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AN OPEC IN FANTASYLAND?  
The NAB Television Code as Cartel

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Abstract

*The U.S. Justice Department filed suit against the National Association of Broadcasters in 1979, charging that its Television Code restricted the supply of advertising. Had the case, which was settled by consent decree in 1982, gone to trial under a "rule of reason," the cartel effects of the code would have been examined.*

*This paper employs a "dummy endogenous variable" model to see if the code provided cartel benefits. The results suggest that subscribing stations received higher profits, but that these cannot be unambiguously ascribed to cartel effects of the code.*

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## AN OPEC IN FANTASYLAND?

### The NAB Television Code as Cartel<sup>\*</sup>

#### (Introduction)

In June 1979, the Antitrust Division of the U.S. Justice<sup>1</sup> Department filed suit against the National Association of Broadcasters (NAB), charging that certain provisions of its Television Code constituted unreasonable restraint of trade and commerce in violation of the Sherman Act. The questionable provisions regulated the quantity, length, placement, and format of "non-program material" (commercials and promotional announcements) code subscribers could broadcast. These advertising restrictions were eliminated from the code when the case was settled by consent decree in November 1982.

It is well-established in economic theory and in case law that a trade association like the NAB may facilitate collusion by firms in the industry. If the association's efforts are successful, industry profit increases. Was the NAB's Television Code an instrument of collusion? Clearly the Justice Department thought so and it can be argued that NAB and code practices fell into the category of proscribed behavior as established by legal

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<sup>1\*</sup>The authors are grateful to William Greene, William Mason, and Albert Anderson for programming assistance, and to Kenneth Boyer and Rick Bold for reading the preliminary draft. The usual *nostra culpa* applies.

precedent in trade association cases. If true, and if the suit had been tried in court under a *per se* rule, the NAB would have lost. Thus, the consent decree may have protected the NAB from subsequent treble-damage suits. But many observers of the commercial broadcasting industry considered the code to be ineffective, unenforceable, and honored as often as not in the breach. Under a "rule of reason," applied in most court decisions involving trade association conspiracy, the question of the actual anticompetitive effect of the code arises.

The effect of the code is analyzed in this paper. Part One discusses the history of the NAB and the Television Code and summarizes the implications of a model of a television trade association. Part Two follows the course of the government antitrust suit and makes some conjectures regarding legal interpretation of NAB code practices. Part Three employs a "dummy endogenous variable" (DEV) model to assess whether code-member TV stations were more profitable than non-members, and whether stations were relatively more profitable if they served a market where a high proportion of stations were code members. Part Four summarizes findings: that code membership was profitable, but that this increased profitability was not due to collusive output restrictions.

## 1. Background

### 1.1 The Commercial Television Industry

A commercial television station broadcasts programs and non-program material, including paid advertisements, to a viewing audience free of charge. The station's programs come from a network (if the station is a network affiliate), from syndicators who deliver tapes of programs (e.g., old movies) to stations, and from the station's own production facilities (e.g., news shows). Station revenue comes from sale of commercial time on programs and from payments from networks for showing network programs and commercials.

Advertisers in turn purchase commercial air time in order to produce customer advertising response -- increased sales. A national advertiser can buy network advertising time carried nationwide by the network's affiliated stations. Regional advertisers purchase advertising time from an agent representing several stations or from program syndicators. Local advertisers purchase advertising time directly from one or more local stations. Television commercials represent sponsorship of a program period, participation with other advertisers in sponsorship, or spot announcements inserted between program periods.

The individual station acts to maximize profit. The profit function is of the form:

$$R = pnA(n, q, k', z') - C(q) \quad (1)$$

where R = station profit per period;

p = price per commercial exposure;  
n = number of commercials shown by station;  
A = station's audience size (commercial exposures per commercial);  
q = program quality;  
k = vector of program characteristics other than quality;  
z = vector of effects varying with the number of competing stations and the quality and timing of their programs;  
C = station cost.

The price per commercial exposure (p) is not observed in the market. Advertisers are interested in showing their commercial to viewers and are only willing to pay to show commercials if viewers are exposed to those commercials. The price paid by an advertiser to show a commercial is thus directly related to the number of people who are exposed to the commercial.

The model assumes  $\partial A/\partial n < 0$ ,  $\partial A/\partial q > 0$ , and  $\partial C/\partial q > 0$ . As the number of commercials (n) increases, the number of viewers of the program (A) falls. If program quality (q) increases, the number of viewers increases. Program cost (C) is an increasing function of program quality.

The station, in the absence of regulatory or trade association restraints, takes price of commercial exposures (p) and actions of other stations (z) as given and chooses number of commercials (n), program quality (q), and those program characteristics under its control (k) to maximize profit (R). Program quality depends in part on signal clarity, which varies with assigned channel, antenna height, and power output. Commercials are costly to the station, even though the station does not physically produce them, because an additional commercial reduces audience size. The first-order conditions for

maximizing equation (1) include the requirement that  $\partial R/\partial n = np\partial A/\partial n + pA = 0$ . Competitive stations sell  $\bar{n}_c^*$  commercials at which the marginal revenue of an additional commercial,  $pA$ , equals the marginal opportunity cost in lost viewers,  $-np\partial A/\partial n$ .

The price of commercial exposures is a function of the quantity produced in the industry. Under competition or oligopolistic rivalry, stations compete for viewers (and profit), reducing the price of commercial exposures to some competitive level. By contrast, a trade association seeking to increase industry profit will (1) restrict output and/or raise price, (2) establish and maintain barriers to entry, and (3) monitor and enforce compliance by association members. A television trade association is hindered somewhat in the achievement of the first objective by the difficulty of defining, measuring, and monitoring the price and quantity of the industry's output, commercial exposures. The *number* of commercials is easy to measure, however, and this may be sufficient to increase industry profit.<sup>1</sup>

If only the number of commercials is controlled, stations can compete by altering program quality and other program characteristics. Whether this non-price competition dissipates all potential cartel profit depends on the marginal cost and benefit to individual stations of non-price competition and on the nature of viewer response to changes in program quality and

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<sup>1</sup>Reducing the number of commercials reduces the number of commercial exposures produced since, for an interior maximum, the increase in number of viewers must be smaller than the reduction in the number of commercial exposures due to fewer commercials.



characteristics. Although some cartel profit will be dissipated through non-price competition, sufficient profit may remain to justify trade association restriction on number of commercials.

## 1.2 The NAB and Implications of the Model

This section briefly reviews the history of the NAB and shows how industry behavior conforms in many respects to the predictions of the model outlined above.

The National Association of Broadcasters was formed in 1923 during a time of confusion and conflict in the fledgling radio broadcast industry. RCA and AT&T were trying to extend their patent monopolies on crucial components of radio receivers and transmitters, the second Washington Radio Conference was allocating frequency bands on the radio spectrum to reduce mutual station interference, and the American Society of Composers, Authors and Publishers was demanding royalty fees for use of copyrighted music and material used on the air [Barnouw (1966), pp. 114-21]. By banding together in what must have been perceived as self-defense, commercial radio stations felt they could better protect their interests.

The NAB's role in the industry, which has changed little since the early years, consists of lobbying for broadcast interests, providing services to members, and promoting industry "self-regulation." The principal instrument of self-regulation has been the issuance of "codes" whose provisions are divided between programming ethics and advertising standards. The first NAB radio code was ratified in 1929 and the first television code in 1952.

Self-regulation can serve three purposes. Publishing ethical standards of conduct builds good public relations, important for an industry that wants to be "invited into the nation's living rooms." Also, by giving the appearance of policing themselves, commercial broadcasters may be able to forestall more inflexible or undesirable regulation by the FCC and other government agencies. Finally, by facilitating the exchange of market and cost information, providing focal point pricing and output levels for advertising, and monitoring station compliance with code recommendations, a trade association may "organize" the industry in anti-competitive ways. It is the ability of the NAB to accomplish this last task which is the principal concern of this paper.

The behavioral model predicts that a profit-maximizing association of broadcasters wants higher barriers to entry than would occur under competition.<sup>2</sup> Historical evidence supports this predictions. The NAB, the networks, and *ad hoc* groups of large stations have continually and successfully lobbied Congress and the FCC for restrictions on the rate of entry of additional stations and substitute technologies.

A good example is provided by the DuMont controversy in 1952. In that year, after a four-year freeze on licensing new applicants, the FCC produced a table of new station and frequency assignments. Stations were more geographically dispersed than

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<sup>2</sup>The television market in a large metropolitan area can often be described as a dominant group of high-powered VHF and network-affiliated stations, accompanied by a competitive fringe of UHF and mostly non-commercial stations. Restrictions on entry into the dominant group are most valued by the NAB.

they would have been under unregulated competition, since small communities often had unused frequencies allotted to them, while in larger cities some license applications were denied. The 1952 allocation did increase somewhat the number of channels assigned to large, established television markets, but not by as much as was technically feasible. The DuMont Television Network needed more VHF channels in large cities to survive, and presented a technically viable proposal to the FCC. Under pressure from existing networks and television interests, however, the commission rejected the DuMont plan [FCC (1952)]. Shortly thereafter, DuMont ceased operation.

Cable television provides another example of NAB efforts to restrict entry. In the early years of cable development neither the NAB nor the FCC paid much attention to cable television systems. As cable penetrated larger markets and competed with VHF broadcasters, however, the trade association began its opposition. In 1974 for example, the NAB spent or committed over \$800,000 to restrict cable and subscription television growth [*Broadcasting* (7 October 1974), pp. 3,6]. Due to NAB efforts, FCC regulatory restrictions on cable grew apace. Although the commission began relaxing its most restrictive cable television rules after 1980, the FCC generally continues to support network and NAB desires for obstacles to entry by new stations and technologies.<sup>3</sup>

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<sup>3</sup>In more recent years a rivalry has grown between existing commercial broadcasters and low power VHF "drop in" stations, direct broadcast satellite systems and "pay television" in the form of multipoint distribution services. Cornell and Webbink write: "Today new applicants and new services bear the

The model also predicts that a trade association wants to restrict the number of commercials and so restrict the number of commercial exposures. The advantage of choosing number of commercials as the target for cartel restriction is obvious.

Owen, Beebe, and Manning write:

The price and quantity of advertising time is relatively easy to agree upon, because the market is well organized and well informed, and because cheating can quickly be detected. Also, the NAB code limits on the number of commercial minutes per hour provide a convenient process for agreement . . . [(1974), p. 104].

The Television Code limits the number of commercial minutes per hour, the number of consecutive commercials, and the number of products which can be advertised in one commercial. These restrictions, while consistent with a pattern of output reduction by a cartel, may also reflect the notion that self-regulation averts formal regulation. In 1964, for example, the FCC, concerned about the "over-commercialization" of broadcasting, considered adopting the NAB's advertising restrictions as its own regulatory standard. The NAB resisted vigorously (and successfully), motivated by the desire to preserve the flexibility of self-regulation:

The NAB television and radio codes were constantly held up by industry spokesmen as shining examples of self-regulation, though regarded by many broadcasters as a charade. Most of its edicts had built-in escape hatches, and the few clear rules -- such as those dealing with the time to be devoted to commercials -- were widely ignored. An FCC sampling of stations in 1963 found that 40 per cent had advertising exceeding the code limits [Barnouw (1970), pp. 250-51].

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burden of showing [the FCC] that their proposed services are wanted by the public and *would not hurt existing firms*" [(1983), p. 197; emphasis added]. See also Barton (1979) and Greer (1983), ch. 17.

It would seem that commercial reduction by FCC edict is less desirable to the industry than reduction by "selective adherence" to the NAB's Television Code. Under the latter, "it is doubtful that prices and quantities thus set would depart very much from competitive levels" [Owen, Beebe and Manning (1974), p. 104].<sup>4</sup>

For successful cartelization of broadcasting, the NAB must encourage membership, monitor compliance with cartel restrictions, and detect and penalize cheating and free riders. The NAB's monitoring capability is strong and efficiently centralized, and membership seems not to have been a problem. NAB member television stations do not have to subscribe to the Television Code, and code subscribers need not be members of the NAB. But of 630 commercial television stations in 1970, 86 percent belonged to the NAB and 65 percent subscribed to the code [Head (1972), table 22.1]. By 1979, "some 77% of all television stations in the top 50 markets -- stations that reach 70% of all television households in the country" were code subscribers [Broadcasting (18 June 1979), p. 27].

NAB membership and code compliance are encouraged by several means. The NAB provides services to members at low cost, including engineering and legal help, broadcast and audience research, a news bureau and library, and publications dealing with FCC regulations and licensing procedures. A separate NAB Code Authority monitors member programs. Although primarily a

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<sup>4</sup>NAB restrictions on advertising were frequently modified in the twenty-two editions of the Television Code which appeared between 1952 and 1982. When the FCC finally enacted its own limits on commercial minutes in 1973, they were less restrictive than the NAB's.

means of measuring compliance with code restrictions, this monitoring can be very helpful to the stations at license renewal time. By checking member broadcasts, the Code Authority can help stations adhere to implied FCC and Federal Trade Commission standards regarding news policy, public service announcements, children's programming and toy commercials, and allowable amounts of sex, violence, and anti-social behavior during the family viewing hour. The ability to deny some of these valuable services to non-members and to detect, expose, and/or expel code violators, gives the trade association the potential to administer and sustain at least moderate cartel restrictions on output.<sup>5</sup>

## 2. The Antitrust Suit Against the Television Code

### 2.1 Legal History

The Justice Department suit against the Television Code grew out of an earlier case against the three major networks. In 1972 the Department charged NBC, CBS, and ABC with violation of Sections 1 and 2 of the Sherman Act. The complaint accused the networks of monopolizing prime time programming, including refusal "to offer air time to advertisers and other outside program suppliers seeking to have their own programs shown on the network" [*U.S. v. NBC* (1974)]. As the case proceeded, the NAB's Television Code came under scrutiny, and on June 14, 1979, the

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<sup>5</sup>Some authors might disagree -- see Barnouw (1970), p. 251, and Head (1972), pp. 470-71.

Justice Department filed suit against the NAB in the U.S. District Court, Washington, D.C.

The government's complaint alleged:

. . . that the NAB had violated Section 1 of the Sherman Act (15 U.S.C. 1), by combining and conspiring to restrain trade. Specifically . . . the NAB had promulgated and enforced a television code, certain provisions of which restricted the quantity, placement, and format of television advertisements [47 Fed. Reg. 32813 (29 July 1982)].

Four sets of television code advertising rules were challenged: (1) commercial time limitations, (2) program interruptions, (3) consecutive announcements, and (4) multiple product advertisements. Briefly, the code defined "non-program material" to include commercials, promotional announcements, and credits exceeding a specified length. Paragraph XIV of the 22d edition of the code set limits for network affiliates: 9.5 minutes of non-program material per hour during prime time and 16 minutes per hour at other times; two interruptions per half hour during prime time and four per half hour at other times; and up to four consecutive commercials per interruption. Paragraph XV set limits for independent stations: 7 minutes of commercials per half hour in prime time and 8 minutes per half hour at other times; up to four interruptions per half hour, or seven per hour, or 13 in two hours; up to four announcements per interruption. Paragraph IX prohibited advertising two or more separate products in an announcement of less than 60 seconds. A variety of

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<sup>6</sup>The Radio Code and provisions of the Television Code not related to advertising were not affected by the suit. The challenged paragraphs of the code are reprinted in Appendix A of *U.S. v. NAB* (1982). The complete code is printed in *NAB* (1981).

exceptions or additions to these limits was applied to children's programming, news and sports programs, and short features.

The government's suit claimed that, as a result of the above code provisions, "purchasers of television advertising time have been deprived of the benefits of free and open competition among television broadcasters" [quoted in *Broadcasting* (18 June 1979), p. 27]. The NAB countered that (1) the association's attempts to avoid over-commercialization were valued by the public,<sup>7</sup> (2) subscription to the code was voluntary, (3) the government needed to show an anti-competitive purpose to the code, and (4) the code was "endorsed" by the FCC and other government agencies. The Justice Department responded that (1) fear of losing viewers would prompt individual stations to avoid over-commercialization without NAB help,<sup>8</sup> (2) the code was "not a mere set of advisory standards which subscribers may choose to ignore, but a contractual arrangement to which they are obligated to adhere," (3) the intent of the code was open to debate, but "anticompetitive effect would be enough to prove a violation of the law," and (4) endorsement of the code by government bodies other than Congress does not confer antitrust immunity.<sup>9</sup>

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<sup>7</sup>Theoretical support for this argument is developed in Koford (1984).

<sup>8</sup>After the code advertising provisions were suspended in 1982, the only restrictions on commercials were those adopted by the FCC in 1973: 16 minutes per hour for all stations (20 minutes during political campaigns). Recent FCC staff studies have found that most stations are well below these limits [Smyntek and Peterson (1984); Donovan (1984)].

<sup>9</sup>The charges and countercharges listed above are quoted or paraphrased in *Broadcasting* [(8 March 1982), pp. 37-38].



In March 1982 the District Court issued a summary judgment requiring the NAB to suspend enforcement of the multiple product rule (paragraph IX); the NAB immediately suspended enforcement of all the challenged code rules. In July the Justice Department filed a proposed consent decree and the NAB accepted, reasoning that continued litigation would be costly, that they were losing the case, and that loss after trial would expose the association to subsequent private suits and treble-damage claims [*Broadcasting* (19 July 1982), p. 39]. The decree was officially entered on November 23, 1982. By its provisions, the NAB immediately canceled the challenged portions of paragraphs IX, XIV, and XV of the code, and agreed not to reinstate them for ten years [*U.S. v. NAB* (1982)].

## 2.2 The "Rule of Reason" and Trade Association Cases

As of a decade ago, the Justice Department routinely filed about ten cases a year against trade associations, the majority of which ended in consent decrees [*Wilcox and Shepherd* (1975), p. 162]. Cases actually going to trial in the 1920-50 era usually involved industrial and retail trade associations, but more recently self-regulation by professional associations has come under closer antitrust scrutiny. Trade associations are most commonly charged with some form of price-fixing violation of the Sherman Act, Section 1 of which prohibits a "contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce. . . ."

Price-fixing conspiracy is usually subject to a *per se* prohibition,<sup>10</sup> but trade association price-fixing seems to be an exception, and naturally so. Trade association activities often include price reporting systems. These systems are said to improve market functioning under some conditions and to facilitate collusion under others. According to Wilcox and Shepherd, for these systems to avert antitrust challenge:

[they] will need to: (1) be fully available to all sellers and buyers, (2) not identify traders, (3) cover only past sales, not present or planned ones, (4) avoid circulating average prices (focal points for new price agreements), and (5) be free of any controls or penalties on sellers [(1975), p. 160; emphasis in original].

Thus, price reporting is not *per se* illegal; a court must examine the circumstances surrounding a plan and the "consequences flowing from it," -- in other words, apply a "rule of reason." Even in *United States v. Container Corp. of America, et al.* [393 U.S. 333 (1969)], where the courts came close to applying a *per se* rule to a trade association case, the structure of the market, elasticity of demand, and the "stabilizing" effects of the sharing of price information were all taken into account before a verdict was reached.<sup>11</sup>

The NAB's Television Code was not a price reporting scheme. However, it did serve as a focal point for present and

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<sup>10</sup>Under a *per se* prohibition, there is "no need for the reasonableness of fixed prices to be considered.... This is the basic statement of the *per se* approach: The action is by itself illegal; the circumstances surrounding the action, and the consequences flowing from it, are irrelevant" [Asch (1983), p. 210; emphasis changed from original].

<sup>11</sup>The Supreme Court decision is excerpted in Stelzer (1981). The evolution of trade association price-fixing case law is briefly traced in Asch (1983), pp. 214-17.

planned future restrictions of *output* (i.e., number and length of commercials), and there were penalties (exposure, expulsion) on sellers who did not adhere to the code's provisions. It seems clear that the Justice Department's case against the code fits into the standard trade association category. It follows from legal precedent and from the District Court's responses noted in the previous section that, had the case gone to trial, a "reasonableness test" may well have been applied.<sup>12</sup> If so, the question of the actual anticompetitive effects of the code's advertising restrictions would have arisen. It is this empirical question which the remainder of this paper addresses.

### 3. Empirical Analysis of Code Effects

#### 3.1 Hypotheses and Data

Previous sections demonstrated that (a) it is theoretically possible for a cartel to raise station profits by restricting the number of commercials, even though the industry's output is commercial exposures, but (b) the NAB television code authority appears to have had only weak enforcement sanctions for effecting a significant cartel restriction of this nature. Nevertheless, television stations subscribed to the code, and the Department of Justice filed a Sherman action against it. Thus, the possibility that the code functioned as an effective supply-reducing cartel must be entertained.

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<sup>12</sup>In preliminary arguments the NAB specifically asked for a rule of reason interpretation of the case, while the Justice Department requested application of *per se* [*Broadcasting* (10 December 1979), p. 93].

The investigation below is predicated on the assumption that if the code constituted a successful cartel device, television station profits will have been higher as a result. Two "empirical hypotheses" are tested. First, code membership is positively associated with station profits. Second, station profits are higher in television markets with a high "code penetration" (*i.e.*, where a large proportion of stations were subscribers).

Acceptance of the first hypothesis will not by itself be sufficient to conclude that the code was effectively anticompetitive. If the code was a cartel, then individual station membership must marginally increase its effectiveness. But code membership can raise station profits in other ways. Display of code affiliation may signal a station's reputability to potential advertisers and to watchdog groups within the community. The code authority's monitoring of station compliance with NAB commercial and ethical standards reduces the probability of closer scrutiny by the FCC at license-renewal time. These latter considerations reduce station costs and risk, and may enhance profits, regardless of cartel effects.

The second hypothesis is more straightforward. It is difficult to see how code penetration of a television market could affect station profit except through some kind of output restriction. Barring modeling inadequacies and sampling error, the absence of a link between profit and penetration suggests either that the code did not intend output restrictions or, due

to weak adherence and enforcement, it failed to carry out those intentions.

The hypotheses above focus on code effect and penetration in a local television market. The possibility that the code restricted the supply of commercials nationwide, thereby increasing all station profits simultaneously, is implausible and perhaps irrelevant. It is implausible because stations, with few exceptions, sell commercial exposures in a localized "area of dominant interest" (ADI). It may be irrelevant because those television trade association activities with likely nationwide effects, such as lobbying before Congress and the FCC for entry restrictions and other favors, are carried out not by the code authority but by the NAB itself. In any event, the national effects of supply restriction by the code cannot be estimated with the cross-sectional data base used below.<sup>13</sup>

The first difficulty in testing the empirical hypotheses is the unavailability of data on station profits. The proxy used here is the sale price of a television station, which should approximately equal the present value of a stream of anticipated net revenues. The advantage of this approach is that sale price data need no adjustment for deficiencies in accounting measures of profit. The disadvantages are that the potential sample is

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<sup>13</sup>Koford [(1984), n. 11] observes that reductions in the supply of commercial exposures may have an entry-limiting effect. Even this influence would likely be felt at the local, not national, level.

smaller and may be non-random, although the direction of bias, if any, could go either way.<sup>14</sup>

The sale price of station  $i$  at time 0 can usefully be modeled as follows:

$$P_i(0) = \int R_i(t)e^{-gt}dt + \int R_i^m(t)e^{-gt}dt \quad (3a)$$

where  $R_i$  is the component of the station revenue stream which would obtain in the absence of any restrictive cartel, and  $R_i^m$  is a monopoly profit component attributable to the workings of the code.<sup>15</sup> It is further assumed that:

$$R_i(t) = R[A_i(t), V_i, NET_i, MS_i(t)]$$
$$R_i^m(t) = R^m[C_i, CP_i(t), MS_i(t)] \quad (3b)$$

$A_i$  is the audience size or viewer share of station  $i$ ,  $MS_i$  is some measure of market structure in station  $i$ 's ADI, and  $CP_i$  is some measure of code penetration in the ADI.  $V_i$ ,  $NET_i$  and  $C_i$  are binary (dummy) variables set equal to 1 if the  $i^{\text{th}}$  station is VHF, a network affiliate, or a code subscriber, respectively, and

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<sup>14</sup>Other approaches to station profit have been employed. Park, Johnson and Fishman had individual station profit data for their study at the Rand Corporation. Boyer and Wirth, who did not have such data, used the Park, et al., regression equations to compute estimates of station profits. See Boyer and Wirth (1981), and references cited therein.

<sup>15</sup>While this separation is helpful for model building and exposition, there may be some monopoly rent in the first term because of FCC licensing restrictions. Greer writes: "When sold to new owners, prime stations go for prices many times the cost of their physical assets, a phenomenon explained by the fact that the intangible license rights are worth millions of dollars" [(1983), p. 356].

set equal to 0 otherwise. The upper limit of integration in the second term of equation (3a) is  $\tau$ , which may be finite if stations accurately foresaw the demise of the code. Note that market structure will influence profitability directly, but may also influence the effectiveness of any collusive voluntary organization; hence, MS appears in both the  $R_i$  and  $R_i^m$  components.

The data base consists of observations on 74 commercial television stations which were sold between February 1977 and the NAB code suspension in March 1982.<sup>16</sup> For each station the sale price at time of sale,  $P(t)$ , and status with regard to the code approximately six months after the sale ( $C = 1$  if subscriber) were recorded.<sup>17</sup> Additional variables were measured as of January 1980: number of television households in ADI ( $N^h$ ), type of station ( $V = 1$  if VHF), number of stations in ADI ( $N^S$ ), number of VHF stations in ADI ( $N^V$ ), number of code subscribers in ADI ( $N^C$ ), NAB status ( $NAB = 1$  if member), and network status ( $NET = 1$  if affiliate). The sources of these observations are *Broadcasting-Cablecasting Yearbook* (for  $P(t)$ ,  $N^h$ ,  $N^S$ ,  $N^V$ ,  $V$ , and  $NET$ ), *Broadcasting* (for  $P(t)$  in recent transactions), and *Spot Television Rates and Data* (for  $NAB$ ,  $C$ , and  $NET$ ).

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<sup>16</sup>Non-commercial, satellite and translator stations were omitted from the sample, as were stations where a cable system or other assets were part of the transaction. One outlier (KQVR, Stockton, California) was also dropped since its market area lies between two larger markets and so the actual audience for the station cannot be estimated.

<sup>17</sup>Status at this time should reflect the intentions of the new owners at the time of sale, when the possible benefits of membership would have been calculated in evaluating assets.

The 74 commercial stations in the sample are divided as follows: 35 VHF stations, of which 32 are network affiliates and 23 are members of the TV Code; 39 UHF stations, of which 27 are network affiliates and 24 are code members. Of the 47 code member stations, only 9 are not also members of the NAB; of 43 NAB members, only 5 do not subscribe to the code.

The raw data were transformed in a number of ways. Because station sales were spread over several years, the sale prices were adjusted to their estimated January 1980 equivalents by the formula  $P_i = P_i(0) = P_i(t)e^{-gt'}$ , where  $g = G/12 = .00873$ ,  $G$  is the geometric mean annual interest rate (Moody's Aaa bond yields) for the period 1977-1981, and  $t'$  is the number of months between January 1980 and the date of sale.<sup>1\*</sup>

Station audience size is estimated as  $A_i = N_i^h/N_i^S$ .  $N_i^S$  is the measure of market structure in the regressions below, and  $S_i = N_i^C/N_i^S$ , the proportion of stations in the ADI who subscribed to the code, is the measure of code penetration. Other measures of structure and penetration were tried, and their effects are discussed briefly at the end of section 3.3.

All variables are scaled to have sample means between 0 and 10.  $A_i$  is measured in units of 10,000 viewers,  $P_i$  in \$millions, and  $N_i^S$  and  $N_i^Y$  in stations. The remaining variables are either 0-1 binary variables or decimal proportions.

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<sup>1\*</sup>Time  $t' = -1$  in December 1979,  $0$  in January 1980,  $+1$  in February 1980, and so on.



### 3.2 Regression Model

A regression model for testing the empirical hypotheses will have to address the question of possible simultaneity: does code membership increase profit, do profits encourage membership, or both? A "dummy endogenous variable" (DEV) model with two unobserved variables allows for both directions of causality.<sup>1'</sup>

Let  $E_i^*$  represent the (unobserved) effectiveness of the code in raising profits and reducing advertising market uncertainty for all stations in the  $i^{\text{th}}$  ADI. Define  $C_i^*$  as the (unobserved) incentive for station  $i$  to join the code. Then, making a linear adaptation of equations (3) and omitting  $i$  subscripts and constant terms, write:

$$E^* = a_1 C + a' X_e + u^e \quad (4a)$$

$$P = b_1 C + b_2 E^* + b' X_p + u^p \quad (4b)$$

$$C^* = E^* + c_1 P^{(0)} + c' X_c + u^c \quad (4c)$$

$$C = 1 \text{ if } C^* > 0; C = 0 \text{ otherwise.} \quad (4d)$$

where  $a' = [a_2, a_3]$ ,  $X_e' = [S, N^S]$ ,  $b' = [b_3, b_4, b_5, b_6]$ ,  $X_p' = [N^S, V, NET, A]$ ,  $c' = [c_2, c_3]$ , and  $X_c' = [NAB, T]$ .

Equation (4a) says that the code's effectiveness depends on market structure ( $N^S$ ), code penetration ( $S$ ), and whether or not station  $i$  is a member ( $C$ ). Since membership by any

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<sup>1'</sup>This DEV model is based on the "hybrid" case in Heckman (1978), as modified by Maddala [(1983), sec. 5.8].

individual station should at least marginally increase  $E^*$ , while code penetration should have a pronounced effect, one expects, *a priori*, that  $a_1 \geq 0$  and  $a_2 > 0$ . A larger number of stations makes *secret* collusion more difficult [Stigler (1964)], but the NAB code advertising restrictions were not secret, so  $a_3 \leq 0$  is expected.

Equation (4b) is the station "profit" equation, where profit depends on code status and market and station characteristics. The first empirical hypothesis is that  $b_1 > 0$ , and the second that  $b_2 > 0$ . Because market structure affects profits directly as well as through code effectiveness, and because large values of  $N^S$  ought to be associated with more intense competition in the ADI,  $b_3 < 0$  is anticipated. Because VHF stations have lower transmission costs and greater signal clarity than UHF stations, network affiliates carry programs of greater mass popularity, and audience size is one dimension of output, one expects  $b_4$ ,  $b_5$ , and  $b_6 > 0$ .

In equation (4c), the incentive to join the code depends on code effectiveness, station profit if the station does not subscribe to the code ( $P^{(0)} = P$  when  $b_1 = 0$ ), whether or not the station is also a member of the NAB, and the number of months ( $T$ ) between the station sale and the 1982 suspension of the code's advertising provisions.  $C^*$  is an index which is never observed, but if it exceeds a given threshold (set at 0 in equation (4d)), station  $i$  subscribes to the code ( $C = 1$ ).  $E^*$  should have a positive influence on  $C^*$ , but is unobserved and therefore unscaled; its coefficient is arbitrarily set at unity in (4c).

One expects  $c_2 > 0$  because of the high proportion of NAB members who are code subscribers and vice versa. Variable T is included because of the possibility that  $\tau$  is finite in equation (3a). If stations became reluctant to join the code after the antitrust suit was filed in 1979, one could expect  $c_3 > 0$ . If T merely captures some (reverse) time trend in membership, no *a priori* sign can be attributed to this parameter.

The sign expectation of  $c_1$  is problematic. If a station is profitable without code membership, this very plausibly suggests that it will have reduced incentive to join and pay the subscription fees (*i.e.*, that  $c_1 < 0$ ). But the code fees are relatively small, although slightly discriminatory.<sup>20</sup> Since more profitable stations have more at stake in FCC license-renewal deliberations, code authority monitoring services would be more valuable to them. Furthermore, it is alleged that large firms generally favor planned, orderly market environments.<sup>21</sup> If the code was capable of providing focal points for supply, pricing, and other dimensions of conduct, this would be especially attractive to the larger stations. But these considerations lead to the expectation that  $c_1 > 0$ . The matter is further obfuscated by the game-strategic nature of collusion. Larger stations might contribute more to the effectiveness of the code as a cartel, then have more incentive to cheat on any agreed-upon

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<sup>20</sup>The fees vary according to a station's total revenue, whether or not it is a network affiliate, and whether it is VHF or UHF.

<sup>21</sup>This thesis is central to Galbraith's *New Industrial State* (1967), for example.

arrangements. Their very size makes detection of cheating more likely, however, and increases the size of potential losses in any ensuing advertising price war. In short, the sign of  $c_1$  is very much an empirical question.

Before equations (4) can be estimated, a "logical consistency condition" must be imposed. The use of unobserved variables in a simultaneous equation context implies parameter restrictions not encountered in analogous linear models. After substituting (4a) and (4b) into (4c), the reduced form incentive equation becomes:

$$C^* = a_1(1+c_1b_2)C + (1+c_1b_2)a'e + c_1b'x_p + c'x_c + v \quad (5)$$

where  $v = (1+c_1b_2)u^e + c_1u^p + u^c$ .

Put simply, the probability of the event "joins the code" ( $C^*$ ) cannot depend on whether or not the event has already occurred ( $C = 0$  or  $1$ ). Hence,  $a_1(1+c_1b_2)$  must equal zero, which implies  $a_1 = 0$  or  $c_1b_2 = -1$ . The empirical hypotheses of interest here must at minimum permit  $b_2 = 0$ , so  $a_1 = 0$  is the chosen restriction, and  $C$  is dropped from equation (4a).<sup>22</sup>

Eliminating equation (4a) and imposing the logical consistency condition yields the following "partially reduced form" regression model:

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<sup>22</sup>This logical consistency condition is derived rigorously in Maddala [(1983), p. 118].

$$P_i = \beta_0 + \beta_1 C_i + \beta_2 S_i + \beta_3 N_i^S + \beta_4 V_i + \beta_5 \text{NET}_i + \beta_6 A_i + w_i^D \quad (6a)$$

$$C_i^* = \gamma_0 + \gamma_1 S_i + \gamma_2 N_i^S + \gamma_3 V_i + \gamma_4 \text{NET}_i + \gamma_5 A_i + \gamma_6 \text{NAB}_i + \gamma_7 T_i + w_i^C \quad (6b)$$

$$C_i = 1 \text{ if } C_i^* > 0; C_i = 0 \text{ otherwise.} \quad (6c)$$

The correspondence between the original model parameters of equations (4) and the regression coefficients of equations (6) is detailed in Table 1. Note that none of the profit equation coefficients depends on  $c_1$ , and that  $b_1, b_4, b_5, b_6, c_2$  and  $c_3$  can be estimated directly. Coefficients  $\gamma_3, \gamma_4$  and  $\gamma_5$  will provide the least ambiguous estimates of (the sign of)  $c_1$ , and  $\beta_2$  the least ambiguous estimate of  $b_2$ .

### 3.3 Regression Results

The identification and estimation of equations (6) are discussed in Maddala and Lee (1976) and extended in Maddala [(1983), sec. 5.7]. Two-stage nonlinear least squares (2NLS) is an asymptotically efficient estimation technique. With  $C$  replacing  $C^*$ , equation (6b) can be estimated by probit maximum likelihood methods and the fitted index  $C^*$  calculated. If the cumulative normal probabilities  $F(C^*)$  are substituted for  $C$ , equation (6a) can then be estimated by OLS. The model is identified even if no exogenous variables are excluded from either equation: because  $F(C^*)$  is a nonlinear function of included RHS variables, perfect multicollinearity does not arise

TABLE 1  
STRUCTURAL PARAMETERS AND REGRESSION COEFFICIENTS

Profit Equation	Incentive Equation
$\beta_1 = b_1$	$\gamma_1 = a_2(1+c_1b_2)$
$\beta_2 = a_2b_2$	$\gamma_2 = a_3(1+c_1b_2) + c_1b_3$
$\beta_3 = a_3b_2 + b_3$	$\gamma_3 = c_1b_4$
$\beta_4 = b_4$	$\gamma_4 = c_1b_5$
$\beta_5 = b_5$	$\gamma_5 = c_1b_6$
$\beta_6 = b_6$	$\gamma_6 = c_2$
	$\gamma_7 = c_3$
$w^p = b_2u^e + U^p$	$w^c = (1+c_1b_2)u^e + c_1u^p + u^c$

in the second stage. In the regressions reported below, NAB and T are excluded from the profit equation, which reduces the otherwise high multicollinearity that may cloud the second stage estimates.

The regressions reported in this paper were run using William H. Greene's LIMDEP program. The results are contained in Table 2. Regression summary statistics include the unadjusted  $R^2$  and the Amemiya prediction criterion (PC) for the profit equations, the "pseudo- $R^2$ " and McFadden prediction success index

(PSI) for the probit equations, and the chi-square likelihood ratio test statistic.<sup>23</sup>

Columns (1a) and (1b) of Table 2 present the probit and 2NLS estimates of equations (6b) and (6a), respectively. The profit equation results indicate that  $\beta_1$ ,  $\beta_3$ ,  $\beta_4$ ,  $\beta_5$ , and  $\beta_6$  are significantly positive, but  $\beta_2$ , the coefficient of S, is not significantly different from zero (with t-ratio = 0.26). Thus, the first empirical hypothesis, that code membership yields higher profits (sale price) is substantiated, even after possible simultaneity has been accounted for. The second empirical hypothesis, that profits are higher where code penetration is deeper, is not substantiated. VHF stations, network affiliates, and stations with larger average audience sizes all show higher sale prices, as expected.

Additional insight can be gained by comparing the regression results of Table 2 with the original structural form parameters in equations (6) and Table 1. Note first that  $\beta_4$ ,  $\beta_5$ , and  $\beta_6 > 0$  imply that  $b_4$ ,  $b_5$ , and  $b_6 > 0$ . But  $\gamma_3$ ,  $\gamma_4$ , and  $\gamma_5$  are negative, with  $\gamma_4$  and  $\gamma_5$  significantly so. The implication seems to be that  $c_1 \leq 0$ . Evidently, the more profitable a station is without code membership, the less incentive it has to subscribe and pay the fees. While not unreasonable, this result suggests that either the code was not perceived as capable of ensuring a

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<sup>23</sup>PC penalizes the inclusion of extraneous variables more than the  $\bar{R}^2$ ; a lower PC suggests a better fit [Judge, et. al. (1982), p. 603]. Pseudo- $R^2$  measures are discussed in Judge, et. al. [(1982), p. 525] and Maddala [(1983), p. 39], and McFadden's normalized PSI in Maddala [(1983), pp. 76-77].

TABLE 2  
REGRESSION RESULTS

	Regression Number, Type, and Dependent Variable <sup>(1)</sup>			
	(1a) Probit C	(1b) 2NLS P	(2) OLS P	(3) OLS P
Con.	-7.80**	-11.19**	-10.67**	-11.20**
C	-.-	0.06*	5.02**	-.-
S	9.91**	0.66	-4.30	0.72
N <sup>S</sup>	0.63**	0.87*	0.64	0.87**
V	-0.24	6.29**	5.88**	6.29**
NET	-2.26*	8.47**	8.21**	8.48**
A	-0.37**	0.92**	1.03**	0.92**
NAB	3.95**	-.-	-.-	-.-
T	0.07**	-.-	-.-	-.-
Summary Statistics <sup>(2)</sup>				
R <sup>2</sup>	0.68	0.42	0.48	0.42
PC	-.-	35.95	34.61	38.75
PSI	0.80	-.-	-.-	-.-
χ <sup>2</sup>	66.1	46.8	48.7	39.4

<sup>(1)</sup>Sample size = 74; \*(\*\*) = significant at 5% (1%) level (one-tail z-test).

<sup>(2)</sup>R<sup>2</sup> = "pseudo-R<sup>2</sup>" for probit; PC = Amemiya prediction criterion; PSI = McFadden prediction success index; χ<sup>2</sup> = likelihood ratio test statistic.



"more orderly" television advertising market, or else this capability was not highly valued by larger stations.

Accepting the statistical hypothesis that  $\beta_2 = 0$  implies that  $a_2 = 0$  or  $b_2 = 0$ . If  $b_2 = 0$ , code effectiveness in general ( $E^*$ ) did not influence station profits in equation (4b). If  $a_2 = 0$ , code penetration does not increase the code's effectiveness in equation (4a). But  $a_2 = 0$  implies  $\gamma_1 = 0$ , and  $\gamma_1$  is significantly positive in Table 2. It is tentatively concluded that  $b_2 = 0$ , then, and that the only effect, if any, of code penetration is to increase the incentive to join the code (through  $E^*$ ) in equation (4c).

If  $c_1 \leq 0$  and  $b_2 = 0$ , then  $\beta_3 > 0$  implies  $b_3 > 0$ , and  $\gamma_2 > 0$  implies  $a_3 > -c_1 b_3 \geq 0$ . That is, the number of stations has a non-negative influence on code effectiveness, contrary to expectation *a la* Stigler, and has a positive influence on station profit, contrary to the anticipated effect of increased competition. On reflection, these results are not surprising. Large values of  $N^S$  will be associated with large metropolitan television markets where spectrum limitations and FCC license allocation make entry barriers absolute and binding.<sup>24</sup> Station asset values, including the intangibles, are naturally higher in such areas. High entry barriers make successful output restriction more profitable, possibly explaining the positive sign for  $a_3$  in equation (4a) and  $\gamma_2$  in equation (6b).

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<sup>24</sup>Because of FCC spectrum allocation, most cities have only up to three commercial television stations. These tend to be both VHF and network affiliates [Greer (1983), pp. 350-51].

Finally, note that  $\gamma_6 > 0$ , due to the close association between code and NAB membership status.  $\gamma_7 > 0$  implies  $c_3 > 0$  in equation (4c); the closer the "demise" of the code's advertising provisions, the less the station's incentive to join.

To summarize thus far, it appears that it is profitable for a station to subscribe to the code ( $b_1 > 0$ ), that code effectiveness as a potential cartel does not directly increase station profit ( $b_2 = 0$ ), but does increase the incentive of stations to subscribe ( $a_2$  and  $a_3 > 0$ ), the latter influence being felt indirectly through an entry barrier effect. These are mixed results. With  $b_2 = 0$ , it seems unlikely that the code enjoyed any success as an output-reducing collusive device, especially since  $b_1 > 0$  can be explained without reference to cartel behavior. But the indirect effects of market structure, code penetration, and time until suspension, operating through the incentive equation, may also help explain why  $b_1$  is positive, thereby leaving open the possibility that the code did, in fact, enjoy some cartel success. Further analysis makes this doubtful, however.

To begin with, the DEV model allows for simultaneity between profit and code incentive functions. But if the error terms in (6a) and (6b) are independent, the profit equation can be efficiently estimated by OLS. Looking again at Table 1, it can be seen that  $w^P$  and  $w^C$  are independent if  $b_2 = c_1 = 0$ . Since it appears from the DEV estimates that  $b_2 = 0$  and  $c_1 \leq 0$ , with the evidence on  $c_1$  being very indirect (through the probit equation), this possibility must be addressed. A "Hausman test"

for simultaneity could perhaps be employed here,<sup>25</sup> but such a test is unnecessary. Column (2) of Table 2 estimates equation (6a) with OLS.  $\beta_1$ ,  $\beta_4$ ,  $\beta_5$  and  $\beta_6$  are significantly positive, as before.  $\beta_2$  is negative (but insignificant), and  $\beta_3$  is insignificantly positive. These are not substantially different results from those obtained with the DEV model -- code membership enhances profit, but code penetration does not -- but there are no indirect effects through an incentive equation.

Second, the code penetration variable  $S = N^C/N^S$  is related by construction to C: the in-sample biserial correlation between C and S is 0.6460.<sup>26</sup> Since S is so important in evaluating the influence of the "cartel" on profits, the possible collinearity between S and C must be examined. Column (3) of Table 2 estimates the profit equation by OLS with C omitted. The coefficient of S is positive, but still insignificant (t-ratio = 0.28).<sup>27</sup> Collinearity does not account for the insignificant (and sometimes negative) coefficients of S in previous regressions.

Finally, the regressions reported in Table 2, where S is used for CP and  $N^S$  for MS, provided the strongest support, however weak, for the hypothesis that station profit is partly attributable to the effectiveness of the NAB code in reducing the

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<sup>25</sup>See Hausman (1978).

<sup>26</sup>Biserial correlation is defined in Kendall and Stuart [(1973), pp. 319-23].

<sup>27</sup>When S is dropped, C remains significantly positive in OLS estimates of the profit equation.

supply of output in a station's ADI.  $N^V$ , the number of VHF stations, was tried as a measure of structure which might capture the "dominant (VHF) group with competitive fringe" aspects of local television markets. A single-station monopoly dummy variable ( $M = 1$  if  $N^S = 1$ ) was included in some of the trial regressions.  $S^m = S(1-M)$  was employed as an alternate code penetration variable which recognizes that a single station cannot "collude." In these preliminary regressions,  $N^V$  was never significant,  $S^m$  and  $M$  were never positive, and the  $R^2$ , pseudo- $R^2$ , and PC values were lower than for the regressions in Table 2.

#### 4. Summary and Conclusions

The theory developed in part 1 demonstrates the ability of a television trade association to raise industry profit by reducing the number of commercials, even though the actual product is commercial exposures. It is not clear to what extent this extra profit might be eroded by increased competition along the dimensions of program quality, type, and scheduling. It is clear, however, that the Justice Department brought an antitrust suit against the NAB for restricting the number of commercials. If the suit had economic justification, then the prosecution must have believed that the commercial restrictions either *could have* or *actually did* raise station profits above the competitive level.

Under a *per se* rule, the government's case is substantiated if the television code could have raised profits (through cartel operations). But under a rule of reason,

normally applied in trade association cases, the successful prosecution of the suit would require evidence that the code actually did raise station profits.

The empirical results in this paper are based on such indirect evidence as is available. They consistently show that stations which subscribed to the code were more profitable than stations which did not, but that code penetration in the local market area had no discernible direct effect on profits. A simultaneous equation model, used to deal with the possibility that profits generate code membership as well as the other way around, did reveal an indirect effect of penetration on the incentive to subscribe.

In interpreting these results, it must be kept in mind that code membership may be profitable for reasons unrelated to cartel output restrictions. The code provided monitoring and other services to members for a nominal (if discriminatory) fee. These services reduce station risk at license renewal time. Membership may also be valuable in signalling the station's reputability to potential advertisers and interested community groups.

Thus, a finding of anticompetitive or cartel effect of the code depends heavily on the code penetration variable. Surely a cartel is more effective in any given market area the higher the proportion of members it has. Yet the various measures of penetration seem only weakly and indirectly related to station profitability in the "best" simultaneous equation regressions (*i.e.*, those in Table 2). OLS regressions show no

positive link between profit and code penetration, however measured.

Given these results, our findings are that: (1) the television code did not successfully increase member station profits through restrictions on the output of commercial exposures, (2) code membership appears to have been profitable, but for reasons which were probably unrelated to the antitrust suit, and therefore (3) the government's antitrust suit was economically ill-advised, especially if a "rule of reason" was to be applied to evaluating industry conduct and performance.

These findings are deliberately cautious for both legal and statistical reasons. Had the antitrust case been decided in court under a rule of reason, the NAB would have to be acquitted unless found guilty beyond reasonable doubt. The evidence in this paper against the NAB is based on indirect estimates obtained with asymptotically efficient methods applied to a possibly non-random sample of 74 proxy observations on station profits. It hurts us to say so, but "further research is required." In particular, a cross-sectional census of actual station profits and audience size for, say, 1978 (before the code was challenged), combined with a model on the order of equations (4), could undoubtedly deliver much more definitive results.

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