into case (1) above. No sample of any length necessitates obtaining a license. Socially valuable derivative works are not created whenever $q\pi < c_{DW}$. Nor are they created if either $(1 - m)\, v\pi < c_{SR}$ or $mv\pi < c_{MC}$, since the creators of the original, sampled song cannot make a positive profit.

Complete copyright over derivative works. Next consider the consequence of $\overline{y} = 0$. Here, only case (3) is relevant, because there is no de minimis threshold and thus there is no reason in this simple setup for the sampler to alter the sample length. Society *gains* creative works with respect to the no-copyright scenario when both original artists cross the profitability threshold:

$$(1 - m)\, v\pi < c_{SR} < [(1 - m)\, v + \left(\frac{q}{3}\right)]\pi \quad \textbf{and} \quad mv\pi < c_{MC} < \left[mv + \left(\frac{q}{3}\right)\right]$$

[34]See the end of the preamble to Section 3.3 for the three positive social value conditions.

and sampling is still profitable:

$$\frac{q\pi}{3} > c_{DW}$$

Society *loses* socially valuable sample-based works because of the need to license when creating the derivative work slips below profitability:

$$\left(\frac{q}{3}\right)\pi < c_{DW} < q\pi$$

Therefore, there are benefits and costs from moving between a regime of no copyright at all to a regime of complete copyright.

Copyright over derivative works with a de minimis threshold. Now suppose that $\overline{y}$ is strictly greater than zero, but is still less than one. The particular costs and benefits of moving to this intermediate level of copyright protection determine the optimal level of $\overline{y}$.

Case (1): $y^* \leq \overline{y}$. Among sample-based works with y^* below the de minimis threshold, we *gain* any works for which the following relations hold:

$$\frac{q\pi}{3} < c_{DW} < q\pi; \quad mv\pi > c_{MC}; \quad \textbf{and} \quad (1-m)\,v\pi > c_{SR}$$

We *lose* both the original, preexisting work and the sample-based works for which the following relations hold:

$$c_{DW} < \frac{q\pi}{3}$$

meaning that the sample-based work would have been profitable, had the original works come into being;

$$mv\pi < c_{MC} \qquad \textbf{or} \qquad (1-m)\,v\pi < c_{SR}$$

meaning that without licensing revenue, at least one of the copyright owners of the original song will not make a profit; and

$$mv\pi + \frac{q\pi}{3} > c_{MC} \quad \textbf{and} \quad (1-m)\,v\pi + \frac{q\pi}{3} > c_{SR}$$

meaning that with the licensing revenue, the copyright owners of the original song *would* have made a profit, and thus seen fit to produce the original work.

Case(2): $\overline{y} < y^* \leq \left(\frac{1}{1-(\frac{2}{3})^\lambda}\right)\overline{y}$**.** In this adjusted-sample case, we first need to revise the positive social value conditions slightly, to reflect the derivative work's decline in value:

- Derivative work: $[1 - L(\overline{y})]q\,(1-l) - c_{DW} > 0$
- Original recording: $\{(1-m)\,v + q(1 - L(\overline{y})]\}\,(1-l) - c_{SR} - c_{DW} > 0$
- Original composition: $\{mv + q[1 - L(\overline{y})]\}\,(1-l) - c_{MC} - c_{DW} > 0$

Assuming that those conditions hold, we can now discuss the socially valuable works that would be gained or lost as compared to the complete-copyright scenario. Among sample-based works with y^* lying between the de minimis threshold and the largest sample length y that is worth incurring the loss $L(y)$ to adjust, we gain sample-based works for which:

$$\frac{q\pi}{3} < c_{DW} < [1 - L(\overline{y})] \cdot q\pi$$

which specifies that the derivative work, which was not profitable if the full sample was licensed, would be profitable with an adjusted sample. For this gain in the number of sample-based works created to occur, it also must be true that both

$$mv\pi > c_{MC} \qquad \textbf{and} \qquad (1-m)\,v\pi > c_{SR}$$

which guarantees that the original, sampled song will still be created, even without the licensing revenue.

As in Case (1), we *lose* both the original, preexisting work and the sample-based works for which the following relations hold:

$$c_{DW} < \frac{q\pi}{3}$$

meaning that the sample-based work would have been profitable, had the original works come into being;

$$mv\pi T < c_{MC} \qquad \textbf{or} \qquad (1-m)\,v\pi < c_{SR}$$

meaning that without licensing revenue, at least one of the copyright owners of the original song will not make a profit; and

$$mv\pi + \left(\frac{q\pi}{3}\right) > c_{MC} \quad \textbf{and} \quad (1-m)\,v\pi + \frac{q\pi}{3} > c_{SR}$$

meaning that with the licensing revenue, the copyright owners of the original song *would* have made a profit, and thus seen fit to produce the original work. These conditions for losing the original work are the same as in case (1) because, regardless of the sampler's particular y^*, the requirement for a work to be lost is that it was being made before and that it will no longer be licensed thanks to the de minimis exception and the ability to adjust sample length downward.

In addition, society could lose some value from samples being adjusted in derivative works that were already being made under the complete-copyright scenario. For this to occur, c_{DW} would have to be less than $\frac{q\pi}{3}$, so that the work was getting made in the complete-copyright scenario. But if it's also the case that

$[1 - L(\overline{y})] \cdot q\pi > \frac{q\pi}{3} < c_{DW}$, then the sampler will adjust the sample to make more profit. In that event, society gets only the fraction $[1 - L(\overline{y}]$ times the original social value of the sample-based work. That loss in social value must also count in the ledger when assessing the gain and loss from introducing a de minimis threshold $\overline{y}$ greater than zero.

Case(3): $y^* > \left(\frac{1}{1-(\frac{2}{3})^{\lambda}}\right)\overline{y}$**.** In this event, no works are gained or lost, nor is any social value lost, with respect to the complete-copyright scenario. No sampler with a y^* this high will find it profitable to adjust their sample; he or she will either license the sample or choose not to produce the sample-based work at all.

3.4.3 The optimal threshold for copyright protection

As in the previous section, the optimal policy will depend on the distributions of the random variables and the values of the parameters. Some general conclusions might be drawn about which regime the cost-benefit calculation would be likely to recommend. In contrast to Green and Scotchmer's concerns in the patent context about whether basic research will occur, the copyright context suggests that policy makers should have concerns about balancing the incentives of both upstream and downstream creators (rather than having a primary concern on just the upstream creators).

In the music context, ex ante licensing does occur, as when copyright holders hire other musicians to remix their songs. But many samplers do not know in advance which samples, sounds, and combinations of sounds will occur to them and sound good together. With ex post licensing, the creator of the derivative work typically has no opportunity to share their costs with the copyright owners of the original work. This is especially true in light of the distance in time that can often occur between samplee and sampler, described in subsection 3.3.2. This makes possible a number of situations in which samplers' incentive problem results in derivative works not being created. In those instances, copyright's regime for sampling can backfire. When the derivative work is not created, the copyright holder in the preexisting work receives no licensing revenue. This endangers the preexisting work's creator's ability to solve his or her incentive problem.

A positive de minimis threshold gives copyright law a mechanism to put some derivative works outside the reach of copyright, alleviating the incentive problem for some creators of derivative works and potentially providing some balance. While not perfect, sample length is an attractive policy lever because it is objective, not requiring private parties or judges to engage in aesthetic assessments to understand the reach of copyright law. But the de minimis threshold may entice some samplers to alter the samples they use from their desired lengths. That consequence has both advantages and drawbacks, in terms of the number of works created and the value of the works created. With a relatively small de minimis threshold, however, both these effects will be relatively small. Based on the simple model presented so far, it seems possible that some positive de minimis threshold would have broad social benefits.

3.5 Conclusion

This chapter has addressed the problems facing creators of derivative works in the music industry, particularly those musicians engaged in sampling or collage. Specifying a model of the division of profit between the copyright holders of preexisting works and the creator of a prospective derivative work, I have attempted to isolate what I see as the fundamental inefficiency involved. Because of factors the separation in time between the original work and the derivative work, I have argued that society has reason to be concerned about both samplees' and samplers' incentives at the same time, for the sake of both groups.

Although the model of Section 3.3 focuses on the difficulties that can arise in sample licensing because of non-contractibility, in truth the situation is both better and worse than that for musicians who sample. On the plus side, musicians can adjust the samples they use, how may samples they use, or even alter their method of musical borrowing from sampling to "replaying" small pieces of compositions themselves (which reduces the licensing burden to one type of license). Musicians can also adjust the method by which they release their music to the public; in essence, they have choice over their particular business model. The tradeoffs involved can result in differently situated musicians making different business-model choices.[35] Consideration of copyright law's policy toward sampling should take into account the flexibility that samplers have on the margins of both artistic choices and business models.

[35]A numerical simulation with calibrated assumptions about various music-industry parameters can illustrate how different business models become more and less attractive under which conditions. See Peter DiCola, "An Economic Model of Sampling, Cover Versions, and Musical Collage," (working paper on file with author, 2006).

Extending the model to the multiple-sample situation shows that the real-world situation of musicians who sample can be worse than the stylized model suggests. Moreover, market imperfections like transaction costs, uncertainty, and asymmetric information would exacerbate the division-of-profit problem. For example, adding transaction costs to the copyright-in-samples regime would create a deadweight loss that would lead the copyright regime to fare worse (under any assumptions) than the no-copyright-in-samples regime. The appropriate policy solution to the inefficiencies involved in sample licensing requires a detailed investigation of the institutional features of the music industry, a much longer project that I have participated in separately.[36] This chapter seeks to lay a foundation for that work by demonstrating that one cannot determine the optimal policy with a simplistic appeal to property rights, as the Sixth Circuit Court of Appeals took in *Bridgeport*. The division-of-profit problem, applied to the context of sample licensing, shows that the interaction between upstream and downstream authors is complex enough to resist such a priori generalizations.

[36] *See* KEMBREW MCLEOD & PETER DICOLA, CREATIVE LICENSE: THE LAW AND CULTURE OF DIGITAL SAMPLING (Duke Univ. Press, forthcoming 2010).

Appendix 3.A: A three-person licensing game

Three people bargain to divide a pie of size q. Player 1 is the licensee, while Players 2 and 3 are the licensors. Their positions are asymmetric. Player 1 deals with each other player in bilateral negotiations. Players 2 and 3 act simultaneously during each round and cannot communicate to strategize or collude. But all parties have complete information about the structure of the game and the potential payoffs.

Negotiations continue indefinitely. The discount factor is the same for all players and is $\delta \in (0, 1]$. Deals are binding once made but no bankruptcy allowed. So if the pie is not produced, no money is owed. The breakdown payoff for each player is zero.

When a deal is accepted early, the player gets paid in terms of that periods dollars, with no further discounting, even if the game carries on and the pie is not produced until a later period.[37] If one bilateral deal is made between two players (say, Player 1 and Player 2) but the other bilateral deal (between Player 1 and Player 3) is not, then the remaining two players engage in the alternating-offers game of Rubinstein,[38] which splits the pie $\left(\frac{1}{1+\delta}, \frac{\delta}{1+\delta}\right)$ between the first offeror and the first offeree.

Game play proceeds as follows:

1. In round one, Player 1 simultaneously solicits offers from Players 2 and 3, resulting in the following payoffs for (Player 1, Player 2, Player 3): $(q - a_1 - b_1, a_1, b_1)$. Players 2 and 3 each make their offers. There are four possible scenarios, based on the offers made in the first round of bargaining.

[37] See Suchan Chae & Jeong-Ae Yang, *An N-Person Pure Bargaining Game*, 62 J. ECON. THEORY 86, 89 (1994).

[38] See Ariel Rubinstein, *Perfect Equilibrium in a Bargaining Game*, 50 ECONOMETRICA 97 (1982).

(a) If Player 1 accepts both offers, then the game ends, with payoffs equal to: $(q - a_1 - b_1, a_1, b_1)$.

(b) If Player 1 accepts 2s price but rejects 3s, then we have a bilateral game between 1 and 3, in which 1 makes the first offer. The remaining pie size is: $\delta q - a_1$ and the resulting payoffs are: $\left(\frac{\delta q - a_1}{1+\delta}, a_1, \frac{\delta^2 q - \delta a_1}{1+\delta}\right)$.

(c) If Player 1 rejects 2s price but accepts 3s, then we have a bilateral game between 1 and 2, in which 1 makes the first offer. The remaining pie size is: $\delta q - b_1$ and the resulting payoffs are: $\left(\frac{\delta q - b_1}{1+\delta}, \frac{\delta^2 q - \delta b_1}{1+\delta}, b_1\right)$

(d) If 1 rejects both 2 and 3 price quotes, then we reach round two.

2. In round two, a similar 3-person game to round one is played for a pie size δq and with the difference that player 1 make the first offers. In the event that the game reaches round two, there are four scenarios:

(a) Both Players 2 and 3 can accept, ending the game with payoffs: $(\delta(q - a_2 - b_2), \delta a_2, \delta b_2)$.

(b) Player 2 could accept while player 3 rejects. This launches a bilateral game between Player 1 and Player 3, with Player 3 making the first offer and a pie size of $\delta^2 q - \delta a_2$. The resulting payoffs are: $\left(\frac{\delta^3 q - \delta^2 a_2}{1+\delta}, \delta a_2, \frac{\delta^2 q - \delta a_2}{1+\delta}\right)$.

(c) Player 2 could reject while player 3 accepts. This launches a bilateral game between Player 1 and Player 2, with Player 2 offering first and a pie size of $\delta^2 q - \delta b_2$. The resulting payoffs are: $\left(\frac{\delta^3 q - \delta^2 b_2}{1+\delta}, \frac{\delta^2 q - \delta b_2}{1+\delta}, \delta b_2\right)$.

(d) Both Players 2 and 3 could reject. Now we play the original three-person game, with Players 2 and 3 offering first, for a pie of size $\delta^2 q$. The structure is thus recursive. Call the payoffs in the subgame $(\delta^2(q-a-b), \delta^2 a, \delta^2 b)$, with no subscripts on the offers.

To solve this infinitely repeated game, I follow the solution method outlined in Gibbons.[39] Taking the second round of bargaining first, what would it take for both Player 2 and Player 3 to accept Player 1s offers? In other words, what are the incentive constraints for a subgame-perfect equilibrium?

The first four conditions determine the optimal offers by Player 1 in round two of bargaining, a_2^* and b_2^*, as a function of the continuation payoffs a and b in the event of the entire supergame being repeated (i.e., when both Player 2 and Player 3 reject Player 1's offers in the second round). These conditions can be understood as Player 1 avoiding creating a prisoners' dilemma among Player 2 and Player 3. The final three conditions consider what would it take, in the first round of bargaining, for Player 1 to accept both Player 2's and Player 3s offers.

1. Player 2's payoff δa_2 must be greater than or equal to $\delta^2 a$, the continuation payoff if neither Player 2 nor Player 3 accepts.

2. Player 3's payoff δb_2 must be greater than or equal to $\delta^2 b$, the continuation payoff if neither Player 2 nor Player 3 accepts.

3. Player 2's payoff δa_2 must also be greater than or equal to $\frac{\delta^2 q - \delta b_2}{1+\delta}$, which is Player

[39]Robert Gibbons, Game Theory for Applied Economists 68-71 (1992) (citing Rubinstein, *supra*, and Avner Shaked & John Sutton, *Involuntary Unemployment as a Perfect Equilibrium in a Bargaining Model*, 52 Econometrica 1351 (1984)).

2's payoff if Player 3 accepts while Player 2 rejects.

4. Player 3's payoff δb_2 must also be greater than or equal to $\frac{\delta^2 q - \delta a_2}{1+\delta}$, which is Player 3's payoff if Player 2 accepts while Player 3 rejects.

5. It must be the case that $q - a_1 - b_1 \geq \delta(q - a_2^* - b_2^*)$, so that it is worthwhile from Player 1's perspective not to reject both offers.

6. It must also be the case that $q - a_1 - b_1 \geq \frac{\delta q - a_1}{1+\delta}$, so that Player 1 does not have incentive to accept Player 2's offer but reject Player 3's offer.

7. Finally, and similarly, it must be true that $q - a_1 - b_1 \geq \frac{\delta q - b_1}{1+\delta}$, so that Player 1 does not have incentive to accept Player 3's offer but reject Player 2's offer.

This determines the optimal offers by Player 2 and Player 3 in round one, as a function of the second-round continuation payoffs a and b. In other words, to calculate the equilbrium, we will aim to set $a_1^*(a) = a$ and $b_1^*(b) = b$. Conditions (3) and (4) imply (1) and (2), but not the reverse. So one must solve (3) and (4), the binding incentive constraints, for Player 1s optimal second-round offers. Then, based on that, we can get Player 1s best second-round payoff. Next, one can solve equation (5) based on that result. It turns out that condition (5) implies conditions (6) and (7), and the game is solved. The equilibrium payoffs (after some algebraic work based on the solution strategy just described), are:

$$\left(\delta - \frac{2\delta^2}{\delta+2}, \frac{\delta^2 - \delta + 2}{2\delta + 4}, \frac{\delta^2 - \delta + 2}{2\delta + 4}\right)$$

which approaches $\left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$ as δ approaches 1.

Chapter 4

Employment and Wage Effects of Radio Concentration

4.1 A Spate of Radio Layoffs

A typical late-1990s headline about the radio industry lamented: "Local Radio Loses a Distinctive Voice."[1] Another reported:"Radio News Facing Cutbacks: Consolidation in the Industry Brings Leaner Staffing."[2] A more pointed article offered a metaphor: "Localism Vanishing as N[ew] H[ampshire] Radio Is 'McDonaldized.' "[3] Such accounts often tell the story of a single veteran disk jockey, ousted from his or her longtime on-air slot, often at the decision of large companies like Clear Channel, Viacom, Radio One, or their pre-merger predecessors. Many commentators point to the brisk pace of ownership consolidationthe phenomenon of mergers and acquisitions leading to a more concentrated market structure in the industryas the primary cause of local radio employees losing their jobs. One article quotes an estimate that "10,000 radio-related jobs"

[1]Tom Feran, "Local Radio Loses a Distinctive Voice," CLEV. PLAIN DEALER, June 3, 1999, at 1E.

[2]Steve Knoll, "Radio News Facing Cutbacks: Consolidation in the Industry Brings Leaner Staffing," N.Y. TIMES, Dec. 30, 1996, reprinted in CLEV. PLAIN DEALER, Dec. 31, 1996, at 3C.

[3]Jack Kenny, "Localism Vanishing as N.H. Radio Is 'McDonaldized,' " N.H. BUS. REV., Oct. 23, 1998, at 1.

disappeared between 1996 and 2002.[4] The Telecommunications Act of 1996 eliminated the national ownership limit for owners of radio stations while relaxing the limits on local radio ownership.[5] In this chapter, I examine how increased concentration of radio station ownership relates to employment and wages in three radio-industry occupations by analyzing data from the seven years following the Telecommunications Act (1996 to 2003).

While the employment effects of consolidation have economic importance in their own right, they also fall under the purview of the FCCs major policy goals of ensuring localism and fostering diversity.[6] One journalist in Detroit, where four firms garner over eighty percent market share,[7] argues that "radio programming leaves little room to showcase local musicians, and there has been an invasion of syndicated shows and on-air personalities spliced in from distant cities via computer" and observes that "[s]yndicated hosts . . . threaten local jobs."[8] The author concludes, under the heading "Loss of Jobs," that "[r]adio analysts are convinced that many practices the big chains are responsible forthe de-emphasis on local contentsave[] money, but will ultimately kill local radio."[9] A radio station's choice to carry remotely produced programming, while it may satisfy some listeners' preferences, may simultaneously detract from localism and reduce employment. To the extent that consolidated firms have a stronger tendency to rely on syn-

[4]Todd Spencer, "Radio Killed the Radio Star," SALON.COM (Oct. 1, 2002), at http://www.salon.com/tech/feature/2002/10/01/nab/.

[5]Pub. L. No. 104-104, 110 Stat. 56 (1996).

[6]The FCC has cited three major, longstanding goals in its broadcast media policy: competition, diversity, and localism. See, for example, Federal Communications Commission, Notice of Proposed Rulemaking, No. 02-249, 2 (Sept. 12, 2002).

[7]Source: BIA Financial Networks, Media Access Pro, data as of May 16, 2002.

[8]Susan Whitall, "Once Distinctive Sound Fades into Predictability; Media Giants Control What Music Is Played," DETROIT NEWS, Nov. 10, 2002, at 1.

[9]*Id.*

dication, voice tracking technology, or national programming than smaller firms, larger job losses (or smaller job gains) will accompany greater ownership concentration. Furthermore, if media mergers lead to job losses on a local level, then media outlets could become less familiar with and less responsive to the local communities in which they are based. And thinner ranks of disk jockeys and news reporters may mean less diverse choices of music and news stories. Empirical analysis shows that the FCC should concern itself with the threat to localism and diversity that job losses (and, indirectly, wage reductions) represent.

Common sense—as well as much anecdotal and qualitative evidence in the public debate over media regulation—holds that media mergers have led to downsizing. After all, the proponents of relaxed ownership rules argued that more restrictive rules prevented media firms from exploiting economies of scale. That is to say, commentators on all sides expected consolidators to centralize some functions that previously existed separately in separately owned stations. But studies using aggregate data can test these theories and verify anecdotal claims, like those quoted above from post-Telecommunications-Act newspaper accounts. Quantitative analysis allows one to ask more formally whether ownership consolidation has led to job losses or wage reductions. Furthermore, it allows one to estimate the magnitude of those relationships and to determine whether different occupations within the radio industry have experienced different levels of employment decreases and wage decreases.

Using data from the Occupational Employment Survey of the U.S. Bureau of Labor Statistics, I estimate the effects of radio consolidation on employment and wages for three occupations: announcers, news reporters, and broadcast technicians. I find that, comparing figures across metropolitan areas, an increase in the number of stations per owner within a metropolitan area was associated with both lower employment levels and lower wages during the years 1996 to 2003. Whether this represents a causal effect of radio consolidation, in the sense that increasing the concentration of ownership within a particular market over time would in fact lead to job losses and lower wages, is a more difficult question. I conclude that the relationship between greater consolidation and lower levels of employment and wages probably pre-dates the Telecommunications Act of 1996; the data studied in this article do not answer definitively whether consolidation "causes" job loss or wage reductions in the sense described above. Yet the strong correlation between radio consolidation, job losses, and lower wages for common radio occupations remains an important fact for policymakers at the FCC as they seek to promote localism and diversity in radio programming.

4.2 Industry Context

Beginning in the 1980s, Congress and the FCC passed statutes and adopted regulations to relax the limits on national and local radio ownership.[10] But the most dramatic changes to ownership policy in radio arrived with the Telecommunications Act of 1996. In that legislation, Congress repealed the national radio ownership limit, which previously capped a firms holdings at forty stations. Moreover, Congress raised the local

[10]For a fuller description of radio's regulatory history, see PETER DICOLA & KRISTIN THOMSON, RADIO DEREGULATION: HAS IT SERVED CITIZENS AND MUSICIANS? 5–16 (2002), *available at* http://www.futureofmusic.org/research/radiostudy.cfm (last visited Apr. 3, 2005).

radio ownership limit from a sliding scale of three to four stations, depending on the total number of stations in a market, to a sliding scale of five to eight stations. As a result, many stations changed hands and many firms merged. The national radio market became much more concentrated; by spring 2002 the ten largest firms had two-thirds market share and the two largest (Clear Channel and Viacom) combined for over forty percent market share.[11] Local radio markets became highly concentratedin almost every metropolitan area, the four largest firms together had over seventy percent market share.[12] That figure generally exceeded ninety percent in smaller markets (that is, in all but the fifty largest U.S. cities).[13] This article will focus on local radio markets in order to study the corresponding local labor markets for radio-industry occupations.

While advocating the relaxation or elimination of various media ownership rules, both before the passage of the Telecommunications Act and later in debate over the FCCs recent biennial review of its media ownership rules,[14] media companies and some commentators often argued that media companies were poised to benefit from economies of scale if allowed to grow bigger and to centralize some operations.[15] In other words, two stations that each required ten employees when separately owned could, in theory, be staffed by fewer than twenty employees when jointly owned. Implicit in the economies-of-scale theory is a promise to shareholders to reduce the number of em-

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[11] *Id.* at 18.
[12] *Id.* at 31.
[13] *Id.* at 33.
[14] Federal Communications Commission, Report and Order in the Matter of 2002 Biennial Regulatory Review, No. 03-127 (June 2, 2003).
[15] *See, e.g.*, Bill Holland, "Telecommunications Act Signed: Legislation to Revamp Media Climate," BILLBOARD (Feb. 17, 1996) ("Scott Ginsburg, Evergreen Media chairman/CEO, says that signing the bill into law 'will lead to a tide of radio ownership consolidation and improved economies of scale for radio broadcasters.' ").

ployees needed to support the same number of broadcast outlets. If media companies made good on their stated intentions, then one should observe lower employment levels in more consolidated markets.

Theoretical predictions of the effect of radio consolidation on wages in particular occupations are more ambiguous. Decreased demand for labor resulting from economies of scale could depress wages, based on a simple supply-and-demand diagram. But surely such a model is too simple. Technological developments facilitated by economies of scale could enhance productivity per worker. Macroeconomic trends could exert pressure on industry-wide wages. Perhaps most importantly, layoffs might target employees with above-average or below-average wages compared to the industry as a whole. The wage effects of firms' layoff choices will depend on many factors that are difficult to observe, especially at the aggregate level, such as the particular organizational structure of firms and the wage profile of the particular employees laid off.

New technologies and organizational strategies have indeed arisen in the wake of the Telecommunications Act. First, large radio companies can now adopt "voice tracking" technology. Voice tracking is the practice of broadcasting the show of a famous radio announcer (or DJ) nationwide while trying to make the show seem local.[16] Radio companies can enjoy the cost savings that accompany syndication while appearing to tailor its programming to communities' needs. Second, radio companies now plan much of their programming centrally. DJs have less choice; market-testing of ten-second song

[16]*See, e.g.*, Anna Wilde Mathews, "From a Distance: A Giant Radio Chain Is Perfecting the Art Of Seeming Local," WALL ST. J., Feb. 25, 2002, at A1; Randy Dotinga, "Good Morning [Your Town Here]," WIRED.COM (August 6, 2002), *at* http://www.wired.com/news/business/0,1367,54037,00.html (last visited Apr. 3, 2005).

snippets has become prevalent; and payola-like practices have allegedly affected programming decisions. To the extent that more programming decisions occur centrally, fewer DJs and program directors are needed.[17] Third, there have been large radio firms that appear to take advantage of their size to hire fewer broadcast technicians. Consider the now-infamous incident in Minot, North Dakota, which arose when a train carrying ammonia fertilizer derailed, releasing deadly ammonia gas.[18] When local officials sought to broadcast warnings on the radio, no one at the designated emergency broadcast station (KCJB, owned by Clear Channel) was available at the station to answer the phone.[19] The allocation of labor across radio stations delayed an emergency response teams attempts alert to their local community. These three examples show that firms in the radio industry have in fact attempted to exploit economies of scale.

Consolidation of operations like the engineering tasks performed by broadcast technicians represents centralization within a local market. What used to be two jobs in a particular city becomes one job. Some centralization of programming occurs on a local level as well. If two stations had separate radio newsrooms but become jointly owned, the consolidator will probably close one of the newsrooms. The phenomenon of "simulcasting" functions similarly. An owner of multiple stations within a market might choose to rebroadcast all or part of one station's programming on one of the jointly owned stations within the same local market. One reason a firm might do this is to increase signal reach; its broadcast towers could stand on either side of a large city, both

[17] *See* DiCola & Thomson, *supra* note 10, at 61-67.

[18] Eric Klinenberg, Fighting For Air: The Battle to Control America's Media 1–4 (2007); Jill Burcum, "Ammonia Cloud Engulfs Minot," Minn. Star-Trib., Jan. 19, 2002, at 1A.

[19] See Jennifer 8. Lee, "On Minot, N.D., Radio, A Single Corporate Voice," N.Y. Times, Mar. 31, 2003, at C7.

considered part of the same market. A decision to simulcast by a consolidating firm, like other strategies of local centralization, will cause job losses.

Centralization on a national scale also shrinks radio-industry employment, but in a more complicated fashion because of the interplay between the national and local levels of organization. It is unclear whether the more consolidated local markets will experience relatively more job loss as a result of nationally centralized programming. Syndication and voice tracking have developed within larger firms, which tend to have holdings in larger markets.[20] Larger markets, in turn, tend have less concentrated ownership than smaller markets, on average. Together these facts suggest that less consolidated markets might experience more of the job loss caused by national centralization. On the other hand, if a consolidating firm happens to locate some of its centralized operations in a particular market, that city might retain (or even gain) radio jobs. Syndicated shows and voice-tracked programs employ at least a few people and have to locate somewhere. Radio firms may choose to centralize operations in larger metropolitan areas, resulting in more job losses within small markets, which generally have more concentrated ownership. In general, the location of jobs after a firm implements more nationally centralized programming will depend on the firm's particular strategy, its existing employment allocations across stations, and other hard-to-measure factors. Thus, national centralization may influence the correlation between local-market consolidation and job loss positively or negatively. Overall, however, based on the impact of the various forms

[20]This observation stems from a series of cross-tabulations of indicator variables for holdings of large firms versus concentration ratios in local markets. Source: BIA Financial Networks, Media Access Pro, data as of May 16, 2002.

of local centralization discussed above, one would predict that greater consolidation in a local market should lead to lower employment levels in that market.

4.3 Regulatory Framework

Achieving the FCC's goals of competition, diversity, and localism in media requires attention to what happens in media and communications industry labor markets. The employment levels and wages of those in radio-industry occupations are highly relevant to whether broadcasters have to resources to serve local communities adequately. Employment issues relate most closely to localism, although they can also influence diversity.The notion that employing local residents may contribute to community responsiveness runs through many of the public debates over issues like syndication and nationalization. Lower wages could indirectly decrease the quality of local radio programming by providing talented media employees with less incentive to work in radio. Labor-market issues also affect diversity, particularly viewpoint diversity, since job losses mean fewer participants in media production and fewer participants means fewer viewpoints.

Phillip Napoli has identified two major strains within policymakers' and scholars' thinking about the goal of localism.[21] Both can accommodate a concern for what occurs in the labor markets for radio occupations. The first theory conceives of localism geographically. As Napoli explains, under this theory "any program produced and presented within a local community would be seen as contributing to the fulfillment of the local-

[21] PHILIP M. NAPOLI, FOUNDATIONS OF COMMUNICATIONS POLICY: PRINCIPLES AND PROCESS IN THE REGULATION OF ELECTRONIC MEDIA 209–224 (2001).

ism ideal."[22] This geographic conception depends on local production and thus on local employees. In this way, local labor markets become highly relevant to the localism goal, with job losses thwarting its achievement. The second theory focuses more on content; in this conception "the localism principle is only fulfilled if the programming addresses the unique needs and interests of the local community."[23] Whether radio employees are local to a geography (such as a city, town, or metropolitan area) will relate to the second conception of localism under two conditions: (a) if one decides that geographic definitions of "community" remain important despite mass-media technology, perhaps in light of state and local politics; and (b) if one thinks that radio employees' physical presence in a community will promote responsiveness to community needs. This article will not address whether those two conditions hold. But if those conditions did hold true, then the employment effects of radio consolidation would matter a great deal for localism.

Historically, the FCC has scrutinized the organization and location of work in media industries, so labor-market issues have always been part of the localism goal, whether directly or indirectly. Section 307(b) of the Communications Act, which the Senate has recently called the "pole star" of telecommunications regulation,[24]directs:

> In considering applications for licenses, and modifications and renewals thereof, when and insofar as there is demand for the same, the Commission shall make such distribution of licenses, frequencies, hours of operation, and of power among the several States and communities as to provide a fair,

[22]*Id.* at 210.

[23]*Id.* at 212.

[24]Preservation of Localism, Program Diversity, and Competition in Television Broadcast Service Act, S. 1046, 108th Cong. (2003).

efficient, and equitable distribution of radio service to each of the same.[25]

By directing the FCC to consider "communities" and the distribution of licenses among them, the statute created a foundation for considering whether stations serve local communities well. When the FCC still conducted initial assignment hearings, two of the seven factors required applicants to show that "there is a need for the proposed broadcast station in the community" and that they "will be responsive to local community needs."[26] These factors related to employment issues only indirectly. But in comparative hearings, the FCC would consider the "full-time participation in station operation by owners" and explained that "[w]hile . . . integration of ownership and management is important per se, its value is increased if the participating owners are local residents."[27] The FCC argued that local residents could respond to changing community needs better than non-locals. Thus, in the days of licensing hearings, FCC policy connected the localism goal to the geographic location of station employees, specifically the day-to-day managers.

Decades later, the U.S. Court of Appeals for the D.C. Circuit struck down the integration criterion for ownership and management in 1993 in *Bechtel v. FCC*,[28] and Congress and the FCC have done away with comparative licensing hearings.[29] But

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[25] 47 U.S.C. §307(b) (2000).

[26] STUART MINOR BENJAMIN ET AL., TELECOMMUNICATIONS LAW AND POLICY 85 (1st ed. 2001). The seven-factor test grew out of the FCC's interpretation of Section 308 of the Communications Act, which "requires that applicants demonstrate 'citizenship, character, and financial, technical, and other qualifications.' " *Id.* at 84–85 (quoting 47 U.S.C. §308(b) (2000)). The catch-all phrase other qualifications permitted the FCC to consider localism.

[27] *Id.* at 87-88 (quoting FCC Policy Statement on Comparative Broadcast Hearings, 1 FCC 2d 393 (1965)).

[28] 10 F.3d 875 (D.C. Cir. 1993).

[29] See BENJAMIN ET AL., *supra* note 26, at 144–147.

those particular decisions do not prohibit the FCC from considering labor-market issues in other ways in the course of regulating broadcast. The norms behind the former integration preference survive in the two theories described above, not to mention the ideals still reflected in Section 307(b). If eliminating the national radio ownership limit and relaxing local radio ownership limits led to detrimental effects on localism and diversity, then the FCC can and should examine them. The court in Bechtel had a multi-pronged rationale for overturning the integration preference, including concerns about the particular implementation of the FCC's policy and the ease of circumventing it.[30] Most importantly, the court wanted to see some kind of empirical evidence to support the FCC's policy,[31] a common theme in recent administrative-law reviews of FCC policy.[32] Suppose, for example, that the FCC collected empirical evidence linking consolidation to job loss, and coupled it with evidence associating local employees with responsiveness to their geographic community. Then, in accordance with its localism goal, the FCC could take action (such as maintaining or even reducing ownership caps) and have a strong argument that a reviewing court should show deference to its decision.

Recently the FCC launched a Localism Task Force "to gather empirical data on broadcast localism, and to advise the Commission on concrete steps to promote this significant policy goal."[33] The commission announced its intentions to investigate some

[30] *Bechtel*, 10 F.3d at 885–86.

[31] *Bechtel*, 10 F.3d at 880 ("Despite its twenty-eight years of experience with the policy, the Commission has accumulated no evidence to indicate that it achieves even one of the benefits that the Commission attributes to it.").

[32] *See, e.g.*, Fox Television Stations, Inc. v. FCC, 280 F.3d 1027 (D.C. Cir. 2002).

[33] Federal Communications Commission, Notice of Inquiry, No. 04-129, ¶6 (June 7, 2004).

of the issues discussed above, such as voice tracking,[34] national playlists,[35] diminished political news coverage,[36] and disaster warnings.[37] In this chapter, I study the labor markets for the very occupations involved in these policy debates: on-air announcers (including disk jockeys), broadcast news reporters, and broadcast technicians. Thus the employment effects of radio consolidation provide the FCC with another angle from which to research the issues it has recently deemed most important for achieving the ideal of localism.

4.4 Labor Market Trends

General labor-market trends in employment and wages in radio provide context for analyzing the labor-market effects of radio consolidation. The Current Employment Statistics survey (CES), conducted and published by the Bureau of Labor Statistics (BLS) can provide a broad overview. Figure 4.1 shows industry-wide employment levels over time for the radio industry as well as the television industry, for comparison.[38] (The dotted line marks the passage of the Telecommunications Act of 1996.) From this chart, it appears that radio employment has stagnated, while from 1992 onward television employment has increased. This may reflect factors beyond radio deregulation, such as the upsurge of cable television along with cable music channels.

Figure 4.2 adjusts the aggregate radio employment figures for the number of stations

[34] *Id.* at ¶38.
[35] *Id.* at ¶39.
[36] *Id.* at ¶¶21–23.
[37] *Id.* at ¶¶27–29.
[38] Source: Current Employment Statistics survey, data from 1982–2004, at http://www.bls.gov/ces/ (last visited March 1, 2005).

in the U.S.[39] It appears that the late 1980s and early 1990s actually brought about the most significant decrease in employment per station over the past two decades. From 1988 to 1995, employment per station dropped from 11.65 to 9.54, an 18.1 percent decrease. In the period following the Telecommunications Act of 1996, employment per station has continued to drop (from 9.54 to 8.70), but by only 8.8 percent. The decline between 1988 and 1995 might be explained by the incremental steps of deregulation that occurred in 1984 and 1992, that is, the gradual relaxation of both the national and local radio ownership limits. The precipitous decline may also signify a period of sagging financial outcomes for radio firms; the Telecommunications Act was pitched as a way to rescue ailing radio firms.[40]

Real wages in the radio industry show a steady upward trend over the past two decades, as illustrated in Figure 4.3.[41] Over the period from 1995 to 2004, real wages increased 38.7 percent; this compares to 3.3 percent increase from 1988 to 1995. Macroeconomic trends have no doubt influenced these figures, but it appears from the aggregate statistics that since the Telecommunications Act of 1996, employment per station in the radio industry has declined a total of about nine percent while real wages have risen by almost thirty-nine percent.

In sum, total employment in the radio industry has been steady. But this, together with the growth in the number of licensed stations, means that employment per station

[39] Sources: Current Employment Statistics survey, data from 19822002; BIA Financial Networks, Media Access Pro, data as of May 16, 2002.

[40] *See* PATRICIA AUFDERHEIDE, COMMUNICATIONS POLICY AND THE PUBLIC INTEREST: THE TELECOMMUNICATIONS ACT OF 1996, at 48-49 (1999).

[41] Sources: Current Employment Statistics survey, data from 1982–2002; annual CPI from the Bureau of Labor Statistics.

has declined over the past two decades. On average, each radio licensee utilizes fewer labor resources to produce its programming. The regulatory changes of 1996 came at a time when job losses already occurred fairly frequently; this accords with anecdotal accounts. Real wages, in contrast, have increased sharply in the years following the Telecommunications Act.

4.5 Data Sources

Consolidation rarely occurs in a quick, coordinated way. This makes it difficult, in general, to isolate the effects of consolidation on labor market outcomes. But in the radio industry, the removal of certain regulations directly limiting the size of firms resulted in an industry-wide wave of consolidation within a relatively short period of time. Change has occurred at a fast pace in radio since the passage of the Telecommunications Act of 1996, as shown by the time series of station acquisitions displayed in Figure 4.4.[42]

The brisk pace of mergers and the resulting concentration of ownership provides a source of variation. Different markets started from different levels of concentration and experienced consolidation at different rates over time. Using this variation in consolidation, I use ownership concentration as an explanatory variable in a series of panel regressions with employment and wages as the outcomes. Figure 4.4 shows that the pace of consolidation peaked in 1996–1997 and slowed by 2001–2002. Since the change in consolidation occurred over a relatively brief span of time, one can hope that fewer unobserved, confounding factors have influenced consolidation, employment and wages,

[42]Source: BIA Financial Networks, Media Access Pro, data as of May 16, 2002.

or their relationship.

The Occupational Employment Survey (OES), conducted by the BLS, contains data on employment and wages, broken down by occupation and by metropolitan statistical area (MSA), in non-agricultural industries. In 1998, the BLS began conducting the OES on a yearly basis, rather than once every three years.[43] In 2003, the OES shifted again, to a twice-yearly format. Each release of the OES contains data looking back on three years. In this article I use OES data from the 1998 release through the November 2003 release; thus, I have employment and wage data from 1996 to late 2003. The advantage of the OES data for studying the radio industry is that three occupations of interest can be studied: (1) announcers; (2) news analysts, reporters, and correspondents ("news reporters"); and (3) broadcast technicians. Table 4.1 displays some summary statistics on the OES occupational data; note that until recently the OES aggregated radio and television into one industry group.[44]

I merged the OES data with information from BIA Financial Networks' Media Access Pro (Radio Version) database, which contains information about every radio station in the U.S., including ownership history, ratings, and estimated revenue. The database classifies stations by "Arbitron markets," geographical areas roughly corresponding to MSAs used by the Arbitron Company.[45] I matched MSAs with Arbitron markets wher-

[43] Starting in 1998, each year, BLS surveyed at least some establishments; some of the smaller individual establishments were surveyed on a rotating basis once every three years.

[44] Source: Occupational Employment Survey, data from 1998 through Nov. 2003.

[45] The Arbitron Company identifies over 280 markets (cities and metropolitan areas) in which it conducts surveys on radio listenership. These markets are ranked according to population, from New York City (#1) to Casper, Wyoming (#285). I will use and refer to these 280-plus "Arbitron markets" throughout my analysis. Arbitron markets differ from MSAs because of some adjustments based on industry practice and marketing considerations.

ever possible to produce a panel data set with 246 markets and 7 time periods (1998 through 2002, plus May 2003 and November 2003). Since the OES does not survey firms in every market about every occupation in every year, several of the potential observations in the panel are missing.

The panel data set I constructed has four main drawbacks. First, while the OES samples about 400,000 establishments each year, the sample sizes for an individual occupation in a particular market-year combination can be tiny (or zero, when the market-year observation is missing). Second, to use the occupational data in the OES, one must look at all individuals in a given occupation, not just the individuals in one industry-occupation combination. In other words, the outcome variables I use include some employees from non-radio industries, potentially confounding the effects of radio consolidation on radio employment, especially in the news reporters occupation. Third, the OES reports data only at the market levelso one cannot disaggregate the data to study issues like the employment effects when two previously independent stations come under common ownership. Fourth, both the OES and Media Access Pro data sets begin in 1996, eliminating the potential for pre/post analysis of the Telecommunications Act. Despite these disadvantages, the panel data provide a number of interesting insights.

4.6 Econometric Approach

The unit of observation in my analysis is a market-year combination. As described above, the data set includes 246 markets and 7 time periods, with many market-year observations missing due to the nature of the OES. The labor-market outcome variables

I analyze come in three groups of three: the number of employees, the mean hourly wage, and the median wage for announcers, news reporters, and broadcast technicians. Sample sizes vary by both occupation and the particular outcome in question, again as a result of the OES survey methodology.

I study three explanatory variables for each market-year combination: number of stations, stations per owner, and the variance of stations owned. First, the number of radio stations in a market should affect employment simply because, all else equal, more stations will require more employees. I include both commercial and non-commercial stations, since both for-profit and non-profit employees can show up in the OES data. Second, the number of stations in a market divided by the number of firms owning stations provides a measure of consolidation. I will refer to this variable as stations per owner, but it is important to remember that the variable is measured locally; stations owned in other markets are not taken into account. Third, the variance of stations owned by each firm within a market measures a second-order effect of consolidation that may relate to labor-market outcomes in the presence of economies of scale. Consider two markets, A and B, each with 20 total stations and each with 5 stations per owner. The holdings of the four owners in these hypothetical markets could differ considerably. For instance, in market A, each owner might have 5 stations, while in market B, two owners have 9 stations and two owners have just 1 station. The variance of stations owned captures such differences in ownership structure within markets.

Table 4.2 reports summary statistics for the panel data set.[46] Because the OES em-

[46]Sources: Occupational Employment Survey, data from 1998 through Nov. 2003; BIA Financial Networks, Media Access Pro, data as of May 16, 2002.

ployment data include a greater number of missing values than the OES wage data, the sample sizes vary. Thus, Table 4.2 contains two sets of summary statistics for the outcome variables, one corresponding to the employment regressions and one corresponding to the wage regressions.

Because the data set is a panel, I can estimate multiple types of models to measure the effect of consolidation on employment and wages. I start with a pair of pooled regressions, which treat each market-year observation as independent, essentially ignoring the panel nature of the data set.[47] The first of the pooled regressions uses only two explanatory variables (the number of stations and stations per owner); the second adds the variance of stations owned. Next, I estimate a similar model, using all three explanatory variables, but control for year-specific effects. Finally, I estimate a fixed effects model by adding to the year-specific effects a full set of market-specific indicators.

Stated more formally, for each of the three occupations and each of the three outcome variables, I estimate four types of models:

$$y_{mt} = w^{'}_{mt}\gamma + \epsilon_{mt} \tag{4.1}$$

$$y_{mt} = x^{'}_{mt}\beta + \epsilon_{mt} \tag{4.2}$$

$$y_{mt} = x^{'}_{mt}\beta + d^{'}_{mt}\lambda_t + \epsilon_{mt} \tag{4.3}$$

$$y_{mt} = x^{'}_{mt}\beta + d^{'}_{mt}\lambda_t + +d^{'}_{m}\alpha_m + \epsilon_{mt} \tag{4.4}$$

where y_{mt} denotes the outcome variable in question (employment, mean hourly wage, or median hourly wage); w_{mt} denotes a shortened vector of explanatory variables (just

[47] *See* JACK JOHNSTON & JOHN DINARDO, ECONOMETRIC METHODS 390 (4th ed. 1997).

number of stations and stations per owner); x_{mt} denotes the full vector of explanatory variables (number of stations, stations per owner, and variance of stations owned); d_t denotes a vector of year indicators; λ_t denotes year-specific fixed effects; d_m denotes a vector of market indicators; α_m denotes market-specific fixed effects; and ϵ_{mt} denotes the error term.

The pooled regressions serve as a sort of baseline for comparison. Their coefficient estimates are based on both cross-sectional variation and variation over time. Including year-specific effects, which control for industry-wide time trends, allows one to focus on cross-sectional variation as well as deviations from time trends within particular local markets. The fixed-effects model that also controls time-specific effects has the advantage of allowing one to ignore any omitted variables that do not change over time (but do vary across individuals) as well as any omitted variables that do not vary across individuals (but do change over time).[48] This approach, in other words, attempts to avoid the common problem of omitted variable bias.[49] Since many unobservable factors influence radio firms' employment decisions, as discussed above, I try to address the omitted-variable-bias issue with a fixed-effects approach.

4.7 Results

Striking results emerge from the pooled regressions and the regressions including year-specific effects in Tables 4.3, 4.4 and 4.5.[50] Estimates from the pooled regressions and

[48] *See* PAUL RUUD, AN INTRODUCTION TO CLASSICAL ECONOMETRIC THEORY 625 (2000).
[49] *See* Johnston & DiNardo, *supra* note 47, at 395.
[50] Sources: Occupational Employment Survey, data from 1998 through Nov. 2003; BIA Financial Networks, Media Access Pro, data as of May 16, 2002.

the regressions including year-specific effects are broadly similar. The total number of stations variable has a positive correlation with employment, as expected. Markets with more stations also had higher hourly wages (both mean and median), perhaps reflecting the higher cost of living in larger markets.

Greater consolidation, as measured by stations per owner, has a negative and statistically significant association with employment of both news reporters and broadcast technicians. (The coefficient on stations per owner in column (3) of Table 4.3 for announcers is negative but not statistically significant.) The relationship between employment and consolidation is also economically meaningful: a 1 percent increase in consolidation was associated with a 1.5 percent decline in employment of news reporters and a 0.8 percent decline in employment of broadcast technicians. Suppose that model (3), with year-specific effects, is the correct model of a radio market, allowing one to estimate the true causal effect of consolidation on employment. In the average Arbitron market, stations per owner increased by about 36 percent between 1996 and 2003.[51] So in an average market, according to the estimates in column (3) of Table 4.3, employment of news reporters would have declined by 56 percent and employment of broadcast technicians by 30 percent over this time period (if all other variables remained unchanged), signifying very large job losses.

Consolidation also has a negative and statistically significant correlation with mean hourly wages, for both news reporters and announcers, and with median hourly wages for news reporters. In the context of large wage increases industry-wide, as shown in

[51] Source: BIA Financial Networks, Media Access Pro, data as of May 16, 2002.

Table 4.3 above, this means that markets with more ownership consolidation experienced smaller wage increases. Stations per owner has an estimated coefficient of -0.33 for announcers and -0.28 for news reporters, as shown in column (3) of Table 4.4. Using these estimates and making the same assumption as above about the veracity of model (3), it appears that wages for announcers and news reporters in an average market are 12 percent and 10 percent lower, respectively, as a result of radio consolidation.

The fixed-effects estimates in column (4) of Tables 4.3, 4.4, and 4.5 complicate this picture. Only one of the estimates for the coefficients on stations per owner remains statistically significant after including market-specific indicator variables. (The negative association between consolidation and median hourly wages for news reporters remains statistically significant at the five percent level.) This shows that cross-sectional variation provided most of the identification in the regressions with only year-specific effects. In other words, differences across markets, rather than within markets, appear to have generated the negative correlations between consolidation and employment and between consolidation and wages. The fixed-effects regressions do not support the causal inference that if consolidation increased over time (for some reason exogenous to the workings of the market) in a particular local market, job loss and lower wages would result in that particular market. Rather, the shift in the results from the year-specific-effects model to the fixed-effects model only demonstrate a cross-sectional relationship between consolidation and job loss and between consolidation and lower wages.

On the other hand, the fixed-effects estimates have some potential problems. The OES data may be too incomplete (that is, they may contain too many missing values) to generate statistically significant estimates based solely on within-market variation over time. Because it uses a full set of indicator variables for markets and years, the fixed-effects model may ask too much of the OES data. Furthermore, fixed-effects models in general are highly sensitive to measurement error in the explanatory variable.[52] While the data on station ownership histories from Media Access Pro are fairly reliable, they may not be perfect. More importantly, the combination of Media Access Pro and OES may introduce something akin to measurement error. Since the OES only surveys a subset of firms in a market in a given year, it may be that the most appropriate x variables would reflect the number of stations owned by those particular firms, the stations per owner actually surveyed by OES, and so on. Instead, the x variables include market-wide measures that may not correspond properly to the y variables in a particular market-year, since the identities of the firms surveyed by OES are unavailable. This kind of measurement error might even attenuate (bias toward zero) the estimates somewhat in the pooled and year-specific-effects models, but would introduce stronger attenuation bias in the fixed-effects model.

Even taking the fixed-effects estimates as accurate, the pooled regressions and the regressions with only year-specific effects suggest a strong cross-sectional correlation between greater consolidation and lower employment and wages. This may reflect economic relationships between the variables that pre-date the 1996–2003 period of study. Radio ownership limits, both national and local, began to increase gradually in the 1980s. So a causal relationship between consolidation and employment (and be-

[52] *See* JOHNSTON & DINARDO, *supra* note 47, at 399-401.

tween consolidation and wages) may exist, though it may have commenced operating more than a decade before the time period I have been able to study using the OES and Media Access Pro. One can conclude from the regressions that more consolidated markets, controlling for the number of stations as well as year-specific effects, have lower employment levels and lower wages than less consolidated markets do.

4.8 Conclusion

Labor-market outcomes have not often, if ever, received explicit empirical scrutiny in discussions of broadcast media regulation. Yet many issues important to legislators, scholars, activists, and FCC regulatorssyndication, voice tracking, emergency broadcast warnings, nationalized music programming, and local news coveragehave important labor-economic aspects. Under the rubric of localism, especially, but also in the context of promoting viewpoint diversity, the FCC can and should monitor job losses and wage reductions in radio-industry occupations. The empirical analysis in this article, controlling for the number of stations and industry-wide time trends, demonstrates that more consolidated markets have fewer radio announcers, news reporters, and broadcast technicians. Job losses in these professions indicate that fewer local residents make decisions now about what music to play and what stories to report. The employment effects of radio consolidation thus represent a threat to both localism and diversity.[53]

[53] This chapter originally appeared in a slightly different form in the edited volume MEDIA DIVERSITY AND LOCALISM: MEANING AND METRICS (Phil Napoli, ed. 2006) published by Lawrence Erlbaum Associates.

Figure 4.1: Industry-Wide Employment, 1982-2004

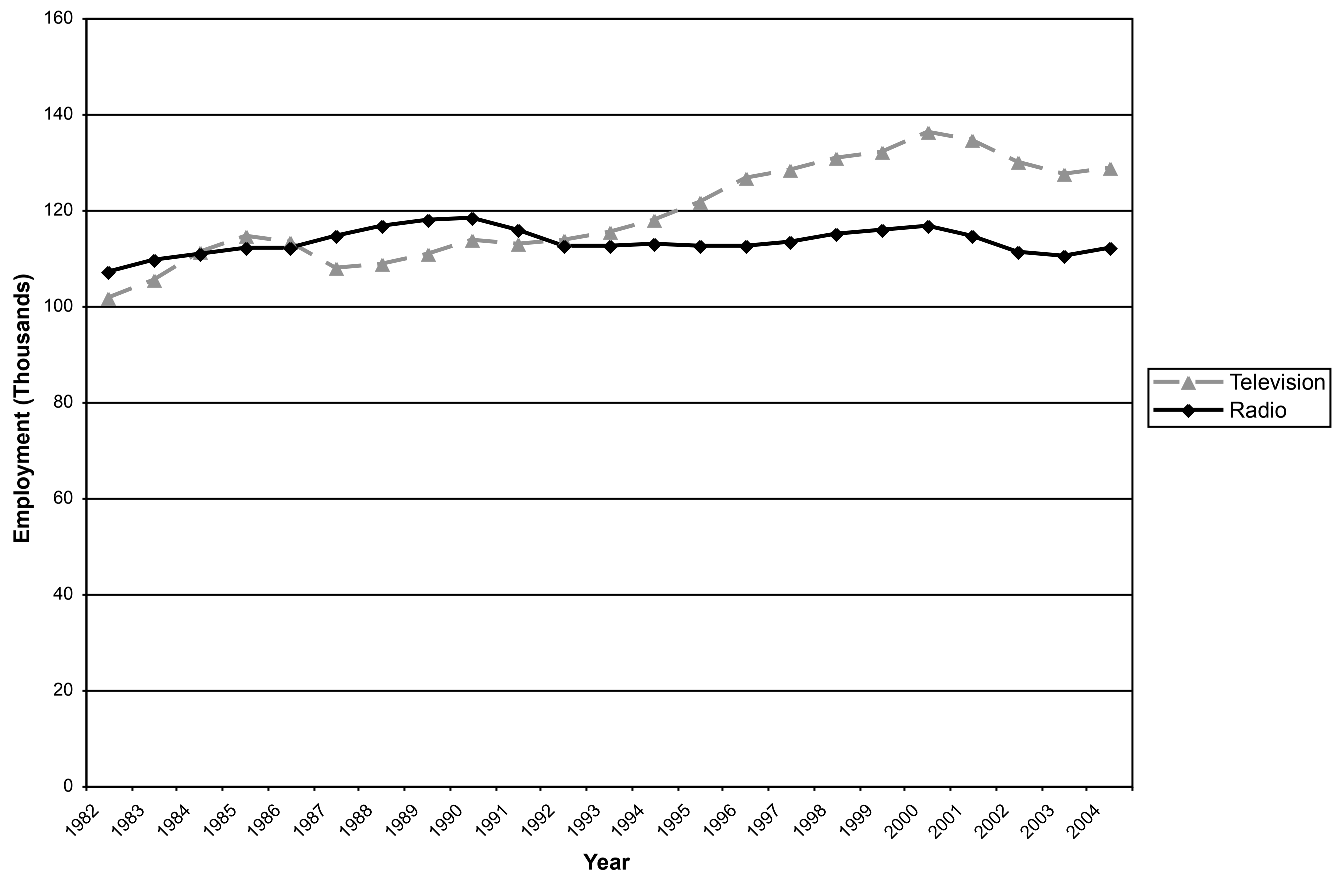

Figure 4.2: Radio Employment Per Station, 1982-2004

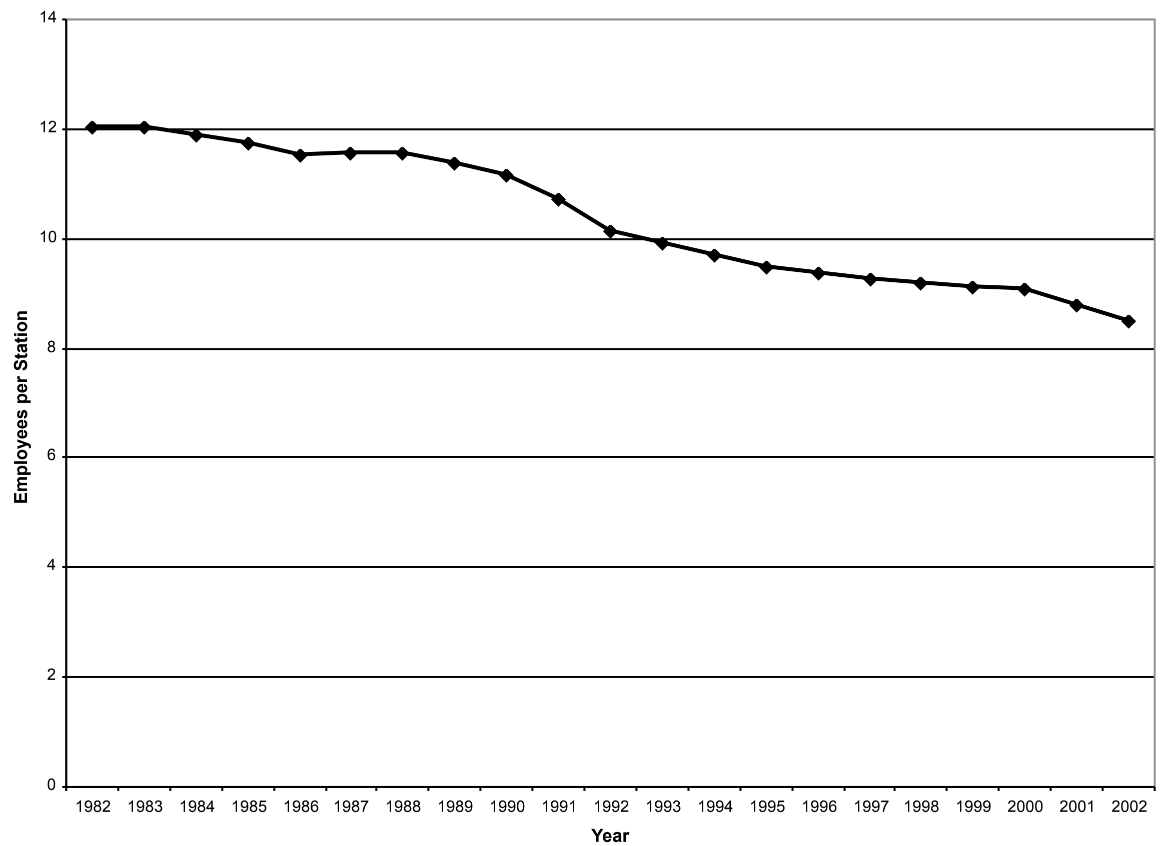

Figure 4.3: Industry-Wide Average Hourly Wage, 1982-2004

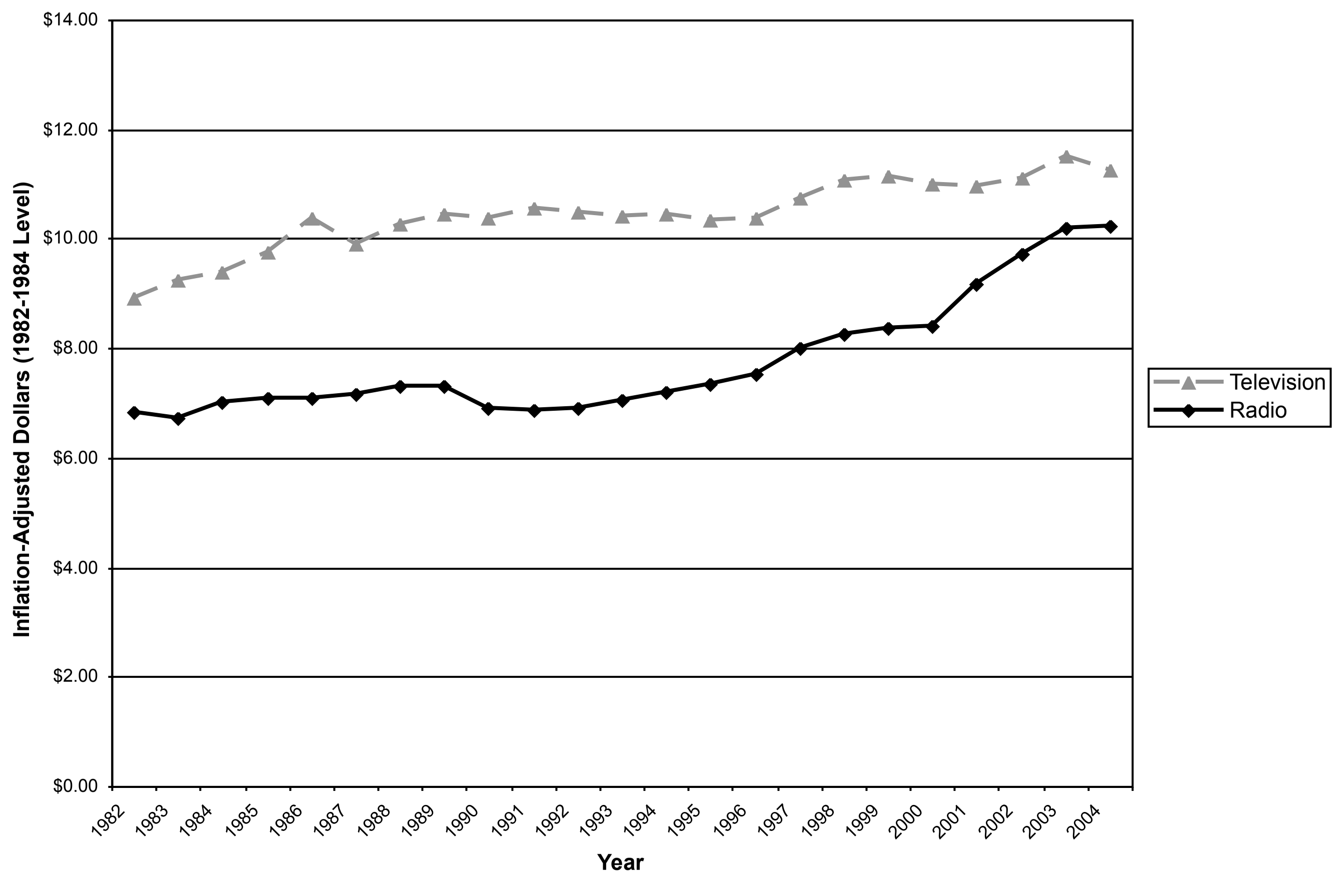

Figure 4.4: Acquisitions of Radio Stations, 1982-2002

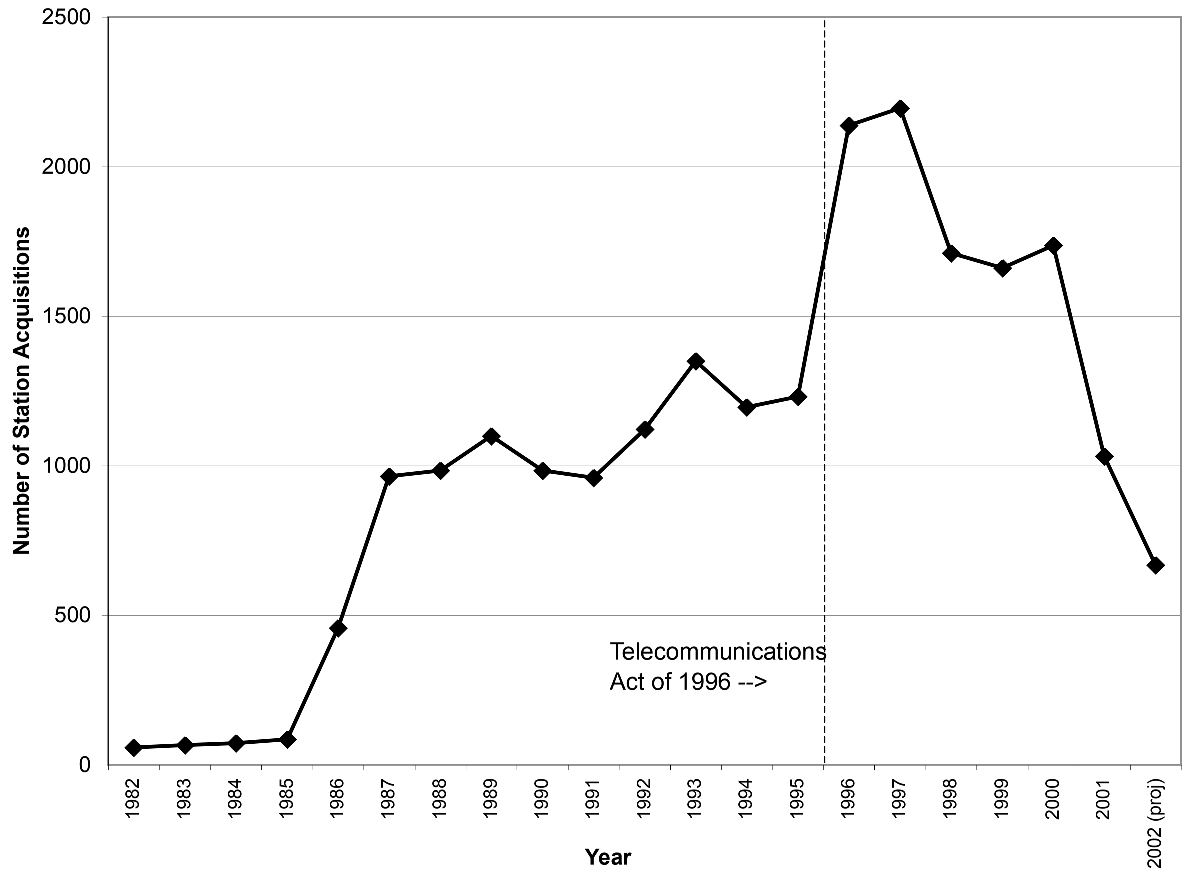

Table 4.1: OES Statistics for the Radio and Television Industries

Occupation	Year	Employment in Radio & TV	% Radio & TV	% Just Radio	Mean Hourly Real Wage	Median Hourly Real Wage	Mean/ Median
Announcers	1998	46,100	93.8%	—	$11.44	$8.51	1.34
	1999	45,010	89.3%	—	$11.98	$8.68	1.38
	2000	42,220	84.8%	—	$12.44	$9.03	1.38
	2001	40,990	81.3%	—	$12.22	$8.90	1.37
	2002	40,280	80.9%	73.6%	$12.70	$8.93	1.42
	2003(May)	38,990	79.0%	71.4%	$12.43	$8.86	1.40
	2003(Nov.)	38,350	78.7%	70.8%	$12.64	$9.03	1.40
News Reporters	1998	11,320	21.6%	—	$18.65	$13.35	1.40
	1999	17,530	27.1%	—	$19.39	$14.16	1.37
	2000	19,900	30.2%	—	$20.64	$15.27	1.35
	2001	19,020	29.7%	—	$20.12	$15.02	1.34
	2002	16,890	27.6%	6.8%	$20.15	$14.52	1.39
	2003(May)	16,350	27.1%	6.3%	$20.69	$14.81	1.40
	2003(Nov.)	17,480	28.6%	6.9%	$21.21	$15.47	1.37
Broadcast Technicians	1998	22,990	61.7%	—	$13.72	$10.70	1.28
	1999	19,820	77.5%	—	$12.57	$10.15	1.24
	2000	24,610	73.3%	—	$14.57	$10.80	1.35
	2001	21,960	70.6%	—	$14.37	$10.98	1.31
	2002	21,210	67.3%	20.1%	$13.94	$10.63	1.31
	2003(May)	21,820	66.6%	21.2%	$13.72	$10.52	1.30
	2003(Nov.)	21,230	68.6%	22.8%	$13.58	$10.82	1.25

Table 4.2: Means, Standard Deviations, and Sample Sizes

		Occupation			
Category	**Variable**	Announcers	News Reporters	Broadcast Technicians	Total
Outcome Variables	Employment	183	275	196	—
		(215)	(426)	(360)	
		[1067]	[966]	[811]	
	Mean Hourly Wage ($)	13.08	17.47	13.80	—
		(3.77)	(4.35)	(3.50)	
		[1278]	[1114]	[891]	
	Median Wage ($)	10.24	15.13	12.37	—
		(2.58)	(3.90)	(3.56)	
		[1278]	[1114]	[891]	
For Employment Regressions	Total Stations in Market	32.7	35.0	37.8	27.0
		(17.9)	(18.6)	(18.3)	(16.6)
		[1067]	[966]	[811]	[2023]
	Stations per Owner	1.81	1.83	1.83	1.82
		(0.356)	(0.356)	(0.342)	(0.395)
		[1067]	[966]	[811]	[2023]
	Variance of Stations Owned	2.11	2.28	2.29	2.10
		(1.44)	(1.53)	(1.51)	(1.70)
		[1067]	[966]	[811]	[2022]
For Wage Regressions	Total Stations in Market	32.0	34.1	37.4	27.0
		(17.5)	(18.1)	(18.2)	(16.6)
		[1278]	[1114]	[891]	[2023]
	Stations per Owner	1.81	1.82	1.83	1.82
		(0.360)	(0.358)	(0.345)	(0.395)
		[1278]	[1114]	[891]	[2023]
	Variance of Stations Owned	2.09	2.23	2.33	2.10
		(1.45)	(1.56)	(1.57)	(1.70)
		[1278]	[1114]	[891]	[2022]

Notes: Standard deviations in parentheses; sample sizes in smaller font and brackets.

Table 4.3: Employment as the Outcome Variable

		Model			
Occupation	**Explanatory Variable**	**(1)**	**(2)**	**(3)**	**(4)**
Announcers	Total Stations in Market	1.25**	1.26**	1.25**	-0.280
(N = 1067)		(0.077)	(0.082)	(0.082)	(0.416)
	Stations per Owner	-0.401**	-0.307	-0.268	-0.112
		(0.143)	(0.294)	(0.296)	(0.212)
	Variance of Stations Owned	—	-0.027	-0.033	-0.012
			(0.070)	(0.076)	(0.045)
	Year Effects	No	No	Yes	Yes
	Market Effects	No	No	No	Yes
	R^2	0.560	0.560	0.567	0.905
News Reporters	Total Stations in Market	1.39**	1.33**	1.36**	-0.124
(N = 966)		(0.098)	(0.100)	(0.097)	(0.402)
	Stations per Owner	-1.04**	-1.58**	-1.56**	0.026
		(0.212)	(0.336)	(0.337)	(0.191)
	Variance of Stations Owned	—	0.162*	0.062	0.042
			(0.075)	(0.081)	(0.040)
	Year Effects	No	No	Yes	Yes
	Market Effects	No	No	No	Yes
	R^2	0.590	0.595	0.614	0.947
Broadcast	Total Stations in Market	1.42**	1.39**	1.38**	0.104
Technicians		(0.111)	(0.119)	(0.119)	(0.541)
(N = 811)	Stations per Owner	-0.582**	-0.855*	-0.838*	-0.172
		(0.181)	(0.332)	(0.337)	(0.252)
	Variance of Stations Owned	—	0.082	0.117	0.039
			(0.083)	(0.095)	(0.050)
	Year Effects	No	No	Yes	Yes
	Market Effects	No	No	No	Yes
	R^2	0.555	0.556	0.560	0.927

** denotes significant at the 1% level; * denotes significant at the 5% level.
Notes: All variables in natural logarithms. Standard errors in parentheses.

Table 4.4: Mean Hourly Wages as the Outcome Variable

		Model			
Occupation	**Explanatory Variable**	**(1)**	**(2)**	**(3)**	**(4)**
Announcers	Total Stations in Market	0.225**	0.192**	0.210**	0.075
(N = 1278)		(0.030)	(0.031)	(0.030)	(0.170)
	Stations per Owner	-0.037	-0.302*	-0.334**	0.021
		(0.073)	(0.118)	(0.116)	(0.092)
	Variance of Stations Owned	—	0.078**	0.027	-0.008
			(0.029)	(0.031)	(0.019)
	Year Effects	No	No	Yes	Yes
	Market Effects	No	No	No	Yes
	R^2	0.173	0.186	0.262	0.757
News Reporters	Total Stations in Market	0.192**	0.149**	0.165**	0.327
(N = 1114)		(0.029)	(0.030)	(0.031)	(0.180)
	Stations per Owner	0.083	-0.285**	-0.277*	-0.145
		(0.061)	(0.108)	(0.108)	(0.089)
	Variance of Stations Owned	—	0.110**	0.061**	-0.002
			(0.026)	(0.027)	(0.018)
	Year Effects	No	No	Yes	Yes
	Market Effects	No	No	No	Yes
	R^2	0.169	0.204	0.270	0.773
Broadcast	Total Stations in Market	0.196**	0.178**	0.189**	0.408
Technicians		(0.041)	(0.045)	(0.043)	(0.242)
(N = 891)	Stations per Owner	-0.001	-0.149	-0.143	0.056
		(0.074)	(0.161)	(0.159)	(0.114)
	Variance of Stations Owned	—	0.045	-0.011	-0.034
			(0.035)	(0.35)	(0.023)
	Year Effects	No	No	Yes	Yes
	Market Effects	No	No	No	Yes
	R^2	0.140	0.145	0.197	0.763

** denotes significant at the 1% level; * denotes significant at the 5% level.
Notes: All variables in natural logarithms. Standard errors in parentheses.

Table 4.5: Median Hourly Wages as the Outcome Variable

		Model			
Occupation	**Explanatory Variable**	**(1)**	**(2)**	**(3)**	**(4)**
Announcers	Total Stations in Market	0.115**	0.091**	0.106**	0.060
(N = 1278)		(0.026)	(0.027)	(0.026)	(0.168)
	Stations per Owner	0.031	-0.166	-0.189	0.135
		(0.066)	(0.106)	(0.105)	(0.091)
	Variance of Stations Owned	—	0.058*	0.013	-0.024
			(0.025)	(0.027)	(0.019)
	Year Effects	No	No	Yes	Yes
	Market Effects	No	No	No	Yes
	R^2	0.062	0.072	0.147	0.681
News Reporters	Total Stations in Market	0.155**	0.107**	0.122**	0.186
(N = 1114)		(0.030)	(0.030)	(0.031)	(0.197)
	Stations per Owner	0.040	-0.360**	-0.355**	-0.246*
		(0.059)	(0.104)	(0.104)	(0.098)
	Variance of Stations Owned	—	0.120**	0.076**	0.039
			(0.026)	(0.027)	(0.020)
	Year Effects	No	No	Yes	Yes
	Market Effects	No	No	No	Yes
	R^2	0.107	0.148	0.201	0.729
Broadcast	Total Stations in Market	0.207**	0.199**	0.208**	0.369
Technicians		(0.040)	(0.043)	(0.042)	(0.299)
(N = 891)	Stations per Owner	-0.027	-0.095	-0.084	0.184
		(0.073)	(0.154)	(0.152)	(0.142)
	Variance of Stations Owned	—	0.021	-0.034	-0.059*
			(0.035)	(0.037)	(0.028)
	Year Effects	No	No	Yes	Yes
	Market Effects	No	No	No	Yes
	R^2	0.133	0.134	0.173	0.695

** denotes significant at the 1% level; * denotes significant at the 5% level.
Notes: All variables in natural logarithms. Standard errors in parentheses.

Chapter 5

Conclusion

The three papers compiled in this dissertation have a common theme: they each study the effect of law and regulation on creative products. The two industries studied are the radio industry (where the product is a programming format) and the music industry (where the product is a work of music). Although the methodologies range from applied economic theory to econometric estimation, the core theme is determining how government policies—specifically telecommunications regulation and copyright law—affect creativity in the media and entertainment industries.

Chapter 2 concerns radio concentration in the wake of the Telecommunications Act of 1996. In that legislation, Congress increased the limits on how many radio stations one firm can own within a single "radio market." To enforce these limits, the FCC used an idiosyncratic method of defining radio markets, based on the complex geometry of the signal contour patterns of radio stations' broadcasts. Using a unique geographic data set, Chapter 2 provides the first calculations of the pre- and post-1996 limits on local radio ownership as actually implemented by the FCC. The limits are surprisingly permissive and vary considerably from city to city. While the limits were seldom binding on radio firms, I find a strong correlation between the 1996 increase in the limits and the increase in ownership concentration over the following five years. I use this correlation and the variation in the limits as a natural experiment in increased concentration to study the effects of concentration on various radio-market outcomes. The chapter's estimates can contribute to an assessment of the FCC's quasi-antitrust regime for radio and suggest that concentration has a positive effect on advertising revenue and the variety of programming formats but no effect on listenership. Finally, the chapter lays the groundwork for future research that will use the FCC's implementation of local radio ownership limits as a case study in the administrative process.

Chapter 3 studies copyright law as applied to digital sampling. All musical creation builds on previous works, but using fragments of existing pieces of music can constitute copyright infringement. A recent case has strengthened copyright protection for samples of sound recordings, in particular, by lowering the size threshold for protection to zero. This paper describes a model of copyright holders' and samplers' incentives that captures an important inefficiency emerging from the sequential creation context. Bargaining may not divide the profit from the sample-based derivative work between upstream and downstream creators in a way that provides musicians in both groups with sufficient incentives to create. The model suggests that attempting to "maximize" the property rights of copyright holders to increase incentives for creation can backfire. Because the specific bargaining process, and not ex ante efficiency, dictates the results of licensing negotiations, copyright can discourage socially desirable creative works. An optimal system for regulating sequential creation would balance the incentives of upstream and downstream creators, to the benefit of both groups.

Chapter 4 contains estimates of the effect of increased ownership concentration on labor markets. Local radio markets with higher ownership concentration employ fewer radio announcers, news reporters, and broadcast technicians. Moreover, those professions experienced smaller wage increases in more concentrated markets. These results suggest that increased concentration poses a threat to localism in radio as large firms shift away from hiring local employees and toward centralized staffing.

In sum, from the labor market to the product market, and from the studio to the record store, law shapes creativity.

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