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

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Abstract

The Federal Communications Commission rule making for low power FM radio was widely reported as an instance where Congress sharply rebuked a regulatory agency for enacting rules too favorable to entrants. Theories of bureaucratic control generally agree that when such events occur, policy differences of Congress and the agency must be large. Because rival policy positions are quantifiable in this case, the preferences of Congress and the Commission can be directly evaluated. While the distance between the policy position of the Commission and Congress appear large, they signified a negligible increment in competition when compared to a benchmark efficient policy. A financial event study supports this interpretation, as radio broadcaster's equity values were not materially affected by either events in Congress or the Commission. Thus, even marginal differences may prompt a costly intervention by Congress to ostensibly discipline an agency.

KEYWORDS: bureaucratic control, regulatory process, broadcasting policy

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I. Introduction

The literature on political control of bureaucracies evolved from the powerful bureaucrat view[1] to the Congressional dominance view.[2] Later contributions showed that delegation may efficiently reduce congressional monitoring costs, while agencies that stray too far from congressional intent can be disciplined.[3]

This principal-agent view was compelling, but soon became complex. The existence of multiple principals with (partial) authority over bureaucracies became the focus of attention.[4] Agency decision makers are jointly appointed by the president and the legislature.[5] Moreover, presidential veto power and judicial review influence the policy choices of agencies and Congress.[6] No single institution has the power to control the bureaucracy.[7]

Disentangling the influence of each actor is difficult because the rival policy preferences are seldom revealed in a quantifiable way. However, a recent regulatory episode – the low power FM radio rule making at the Federal Communications Commission (FCC) – provides a rare opportunity to measure the distance between the revealed policy choice of the agency versus that of Congress. Formally initiated in January 1999, the low power FM rule making culminated in an order creating a new class of low power stations to be licensed to non-profit organizations. In December 2000, as license applications were being processed, Congress enacted legislation that effectively reduced the number of possible awards. The episode provides a unique opportunity to quantify the policy positions of both the FCC and Congress, and to numerically identify the efficient policy.

The metric is the expected number of low power FM licenses.[8] Each license provides similar rights to the license holder, including power limits, ownership, and operations, as specified in FCC rules for low power stations. The policies adopted by the FCC and Congress can be summarized as permitting

[1] Niskanen (1975); Dodd and Schott (1979); Wilson (1980).
[2] Weingast and Moran (1983).
[3] McCubbins and Schwartz (1984); McCubbins, Noll, and Weingast (1987); McCubbins, Noll, and Weingast (1989).
[4] Moe (1990).
[5] Calvert, McCubbins, and Weingast (1989); Kiewiet and McCubbins (1991); Wood and Waterman (1991).
[6] Farejohn and Shipan (1990); Steunenberg (1992).
[7] Hammond and Knott (1996). See also Epstein and O'Halloran (1999) for a general approach focusing on transaction costs.
[8] Regulatory procedures do not create a specific number of licenses. Rather, rules allow applicants to petition for permits, which is why quantities are "expected." Licenses authorized or issued do not guarantee entry, which is a function of both regulatory and market constraints.

approximately 2,300 and 1,300 low power licenses, respectively.[9] While this difference may appear substantial, it is trivial when compared to a benchmark efficient policy, which we calculate by incorporating the interference standards used historically by the FCC, of approximately 98,000 licenses.

To discern if markets agreed with this assessment, we performed a financial event study to test whether equity share returns of incumbent radio station owners were impacted by either FCC or congressional policy changes. The results suggest that the FCC's policy did not hurt incumbent station shares, and Congress' legislation did not help. Congressional intervention occurred over policy differences that are insignificant in economic terms.

This regulatory episode occurred in a relatively short timeframe with no evident changes in either Congress or the regulatory agency's preferences. Nonetheless, a clash between Congress and the Federal Communications Commission occurred. The modest policy divergence was large enough for Congress and the FCC to engage in significant "credit-claming" and "blame-shifting," a common strategy used by legislators when this type of schism arises.[10]

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 (15 May 2000, p. A1) 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 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."

[9] The low power FM licenses were homogeneous between the alternative policies. Congressional action constrained the FCC's allocation numerically, not with respect to station operating rules.
[10] Mayhew (1974); Fiorina (1982); McCubbins and Schwartz (1984).

This gave rise to the view that Congressional action "sharply curtails the ambitious plans of the Federal Communications Commission to issue licenses for low-power FM radio stations."[11]

We do not explore the issue of why legislators engaged in this game; rather, we focus on measuring the distances between alternative policies. Our data provide evidence that small policy differences, inconsequential in economic terms, may yet result in legislation constraining the agency.

II. Interference regulation in FM radio

The FCC allocates 20 MHz of spectrum to FM radio service. This portion of spectrum is divided into 100 channels. Each radio station transmits in one channel but uses adjacent channels (*i.e.,* frequencies) as buffers to avoid interference. The FCC controls interference between stations by imposing power and antenna height limits, and geographical and frequency separation. If stations transmit

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: CFR (1999), 47 §73.210, 73.211, 73.333.

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

[a] The FCC estimates a station's 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.

[11] Stephen Labaton, Congress Severely Curtails Plan For Low-power Radio Stations, The New York Times (19 December 2000, p. A1). Another report explained the events thusly: "Even as the Federal Communications Commission charges ahead with its fast-track licensing drive, powerful forces in Washington, DC 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." Mark Fisher, Lobbying Against Low-power Radio, American Journalism Review (October 2000).

within three channels the FCC imposes minimum distance requirements.[12] 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.[13] 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 radius of just 3.5 miles.

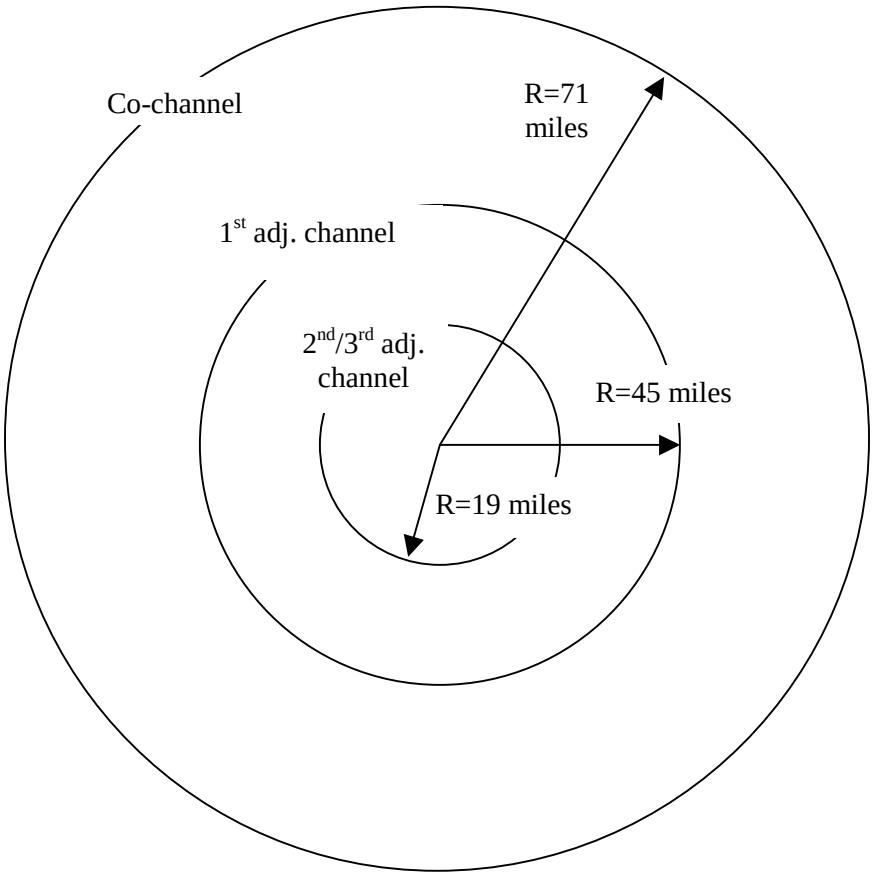

Figure 1: Separation requirements for two Class-A FM stations

[12] CFR (1999), 47 §73.201, subpart B and §73.207.
[13] CFR (1999), 47 §73.211.

Figure 1 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 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. With three or more buffer channels, no distance separation is required.[14]

III. The FCC's low power radio rule making

On 17 July 1997, Nickolaus Leggett, Judith Leggett, and Donald Schellhardt petitioned the FCC 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.[15] On 20 February 1998, another petition 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.[16]

The FCC requested public comment on the petitions,[17] triggering a formal rule making process. Rulings were issued in January 1999, January 2000, and September 2000,[18] as outlined in Appendix 1. Restrictions increased from start to finish. Congressional activity likely influenced this outcome, as hearings, legislation, and statements by key committee members (overwhelmingly critical of the FCC for being too liberal, or pro-entry) were frequently reported in the trade press.[19] A summary of the main events in Congress is given in Appendix 2.

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[14] 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 (CFR [1999], 47 §73.207 paragraph b). Finally, another type of distance requirement is to avoid "blanketing interference", which affects all stations geographically located (regardless of frequency) within a radius (R) estimated by: $R = 0.245(P)^{1/2}$; where *R* is measured in miles, and P is the maximum effective radiated power in kilowatts (CFR [1999], 47 §73.318).

[15] Leggett *et al.*, (1997).

[16] Skinner (1998).

[17] Public Notice: Report No. 2254 (5 February 1998); Public Notice: Report No. 2261 (10 March 1998).

[18] FCC (1999); FCC (2000a); FCC (2000b). A final report was adopted by the Commission in March 2001 to incorporate the rules imposed by Congress on low power FM. See FCC (2001).

[19] "'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…" Stephen

In the conventional view, the FCC promoted competitive entry in the newly created low power FM service, while Congress sharply restricted it, suggesting large policy differences between the two. Fortuitously, this view yields testable implications. To this end, we proceed to quantify the policy positions of the FCC, Congress, and a benchmark policy of liberal entry in low power FM.

IV. Estimate of Congress and the FCC's preferred policies

Applicants for low power FM radio licenses were given five FCC filing deadlines. Each filing window encompassed a different set of states and territories.[20] Importantly, the second window closed 1 September 2000; congressional legislation passed in October 2000, signed into law (December 2000) forced the FCC to revise its list of accepted applicants. This revision allows calibration of both licensing policies: the *ex ante* FCC choice (*i.e.*, from the Report and Order of 2000) versus the statute. For the first two filing windows we estimate the total number of accepted license applications under the *ex ante* FCC policy as equaling 731, with the number of licenses under statutory rules falling to 426 (see Table 2). These data define a ratio indicating licensing outcomes across policies. We apply this ratio to the number of accepted (statute-compliant) applications statutes in all five filing windows of 1,326, to estimate of the policy position of the FCC: 2,275 (see Table 2). The details follow.

The Commission received 1,195 applications in the first two filing windows, which included Alaska, California, Georgia, District of Columbia, Indiana, Louisiana, Maine, Mariana Islands, Maryland, Oklahoma, Rhode Island, Utah (Group 1), Connecticut, Illinois, Kansas, Michigan, Minnesota, Mississippi, Nevada, New Hampshire, Puerto Rico, Virginia, Wyoming (Group 2). The agency identified 255 applicants for low power FM licenses that were uncontested (*i.e.*, no competing claims) and which comply with *ex ante* FCC rules and the modifications passed in Congress.[21] Another group of 127 applications were deemed in compliance with all statutory modifications but involved conflicting claims. By examining the actual petitions, we were able to eliminate overlapping

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Labaton, House Clears Bill To Curb Plans For FM, The New York Times (14 April 2000). "…Chairman Kennard, wanting this as his legacy, pushed this issue before it was fully and completely tested', said Representative Bill Tauzin…" David Leonhardt, Religious groups at odds with G.O.P. on radio licenses, The New York Times (11 July 2000).

[20] See Federal Communications Commission. Low Power FM Radio: An Applicant's Guide. http://www.fcc.gov/mb/policy/lpfm/lpfmguide.pdf.

[21] Federal Communications Commission. Public Notice. Notice of Acceptance of Low Power FM Broadcast Applications and Notification of Petitions to Deny Deadline. 21 December 2000.

Table 2: NUMBER OF LICENSES UNDER CONGRESS AND FCC RULES

	Applicants Windows 1&2	Expected licenses (Cong.)	Expected licenses (FCC)
Total applications (Windows 1&2)	1,195		
Non competing claims and complying with FCC *ex ante* and statutory rules	255	255	255
Competing claims and complying with FCC *ex ante* and statutory rules	127	57	57
Eliminated by statutory rules and allowed to re-file in remedy window	638	114	n.a.
Competing applications (of the 638) eliminated by statutory rules = 304	n.a.	n.a.	85
Non-competing applications (of the 638) eliminated by statutory rules=334	n.a.	n.a.	334
Applications not complying with FCC *ex ante* rules	175	0	0
Estimated No. of licenses Windows 1 & 2	*n.a.*	*426*	*731*
Ratio Congress to FCC licenses = 731/426 = 1.716			
Qualifying applic. (Cong. rules) Windows 3	*n.a.*	*232*	*n.a.*
Qualifying applic. (Cong. rules) Windows 4 & 5	*n.a.*	*668*	*n.a.*
Total estimated licenses	*n.a.*	*1,326*	*2,275*

n.a. = not applicable.

Sources: FCC. Public Notice. Notice of Acceptance of Low Power FM Broadcast Applications and Notification of Petitions to Deny Deadline. 21 December 2000.
FCC (2001).
FCC. Report No. 24760. Broadcast Applications (21 June 2000).
FCC. Report No. 24820. Broadcast Applications. (15 September 2000).
FCC. Public Notice. Notice of Acceptance of Low Power FM Broadcast Applications and Notification of Petitions to Deny Deadline. Report No. LPFM-S-2 (16 August 2001).
FCC. Public Notice. Notice of Acceptance of Low Power FM Broadcast Applications and Notification of Petitions to Deny Deadline. Report No. LPFM-S-3 (11 March 2002).
FCC. Public Notice. Notice of Acceptance of Low Power FM Broadcast Applications and Notification of Petitions to Deny Deadline. Report No. LPFM-S-4 (23 May 2002).
FCC. Public Notice. Notice of Acceptance of Low Power FM Broadcast Applications and Notification of Petitions to Deny Deadline. Report No. LPFM-S-5 (6 Sep. 2002).
FCC. Public Notice. Notice of Acceptance of Low Power FM Broadcast Applications and Notification of Petitions to Deny Deadline. Report No. LPFM-S-6 (16 Oct. 2002).
FCC. Public Notice. Notice of Acceptance of Low Power FM Broadcast Applications and Notification of Petitions to Deny Deadline. Report No. LPFM-S-7 (13 Feb. 2003).
FCC. Public Notice. Notice of Acceptance of Low Power FM Broadcast Applications and Notification of Petitions to Deny Deadline. Report No. LPFM-S-8 (17 Apr. 2003).

applications (requests for use of the same frequency as another applicant in a given market), and determine that 57 distinct licenses were possible.[22]

The Commission also released a list of 638 applicants who were disqualified by the new legislation.[23] These however, were allowed to reapply in a remedial window in late 2002.[24] Of these 638, there were 304 applications for licenses that were incompatible with other applications under the *ex ante* FCC rules, while 334 constituted non-competing applications. Finally, 175 applications were eliminated, presumably for non-compliance with Commission *ex ante* rules.[25]

Under the final rules, as modified by Congress, some 426 applications are expected to qualify for a license in the first two filing windows: 255 plus an estimated 57 licenses to be awarded from 127 competing applications pending, plus 114 applicants (out of 638 applicants allowed to re-file) that qualified from the remedial window held in late 2002.[26] Under the FCC *ex ante* rules; 731 applications could have qualified for a license in the first two filing windows. This estimate includes the 255 and 57 expected licenses that comply with both statutory and FCC *ex ante* rules, plus 334 non-competing applications eliminated by statutory rules, plus 85 qualifying applications predicted to result from 304 competing applications. Hence, the ratio of expected licenses under FCC *ex ante* rules to that under Congress' equals 1.716 (731÷426). As the total expected licenses (considering all five filing windows) with Congress statutes is 1,326, the estimated number of low power FM licenses under the FCC *ex ante* rules is estimated to be 2,275.

V. An estimate of a benchmark policy optimum

[22] We adopted a conservative approach to not include low power FM stations on the same channel within the same radio market. The FCC's separation rule (pre-statute) established minimum separation for co-channel use of 24 kilometers.

[23] There were 648 applications affected by Congress' restrictions on third adjacent channels. Ten of these had engaged in unlicensed operations in the past, however, disqualifying them according to Commission rules. Thus, a net total of 638 applications were affected by the congressional legislation. FCC (2001), Appendices A, B, and C.

[24] FCC (2001).

[25] These are applications that do not appear among the 255 exempt of any dispute, the 634 eliminated by Congress legislation, or the 127 competing applications that did not appear in the list of applications eliminated by statute.

[26] See Federal Communications Commission. Public Notice. Notice of Acceptance of Low Power FM Broadcast Applications and Notification of Petitions to Deny Deadline. Report No. LPFM-S-7 (13 Feb. 2003). Federal Communications Commission. Public Notice. Notice of Acceptance of Low Power FM Broadcast Applications and Notification of Petitions to Deny Deadline. Report No. LPFM-S-8 (17 Apr. 2003).

Interference between radio stations is solved by a command and control system instituted more eight decades ago by a coalition of incumbent broadcasters, legislators, and license grantors.[27] By using engineering standards with little relation to the marginal benefits and costs internalized by wireless users, the FCC generally permits less than the optimal level of interference between broadcast stations,[28] leading Ronald Coase to propose property rights to radio frequencies as an efficient alternative to regulation.[29] While we regard this as the first best policy, our benchmark policy is less ambitious; we use interference protection standards adopted by the FCC so-called short-spaced stations.[30] As will become clear, these standards are relaxed from those imposed on low power FM stations, lowering entry barriers into FM radio markets. Nonetheless, they have proven effective in avoiding harmful interference between stations according to regulators.[31]

Our simple model estimates to a first approximation how many additional low power FM stations could broadcast without imposing harmful interference (using the interference standards for short-spaced stations) to existing full power stations. 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 the relevant policy question. In the absence of arguments to the contrary, lowering entry barriers permits movement towards competitive equilibrium.[32] Hence, we calibrate a benchmark policy optimum.

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. We further assume that within each of 269 metropolitan markets,[33] existing stations continue

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[27] Hazlett (1990; 1998; 2001).

[28] See for example Rappaport *et al*., (1999), p. 3, 6, 43-45, 47.

[29] Coase (1959).

[30] FCC (1997).

[31] FCC (1997).

[32] This is not only the conclusion of welfare economics, but of FCC policy makers. See Rosston and Steinberg (1997), p.7. Also Owen (1999), p. 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 competition which "cannibalizes" existing audiences. This result is obtained with two implausible assumptions: One is that free entry exists in the broadcast industry, and the second is that increased competition has no effect on productive inefficiency; a major source of welfare losses. Even if the free entry assumption 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.

[33] According to Arbitron Radio Market Ranking (Fall 1999) there are 276 metropolitan radio markets in the United States, but seven of these are embedded in larger markets. We combine duplicates to avoid double counting. See: www.arbitron.com/radiosurvey/mm001025.htm. These markets do not exhaustively cover U.S. households; only about one-half of U.S. stations broadcast

to enjoy exclusive use of assigned frequencies and (as buffers) the channels bordering either side. In other words, existing (full power) stations are granted exclusive use of three channels within the local market area. Given these assumptions, the number of available channels in each market equals 100-3X, where X is the number of (full power) FM stations already operating.[34] The rationale for this separation rule is given below.

Our interference protection standards follow the study by Rappaport *et al.*, on interference in the low power FM service.[35] They note that the 3-channel separation rule was established when older technology made FM radios more susceptible to interfering emissions than modern receivers.[36] "The FCC protection ratios were designed to provide simple and conservative spacings to prevent early FM radio receivers from undesired retuning to strong adjacent stations".[37] The conservative assumptions in the FCC propagation models insure that radio stations are inefficiently (too widely) spaced.[38]

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,[39] 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 short-spaced commercial stations have operated for decades without complaint or regulatory correction, indicating an absence of "harmful interference."[40] Since low power (100-watt) stations emit far less potential interference than do full-power stations, using this time tested separation appears reasonable. Again, notice that between full power stations and low power stations our interference protection standards uses frequency separation with unlimited

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in designated radio markets (BIA Financial [1999]). This implies substantial under-estimation of low power FM insert capacity in our model.

[34] A listing of FM stations by market was obtained from BIA Financial, Radio Yearbook 2000.

[35] Rappaport *et al.*, (1999). 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.

[36] Rappaport *et al.*, (1999), p. 3, 6.

[37] Rappaport *et al.*, (1999), p. 43.

[38] 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 theoretical ratios used by the FCC differ from actual signal-to-noise ratios in the field, which are much higher, yielding much better audio quality (Rappaport *et al*., [1999], p. 43-45, 47).

[39] FCC (1997).

[40] 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 allowing 2nd and 3rd adjacent channel use for short-spaced stations authorized prior to 1964 (*ibid*., par. 23).

distance separation in a given market area. This is a conservative interference standard by any account. On the other hand, we do not impose frequency separation requirements between 100-watt stations. We only impose distance separation requirements between low power stations transmitting on the same channel such that they do not transmit within their respective coverage areas.

Once we have the number of available channels in each market area (that is: 100-3X), we need to find how many low power stations could operate in each available channel without interfering with each other. Because low power (100-watt) stations have a signal contour radius of 3.5 miles,[41] the minimum distance separation between them would be 7 miles. We increase this distance to 8 miles and assume that each low power station would "occupy" a square area of 8x8 miles. Hence, the total number of low power stations per market is: [100-3X][Market area in square miles/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 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.[42] 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:

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

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 in all markets. As seen in Table 3, this yields a total of 306,805 low power stations. Even when we cap the density of low power FM stations per market at one per 1,000 population,[43] the number of low power stations is 97,701. This estimate is very

[41] 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 (FCC [1999], par. 30).
[42] Rappaport *et al*, (1999), p. 21 -2.
[43] Since the smaller markets are typically less dense and have fewer radio stations broadcasting, their estimated number of low power stations is greatest. Capping the number of stations by population limits this fact from skewing results.

Table 3: ESTIMATED LOW POWER FM STATIONS NATIONWIDE AND IN 30 SELECTED MARKETS

Rank	Radio Market [a]	Population (12+) [a]	Area [b]	X [c]	Gross 100-watt stations [d]	Less blanket-ing effect [e]	Net 100-watt stations	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-Galvest., 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-Oshk., 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-Norw., 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, 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-Springf., 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 DC market.

[a] Based on Arbitron radio markets by population (age 12 and older).

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

[c] Number of existing full power FM stations. 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.

[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.

likely a lower bound due to the conservative assumptions applied.[44] Moreover, it covers only the 269 metropolitan markets monitored by Arbitron, and these account for just about one-half of existing FM radio stations.

VI. Three policy options

We may now compare the revealed policy preferences of Congress and the FCC, and then contrast either to our benchmark policy optimum. It should first be made clear that the rival policy choices revealed by the Congress and the FCC are not unconstrained optima. The institutional policy choices are strategically crafted anticipating reactions of other players in the regulatory game. This forward-looking optimization leads us to believe that the gap between a theoretically unconstrained preferred policy of the FCC and that of Congress may be larger than exhibited. The fundamental issue for empirical evaluation, however, is that, even after the FCC presumably incorporated Congressional preferences into their rule making, they were overturned.

While the differences between Congress and the FCC may appear large in isolation, putting them in context reveals that they are not substantial. The difference (FCC – Congress) equals 949, which pales in comparison to the difference between either the FCC or Congress and the possible number of LPFM licenses, which is estimated to equal 97,701. In other words, the distance between the policy positions of Congress and the FCC is about one percent of the distance between either policy and the benchmark optimum. Existing broadcasters would be protected from marketplace competition, to virtually the same degree, irrespective of which regulatory plan prevailed.

Non-quantifiable regulations strongly reinforce our quantitative conclusion. Licensing rules, perhaps more than interference protection standards, severely constrained entry by low power stations in the FCC's rule making. These regulatory constraints (outlined in Appendix 1) included:

a. severe limits on license aggregation, pre-empting important economies of scale realized by broadcast chains;[45]

[44] Note that our estimation does not result in 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, 21 June 2000. http://www.fcc.gov/ Bureaus/ Mass_Media/Public_Notices/Brdcst_ Applications/ap000621.txt. See also Federal Communications Commission, Report No. 24820, Broadcast Applications, 15 Sep. 2000).

[45] "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

b. prohibition on license ownership by newspapers, for-profit firms, radio or TV stations, pre-empting economies of scope;[46]
c. prohibition of advertising, blocking direct competition in the revenue-generating markets occupied by incumbent broadcasters;[47]
d. requirements (through licensing preferences) for eight daily hours of original programming, an imposing burden for small-scale enterprises;[48]
e. prohibition of applicants who had engaged in unlicensed radio broadcasting, excluding those with human capital in owning and operating low-budget community stations;

By themselves, FCC rules ensured that low power stations would prove expensive to operate and difficult to fund. Congress and the agency appeared to reach consensus on these regulatory aspects of low power FM policy.

VII. Low power FM policy: A market test

The previous analysis suggests a substantial difference between the benchmark policy optimum and either of the policies preferred by Congress or the regulatory agency which, in context, were not substantially different from each other. Nonetheless, the Congress-FCC gap was sufficient to prompt a well publicized political conflict. Was the policy dispute, if small relative to the policy optima, nonetheless material?

A way to test its significance is to examine the reaction of capital markets. If Congress battled the FCC for control of public policy over economically important margins (as widely reported), investors in full-power radio broadcasting stations would predictably react to changes. Conversely, if Congress were seen by

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the first three years of service, we will allow an entity to own up to ten stations nationwide" (FCC [2000a], par. 39).

[46] "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).

[47] "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 (CFR [1999], 47 §73.503 par. d).

[48] "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.

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 by legislative and regulatory events in the low power FM rule making.

An event study can be used to determine if financial markets anticipated that either FCC rulings or Congressional actions would impact the profitability of existing radio broadcasters. The premise of event studies is that capital markets reveal how new information is anticipated to affect future returns,[49] and is useful in policy analysis because, "If there are specialized resources linked to regulation, such as taxicab medallions or stock exchange seats, the value of these assets can be used to measure some of the effects of regulation."[50] If investors expect serious consequences for the regulation-specific asset held by radio stations, broadcasting licenses,[51] then we expect to observe negative abnormal returns for radio station owners during windows in which the FCC takes pro-entry actions, and positive abnormal share returns with news of congressional intervention to limit entry.

We perform an event study for the period 2 Feb. 1998 – 8 Mar. 2001 (*i.e.*, the whole length of the regulatory episode), examining daily returns to shareholders in relatively "pure" owners of radio stations (full-power AM and FM incumbents). We extend the standard "market model" to include dummy variables to estimate excess 3-day event window returns (encompassing the day before, day of, and day after an event),[52] and use panel data estimation with fixed effects to control for unobserved firm specific characteristics that are time invariant. Our base model regression equation is:

$$r_{it} = \beta_{0i} + \beta_1 M_t + \beta_2 FCC_t + \beta_3 CONG_t + e_{it} \qquad (1)$$

where, r_{it} is the 3-day [t-1 to t+1] percentage change of firm i stock return (price change plus dividends) measured at day t; β_{0i} is the fixed-effect of firm i, taken as constant over time; M_t is the 3-day percent change of market index at day t; FCC_t is a dummy variable with a value of one if on day t an FCC ruling on low power FM occurred, zero otherwise; $CONG_t$ is a dummy variable with a value of one if on day t an event in Congress related to the low power FM initiative occurred, zero otherwise; and e_{it} is the residual of firm i returns at time t.

[49] Fama (1976), p. 66-70.
[50] Schwert (1981), p. 121. See also Binder (1985).
[51] FM and AM full power stations could decline in value with the entry of low power FM stations due to increased competition, harmful interference, or a combination of the two.
[52] Bhagat & Romano (2001, Table 1) present findings from 19 event studies, of which nine used three day windows stretching from the day before the identified event to the day after (-1, +1). Four others used (0,+3), three the day before (-1), one the event day (0), one month-long returns, and another week-long returns.

Using our base model we test the hypothesis that a substantial policy difference existed between the FCC and Congress. Following the widespread view of this regulatory episode, the FCC was pro-competition while Congress protected existing broadcasters from competition. This implies jointly that: $\beta_2 < 0, \beta_3 > 0$.

Data. Our sample of six publicly listed radio broadcast firms appears in Appendix 3.[53] Eleven events in Congress signified potentially substantial developments on the low power FM initiative. See Table 4. Five FCC developments signaled potential changes in low power FM rules. See Table 5.[54]

Regression analysis of policy events. The base model (equation 1) is estimated along with two alternative specifications. The first separates Congressional events into those that appear to favor incumbents, and those that favor entrants (the McCain bills). The second tests for the possibility that the first three FCC events were pro-entry, while the last two became hostile after disciplined by Congress. Thus, we estimate three specifications. In each regression we compute efficient standard errors using the Newey-West robust covariance matrix.[55]

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[53] 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 6 February 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 for meaningful analysis.

[54] 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 criterion 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 (7 Sep. 2000) for Cox Radio Inc (CXR) and three observations (25, 26 and 27 October 2000) for Citadel Communications Corp. (CITC). On 25 October 2000, five analysts downgraded Citadel Communications Corp. See http://biz.yahoo.com/c/c/citc.html (visited on 15 Feb. 2001). We did not find news reports on Yahoo!Finance of any merger or takeover activity involving our firms during event windows.

[55] 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. Finally the Chi-square goodness of fit test indicated non normality in the error terms (White [1997], pp. 18-20). These results violate the usual assumptions used in ordinary least square (OLS) regressions. Therefore OLS estimates, although unbiased and consistent, would be inefficient. To correct for inefficient standard errors 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], pp. 504-6). The results appear in Table 6 in specifications 1 to 3. For comparative purposes we also include results using the bootstrap method (specifications 4 to 6), which provide efficient estimators when error terms are not normally distributed (Freedman and Peters [1984]; Efron [1982], pp. 35-6; Johnston and DiNardo [1997], pp. 362-8).

Table 4: RESPONSE OF STOCK PRICES TO CONGRESSIONAL EVENTS: 3-DAY (%) CHANGE [*t-1* to *t+1*]

Date	Events	Nasdaq	CXR	ETM	ROIA	CITC	CMLS	HSP	Median excess return[a]	Mean excess return[b]
17 Nov. 1999	Rep. Oxley introduces HR-3439	3.96	5.07	1.78	-1.71	4.07	8.47	2.46	1.08	1.17
10 Feb. 2000	Sen. Gregg introduces S-2068	-0.72	3.09	-6.40	-5.68	-9.47	-12.99	0.06	-2.25	-1.44
10 Apr. 2000	Commerce Committee Report No. 106-567 on HR-3439	-4.96	3.99	-7.59	-9.81	-7.26	-5.45	-4.93	-6.31	-5.12
13 Apr. 2000	Radio Broadcasting Preservation Act of 2000 passes [Vote:274-110]	-18.11	-11.74	-11.49	-15.48	-8.35	-14.42	-12.84	-2.69	-2.79
8 May 2000	Sen. McCain introduces S-2518	-3.63	0.41	1.59	-13.65	-3.12	-0.48	-19.78	-1.98	-6.02
27 Jul. 2000	Sen. McCain introduces S-2989	-9.10	2.32	-11.63	-4.28	9.59	1.32	-5.38	2.22	2.36
7 Sep. 2000	Sen. Grams introduces S-3020	-3.98	n.a.	0.36	-12.00	2.21	-4.67	-14.95	-3.84	-4.98
25 Oct. 2000	Rep. Rogers introduces HR-5548.	-5.67	-9.60	-13.69	-3.94	n.a.	-6.17	10.48	-3.93	-2.34
26 Oct. 2000	Conference Rep. No.106-1005 passes [Vote:206-198]	-4.14	-9.64	-9.24	-6.25	n.a.	-10.26	0.23	-7.91	-5.70
27 Oct. 2000	Sen. approves Conference Rep. No. 106-1005	-1.18	0.32	14.91	1.67	n.a.	-1.30	6.58	-0.81	1.96
27 Feb. 2001	Sen. McCain introduces S-404	-4.89	6.84	-3.78	3.90	0.00	-1.23	-1.27	-0.14	1.22
	Cumulative return								-26.56	-21.69

Nasdaq = Nasdaq Composite 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] Median excess return (%)= Equally-weighted median price change of 6 firms(%) – Market index change(%). We used the Nasdaq index as the market index.
[b] Mean excess return (%) = Equally-weighted mean price change of 6 firms(%) – Market index change(%). We used the Nasdaq index as the market index.

Table 5: RESPONSE OF STOCK PRICES TO FCC RULINGS: 3-DAY (%) CHANGE [*t-1* to *t+1*]

Date	FCC Ruling	Nasdaq	CXR	ETM	ROIA	CITC	CMLS	HSP	Median excess return[a]	Mean excess return[b]
5 Feb. 1998	Public Notice Report No. 2254	1.68	1.71	n.a.	n.a.	n.a.	n.a.	7.92	3.14	3.14
10 Mar. 1998	Public Notice Report No. 2261	0.19	2.22	n.a.	n.a.	n.a.	n.a.	-3.56	-0.86	-0.86
28 Jan. 1999	Adoption of Notice of Proposed Rule Making	2.98	10.40	n.a.	n.a.	-3.83	3.03	0.27	-1.33	-0.51
20 Jan. 2000	Adoption of Report and Order	2.53	11.67	11.99	-3.79	8.92	8.92	5.34	6.39	4.64
20 Sep. 2000	Adoption of Memorandum Opinion and Order	2.75	-1.05	-8.05	-25.17	-12.58	-4.86	0.00	-9.21	-11.37
	Cumulative return								-1.87	-4.96

Nasdaq = Nasdaq Composite 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] Median excess return (%)= Equally-weighted median price change of 6 firms(%) – Market index change(%). We used the Nasdaq index as the market index.
[b] Mean excess return (%) = Equally-weighted mean price change of 6 firms(%) – Market index change(%). We used the Nasdaq index as the market index.

Results are shown in Table 6. Across all specifications, station owner returns are highly correlated with the NASDAQ market index. In Specification 1 (the base model), incumbent returns lack statistical significance during low power FM regulatory events in Congress and the FCC. Moreover, both estimated dummy coefficients are identically signed (*i.e.*, both are negative). Similar results are obtained using the bootstrap technique. Separating the McCain bills from others in Congress does not alter results (Specification 2), coefficients lack significance and both Congressional dummies are of the wrong sign. Specification 3 tests the hypothesis that initial FCC events threatened broadcasters while subsequent FCC events signified an alignment with Congress. The results

Table 6: REGRESSIONS FOR REGULATORY AND LEGISLATIVE EVENTS
Dependent variable is 3-day (%) returns to broadcast station equity owners.

	OLS with Newey-West standard errors			Bootstrap estimates (10,000 iterations)		
	1	2	3	4	5	6
NASDAQ 3-day return (%)	0.717 (16.40)*	0.717 (16.42)*	0.718 (16.42)*	0.716 (21.72)*	0.717 (21.66)*	0.718 (21.59)*
All FCC events	-1.587 (0.78)	-1.588 (0.78)		-1.593 (0.84)	-1.549 (0.82)	
All Congress events	-0.529 (0.60)			-0.535 (0.49)		
Congress w/o McCain bills		-1.404 (1.46)	-1.404 (1.46)		-1.410 (1.09)	-1.433 (1.11)
McCain Bills		1.625 (0.92)	1.626 (0.92)		1.610 (0.80)	1.590 (0.80)
FCC first 3 events			0.620 (0.38)			0.629 (0.21)
FCC last 2 events			-3.060 (0.98)			-3.067 (1.24)
Observations	3901	3901	3901	n.a.	n.a.	n.a.
R-squared	0.112	0.112	0.112	n.a.	n.a.	n.a.
F-test	0.490	1.235	1.050	n.a.	n.a.	n.a.

Panel data estimation with firm specific fixed-effects and Newey-West standard errors corrected for autocorrelation and heteroskedasticity (specifications 1 to 3). Absolute value of t-statistics in parentheses. Bootstrap estimates (specifications 4 to 6).
*=99% confidence level; n.a. = not applicable.

do not support this hypothesis; again estimated coefficients are insignificant and both FCC dummies are signed the wrong way. The hypothesis that all event coefficients are zero cannot be rejected with 99 percent confidence.

We performed an alternative event study using news stories about low power FM radio regulation in the *Wall Street Journal* or the *New York Times*. The results show insignificant negative returns across all news events. Results are reported in Appendix 4.

We interpret these results as evidence tending to reject the hypothesis that a substantial policy difference was evident between Congress and the regulatory agency. As the FCC's plan did not threaten equity values, Congress did not visibly bolster them. This suggests that the low power FM regulatory episode was a game played by skillful politicians with no economic significance to investors.

This market expectation of zero economic impact is understandable. In 2000, there were 13,307 full power stations in the U.S. (5,009 AM and 8,298 FM). About one-half of these stations were in the 269 defined radio markets. In early 2000, the FCC approved rules allowing for as many as 2,300 new low power radio licenses; in December 2000, Congress enacted rules limiting entry to about 1,300 stations. Yet, as of mid-2004, only 290 low power stations were licensed to operate.[56] Of these, about two-thirds were outside the 269 radio markets which overwhelmingly account for industry sales. Actual low power FM entry appears *de minimus*.

It is important to note that the low rate of entry as a proportion of licenses available is not due to congressional intervention, which limited availability but did not constrain the opportunities embedded in the licenses by statute. Rules to limit stations to just 100 watts (up to 3000 watts had been requested by low power applicants), to forbid for-profit ownership or commercial advertising, and to prohibit multiple station ownership severely limited financial viability. Of the few stations that do broadcast, a great majority appear to be associated with churches, schools, or other non-profit institutions that can subsidize operations.

IX. Conclusion

Congress delegates administrative responsibility to an independent regulatory commission. When conflicts arise, Congress may reclaim jurisdiction by legislating directly. That such action becomes occasionally necessary suggests that the agency may be straying a considerable distance from policies preferred by Congress. In the case of low power FM radio, policy positions are observable and quantifiable. Contrary to public statements and popular press accounts, we find this distance was negligible when compared to a benchmark policy optimum. This

[56] See http://www.fcc.gov/mb/audio/fmq.html

is supported by evidence gleaned from financial markets and *ex post* operating markets. Virtually identical economic results would likely have obtained under the FCC's *ex ante* rules as have obtained with statutory amendment.

This suggests that agency drift is small even for an agency characterized as having considerable leeway on setting policies.[57] Modest policy differences, however, are enough to create an opportunity for "credit-claming" and "blame-shifting," while the underlying regulatory equilibrium is not seriously challenged. Such flamboyant scuffling over essentially fixed policies has long been a noted feature of FCC broadcast regulation. In the words of Ronald Coase: "[T]he regulation of the broadcasting industry by the Federal Communications Commission resembles a professional wrestling match. The grunts and groans resound through the land, but no permanent injury seems to result."[58] Although not the focus of this article, the objectives pursued by self-interested regulators and legislators issuing "grunts and groans" would seem an inviting topic for future research.

Colophon

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[57] de Figueiredo (2002).
[58] Coase (1966), p. 442.

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 adj. 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.
Advertis-ing	No decision	Not permitted	Same as in Report & Order

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

Appendix 2: Main events in Congress

- 17 November 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 10 February 2000 Senator Judd Gregg (R-NH) introduced an identical bill, S-2068, in the Senate.
- 10 April 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.
- 13 April 2000. The House of Representatives approved the Radio Broadcasting Preservation Act of 2000 (HR-3439), 274 – 110.[59]
- 8 May and 27 July 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.[60]
- 7 September 2000. Senator Rod Grams (R-MN) introduced S-3020, identical to HR-3439.
- 25 October 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.
- 26 October 2000. Conference Report No. 106-1005 containing section 632 was approved 206 – 198.[61]

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[59] 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, 13 April 2000; http://clerkweb.house.gov/cgi-in/vote.exe?year =2000&rollnumber=130.

[60] The National Association of Broadcasters (NAB), the leading trade group for incumbent FM stations responded: "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 (28 July 2000). www.nab.org/newsroom/pressrel/STATEMENTS/S1500.HTM, visited 28 February 2001.

[61] 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 22

- 27 October 2000. The Senate approved the Conference Report, and on 21 December 2000 President Clinton signed the measure that became Public Law No. 106-553.
- 27 February 2001. Senator John McCain (R-AZ) introduced S-404, a bill to facilitate the resolution of interference disputes over new low power service. However, it did not lift the severe restrictions imposed on low power FM.

Appendix 3: Profile of radio broadcast firms

Firm	Profile
Cox Radio Inc.	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 Communicat-ions	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 Communicat-ions	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. Owns 45 radio stations in 13 U.S. markets. It also 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 6 Feb. 2001).

February 2001). Of the 206 votes in favor, 185 were Republican and 19 Democratic. Of the 198 votes against, 19 were Republican and 178 Democratic.

Appendix 4: Event study using news stories

We performed an alternative event study, testing whether news stories about low power FM regulation in the *Wall Street Journal* or the *New York Times* were associated with abnormal broadcaster returns. There were two news categories**:** "FCC goes ahead" (presumably negative news for existing FM radio stations); and "Congress prevails" (positive for existing FM stations). We

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.	29 Jan. 1999
FCC is Set to Open Air Waves to Low power Radio. Kathy Chen, WSJ page B12.	17 Jan. 2000
FCC to Approve Low power Radio for Wider Access. Stephen Labaton, NYT page A1.	20 Jan. 2000
FCC to Open Airwaves. Stephen Labaton, NYT page 4-2 Week in Review.	23 Jan. 2000
Upstarts in Radio's Land of the Bland. Jesse Walker, NYT page A15 (op-ed).	29 Jan. 2000
FCC Moves Forward on Issuing Low power FM Licenses. NYT page C8.	28 Mar. 2000
New FCC Rules Could Smooth Way For Low power Stations. Stephen Labaton, NYT page C2.	22 Sep2000
255 Licenses are Awarded for Low power FM Radio. Stephen Labaton, NYT page C5.	22 Dec. 2000
Congress Prevails:	
FCC Gets Static for Promoting Tiny Stations. Mark Wigfield, WSJ page A9.	22 Feb2000
Panel Clears Bill to Curb Low power Radio Stations. WSJ page A8.	30 Mar. 2000
Static Over Low powered Radio. NYT page A26 Editorial.	31 Mar. 2000
House Clears Bill to Curb Plans for FM. Stephen Labaton, NYT page C1.	14 Apr. 2000
Communications Lobby Puts Full-Court Press on Congress. Stephen Labaton, NYT page A1.	24 Oct. 2000
Congress Severely Curtails Plan for Low power Radio Stations. Stephen Labaton, NYT page A1.	19 Dec. 2000
US Bill Could Curb FCC Licensing Plans. WSJ page B12.	20 Dec. 2000
Radio Diversity Curtailed. Stephen Labaton, NYT page 4-2.	24 Dec. 2000

Source: The Wall Street Journal (WSJ) and The New York Times (NYT) from Lexis-Nexis database.

identified eight "FCC goes ahead" articles and eight "Congress prevails."[62] See Table 7. We regressed broadcast radio equity returns against the NASDAQ index and dummies for "FCC goes ahead" news and "Congress prevails" news using a modified version of Equation (1).[63] The results show insignificant negative returns across all news events indicating that no substantial policy discrepancy existed between the FCC and Congress (see Table 8). The fact that financial news coverage was lax, however, is perhaps more telling.[64]

Table 8: ESTIMATED EFFECTS OF NEWS STORIES ON RADIO RETURNS.
Dependent variable is 3-day (%) returns to broadcast station equity owners.

Variables	OLS with Newey-West standard errors	Bootstrap estimates (10,000 iterations)
NASDAQ 3-day return (%)	0.709	0.708
	(16.64)*	(21.63)*
News FCC goes ahead with	-0.386	-0.420
plan	(0.25)	(0.34)
News Congress prevails	-1.177	-1.163
	(0.93)	(0.87)
No. observations	3,894	n.a.
R-squared	0.111	n.a.
F-test	0.464	n.a.

Panel data estimation with firm specific fixed-effects and Newey-West standard errors corrected for autocorrelation and heteroskedasticity. Absolute value of t-statistics in parentheses. *=99% confidence level; n.a. = not applicable. F-test that all news coefficients equal to zero cannot be rejected with 99% confidence.

[62] 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.

[63] In other words, we re-estimated Equation (1) using NYT and WSJ news events in place of actual regulatory or legislative events. The dummy variable "FCC goes ahead" takes the value of one if on day "t" such news appeared; else, the dummy has a value of zero. The dummy variable "Congress prevails" is defined in similar way.

[64] Many seemingly important developments were unreported. 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*.

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