J O I N T C E N T E R
AEI-BROOKINGS JOINT CENTER FOR REGULATORY STUDIES

Legislators v. Regulators: The Case of Low Power FM Radio

Thomas W. Hazlett and Bruno E. Viani

Working Paper 02-1

February 2002

Thomas W. Hazlett is a senior fellow at the Manhattan Institute and a fellow at the Joint Center. Bruno Viani is a research associate at the Manhattan Institute. The authors wish to thank Robert Hahn, Ted Rappaport, Rodger Skinner and seminar participants at Columbia University for helpful discussions, but absolve them of any liability for the contents of this paper. Lydia Regopoulos provided valuable research support.

J O I N T C E N T E R

In response to growing concerns about understanding the impact of regulation on consumers, business, and government, the American Enterprise Institute and the Brookings Institution have established the AEI-Brookings Joint Center for Regulatory Studies. The primary purpose of the center is to hold lawmakers and regulators more accountable by providing thoughtful, objective analysis of existing regulatory programs and new regulatory proposals. The Joint Center builds on AEI's and Brookings's impressive body of work over the past three decades that has evaluated the economic impact of regulation and offered constructive suggestions for implementing reforms to enhance productivity and consumer welfare. The views in Joint Center publications are those of the authors and do not necessarily reflect the views of the staff, council of academic advisers, or fellows.

All AEI-Brookings Joint Center publications can be found at www.aei.brookings.org

Abstract

The recent Federal Communications Commission rule making for low power FM radio has been widely reported as an instance where Congress sharply rebuked the Commission for enacting rules too favorable to entrants. Because rival policy optima are quantifiable in this case, the preferences of consumers, Congress and the Commission can be directly compared. While differences in policy preferences of Congress and the regulatory agency were visible to interest groups, they appear extremely modest when compared to the open entry (welfare maximizing) policy alternative. A financial event study reveals that incumbent broadcast station equity values were neither threatened by the Commission's low power FM rules, nor materially enhanced by their reversal in Congress. This lends empirical support to the Congressional Dominance view of regulation, and illustrates the margins on which blame- and credit-shifting strategies are utilized by policy makers.

Legislators v. Regulators: The Case of Low Power FM Radio

Thomas W. Hazlett and Bruno E. Viani

1. Introduction

a. The Delegation Question

Congress delegates administrative control to regulatory agencies with broad "public interest" mandates. Occasionally, however, it intervenes directly, constraining regulators with specific legislation. This prompts the question: Who controls regulation?

The view that "runaway bureaucrats" pursue their own agendas in defiance of Congress (Dodd & Schott 1979; Wilson 1980) was answered by Weingast & Moran (1983), who showed that enforcement actions of the Federal Trade Commission were highly correlated with the political views of Congress, particularly oversight committee chairs. This evidence, and the fact that Congress enacted laws directly overturning certain FTC initiatives, suggests that Congress controls regulation.

The basic logic of the Congressional Dominance perspective developed by Weingast & Moran (1983) is shown in Figure 1. Regulatory agency actions are characterized in simple, monotonic terms—e.g., the level of antitrust enforcement—on the horizontal axis. Preferences for various enforcement levels generate levels of utility for Congress, given by *U(C),* and the agency, given by *U(A).* The optimal levels for Congress and the agency are *C** and *A**, respectively. A gap between these policy positions may arise. Intervention by Congress moves the level of enforcement, *A**, towards *C**. This pattern is observed both in episodic legislative interventions and in the systematic correlation between agency enforcement actions and the ideological make-up of Congress and its oversight committees.

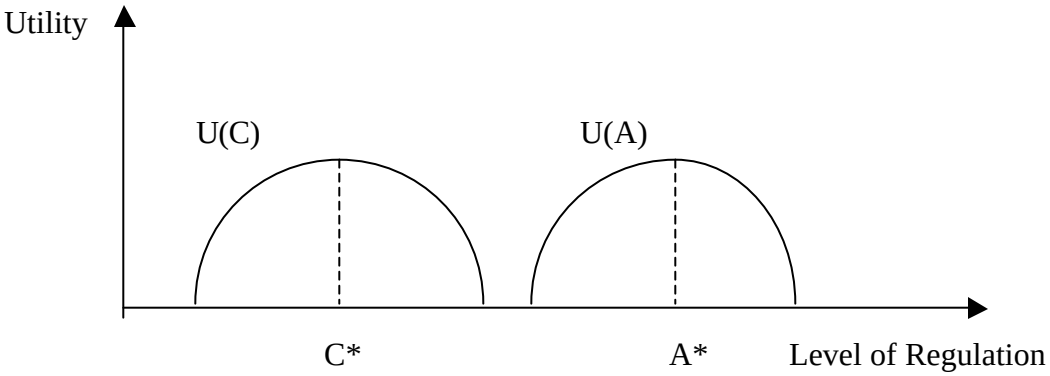

Figure 1. Preferences of Congress and the Regulatory Agency

The preferences of Congress change with political trends and member turnover, and a range of sanctions may be employed to discipline regulators, keeping agency policies in line with new political equilibria.[1] These devices create incentives for agency personnel to follow (or even anticipate) congressional demands. Yet, given their effectiveness, it is curious that disagreements occasionally balloon to a level where statutory constraints are imposed.

The transaction costs literature provides a general explanation (Epstein & O'Hallorin 1999). Agency costs—the costs to Congress of delegating decision-making to an independent regulatory commission—are offset by two factors:

(1) The expertise exercised by agency officials allows Congress to regulate far more widely, and strategically, than otherwise. Congress employs agents just as others do, knowing that conflicts of interest may arise even as arrangements produce net gains via the benefits of specialization.

(2) When conflicts become substantial, Congress may impose remedies at relatively low cost. Indeed, hearings, legislation, or other corrective actions can be undertaken to the benefit of committee chairs and their allies who garner support by appearing to reign in "runaway bureaucrats."

Under this set of constraints, how far do regulators stray? Weingast & Moran (1983) show that, in the 1964-1976 period, the Federal Trade Commission (FTC) was

[1] "There is available to the principal [Congress], however, a large repertoire of mechanisms for reducing agency losses – screening and selection procedures, contract design (including both compensation schedules and sanctions for malfeasance), monitoring and reporting requirements, and institutional checks.

responsive to the changing political demands of congressional members (particularly Senate oversight members). They also note that, pursuant to legislation limiting FTC activities in 1979, agency behavior was brought into conformity with congressional preferences. Yet, neither set of observations calibrates the distance between congressional demands and agency actions (i.e., the magnitude of A^*-C^*). A positive correlation between political changes in Congress and changes in FTC regulatory actions suggests that Congress pulls regulation in its direction (A^* approaches C^*), and statutory constraints demonstrate that discrete policy interventions may be used to eliminate the gap altogether. It remains an open question as to how much leeway independent agencies enjoy.

One recent regulatory episode—the low power FM radio rule making at the Federal Communications Commission (FCC)—provides a rare opportunity to calibrate this distance. Formally initiated in 1999, the low power FM rule making at the FCC culminated in an order creating a new class of low power stations, to be licensed to non-profit community organizations. Congress reacted by enacting legislation in December 2000 that overruled the FCC, reducing the number of slots available for low power radio stations. Like any case study, generalizations must be accompanied by caveats. But the political skirmish does offer suggestive results that can inform the debate over principal-agent relations in economic regulation. What is most promising in this instance is the ability to quantify the policy pursued by the FCC, the policy preferred by Congress, and the policy maximizing consumer welfare. This factual base allows one to observe how far congressional and agency policies differed *relative* to the underlying economic optimum.

b. The Low power FM Radio Issue

News media widely reported that when the FCC attempted to allocate radio spectrum for low power FM licenses, it was sharply rebuked by Congress. As the WASHINGTON POST wrote:

> When it became apparent that the usually plodding FCC was on a fast track to license low power stations, radio stations already on the air became nervous... Under their lobbying group, the National Association of

---

These mechanisms are themselves costly to invoke, but the principal can choose the mix of mechanisms that is most effective and least costly." (D. Roderick Kiewet and Mathew D. McCubbins, 1991:38).

> Broadcasters..., existing broadcasters have fought the low power proposal with everything they've got... The House passed a compromise bill last month that would allow a small percentage of these stations to be licensed after a testing period. But even the watered-down legislation was meant to send [FCC Chairman William E.] Kennard a strong message. "It was clear that the FCC thought all along that they could run roughshod through this without much opposition," [Rep. Michael G. Oxley (R-Ohio)] Oxley said. "We're hoping that the vote will bring them up short until Congress can sort this out."[2]

The FCC continued to slowly advance toward licensing low power FM stations, however, until "a last minute rider in December's [2000] Senate appropriations bill (which eventually became law) severely handicap[ped] the low power initiative."[3] This gave rise to the consensus view that Congressional action "sharply curtails the ambitious plans of the Federal Communications Commission to issue licenses for low power FM radio stations to 1,000 or more schools, churches and other small community organizations."[4]

This high profile battle between Congress and the FCC yields testable implications for the Congressional Dominance view of regulation. Most notable is the opportunity to identify and measure three rival regulatory optima:

---

[2] Frank Ahrens, *Political Static May Block Low power FM; FCC, Congress Battle Over Radio Plan*, THE WASHINGTON POST (May 15, 2000), A1.

[3] Sarah Wildman, *Mixed Signals: NPR Sells Out*, The New Republic (Feb. 5, 2001), www.tnr.com/021201/wildman021201.html. Specifically, it required LPFM stations to provide 3rd adjacent channel protection to existing primary service (full power) FM stations (Congress of the USA, Public Law No. 106-553, 106th Congress, Dec. 21, 2000. Appendix B, Sec. 632).

[4] Stephen Labaton, *Congress Severely Curtails Plan For Low power Radio Stations*, NEW YORK TIMES (December 19, 2000), A1. Wired News reported that "The appropriations bill included legislation by Sen. Rod Grams (R-Minnesota) which could delay and restrict the number of 10 to 100 watts licenses handed out by the FCC." *Senate To Vote On Microradio Bill*, (October 26, 2000), www.wired.com/news/business/0,1367,39765,00.html (visited on 4/16/01); "The appropriations bill President Clinton signed Thursday also delivered a major blow to FCC chairman William Kennard's campaign to bring diversity back to the radio waves." Lyssa Graham, *New Legislation Hurts Low power FM Radio Initiative*, MIAMI HERALD (December 22, 2000), http://www.herald.com/content/today/national/diagdocs/071199.htm (visited on 12/22/00); "Even as the Federal Communications Commission charges ahead with its fast-track licensing drive, powerful forces in Washington are pushing hard to halt this train before it leaves the station. The National Association of Broadcasters and National Public Radio have led the lobbying in favor of separate attempts in the House and Senate to limit low power stations." Marc Fisher, *Lobbying Against Low power Radio,* American Journalism Review (October 2000), 46.

- The FCC's, represented by its proposal to license about *1,000 low power FM stations*;
- Congress', which limited licenses to about *600 low power FM stations*;
- Consumer welfare maximization, achieved by fully utilizing the FM band to accommodate non-interfering broadcasters. As estimated below, this would allow for nearly *100,000 low power FM stations*.[5]

While the FCC's allotment of low power radio licenses differed from that preferred by Congress, both allocations were trivial relative to the level of entry possible.[6] When combined with other rules imposed on prospective low power FM station applicants, the distance between Congress and the FCC was inconsequential as a fraction of total FM band capacity. Hence, the political equilibrium generated by the regulatory agent is revealed to differ only slightly from that of the principal. This modest difference, however, was large enough for Congress and the FCC to engage in significant "credit-claming" and "blame-shifting" (Mayhew 1974, Fiorina 1982, McCubbins and Schwartz 1984), generating gains for incumbent legislators. The results support the Congressional Dominance view of regulation.

II. FM Radio Regulation by the FCC

The FM band is divided into 100 channels, with 200 KHz allocated to each. FCC regulation controls interference by spacing stations geographically and in frequency space. If stations transmit within three channels the FCC imposes minimum distance requirements.[7] The simple trade-offs involved in station separation to limit radio interference are depicted in Figure 2. In panel (a), radio stations in a local market are separated by three adjacent channels on either side. These channels serve as a buffer, but are otherwise idle in this market. In panel (b), stations (with identical power transmission

[5] This estimate abstracts from possible entry into radio broadcasting due to liberalization elsewhere; e.g., in the AM radio, or UHF TV bands.
[6] The overly conservative nature of FCC spectrum allocation policy has long been noted. A detailed treatment is given in Hazlett (2001).
[7] Code of Federal Regulations, 47 CFR section 73.201, subpart B and section 73.207.

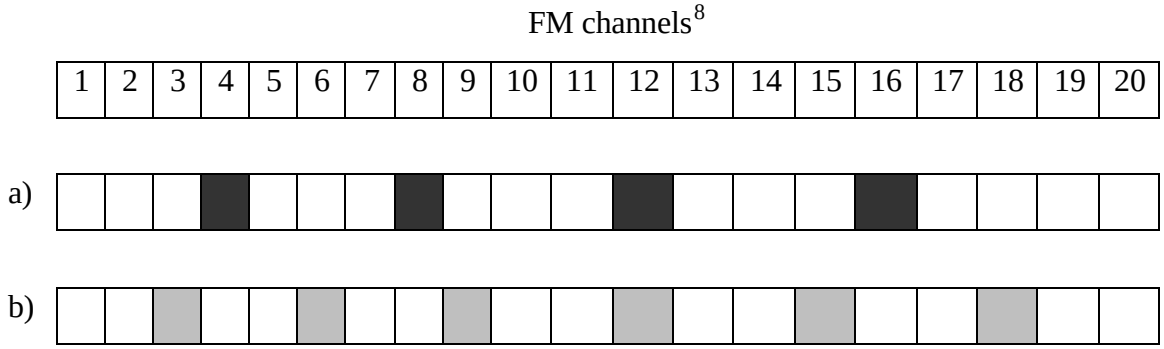

Figure 2. Two Channel Separation Rules

and antenna height as in (a)) are separated by just two adjacent channels, meaning that more broadcasts (and listener choices) are available. The cost of this enhanced band utilization, however, is an increased possibility of harmful interference. With stations packed more densely, broadcaster emissions tend to collide more frequently, degrading signal quality for listeners. The marginal value of the loss will just equal the marginal value of increased program choice in an optimal allocation of radio stations.

FM stations are classified as either primary or secondary service stations. Primary stations are granted interference protection from all other stations; secondary stations are granted interference protection only from other secondary stations but not from primary stations. The FCC classifies primary stations (commercial and noncommercial) in seven categories: Class A, B, B1, C, C1, C2, and C3.[9]

This delineation is based on geographic coverage area, which is a function of two variables: (1) effective radiated power, and; (2) antenna height. Increasing either variable increases signal coverage. See Table 1. By comparison, new low power FM stations have a maximum power of 0.1 kW, antenna height of 30 m, and signal contour of just 3.5 miles.

[8] As noted, the actual FM band consists of one hundred channels; just twenty are shown here.
[9] Code of Federal Regulations, 47 CFR 73.211, October, 1, 1999 edition.

Table 1: Classes of Primary Service FM Stations

Class	Distance to 1mV/m signal contour in Km (miles) [a]	Reference HAAT (m)	Maximum ERP (kW)
A	28 (17)	100	6
B1	39 (24)	100	25
B	52 (32)	150	50
C3	39 (24)	100	25
C2	52 (32)	150	50
C1	72 (45)	299	100
C	92 (57)	600	100

Source: *Code of Federal Regulations,* 47 CFR 73.210, 73.211. 73.333 (Oct. 1, 1999).

ERP: Effective radiated power; HAAT: Antenna height above average terrain.

[a] By mapping the signal's contour the FCC can find the distance to the 1 millivolt-per-meter (mV/m) contour using the ERP and the HAAT values. The table provides the maximum ERP for each class of station, given a reference antenna height (HAAT). Antenna height and maximum power are referential values for estimating signal contour radius, which is what ultimately determines a station's class. Stations may transmit at a higher ERP than listed on the table if they reduce antenna height. For example WBCT in Grand Rapids (MI) transmits at 320 kW, but has an antenna HAAT of 236 meters—less than half the reference value in the table (which limits Class C stations to 100 kW.)

Figure 3 illustrates FCC channel separation and minimum distance requirements. Assume an existing Class A station is located at the center of the concentric circles (called signal contours) and a new Class A station is applying for a license in the same area. The new station could transmit on the same channel as the existing station but would then locate at least 71 miles away. It could transmit on a 1st adjacent channel and locate 45 miles away. It could transmit on a 2nd or 3rd adjacent channel, with 19 miles of separation. If it uses three channels of separation or more, the new station would not require distance separation from the existing station. [10]

[10] Primary stations also need to comply with distance requirement against Intermediate Frequency Interference (IF) which arises from stations broadcasting 10.6 and 10.8 MHz apart. These distances are typically less than those required to protect stations in 2nd and 3rd adjacent channels. An additional distance requirement applies only to stations in channel 253 to protect TV channel 6 stations (47 CFR 73.207 paragraph (b), 10/1/99 edition). Finally, another type of distance requirement is to avoid "blanketing interference," which affects all stations geographically located (regardless of frequency) within a radius (R)

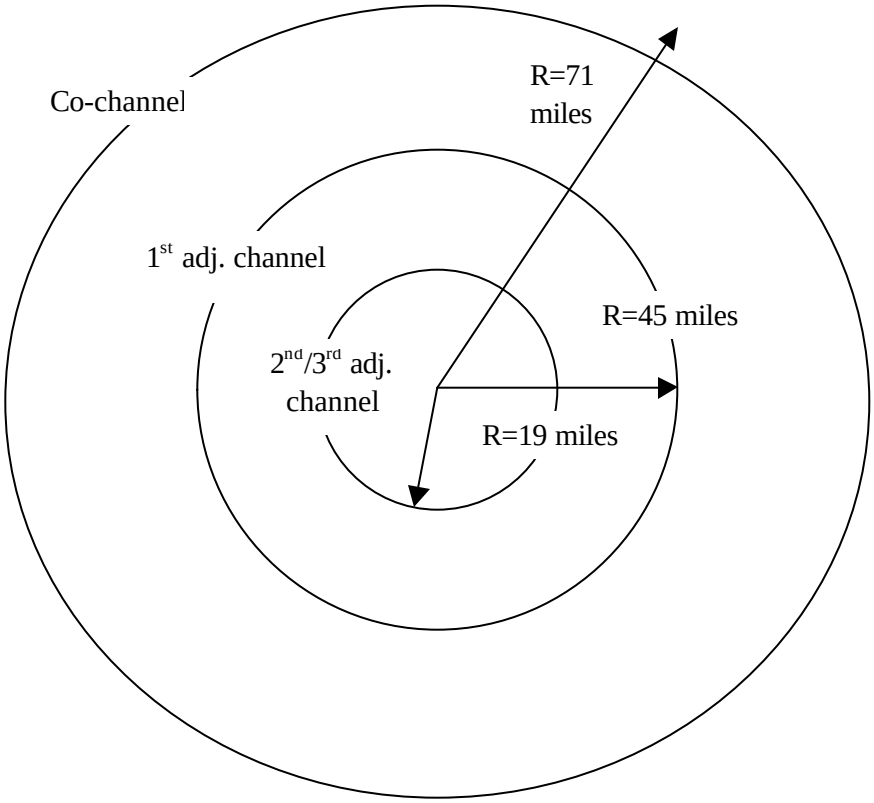

Figure 3: Separation Requirements for Two Class A FM Stations

III. The FCC's Low Power Radio Rule Making

In 1978 the FCC decided it would no longer license Class D 10-watt stations, primarily licensed for noncommercial educational use.[11] This raised minimum power allotments to 3,000 watts; in 1989 the minimum was raised to 6,000 watts. Entry by low power stations was thus precluded.[12]

---

estimated by: $R = 0.245\sqrt{P}$; where *R* is measured in miles, and P is the maximum effective radiated power (ERP) in kilowatts (47 CFR 73.318 [Oct. 1, 1999]).

[11] Federal Communications Commission, *First Report & Order, In the matter of changes in the rules relating to noncommercial educational FM broadcast stations*, Docket No. 20735, 68 FCC 2d 988, adopted June 7, 1978, at 989; Federal Communications Commission, *Second Report & Order, In the matter of changes in the rules relating to noncommercial educational FM broadcast stations*, Docket No. 20735, 68 FCC 2d 240, adopted June 7, 1978, at 250, 266-268. See also Martin (1982: 449-451) and Walker (1997: 8-10).

[12] In theory, class A stations may transmit with less power, but licenses will only be issued to applicants with facilities capable of transmitting at the maximum effective radiated power. For class A, these values have been (using the standard 100 meters antenna height): 3,000 watts between 1962 and 1989; 6,000 watts afterwards. FCC (1962), and FCC (1989). This regulatory practice both raises entry costs for applicants and reduces the number of slots available for stations as evaluating interference contours at higher power levels than are actually used increases perceived transmission conflicts.

While the FCC was increasing minimum power requirements for radio stations, the cost of low power transmitters was dropping rapidly.[13] Consequently, the 1980s and 1990s saw increasing numbers of "pirate radio stations." The FCC, under pressure from licensed broadcasters, shut down scores of unauthorized stations.[14] Unlicensed broadcasters have challenged FCC rules in court, but none have prevailed.[15]

On July 17, 1997, Nickolaus Leggett, Judith Leggett, and Donald Schellhardt petitioned the FCC (RM-9208) to create a new low power radio service. They proposed that one channel be allocated in both the AM and FM bands to provide a new one-watt micro-radio service (Leggett et al, 1997). On February 20, 1998, another petition (RM-9242) was filed by J. Rodger Skinner, who proposed the creation of three classes of low power service in the FM band: 1) A primary service with an effective radiated power between 50 and 3,000 watts; 2) a secondary service with an effective radiated power below 50 watts; and 3) a special event service with an effective radiated power under 20 watts, authorizations not to exceed 10 days. The primary service would be required to comply with the existing criteria for co-channel and first adjacent channel separation (Skinner 1998).

The FCC requested public comment on the petitions,[16] triggering a formal rule making process. Rulings in that process were issued in January 1999, January 2000, and September 2000,[17] as outlined in Appendix 1. While the Commission eventually

---

[13] Stephen Dunifer (Radio Free Berkeley), Doug Brewer (Temple Terrace Community Radio in Florida), and Ernest Wilson (Pan-Com international) sold transmitters for $150-200 (Soley 1999: 104). These kits created stations broadcasting over a two-mile radius.

[14] For a detailed recount of the history of pirate radio see Soley (1999: 58-84). See also Walker (2001).

[15] For a recount of Kantako's Black Liberation Radio and Stephen Dunifer's Radio Free Berkeley see Soley (1999: 75-76, 88-90, 98-99). See also Phillip Taylor *Godfather Of Low power Radio Back On Air Despite Shutdown*, The Freedom Forum Online (November 16, 2000), www.freedomforum.org/templates/document.asp?document ID=3429 (visited 4/19/01). For other cases like that of North Dakota farmer Roy Neset or Alan Freed in Minneapolis, see, *Radio Free America: Fighting the FCC's Assault on Free Speech*, Institute for Justice, www.ij.org/clients/ftc/body.shtml; *Micro-broadcaster Seeks Vindication of Free Speech Rights in the First Micro-radio Case to Reach the US Supreme Court*, Institute for Justice, www.ij.org/media/1ammend/microradio/10%5F4%5F00pr.shtml (visited on April 2, 2001).

[16] Public Notice: Report No. 2254, February 5, 1998; Public Notice: Report No. 2261, March 10, 1998.

[17] Federal Communications Commission, *Notice of Proposed Rule Making: In the matter of creation of low power radio service*, MM Docket No. 99-25, FCC 99-6 (January 28, 1999); Federal Communications Commission, *Report and Order: In the matter of creation of low power radio service*, MM Docket No. 99-25, FCC 00-19 (January 20, 2000); Federal Communications Commission, *Memorandum Opinion and Order: In the matter of creation of low power radio service*, MM Docket No. 99-25, FCC 00-349 (September 28, 2000).

authorized up to 1,000 new low power FM stations, restrictions increased from start to finish. Congressional activity likely influenced this outcome, as hearings, legislation, and statements by key committee members on the subject of low power FM were frequently reported in the trade press.[18] These statements were overwhelmingly critical of the FCC for being too liberal (pro low power FM entry) in its rule making. A summary of the main events in Congress is given in Appendix 2.

In the conventional wisdom, the FCC promoted a liberal allocation of low power FM licenses, while Congress sharply redesigned the policy outcome by harshly reducing available low power FM licenses.[19] If true, this episode could raise troubling questions for the Congressional Dominance view of delegation; even as Congress eventually stepped in to constrain the regulatory agency, such a substantial schism would expose a potentially substantial principal-agent problem. Fortuitously, the theory yields testable implications. Before turning to these tests, however, we examine one additional policy detail: the outcome of a low power FM rule maximizing consumer surplus.

IV. An Estimate of FM Band Low power Station Insert Capacity

How many 100-watt FM radio stations could be slotted into U.S. radio markets without posing unacceptable interference to existing FM stations? A simple model can estimate this number to a first approximation.[20] This model does not predict economic viability; a market test would be necessary to establish how many low power FM stations listeners, advertisers, or contributors would support. But it does answer a relevant policy question. In the absence of arguments to the contrary, open entry creates the standard

---

[18] "Our bill says before you run full speed ahead with these licenses, make sure that the interference requirements are adhered to," said Representative Michael G. Oxley…" *House Clears Bill To Curb Plans For FM*, Stephen Labaton, THE NEW YORK TIMES (April 14, 2000); "…Chairman Kennard, wanting this as his legacy, pushed this issue before it was fully and completely tested', said Representative Bill Tauzin…" *Religious groups at odds with G.O.P. on radio licenses*, David Leonhardt, THE NEW YORK TIMES (July 11, 2000).

[19] See: THE WASHINGTON POST, *Budget Bill Curbs Low power Radio; Stations Would Be Kept out of Cities*, E03, Frank Ahrens (December 20, 2000); THE WASHINGTON POST, *Political Static May Block Low power FM; FCC, Congress Battle Over Radio Plan*, A01, Frank Ahrens (May 15, 2000); THE WALL STREET JOURNAL, *Panel Clears Bill to Curb Low power Radio Station*, A8 (March 30, 2000); THE WASHINGTON POST, *D.C. to Get Low power FM Permits, if Programs Survives*, E01, Frank Ahrens (March 28, 2000).

[20] For a more detailed explanation, see Appendix 3

optimum of a competitive equilibrium.[21] Hence, by estimating the capacity of possible low power FM station assignments, we develop a benchmark policy that quantifies the optimal regulatory outcome.

We assume that the FM band is fixed, and that one hundred 20-kHz channels are allocated to each FM radio market—i.e., the status quo.[22] We further assume that within each local market, every existing FM station will continue to enjoy exclusive use of its broadcast frequency and (as buffers) the channels bordering either side.[23] There are 269 unique U.S. radio markets.[24] New 100-watt low power FM stations are given co-channel protection by keeping a distance between them such that no station transmits within the coverage area of another low power FM station.

Our assumed standard follows Rappaport et al. (1999).[25] The study points out that the 3-channel separation rule was established when older technology made FM radios more susceptible to drifts, adjacent channel capture, and adjacent channel overload than in modern FM receivers (Rappaport et al. 1999: 3, 6).[26] "The FCC protection ratios

---

[21] This is not only the conclusion of welfare economics, but of FCC policy makers. See Rosston & Steinberg (January 1997: 7). Also Owen (1999:59-70), and Comment of Thirty-Seven Concerned Economists (2001). Berry and Waldfogel (1999) argue that free entry in broadcasting is not socially optimal due to excessive competitive investment which "cannibalizes" existing audiences. Even if the free entry assumptions were correctly applied to radio broadcasting (which as the low power FM episode shows, is subject to severe regulatory entry barriers), consumer surplus is still maximized via a policy of open entry.

[22] FM technical standards were set decades ago, prior to the advent of digital tuning devices, and were the FCC to permit stations to broadcast with less separation (thereby creating more listening choices), radio manufacturers would gain the incentive to produce receivers with improved ability to process signals on adjacent frequencies. In assuming such regulatory options away, the estimate of FM station insertion capacity is a conservative one.

[23] In other words, each licensee is granted exclusive use of three channels within the local market area. This is a stronger restriction than imposing minimum distance requirements. The rationale for this separation rule is given below.

[24] According to Arbitron Radio Market Ranking (Fall 1999) there are 276 metropolitan radio markets in the United States. Seven of these markets are embedded in larger markets, however. To avoid double counting, we combine these duplicates. See: www.arbitron.com/radiosurvey/mm001025.htm. These markets do not exhaustively cover U.S. households, as many small towns and rural markets are unranked. Indeed, only about one-half of U.S. stations broadcast in designated radio markets. BIA Financial, The 1999 State of the Industry Radio Report, Executive Summary, 2; www.biacompanies.com/state_radio.htm. This also implies substantial under-estimation of low power FM insert capacity in our model.

[25] The principal author, Theodore Rappaport, is an engineering professor and Founder of the Mobile and Portable Radio Research Group at the Bradley Department of Electrical and Computer Engineering at the Virginia Polytechnic Institute. See: http://www.mprg.ee.vt.edu/people/ tsr/rappaport.html.

[26] Federal Communications Commissions' radio interference rules have been in place since the 1940s. See Moffet, Larson & Johnson, Inc. "Selection of Receivers for FM Receiver Testing and Analysis of Test Results in Support of the Comments of the National Association of Broadcasters in MM Docket 99-25." Cited in Rappaport et al (1999: 41).

were designed to provide simple and conservative spacing," the study notes, "to prevent early FM radio receivers from undesired retuning to strong adjacent stations." The authors add that conservative assumptions in the FCC propagation models insure that radio stations are more widely spaced than necessary.[27]

Indeed, the FCC has tested the one channel FM separation rule used here and found it sufficient to limit interference between full-power stations. In a 1997 FCC Report and Order[28] the Commission cites a study by the National Association of Broadcasters that estimated a total of 312 FM radio stations broadcast on 2nd or 3rd adjacent channels without adherence to minimum distance standards. These so-called short-spaced commercial stations have operated for decades without complaint or regulatory correction, indicating that harmful interference is not present under the Commission's revealed standard.[29] Since 100-watt stations emit far less possible interference than do full power stations, using this time tested separation rule to estimate capacity for low power stations appears reasonable.

Given the assumptions above, the number of available channels in each market equals 100-3X, where X is the number of FM stations already operating. Because 100-watt stations have a signal contour radius of 3.5 miles,[30] the minimum distance separation between 100-watt stations would be 7 miles. We increase this distance to 8 miles and assume that each 100-watt station would "occupy" a square area of 8x8 miles. Hence, the total number of 100-watt stations the FM band could accommodate per market is:
[100-3X][Area in sq. mi/64].

This estimate, however, excludes the "blanketing" effect of existing FM stations on future low power FM stations. Blanketing occurs when a nearby FM station's signal

---

[27] Formally, the FCC seeks to guarantee a minimum signal-to-noise ratio at the edge of the signal contour. These ratios are then used to calculate the required distance separation between stations to avoid interference. Yet, the ratios used by the FCC do not relate to actual signal-to-noise ratios in the field, which are much higher, and thus yield much better audio quality (Rappaport 1999: 43-45, 47).

[28] Federal Communications Commission, *Report and Order: In the Matter of Grand-fathered Short-spaced FM Stations;* MM Docket 96-120 (August 4, 1997).

[29] The FCC stated that "….The small risk of interference is far outweighed by the improvements in flexibility and improved service….." FCC (1997: par. 29). The FCC ruled in favor of eliminating 2nd and 3rd adjacent channel spacing requirements for grandfathered short-spaced stations authorized prior to 1964 (ibid par. 23).

[30] According to the FCC a 100-watt station with and antenna height of 98 feet (30m) would produce a 1mv/m (60dBu) signal contour at a distance of 3.5 miles. Federal Communications Commission, *NPRM: In the Matter of Creation of Low Power Radio Service*, MM Docket No. 99-25 (Jan. 28, 1999), par. 30.

overloads all other signals in the immediate area, including those broadcasting on distant frequencies. The circular blanketing area has been estimated as having a radius of 2.5 miles for the most powerful (Class C) FM stations, or 18.9 square miles (Rappaport et al. 1999: 21-2). To be conservative, we increase the blanketing area to the same value assumed for the contour area of a 100-watt low power FM station, or 64 square miles.

Adjusting our equation to account for blanketing interference, and summing over 269 radio markets, yields the following equation:

$$Y = \sum_{i=1}^{269} [100 - 3X_i][(Area_i - 64X_i)/64]$$

where X_i is the number of existing FM stations in market i and Y is the number of licenses for low power FM service that can be accommodated on the FM dial. As seen in Table 2, this estimation yields a large low power insert capacity for the FM band: 306,805 stations. Even when we cap the density of low power FM stations per market at one per 1,000 population,[31] the band maintains an insertion capacity of 97,701 new 100-watt stations. This estimate of the potential supply of licenses is very likely a lower bound due to the conservative assumptions applied.[32]

[31] Since the smaller markets are typically less dense and have fewer radio stations broadcasting, their insertion capacity is greatest. Capping insert capacity with an arbitrary constraint helps limit this fact from skewing results. As seen in Table 2, medium and small sized radio markets often face a binding constraint in this imposed cap.

[32] Note that our estimation does not provide insertion capacity for new low power FM stations in the top four markets. In practice, such markets allow abundant space for such stations, however, as shown by the FCC's original plan to allocate low power FM licenses to some of these markets (Federal Communications Commission, Report No. 24760. Broadcast Applications, June 21, 2000. http://www.fcc.gov/ Bureaus/ Mass_Media/Public_Notices/Brdcst_ Applications/ap000621.txt. See also Federal Communications Commission, Report No. 24820, Broadcast Applications, Sept. 15, 2000).

Table 2: Low power FM Station Insert Capacity Nationwide and in Selected Markets

Rank	Radio Market [a]	Population (12+) [a]	Area [b]	No. of FM stations [c]	Additional 100-watt slots [d]	Blanketing effect [e]	Net slots after blanketing effect	CAP (Max/1000 pop)	Final No. of 100-watt stations
1	New York, NY	14,449,700	7,796	69	0	0	0	14,500	0
2	Los Angeles, CA	10,347,700	4,850	38	0	0	0	10,348	0
3	Chicago, IL	7,147,300	5,619	46	0	0	0	7,4147	0
4	San Francisco, CA	5,812,200	7,369	62	0	0	0	5,812	0
5	Philadelphia, PA	4,063,000	3,518	19	2,364	817	1,547	4,063	1,547
6	Dallas-Ft. Worth, TX	3,928,600	6,968	32	435	128	307	3,929	307
7	Detroit, MI	3,826,600	4,466	23	2,163	713	1,450	3,827	1,450
8	Boston, MA	3,724,100	3,105	24	1,359	672	687	3,724	687
9	Washington, DC	3,664,600	3,967	29	806	377	429	3,665	429
10	Houston, Galveston, TX	3,613,700	7,107	29	1,444	377	1,067	3,614	1,067
1-10	Large markets total				8,571	3,181	5,487	60,579	5,487
134	Appleton-Oshkosh, WI	289,700	1,399	13	1,333	793	540	290	290
135	Peoria, IL	289,200	1,797	13	1,712	793	919	289	289
136	Biloxi-Gulfport-Pascagoula, MS	286,700	1,785	13	1,701	793	908	287	287
137	Atlantic City-Cape May, NJ	286,600	816	18	587	828	0	287	0
138	Trenton, NJ	284,800	226	5	300	425	0	285	0
139	Stamford-Norwalk, CT	283,300	210	4	289	352	0	283	0
140	Tyler-Longview, TX	272,500	2,101	15	1,806	825	981	273	273
141	Newburgh-Middletown (Mid-Hudson Valley), NY	270,900	816	9	931	657	274	271	271
142	Montgomery, AL	266,400	2,008	10	2,196	700	1,496	266	266
143	Eugene-Springfield, OR	265,200	4,554	9	5,195	657	4,538	265	265
134-143	Mid-size markets total				16,050	6,823	9,656	2,796	1,941

267	Jackson, TN	72,000	557	11	583	737	0	72	0
268	Bangor, ME	71,400	352	12	352	768	0	71	0
269	Beckley, WV	67,800	1,271	6	1,628	492	1,136	68	68
270	Mason City, IA	67,800	1,469	8	1,744	608	1,136	68	68
271	Jonesboro, AR	66,100	711	8	844	608	236	66	66
271	Cheyenne, WY	64,300	2,686	9	3,064	657	2,407	64	64
273	Great Falls, MT	63,300	2,698	5	3,583	425	3,158	63	63
274	Meridian, MS	61,200	1,380	10	1,509	700	809	61	61
275	Brunswick, GA	56,500	1,052	7	1,299	553	746	57	57
276	Casper, WY	50,600	5,340	8	6,341	608	5,733	51	51
267-276	Smallest markets total				20,947	6,156	15,361	641	498
1-276	All markets total	183,127,000	606,292	3,736	488,179		306,805		97,701

Notes: Nassau-Suffolk (NY), Monmouth-Ocean (NJ), Morristown (NJ), and Stamford-Norwalk (CT) included in New York City market; San Jose and Santa Rosa included in San Francisco market; New Bedford-Fall River (MA) included in Providence-Warwick-Pawtucket market; Frederick (MD) included in Washington, D.C.market.

[a] Based on Arbitron radio markets

[b] Square miles. Based on Arbitron definition of market areas which follows U.S. Census Bureau Metropolitan Statistical Areas.

[c] Data from BIA Research, Inc., Radio Yearbook 2000.

[d] Assuming each 100-watt station is located in the center of an 8x8 mile square area (see Appendix).

[e] Formula implicitly assumes a blanketing area of 64 square miles.

Sources: Arbitron Radio Market Rankings- Fall 1999. http://www.arbitron.com/radiosurvey/mm001025.htm U.S. Census Bureau, Geographic Resources. http://www.census.gov/population/censusdata/90den_ma.txt.BIA Research, Inc., Radio Yearbook 2000. Investing In Series.

V. Three Policy Optima

We may now compare the revealed policy preferences of Congress (*C**) and the FCC (*A**), and contrast these preferences with the policy of open entry (*E**). See Figure 4. While the differences between Congress and the FCC appear large in isolation, putting the regulatory skirmish in context produces a dramatically different conclusion. The preferred numerical outcome for Congress was about 600 low power FM licenses,[33] while the FCC authorized approximately 1,000.[34] Either allocation is trivial, compared to the pro-consumer solution. Existing broadcasters would not face substantial marketplace competition no matter which plan were adopted. The agent is observed to be obedient to the principal despite considerable public conflict.[35]

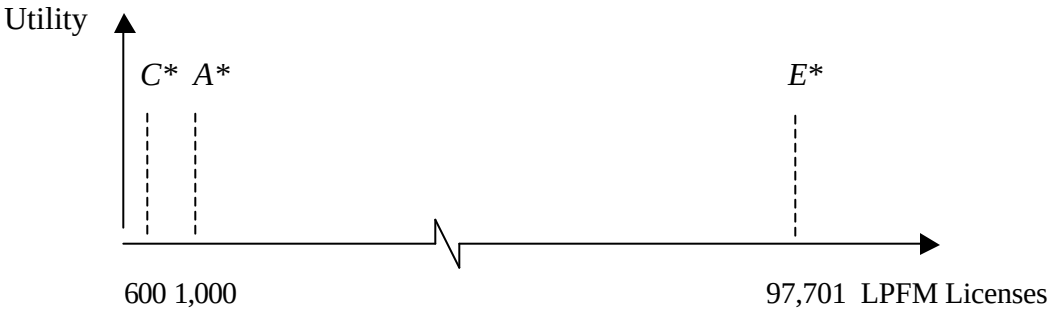

Figure 4. Policy Optima for Congress, FCC, and Consumer Welfare Maximization

---

[33] The estimate for Congress is based on the Federal Communications Commission's Public Notice: *Notice of Acceptance of Low Power FM Broadcast Applications And Notification of Petition to Deny Deadline* (December 21, 2000) in which the FCC lists 255 applications filed in the first two low power FM windows which fully comply with the new rules set by Congress and which are not in conflict with any other application. These two windows represents two-fifth of the window fillings, thus by linear extrapolation we get a total of 637 licenses for the five window fillings. Another estimate is obtained by weighting by population. Using data of population by state, we find that the two first window fillings represent 41.4 percent of the U.S. population. By linear extrapolation we find 617 licenses.

[34] The Federal Communications Commission never explicitly quantified its planned allotment of licenses. The 1,000 estimate is based on press releases, and news articles. For example: "The new [LPFM] stations, which the FCC estimates could number 'as many as 1,000 or perhaps even more,' would operate at power levels of between 10 and 100 watts" *FCC Is Set to Open Airwaves to Low power Radio*, Kathy Chen, THE WALL STREET JOURNAL, page B12 (January 17, 2000).

[35] "Legislation was meant to send [FCC Chairman William] Kennard a strong message. 'It was clear that the FCC thought all along that they could run roughshod through this without much opposition', [Rep. Michael] Oxley said. 'We're hoping that the vote will bring them up short until Congress can sort this out.'" Frank Ahrens, *Political Static May Block Low power FM; FCC, Congress Battle Over Radio Plan*, THE WASHINGTON POST, (May 15, 2000), A1; " 'The FCC has moved without any consideration of the facts,' said Representative John Dingell, Democrat of Michigan. 'This is a reasonable common sense compromise. It will protect the broadcasters, it will protect the licensees, and above all else, it will protect listeners of the FM radio spectrum.' " Stephen Labaton, *House Clears Bill to Curb Plans for FM*, THE NEW YORK TIMES (April 14, 2000), C1.

Non-quantifiable regulations are also important in the low power FM proceeding and they strongly reinforce this conclusion. These regulations, perhaps more than the numerical limits on new licenses, severely constrained entry by low power stations in the FCC's rule making. These regulatory constraints outlined in Appendix 1, include:

a. severe limits on license aggregation, pre-empting important economies of scale realized by broadcast chains;[36]
b. prohibition on license ownership by newspapers, for-profit firms, radio or TV stations, pre-empting economies of scope and eliminating funding opportunities in financial markets;[37]
c. prohibition of advertising, blocking direct competition in the revenue-generating markets occupied by incumbent broadcasters;[38]
d. requirements (through licensing preferences) for eight daily hours of original programming, an imposing burden for small-scale community enterprises;[39]
e. prohibition on pirate radio applicants, excluding the one social segment that has accumulated a modicum of human capital in owning and operating low-budget community stations;
f. severe power limits, constraining station coverage and financial viability.[40]

---

[36] "We will require that for the first two years of LPFM service, any one entity may own only one LPFM station (…). After the first two years, to bring into use whatever low power stations remain available but unapplied for, we will allow one entity to own up to five stations nationally, and after the first three years of service, we will allow an entity to own up to ten stations nationwide." FCC (2000a: par. 39); "We will restrict local ownership and allow one entity to own only one LPFM stations in a community." (Ibid par. 44).

[37] "We will prohibit common ownership of LPFM and any other broadcast station, including translators, and low power television stations, as well as other media subject to our ownership rules (…). This prohibition is national and absolute in nature, unlike our existing cross-media ownership rules. Thus, for example, a newspaper cannot have an attributable interest in any LPFM station, regardless of whether the newspaper and LPFM station are co-located." FCC (2000a: par.29).

[38] "We have also decided to prohibit operating agreements in any form, including time brokerage agreements, local marketing or management agreements." FCC (2000a: par. 29); "We will establish LPFM as a noncommercial educational service." (Ibid par. 17). By establishing low power FM service as noncommercial educational stations the FCC prohibited them from advertising as stated in the Code of Federal Regulations. 47 CFR 73.503 paragraph (d) October 1, 1999 edition.

[39] " Applicants that pledge to originate locally at least eight hours off programming per day will be assigned one point" FCC (2000a: par. 144). The point system developed by the FCC is for the selection of mutually exclusive applications. Applicants with 12 or more hours per day of local programming have preference over those with less local programming.

[40] See FCC (2000a: par. 11-14).

Even prior to congressional intervention, FCC rules ensured that low power stations will prove expensive to operate and difficult to fund. As Rodger Skinner, one of the two petitioners to initiate the low power FM rule making, comments:

> With my engineering background I know what it takes to have a listenable signal with given power and antenna height...Too many commenters in the low power FM proceeding filed comments requesting very low power levels since they were not familiar with coverage vs power/antenna height. Many pirate operators wanted low powers just to "play radio." I opposed them since this was not a "play" thing that I was attempting to create, but rather a full-fledged new broadcasting service. Another huge blow came when the FCC limited low power FM (LPFM) to non-commercial use only. This left station operators with no way to support a real radio station. Of course, there were those who are happy with any crumbs the FCC might throw their way. I posted a tombstone with "LPFM" on it on Jan 20th [2000] when the FCC issued its report and order, proposing a severely watered down version of what I had proposed. In my mind LPFM died that day![41]

Ironically, the constraints on low power FM stations were enthusiastically advanced by low power FM's most ardent public supporters. These include FCC Chair William E. Kennard, who was often lauded in the press as the beleaguered champion of community radio stations, and the Media Access Project, a non-profit law firm that lobbied vigorously for low power FM, but also for strict rules limiting low power FM stations to non-profit status and prohibiting multiple station ownership, cross-ownership, and advertising.[42]

VI. Low power FM Policies and Full-Power Radio Station Equity Values

The above analysis carries testable implications. If Congress battled the FCC for control of low power FM licensing policy, financial markets would predictably react to

[41] Email to Thomas W. Hazlett (March 24, 2001).

evident changes in the political conflict. Conversely, if Congress were seen by investors as having stable preferences and effectively exercising those preferences throughout the policy making process, the asset values of radio stations would not be materially affected as legislative and regulatory events made news in the low power FM rule making.

In this section we perform an event study to determine if financial markets perceived either FCC rulings or Congressional actions as impacting the profitability of existing radio broadcasters. We consider announcements of changes in FCC low power FM rules, either at the Commission or in Congress, as well as stories about the low power FM rule appearing in the *New York Times* or *Wall Street Journal*. We examine excess returns to shareholders in relatively "pure" firms owning AM and FM radio stations (i.e., full-power commercial incumbents) over three-day periods [*t-1* to *t+1*] ("*t*" being the day of an event in the FCC or Congress, or of a story about the regulatory proceedings in the press). We extend the standard "market model" (Fama 1996: 66-70), including a dummy variable to estimate excess event-period returns (Binder 1985):

$$R_{it} = a_i + bM_t + c\,D_t + e_{it}, \qquad (1)$$

where R_{it} = the return of the ith firm on day t; a_i is the individual effect of the ith firm, assumed constant over time; M_t = market return on day t; D_t = 1 if there is an event window on day t, 0 if not; and e_{it} is the error term.

The premise behind event studies is that capital markets incorporate available public information into securities prices without bias, signaling how new information is anticipated to affect future returns. If investors perceive rulings as lowering future profitability of incumbent firms (either through greater competitiveness for audience share, or by harmful interference, or both), then we expect to observe below market returns for shareholders of incumbent firms during event windows in which the probability of low power FM entry rises. The reverse would be witnessed (i.e. positive incumbent share returns) when news of congressional intervention lowered the likelihood of low power FM entry. This implies a joint H_0:

---

[42] See Comments filed by the Media Access Project on behalf of the United Church of Christ, et al., August 2, 1999, pages 10-12, 19-20. http://www.mediaaccess.org/programs/lpfm/lpfmfilings.html (visited April

For low power FM events at the FCC: $c < 0$

For low power FM events in Congress: $c > 0$

Data. Our sample of six radio broadcasters is listed in Table 3.[43]

Table 3: Profile of Radio Broadcast Firms

Firm	Profile
Cox Radio Inc.	National radio broadcasting co. owns, operates, and develops radio stations in the U.S. As of December 1999, Cox Radio owned and/or operated 83 radio stations in 17 markets. Approximately 73% of net revenues are generated from local radio advertising.
Entercom Communications	Fourth largest radio broadcasting company in the U.S. based on revenues. As of December 1999, the company had 96 radio stations (60 FM and 36 AM) in 17 markets.
Radio One	Radio broadcasting firm primarily targeting African-Americans. The company has approximately 40 radio stations.
Citadel Communications	Owns approximately 136 FM stations and 61 AM stations in 42 mid-sized markets. Virtually all of the company's revenues are generated from the sales of local, regional and national advertising on its radio stations.
Cumulus Media Inc.	The third largest radio broadcasting company in the U.S. based on number of stations. Upon conclusion of pending acquisitions, the firm will own 324 radio stations (228 FM and 96 AM). Virtually all of the firm's revenues are generated from the sale of local, regional and national advertising time on its radio stations.
Hispanic Broadcasting	Spanish-language radio broadcasting company that owns 45 radio stations in 13 U.S. markets. In addition the company operates the HBC Radio Network, a Spanish-language radio broadcast network serving the U.S. market.

Source: http://biz.yahoo.com/research/indgrp/brdcst_radio_tv.html (visited Feb. 6, 2001).

Eleven events in Congress signified potentially substantial developments on the low power FM initiative. The first occurred November 17, 1999, when Rep. Oxley introduced HR-3439, a bill to ban the FCC from ruling on low power FM service. The

---

25, 2001).

[43] Publicly listed firms owning radio broadcast stations were identified by examining the firms listed in the "Broadcasting & Cable TV" sector by Yahoo!Finance. Available at http://biz.yahoo.com/research/indgrp/brdcst_radio_tv.html (visited February 6, 2001). Of the 38 firms listed, we selected only those that principally derive company sales from radio broadcasting in the United States, and had sufficient trading data (including volume) for meaningful analysis.

last event occurred February 27, 2001, when Senator John McCain introduced S-404, a bill creating a mechanism for resolving interference disputes resulting from new low power FM service. See table 4.

Five FCC developments signaled potential changes in low power FM rules. The first occurred on February 5, 1998, when the FCC issued a Public Notice (Report No. 2254) asking for comments on Leggett and Schellhardt's petition. Then came the Public Notice issued March 10, 1998, referencing Skinner's petition. Next came adoption of the Notice of Proposed Rule Making, the Report and Order, and the Memorandum Opinion and Order. See Table 5.[44]

[44] We eliminated those observations of events falling within the 3-day period of a stock down or upgrade listed under "Analyst History" on Yahoo!Finance. We extended this criteria to two days before the event [t-2] as the effect of the down or upgrade may extend past one day, or be made after hours. This rule led to the elimination of one observation (Sept. 7, 2000) for Cox Radio Inc (CXR) and three observations (October 27, 26 and 25, 2000) for Citadel Communications Corp. (CITC). On October 25, 2000, five analysts downgraded Citadel Communications Corp. See http://biz.yahoo.com/c/c/citc.html (visited on Feb. 15, 2001). We did not find news reports on Yahoo!Finance of any merger or takeover activity involving our firms during event windows.

Table 4: Response of Stock Prices to Congressional Events: Three-day (%) Change [*t-1* to *t+1*]

Date	Events	SP-500	CXR	ETM	ROIA	CITC	CMLS	HSP	SP500 adjusted median[a]	SP500 adjusted mean[b]
Nov 17, 1999	Rep. Oxley introduces HR-3439	2.19	5.07	1.78	-1.71	4.07	8.47	2.46	1.08	1.17
Feb 10, 2000	Sen. Gregg introduces S-2068	-3.79	3.09	-6.40	-5.68	-9.47	-12.99	0.06	-2.25	-1.44
Apr 10, 2000	Commerce Committee Report No. 106-567 on HR-3439	-0.05	3.99	-7.59	-9.81	-7.26	-5.45	-4.93	-6.31	-5.12
Apr 13, 2000	Radio Broadcasting Preservation Act of 2000 passes [Vote:274-110]	-9.60	-11.74	-11.49	-15.48	-8.35	-14.42	-12.84	-2.69	-2.79
May 8, 2000	Sen. McCain introduces S-2518	0.18	0.41	1.59	-13.65	-3.12	-0.48	-19.78	-1.98	-6.02
Jul 27, 2000	Sen. McCain introduces S-2989	-3.70	2.32	-11.63	-4.28	9.59	1.32	-5.38	2.22	2.36
Sept 7, 2000	Sen. Grams introduces S-3020	-0.83	N/A	0.36	-12.00	2.21	-4.67	-14.95	-3.84	-4.98
Oct 25, 2000	Rep. Rogers introduces HR-5548.	-2.25	-9.60	-13.69	-3.94	N/A	-6.17	10.48	-3.93	-2.34
Oct 26, 2000	Conference Rep. No.106-1005 passes [Vote:206-198]	-1.33	-9.64	-9.24	-6.25	N/A	-10.26	0.23	-7.91	-5.70
Oct 27, 2000	Sen. approves Conference Rep. No. 106-1005	2.47	0.32	14.91	1.67	N/A	-1.30	6.58	-0.81	1.96
Feb 27, 2001	Sen. McCain introduces S-404	-0.48	6.84	-3.78	3.90	0.00	-1.23	-1.27	-0.14	1.22
	Cumulative return								-26.56	-21.69

SP500 = Standards & Poors 500 Index; CXR = Cox Radio Inc; ETM = Entercom Communications; ROIA = Radio One Inc; CITC = Citadel Communications; CMLS = Cumulus Media Inc; HSP = Hispanic Broadcasting; N/A = Not available.

[a] Adjusted median (%)= Equally-weighted median price change of 6 firms(%)—Market index change(%).

[b] Adjusted mean (%) = Equally-weighted mean price change of 6 firms(%)—Market index change(%).

Table 5: Response of Stock Prices to FCC Rulings: Three-day (%) Change [*t-1* to *t+1*]

Date	FCC Ruling	SP-500	CXR	ETM	ROIA	CITC	CMLS	HSP	SP500 adjusted median[a]	SP500 adjusted mean[b]
Feb 5, 1998	Public Notice Report No. 2254	0.64	1.71	N/A	N/A	N/A	N/A	7.92	4.18	4.18
Mar 10, 1998	Public Notice Report No. 2261	1.21	2.22	N/A	N/A	N/A	N/A	-3.56	-1.88	-1.88
Jan 28, 1999	Adoption of Notice of Proposed Rule Making	2.18	10.40	N/A	N/A	-3.83	3.03	0.27	-0.53	0.29
Jan 20, 2000	Adoption of Report and Order	-0.95	11.67	11.99	-3.79	8.92	8.92	5.34	9.87	8.12
Sept 20, 2000	Adoption of Memorandum Opinion and Order	0.31	-1.05	-8.05	-25.17	-12.58	-4.86	0.00	-6.77	-8.93
	Cumulative								4.86	1.77

SP500 = Standards & Poors 500 Index; CXR = Cox Radio Inc; ETM = Entercom Communications; ROIA = Radio One Inc; CITC = Citadel Communications; CMLS = Cumulus Media Inc; HSP = Hispanic Broadcasting; N/A = Not available.

[a] Adjusted median(%)= Equally-weighted median price change of 6 firms(%)–-Market index change(%).

[b] Adjusted mean (%) = Equally-weighted mean price change of 6 firms(%)–-Market index change(%).

Regression analysis of policy events. We examine daily returns of broadcasting shares, February 2, 1998—March 8, 2001. We use panel data estimation with fixed effects to control for unobserved firm specific characteristics. By doing so, we expect to reduce the problem raised by omitting right-hand side variables (Johnston and DiNardo 1997: 395-8). The estimated regression, Equation (2), is slightly modified from the general form presented in Equation (1):

$$r_{it} = b_{0i} + b_1 M_t + b_2 FCC_t + b_3 CONG_t + e_{it} \qquad (2)$$

where r_{it} = 3-day percentage change of firm "i" stock price measured at day "t";

$ß_{0i}$ = is the fixed-effect of firm "i", taken as constant over time;

M_t = 3-day percentage change of a market index such as the SP500 at day "t";

FCC_t = dummy variable with a value of one if on day "t" occurred a FCC ruling on low power FM, zero otherwise;

$CONG_t$ = dummy variable with a value of one if on day "t" occurred an event in Congress related to the low power FM initiative, zero otherwise;

e_{it} = residual term of firm "i" returns at time "t."

We also test a slightly different specification. Because some events in Congress inspired attack from the National Association of Broadcasters, it is likely that Congressional events have differing signs. For example, Senator McCain introduced S-2989, S-2518, and S-404 that defended the FCC's low power FM initiative. We construct an alternative dummy excluding the McCain bills, while including a new dummy for the McCain bills. Thus we estimate two regressions with differing sets of congressional events. In each regression we compute efficient standard errors using the Newey-West robust covariance matrix.[45]

[45] We tested for autocorrelation, heteroskedasticity, and non-normality in the distribution of error terms. The Durbin-Watson test provided evidence of first order autocorrelation while the Breusch-Pagan-Godfrey test indicated heteroskedasticity in error terms. The Breusch-Pagan-Godfrey test uses a Lagrange multiplier statistic with a Chi-square distribution (White 1997: 182). Finally we used a Chi-square goodness of fit test to check for normality of error terms (White 1997: 18-20). In both specifications we rejected the null hypothesis of normally distributed error terms at a five per cent significance level. These results violate the usual assumptions used in ordinary least square (OLS) regressions. Therefore OLS estimates, although unbiased and consistent, would be inefficient (Johnston and DiNardo 1997: 176). To correct for inefficient standard errors in the ordinary least squares results, we used the Newey-West robust covariance matrix that allows for within group (firms in our case) autocorrelation and heteroskedasticity (Newey and West 1987; Greene 1997: 504-6). The results appear in Table 6 in specifications 1 and 2. For comparative purposes we

Table 6: Regression Results for FCC and Congressional Events

Dependent variable is 3-day change (%) returns to broadcast station equity owners.

Variables	OLS with Newey-West standard errors			Bootstrap estimates (10,000 iterations)	
	(1)	(2)		(3)	(4)
SP500 index	1.303 (15.50)*	1.303 (15.49)*		1.304 (21.01)*	1.303 (20.92)*
FCC rulings	-0.464 (-0.22)	-0.464 (-0.22)		-0.464 (-0.24)	-0.481 (-0.25)
All Congressional events	-1.884 (-2.195)**			-1.88 (-1.72)***	
Congressional events except McCain bills		-2.299 (-2.44)**			-2.296 (-1.76)***
McCain bills		-0.872 (-0.49)			-0.871 (-0.43)
No. observations	3901	3901		N/A	N/A
R-squared	0.104	0.104		N/A	N/A

t statistics in parentheses; * = 99% confidence level; ** = 95% confidence level; *** = 90% confidence level; N/A = Not applicable.

From Specification 1 in Table 6, the broadcast station owner returns appear positively and highly related to the change on the SP500 market index. This is anticipated**,** and the estimated beta of 1.3 (for the six firms) is reasonable. Events in Congress are negatively correlated with shareholder returns, however, and statistically significant at the 95 percent confidence level. While returns are also negatively correlated with FCC rulings, the coefficients are small and lack statistical significance. Similar results are obtained using the bootstrap technique.

The most straightforward interpretation of these results is that FCC rulings regarding low power FM had no visible impact on broadcast station values, and Congressional actions had no positive effect. Both components of the null hypothesis can be rejected at any standard significance level. Dropping the McCain bills from the events in Congress does not alter results. The stock price reaction to Congressional events is in

---

also include results using the bootstrap method (specifications 3 and 4), which provide efficient estimators when error terms are not normally distributed (Freedman and Peters 1984; Efron 1982: 35-6; Johnston and DiNardo 1997: 362-8).

the opposite direction from that predicted by the null. The McCain bills and FCC rulings have no discernible relationship with broadcaster returns.

Regression analysis of news stories. We also tested whether stories about low power FM in the *Wall Street Journal* or the *New York Times* were associated with abnormal broadcaster returns. The news were classified in two categories: "FCC goes ahead" (negative news for existing FM radio stations and positive for low power FM entrants); and "Congress prevails" (positive for existing FM stations). We identified eight "FCC goes ahead" (eight articles) and eight "Congress prevails" (eight articles).[46] See Table 7. We regress broadcast radio equity returns against the SP500 index and dummies for FCC and Congress news events as in Equation (2).[47] The results show insignificant negative returns across all news events. See Table 8.

We interpret this as further evidence tending to reject the null hypothesis. As the FCC's plan did not threaten equity values, Congress did not visibly bolster them. The fact that news coverage was lax, however, is perhaps more telling.[48] It appears that low power FM became a political or human interest story, and failed to obtain the immediacy associated with an event of economic significance to investors.[49]

Table 7. WSJ and NYT News Stories about Low power FM Ruling

News	Date
FCC Goes Ahead	
FCC Offers Low power FM Stations. Stephen Labaton, NYT page C1.	Jan 29, 1999
FCC is Set to Open Air Waves to Low power Radio. Kathy Chen, WSJ page B12.	Jan 17, 2000
FCC to Approve Low power Radio for Wider Access. Stephen Labaton, NYT page A1.	Jan 20, 2000

[46] As before, we eliminate observations of news appearing between the window period of [t-2 to t+1] of a stock down or upgrade listed in "Analyst History" in Yahoo!Finance web site.

[47] In other words, we re-estimated Equation (2) using NYT and WSJ news events in place of actual regulatory or legislative events.

[48] Many important developments went unreported entirely. For example, when Rep. Oxley introduced the first bill in Congress opposing the low power FM initiative no report appeared in either the *Journal* nor the *Times*. The next regulatory event concerning low power FM in Congress was reported twelve days after the fact.

[49] A review of the six firms' Annual Reports submitted to the Securities and Exchange Commission does not provide evidence that the low power FM initiative was perceived as harmful. Indeed in Hispanic Broadcasting's report the new low power FM service is not mentioned. In the other five we found a short paragraph stating that they cannot predict in advance how this new low power FM service will affect their business. See SEC filings, Form 10-K405, year 2000.

FCC to Open Airwaves. Stephen Labaton, NYT page 4-2 Week in Review.	Jan 23, 2000
Upstarts in Radio's Land of the Bland. Jesse Walker, NYT page A15 (op-ed).	Jan 29, 2000
FCC Moves Forward on Issuing Low power FM Licenses. NYT page C8.	Mar 28, 2000
New FCC Rules Could Smooth Way For Low power Stations. Stephen Labaton, NYT page C2.	Sep 22, 2000
255 Licenses are Awarded for Low power FM Radio. Stephen Labaton, NYT page C5.	Dec 22, 2000
Congress Prevails	
FCC Gets Static for Promoting Tiny Stations. Mark Wigfield, WSJ page A9.	Feb 22, 2000
Panel Clears Bill to Curb Low power Radio Stations. WSJ page A8.	Mar 30, 2000
Static Over Low powered Radio. NYT page A26 Editorial.	Mar 31, 2000
House Clears Bill to Curb Plans for FM. Stephen Labaton, NYT page C1.	Apr 14, 2000
Communications Lobby Puts Full-Court Press on Congress. Stephen Labaton, NYT page A1.	Oct 24, 2000
Congress Severely Curtails Plan for Low power Radio Stations. Stephen Labaton, NYT page A1.	Dec 19, 2000
US Bill Could Curb FCC Licensing Plans. WSJ page B12.	Dec 20, 2000
Radio Diversity Curtailed. Stephen Labaton, NYT page 4-2.	Dec 24, 2000

Source: THE WALL STREET JOURNAL (WSJ) and THE NEW YORK TIMES (NYT) from Lexis-Nexis database.

Table 8: Estimated Effects of News Stories on Radio Returns

Dependent variable is 3-day change (%) returns to broadcast station equity owners.

Variables	OLS with Newey-West standard errors		Bootstrap estimates (10,000 iterations)
SP500 index	1.297 (15.61)*		1.297 (20.78)*
News FCC goes ahead with plan	-0.535 (-0.39)		-0.568 (-0.43)
News Congress prevails	-2.075 (-1.50)		-2.073 (-1.63)
No. observations	3,894		N/A
R-squared	0.105		N/A

Notes: t statistics in parenthesis; * = 99% confidence level; ** = 95% confidence level; *** = 90% confidence level; N/A = Not applicable.

VII. Conclusion

Previous research has developed a general framework in which Congress, the principal, delegates administrative responsibility to an independent regulatory commission, the agent. When principal-agent disputes arise, the principal may reclaim public policy through, for instance, direct legislation. That such action becomes occasionally necessary suggests that the agent may be straying a considerable distance from its assigned task.

Empirical examination of the Congressional Dominance view of regulation has yielded evidence that regulatory agents respond to changing congressional demands. But moving regulators *towards* the congressional position does not necessarily move regulators *to* the congressional position. Hence, the scholarly debate may be informed by evidence illuminating the distance separating the positions of the respective parties. Most informative in such an analysis is information regarding the position of the set of true principals, consumers.

In the case of low power FM radio, policy position metrics are observable and quantifiable. We have found that, despite selecting a regulatory skirmish in which the publicly stated differences between Congress and the FCC were large, the regulatory commission chose to locate its policy at a point virtually indistinguishable from that selected by Congress when compared to the pro-consumer policy choice. An intense battle was waged over the *one-percent* of low power FM station capacity the FCC attempted to open to entry. Even this minimalist approach to new entry was offset by extensive barriers imposed by the regulatory agency, limiting the financial competitiveness of entrants. This interpretation of events is supported by empirical evidence gleaned from the financial markets. Incumbent radio stations did not suffer a loss in value associated with FCC actions to "open" the FM dial to new low power assignments, nor did they enjoy windfall gains when congressional actions challenged and then limited the FCC initiative.

The low power FM regulatory case supports the Congressional Dominance view of government regulation. Despite the seemingly divergent policy options between the FCC and Congress, the political fight was over trivial increments of competitive entry.[50]

[50] Such flamboyant scuffling over essentially fixed policies has long been a noted feature of FCC broadcast regulation. Former FCC member, now University of Virginia law professor, Glen O. Robinson is credited

This modest margin was sufficient to provoke interest group rent-seeking and Congress supplied a policy amendment. This created an opportunity for "credit-claming" and "blame-shifting," while the underlying regulatory equilibrium was never seriously challenged.

with the generic descriptor: "full of fake grunts and groans, signifying nothing." (in Geller 1994: 15). See also Coase (1965).

Appendix 1: Summary of Changes in FCC Low power FM Rule Making

Issue	Notice of Proposed Rule Making (Jan 1999)	Report and Order (Jan 2000)	Memorandum Opinion & Order (Sep 2000)
Power and type of service	3 classes: 1000-watt: primary 100-watt: secondary 10-watt: secondary to all including 100-watt	2 classes (1000-watt: dismissed): 100-watt: secondary 10-watt: secondary to all including 100-watt	Same as in Report and Order.
Protection required from 100-watt	To all primary service stations: co-channel, 1st adjacent channel and Intermediate Frequency interference (IF). Receive protection only from other low power FM stations.	Same as NPRM plus: 2nd adjacent channel protection, Protect TV channel 6; translators and boosters; class-D; other 100-watt; future primary service stations, and upgrades.	Same as in Report and Order plus protect FM stations providing reading services on 3rd adjacent channel.
Protection required from 10-watt	Same as 100-watt except IF protection, plus protection to 100-watt, translators and boosters in co-channel and 1st adjacent channel. Receive protection only from other 10-watt stations.	Same as 10-watt in NPRM, plus protection to 2nd adjacent channel, IF and TV Channel-6.	Same as in Report and Order plus protect FM stations providing reading services on 3rd adjacent channel.
Ownership restrictions	Low power FM licensees cannot: 1) Own full power radio stations. 2) Own another low power station in same community.	Same as NPRM plus: 1) Max. stations owned per entity nationwide: 5 after two years, 10 after 3 years. 2) Licenses not transferable. 3) No newspaper or other media entity owner. 4) No pirate stations allowed.	Same as in Report and Order plus slightly relaxed restrictions on max. number of licenses nationwide for schools, universities, public safety, transportation, and government orgs.
Advertising	No decision	Not permitted	Same as in R&O
Channels available	All FM band	All FM band	All FM band
Estimated new LPFM stations[a]	Not available	1,000	1,000

Source: FCC (1999); FCC (2000a); FCC (2000b).

[a] The FCC never gave an estimate number. This is based on press articles. See for example: Stephen Labaton, *Congress Severely Curtails Plan For Low power Radio Stations*, THE NEW YORK TIMES (December 19, 2000).

Appendix 2: Main Events in Congress

- November 17, 1999. Rep. Michael G. Oxley (R-Ohio), a senior member of the Commerce Committee (with FCC oversight) introduced HR-3439, a bill to prohibit the FCC from establishing low power FM rules. On February 10, 2000, Senator Judd Gregg (R-NH) introduced an identical bill, S-2068, in the Senate.
- April 10, 2000. The House Commerce Committee issued Report No. 106-567 approving HR-3439 with amendments. The report did not prohibit the FCC from establishing a new low power FM service, but imposed the same level of protection afforded by full-power FM stations. The FCC was also required to conduct tests, reporting findings to Congress on the degree of harmful interference caused to existing FM stations before considering elimination of 3rd adjacent channel protection. This report had to include an analysis of the *economic impact* of low power FM competition on incumbent FM stations.
- April 13, 2000. The House of Representatives approved the Radio Broadcasting Preservation Act of 2000 (HR-3439), by a vote of 274—110.[51]
- May 8 and July 27, 2000. Senator John McCain (R-AZ, Chair of the Senate Commerce Committee) introduced S-2518 and S-2989, respectively. The first measure gave the National Academy of Science a key role in determining harmful interference from low power FM. The second bill re-assigned responsibility to the FCC, while adding a mechanism for compensating incumbent FM stations should harmful interference occur. The measure was seen to advance low power FM by removing the interference issue from the FCC's rule making process.[52]
- September 7, 2000. Senator Rod Grams (R-MN) introduced S-3020, identical to HR-3439.

[51] Republicans voted 188 in favor and 3 against; Democrats voted 85 in favor and 106 against. Congress of the U.S., Final vote results for Roll Call 130, April 13, 2000. http://clerkweb.house.gov/cgi-in/vote.exe?year =2000&rollnumber=130.

[52] The National Association of Broadcasters (NAB), the leading trade group for incumbent FM stations responded furiously: "The McCain/Kerry Low power Radio Act introduced yesterday should be renamed the 'Interference Assurance Act'……..Even though the FCC acknowledges there will be interference on the FM band, both lawmakers prefer that the FCC deal with it after the fact, rather than trying to solve the problem before…" NAB, Statement by NAB President/CEO Eddie Fritts, *RE: McCain/Kerry Low power FM Bill (*July 28, 2000). www.nab.org/newsroom/pressrel/STATEMENTS/S1500.HTM, visited February 28, 2001.

- October 25, 2000. Rep. Harold Rogers (R-KY) introduced HR-5548, an appropriations bill for the Departments of Commerce, Justice, State, the Judiciary, and related agencies. Section 632 of the bill follows HR-3439. The bill was referred to the Committee on Appropriations. On October 26, the Conference Report containing section 632 was approved 206 to 198.[53] On October 27, the Senate approved the Conference Report, and on December 21, 2000 President Clinton signed the measure that became Public Law No. 106-553. Initial estimates were that only 20 to 25 percent of the eligible low power FM stations would be licensed under this law. [54]
- February 27, 2001. Senator John McCain (R-AZ) introduces S-404, a bill to facilitate the resolution of interference disputes over new low power service. However, it does not lift the severe restrictions imposed on low power FM.

[53] U.S. Congress, *Bill Summary And Status For The 106th Congress, HR-4942*, http://thomas.loc.gov/cgi-bin/bdquery/z?d106:HR04942@@@L&summ2=m&, (visited February 22, 2001). Of the 206 votes in favor, 185 were Republican and 19 Democratic. Of the 198 votes against, 19 were Republican and 178 Democratic.

[54] Or 200 to 250 new low power FM stations. This estimate was revised upward based on the first two groups of accepted low power FM license applications issued by the FCC. See *Congress Partly Overrules FCC, Cuts LPFM Back*, LPFM Legislation in Congress, The Center for Democratic Communications of the National Lawyers Guild, www.nlgcdc.org/legislation.htm (visited April 23, 2001).

Appendix 3: Estimating the Low power Station Insert Capacity of the FM Band

To estimate the number of new 100-watt stations that could be added to the FM band under assumptions given in the text, we followed these six steps:

1) *Define market areas.* We used Arbitron's list of radio markets ranked by population.[55] According to this classification, the United States is divided in 276 markets. The largest market is New York City, featuring an estimated population of nearly 14.5 million persons above age 12. Market area estimates were obtained by associating each radio market with the corresponding Metropolitan Statistical Area used by the U.S. Census Bureau.[56] In some cases it was necessary to aggregate areas.

2) *Identify FM stations in each market.* This information was obtained from BIA Financial, Radio Yearbook 2000, which lists all FM stations in each Arbitron market. To avoid double counting, we eliminated stations with the same call number or frequency. We also eliminated seven Arbitron markets embedded in other markets. The final listing yielded 269 radio market featuring 3,736 FM radio stations.

3) *Estimate available channels for new low power stations in each market.* We assume that each existing FM station needs co-channel and 1st adjacent channel protection from the signals of full-power FM or low power FM stations. This entitles existing FM stations to three channels, as shown in Figure 5. As the FM band has 100 channels, available channels per market are calculated by: *[100-3X]*, where *X* is the number of existing FM stations in a given market.

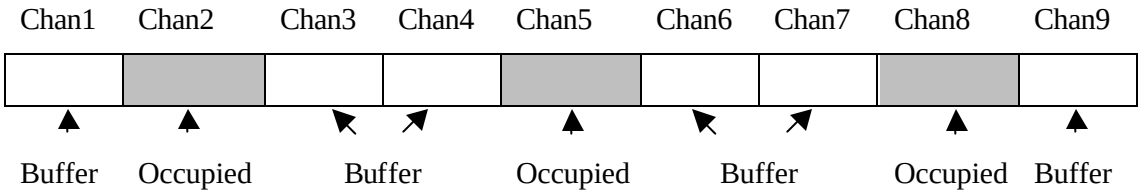

Figure 5: Channels Used by Full power FM Stations

[55] Arbitron Corporation, Market rankings: Fall 1999, http://www.arbitron.com/radiosurvey/mm001025.htm

[56] Arbitron market areas are based on standard Metropolitan Statistical Areas used by the US Census Bureau. http://www.census.gov/population/censusdata/90den_ma.txt. See also BIA Research Inc, "Radio Markets Report 2000" which provides maps for each radio market.

4) *Estimating the number of 100-watt stations that could safely broadcast in each free channel.* We assume that each 100-watt station has a contour area equivalent to a square of 8x8 miles. Thus the total number of insert stations per free channel in a given market is calculated by: *[Market Area/64]*, where the market area is measured in square miles. The area of each radio market was obtained from the US Census Bureau.

5) *Adjusting for blanketing interference.* We assume that the area blanketed by a full power FM station is equivalent to a low power FM contour area, or 64 square miles.[57] This reduces the area available for new low power FM stations by *64X* square miles in each radio market. Hence, new low power FM insert capacity per market is given by: *[(100-3X) (Market Area-64X)/64]*.

6) *Aggregation.* Aggregating to national insert capacity, *Y*, is calculated as:

$$Y = \sum_{i=1}^{269} [100 - 3X_i][(Area_i - 64X_i)/64]$$

Numerical results are summarized in Table 2.

[57] This is far more than actual blanketing interference. See discussion in text.

References

Berry, Steven T., and Waldfogel, Joel. "Free Entry and Social Inefficiency in Radio Broadcasting." *Rand J. of Economics* 30, no. 3 (Autumn 1999): 397-420.

BIA Financial. "The State of the Industry Radio Report: Executive Summary." 1999, http://www.biacompanies.com/state_radio.htm.

Binder, John J. "Measuring the Effects of Regulation with Stock Price Data." *Rand J. of Economics* 16, no. 2 (summer 1985): 167-183.

Coase, Ronald. "Evaluation of Public Policy Relating to Radio and Television Programming: Social and Economic Issues." *Land Economics* 41, 1965: 161-67.

Code of Federal Regulations. "Title 47 Telecommunications." (October 1, 1999). http://www.access.gpo.gov/cgi-bin/cfrassemble.cgi?title=199947.

Comments of 37 Concerned Economists. Federal Communications Commission, In the Matter of Promoting Efficient use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, WT Docket No. 00-230 (Feb. 7, 2001).

Dodd, Lawrence C., and Schott, Richard L. *Congress and the Administrative State.* New York: Wiley, 1979.

Efron, Bradley. "The Jackknife, the Bootstrap and Other Resampling Plans." CBMS-NSF Monograph 38. Philadelphia Society of Industrial and Applied Mathematics, 1982.

Epstein, David, and O'Halloran, Sharyn. *Delegating Powers: A Transaction Cost Politics Approach to Policy Making under Separate Powers.* Cambridge: Cambridge Univ. Press, 1999.

Fama, Eugene F. *Foundations of Finance.* New York: Basic Books, 1976.

Federal Communications Commission. "First Report and Order: in the Matter of Revision of FM Broadcast Rules, Particularly as to Allocation and Technical Standards." 40 FCC 662, Docket No. 14185 (August 8, 1962).

Federal Communications Commission. "First Report and Order: In the Matter of Changes in the Rules Relating to Noncommercial Educational FM Broadcast Stations." 68 FCC 2d 988, Docket No. 20735 (June 7), 1978a.

Federal Communications Commission. "Second Report and Order: In the Matter of Changes in the Rules Relating to Noncommercial Educational FM Broadcast Stations." 68 FCC 2d 240, Docket No. 20735 (June 7), 1978b.

Federal Communications Commission. *Second Report and Order: In the Matter of Amendment of Part 73 of the Rules to Provide for an Additional FM Station Class (Class C3) and to Increase the Maximum Transmitting Power for Class A FM Stations.* MM Docket No. 88-375. 4 FCC Rcd No. 17, 6375 (July 13, 1989).

Federal Communications Commission. "Report and Order: In the Matter of Grandfathered Short-spaced FM Stations." MM Docket No. 96-120, RM 7651, FCC 97-276 (August 4, 1997).

Federal Communications Commission. "Notice of Proposed Rule Making: In the Matter of Creation of a Low Power Radio Service." MM Docket No. 99-25, FCC 99-6 (January 28, 1999).

Federal Communications Commission. "Report and Order: In the Matter of Creation of a Low Power Radio Service." MM Docket No. 99-25, FCC 00-19 (January 20), 2000a.

Federal Communications Commission. "Memorandum Opinion and Order: In the Matter of Creation of a Low Power Radio Service." MM Docket No. 99-25, FCC 00-349 (September 28), 2000b.

Fiorina, Morris P. "Legislative Choice of Regulatory Forms: Legal Process or Administrative Process?" *Public Choice* 39 (1982): 33-66.

Freedman, David A., and Peters, Stephen C. "Bootstrapping a Regression Equation: Some Empirical Results." *J. of the American Statis. Assoc.* 79 (March 1984): 97-106.

Geller, Henry. "1995-2005: Regulatory Reform for Principal Electronic Media." Manuscript. The Annenberg Washington Program. Communications Policy Studies, Northwestern University (Nov. 1994).

Greene, William. *Econometric Analysis.* 3rd Edition. New Jersey: Prentice Hall, 1997.

Hazlett, Thomas W. "The Wireless Craze, The Unlimited Bandwidth Myth, The Spectrum Auction Faux Pas, and the Punchline to Ronald Coase's Big Joke." *Harvard J. of Law and Technology* 15 (Spring 2001, forthcoming).

Johnston, Jack, and DiNardo, John. *Econometric Methods.* McGraw-Hill Companies, 1997.

Kiewiet, D. Roderick, and McCubbins, Matthew D. *The Logic of Delegation: Congressional parties and the Appropriations Process.* Chicago: Univ. of Chicago Press, 1991.

Leggett, Nickolaus; Legget, Judith; and Schellhardt, Donald. "Petition for a Microstation Radio Broadcasting Service." Manuscript. (June 26, 1997). http://www.fcc.gov/Bureaus/Mass_Media/filings/rm9208.pdf.

Martin, Scott. "Educational FM Radio: The Failure of Reform." *Federal Communications Law J.* 34 (Summer 1982): 431-465.

McCubbins, Mathew D., and Schwartz, Thomas. "Congressional Oversight Overlooked: Police Patrols Versus Fire Alarms." *American J. or Political Science.* 28 (Feb. 1984): 165-179.

Meyhew, David R. *Congress. The Electoral Connection*. New Haven: Yale University Press, 1974.

Newey, Whitney K., and West, Kenneth D. " A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix." *Econometrica.* 55 (May 1987): 703-8.

Owen, Bruce M. *The Internet Challenge to Television*. Cambridge: Harvard University Press, 1999.

Rappaport, Theodore; Carter, Kirk; and Skidmore, Roger. "Technical Analysis of the Low Power FM Service." Manuscript. Washington DC: Media Access Project (August 26, 1999).

Rosston, Gregory, L., and Steinberg, Jeffrey. "Using Market-Based Spectrum Policy to Promote the Public Interest." Federal Communications Commission Staff Paper (January 1997).

Skinner, J. Rodger. "Petition for Rule Making: Proposal for Creation of the Low Power FM (low power FM) Broadcast Service." Manuscript. (February 28, 1998). http://www.fcc.gov/Bureaus/Mass_Media/filings/rm9242.pdf.

Soley, Lawrence. *Free Radio*. Boulder: Westview Press, 1999.

Walker, Jesse. "With Friends Like These: Why Community Radio Does Not Need the Corporation for Public Broadcasting." *Cato Policy Analysis* 227, The Cato Institute (July 24, 1997). http://www.cato.org/pubs/pas/pa-277.html.

Walker, Jesse. *Rebels on the Air: An Alternative History of Radio in America*. New York: New York University Press, 2001.

Weingast, Barry, and Moran, Mark. "Bureaucratic Discretion or Congressional Control? Regulatory Policymaking by the Federal Trade Commission." 91 *Journal of Political Economy* (October 1983): 765-800.

White, Kenneth. *Shazam Econometrics Computer Program.* Irwin/McGraw-Hill, 1997.

Wilson, James Q. *The Politics of Regulation.* New York: Basic Books, 1980.