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Do Government-Imposed Ownership Restrictions Inhibit Efficiency?:

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Introduction

Throughout virtually its entire institutional lifetime, the Federal Communications Commission (FCC) has had in place a maze of regulations governing local and national media ownership spanning radio and television broadcast technologies, cable television systems, and newspapers.[1] These ownership restrictions were imposed primarily to further the FCC's objective of promoting diversity and localism.[2] Recently, however, the FCC has been considering modifications to its rules and has indicated more interest in the efficiency consequences of the rules, including those that might arise from common ownership of multiple radio stations within a market.[3]

In this paper, we seek to determine whether efficiencies would likely be realized if the FCC relaxed its prohibition of multiple ownership of the same kind of media outlet in a single market. The empirical bases for this investigation are the AM-FM radio combinations permitted by the FCC. First, we examine the change in the relative frequency of combinations. If AM-FM combinations are more efficient than independently owned and

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[1] The regulations forbid ownership of multiple outlets of the same media type -- *e.g.*, television stations -- in a local market and limit the number of outlets nationally that can be owned by a single firm. In addition, the regulations restrict common ownership of different media types -- *e.g.*, newspapers and television or radio stations -- within the same local market.

[2] Besen, et al. (1984), pp. 23-29.

[3] The rules restricting common ownership at the national level have been relaxed and the FCC has proposed relaxing the ban of the common ownership of television networks and cable systems and a number of its local market rules with respect to radio, including a proposal to permit common ownership of two or more AM stations in the same local market. In part the increased attention to efficiency may reflect a recognition that there may be complementarities between efficiency and the FCC's goal of promoting diversity. (A review of these proposals can be found in (FCC, 1987).)

operated stations (*i.e.*, "stand-alone" stations), over time we should see an increase in the number of combinations. The second test involves an examination of the prices paid for radio stations: Ceteris paribus, if the common ownership of radio stations generates efficiencies, the prices of commonly-owned radio stations should be greater than the prices those same stations would command if sold separately and compelled to operate independently.[4]

Our results provide evidence consistent with their being efficiencies in joint ownership of multiple stations in the same local market and provide support for the relaxation or repeal of the current FCC restriction on such joint ownership. The number of AM-FM combinations increased between 1986 and 1988. Further, AM-FM combinations command a price premium over the sum of the prices that would be realized if the stations were sold and operated separately.

Previous Studies

A recent review of the literature on the efficiencies from common ownership of broadcast stations by Besen and Johnson (1984) concluded that there is little credible evidence of statistically-detectable economies from either the common ownership of different kinds of media outlets within the same market or from the ownership of multiple television stations in different markets (group ownership). They find this to be true both of studies examining advertising rates and those examining profit margins of broadcast stations. Besen and Johnson note that the studies based upon

[4] Of course, higher prices could also result if creation of AM-FM combinations created market power in the local advertising market. In our empirical work, we attempt to control for this possibility.

profit margins are subject to the conventional criticisms of the use of accounting data. In addition, the typical source of this data was the FCC which did not require that the data be submitted on a consistent basis. With regard to advertising rates, the authors conclude that the failure of these studies to distinguish between the market power and efficiency effects of group ownership and the use in many studies of list rather than transaction advertising prices call the results of the studies into question.[5]

One study of note that appears to provide more credible evidence of multimarket efficiencies is that of Parkman (1982). Parkman hypothesized that group ownership may generate joint economies in covering national news events of local interest. To test this hypothesis, he related the share of viewers of local television news programs to whether or not the station was part of a group (among other variables) for the years 1965 and 1975. While the group ownership variable was not significant in 1965, it was significant in 1975 and its effect was quite large. Parkman also examined whether the common ownership of a television station and an AM radio station within the same market and the joint ownership of a newspaper and television station within the same market increased local television news shares. While these ownership configurations were significant in the 1965 regression, they were not significant in 1975.

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[5] While there were a number of studies that examined the relationship between station selling prices and group ownership (Cherington et al. (1971) and Levin (1980)), the question asked in these studies is clearly inappropriate. The studies hypothesized not that the prices of stations sold and operated as part of a group would be higher (ceteris paribus) than stations sold individually and operated independently, but rather that stations purchased by a group would command a higher price. As Besen and Johnson (1984) comment, even if there were efficiencies from group ownership, one would not in general expect group owners to pay higher prices for stations than nongroups.

Rather than examining the efficiencies in the common ownership of different types of media within a market or in group ownership across markets, we examine whether any efficiencies are statistically evident in the common ownership of more comparable broadcast stations, AM and FM radio stations, in the same market. Further, our empirical analysis controls for the degree of market power.

Possible Sources of Efficiencies from Joint Operation

If there are efficiencies -- economies of scope -- from joint operation of an AM-FM combination, the cost of jointly operating both an AM and an FM station would be less than the sum of the costs of an independently owned AM station and the costs of an independently owned FM station.[6] As we discuss below, the efficiencies may also lead a station to earn higher revenues. Higher levels of expected future revenue or lower future costs should, in turn, result in potential buyers being willing to pay higher prices for a set of stations, provided the same efficiencies cannot be obtained by purchasing stand-alone AM and FM stations and combining their operations.

There are a variety of ways in which the costs of operating a radio station could be reduced as a result of joint ownership. For example, there may be economies in selling advertising. A firm operating both an AM and an FM station in the same local market may be able to achieve economies of scope by having the same sales representative sell time on both of its

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[6] For an exposition of the scope economies concept, see Baumol, Panzar, and Willig (1982).

stations in the same visit.[7] Economies may also be present in the provision of services that can be utilized by both stations. For example, the FCC (1987) notes that there may be economies in the provision of news services since the same news gathering and production staff could produce news broadcasts for several stations under common ownership.[8] Similar economies may exist in the production of other program material that can be used on two or more stations. Most obviously, two commonly-owned stations may simulcast the same programming. In addition, common ownership, particularly if both stations operate from the same location, may permit more efficient utilization of personnel and capital equipment.[9]

The efficiencies resulting from joint operation of radio stations could lead to increased station revenues by increasing the number of listener minutes of advertising it is profitable for the station to carry.[10] For example, if a station that is part of a joint operation is able to attract more listeners, *e.g.*, because it provides better news service, the revenues received for each minute of advertising sold will increase. Similarly, if the marginal cost of selling an additional minute of advertising is lowered because of

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[7] Because a visit to a customer may take somewhat longer if the sales person is representing more than one station, the sales force may be somewhat larger than that which would be employed by any one of the stations if it were operated separately. However, there are scope economies in the sale of advertising provided that the sales force of the combined operation is less than the sum of those that would be employed by the various stations if they operated independently.

[8] Parkman (1982) offers a similar hypothesis.

[9] See Appendix A to Comments of the National Association of Broadcasters, In the Matter of Provision of Improvements and Benefits to the AM Radio Broadcast Service, August 1, 1986.

[10] This will result in higher revenues for the station even though advertising rates, measured in price per listener minute, are unchanged.

increased efficiency in the sale of advertising, the station may sell additional advertising time and thus earn greater revenues.

While there may be efficiencies realized by operating an existing AM-FM combination, these efficiencies would not be available from the purchase and combination of independent stand-alone stations in at least two situations. First, the magnitude of the efficiencies from combination operation may depend on the characteristics of a station. For example, if stations with low power are most profitably used to cater to specialized tastes (*e.g.*, a gospel format rather than top 40), there may be fewer gains from program simulcasting for low power stations since there may not be sufficient demand for this type of programming to justify both an AM and an FM station in the specialized format. If the efficiencies from combination operation differ among stations, it may only be more efficient to operate some stations as combinations. Other stations may be more efficiently operated on a stand-alone basis.

Alternatively, there may be transactions costs incurred in acquiring and combining the operations of two stand-alone stations. For example, if the owner of one of the two stations targeted for combination is not actively seeking to sell his station, he may not have a good idea of the current value of the station. Further, the cost of determining the station's value may be great enough that he will only entertain an offer if the price is extremely high. As a result, it may be less costly to postpone purchase until the current owner seeks to sell, determines the station's actual market value, and lowers his minimum acceptable price. It may, therefore, be necessary to continue to operate one station inefficiently as a stand-alone until the second station is put on the market. In addition, there may be costs incurred in combining the operations of the two stations after both are acquired.[11] Since neither of these costs are incurred if an existing combination is purchased, the existing combo would command a higher price.[12]

While efficiencies would lead to higher station profits and therefore higher selling prices, station profits would also increase if the price of advertising rose with common ownership. That is, profits would rise if common ownership led to the creation of market power in the local advertising market. If increased advertising rates resulting from the exercise of market power were the cause of increased profits and therefore increased sales prices, the higher sales prices could not be taken as evidence that there were necessarily efficiencies resulting from combinations. Thus, we need to account for this possibility in our analysis if our results are to provide evidence of any increased efficiency from joint operation.

Evidence from a "Survivor" Analysis

A "survivor" analysis of the number of AM-FM combinations provides some preliminary evidence of efficiencies in AM-FM combinations: An increase over time in the number of combinations would be consistent with

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[11] For example, some of the economies associated with combination operation may only be available if the two stations operate from the same physical location. In particular, economies from more efficient scheduling of operating personnel may not be achievable without a common location.

[12] If transactions costs are responsible for the continued existence of stand-alone stations, the difference in the prices of pre-existing combinations and pairs of stand-alone stations, which is the parameter on which we focus below, would represent either the efficiency gains from combination operation or the transactions costs involved in combining the stand-alone stations, whichever is smaller.

the hypothesis that combinations are more efficient than stand-alones.[13] We examine the change in the number of combinations in 171 markets over the two year period 1986 to 1988. We find that, out of a possible 1,347 combinations, the number of combinations increased by 27 from 862 to 889 during this period.[14] Further, the number of combinations increased in 42 markets, while the number decreased in only 17 markets.[15] These findings lead us to reject, at the one percent level, the hypothesis that the probability that the number of combinations in a market will increase is the same as the probability of the number of combos decreasing.[16]

Another way to consider increases in combinations is to look at changes among stations that were sold. Since these stations are clearly in a transition of ownership, we would expect them to show trends in ownership patterns more clearly than other stations. If combinations are more efficient, we would expect that, particularly for stations that are sold, there

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[13] A finding that the number of combinations has increased would also be consistent with the hypothesis that creation of combos leads to increased market power. Our analysis of sales prices will attempt to differentiate between these two hypotheses. For earlier applications of the survivor technique and discussion of the problems resulting from it, see, *e.g.*, Stigler (1958), Saving (1961), Weiss (1964), and Shepherd (1967).

[14] The data for this analysis comes from *Investing in Radio* for 1986 and 1988. The potential number of combinations in a market is the smaller of the number of AM stations and the number of FM stations in the market. Throughout the analysis in this paper, local market definitions are those of Arbitron, Inc., as used in *Investing in Radio.* In performing these calculations, we did not count a new combination unless both stations that made up the combination were listed in both editions of *Investing in Radio.* Since the 1988 edition lists more stations than the earlier edition, this was necessary to avoid biasing our results toward finding an increase in the number of combinations.

[15] The number of combinations was unchanged in the remaining 112 markets.

[16] The value of the Chi-square statistic to test this hypothesis is 10.6.

would be a greater likelihood of a stand-alone station becoming part of an AM-FM combination than of a station that was part of a combination becoming a stand-alone. This is indeed the pattern that we find among stations sold during 1986. Of 145 sold-stations that could be identified as having been stand-alones prior to sale, 37, or 25.5 percent, had become part of an AM-FM combination by the end of 1987. Among the 197 combination stations sold, only 26, or 13.2 percent, were operating as stand-alones at the end of 1987.[17] A t-test for the difference of means confirms that the probability that a stand-alone would be converted into part of a combination is significantly greater than the probability of conversion of a station that is part of an existing combination.[18]

Thus, both of these tests provide some evidence of efficiencies associated with combinations. However, in both cases, some observations appear to move in the opposite direction. Further, there are large numbers of stations that continue to operate as stand-alone stations suggesting that not all stations may be candidates for combination. In the subsequent sections of the paper, we attempt to assess this possibility in a more empirically rigorous fashion.

Factors Affecting a Radio Station's Sales Price

In order to isolate the price effects of joint ownership of AM-FM combinations, we must have estimates of the prices that would have been

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[17] There were an additional 106 station sales for which a station's pre-sale status could not be determined either because the station was not listed in *Investing in Radio, 1986* or because that source already preliminarily showed the results of the sale.

[18] The value of the t-statistic is 2.83.

paid for the stations in a combination if those stations had been sold, and compelled to operate, as stand-alones. We use the prices we observe for stations that were indeed sold and continue to operate as stand-alones to infer these prices.[19] However, in order to isolate the price effect of joint operation, it is necessary to adjust the observed prices of stations for other factors that affect the price paid.

Drawing on the literature on the profitability of television stations[20], we consider three kinds of factors that influence the price paid for a station: the expected market share of the station, the difference between the actual and expected share, and the characteristics of the market. Ceteris paribus, stations with "better" technical characteristics (*e.g.*, higher maximum power limits) can transmit a higher quality signal at a lower cost within any given geographic area. Such stations can therefore be expected to attract more listeners (*i.e.*, have a higher market share) and earn greater advertising revenues. Consequently, the higher expected share of these stations should be reflected in a higher market price.

The degree to which any particular station can command a high market price may also depend upon the characteristics of the other stations in the market. That is, as in the case of television stations, the technical advantage may be relative rather than absolute.[21] A station broadcasting

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[19] Conversely, we use the prices of stations sold as part of combinations to infer the prices that would have been received for stations that were sold on a stand-alone basis if those stations had been sold as part of a pre-existing combination.

[20] For example, see Besen and Hanley (1975), Fournier and Martin (1983) and Fournier (1986).

[21] For a discussion of the relative versus absolute advantages of a station's technical characteristics in the context of television broadcasting, see Besen and Hanley (1975), Parkman (1982) and Fournier (1986).

with 100 kilowatts (kW) of power may have a higher expected market share than its competitors if the other stations in the area have only 10 kW of power. However, if its competitors also operate at 100 kW, there will be no competitive advantage. Ceteris paribus, the greater the technical advantages of a particular station relative to the competing stations in the market, the higher its expected market share and the higher its price.

Given the expected market share, the divergence between the actual and expected share may also be positively related to the market price of the station. A higher-than-expected share may indicate that the station has an unusually strong management or an unusually successful format. While such competitive advantages may tend to be transitory, a new owner can expect to reap some benefits from them, and therefore the market price for such stations may be higher than the price of other stations with comparable technical characteristics.[22]

Similarly, a station with a lower-than-expected market share may command a lower market price. In order to raise the market share of such a station up to its expected level, a purchaser may have to change the management of the station, change the station's programming, hire new on-air personalities, and promote (advertise) the newly-packaged station to listeners and advertisers. Such changes are likely to be costly. Further, such changes take time and, while they are being made, the station will have a lower market share, and lower advertising revenues, than expected from its technical characteristics. As a result, the lower a station's actual share relative to its expected share, the lower the market price of the station.

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[22] This would be true unless all of the rents or quasi-rents resulting from the factors resulting in the higher than expected share are captured by other inputs.

The expected market share and the divergence between the actual and expected share are not likely to be the only factors influencing the price for which a station is sold. The nature of the market in which the stations operate will also affect the price. For example, a station with a given expected market share will bring a higher price in a market with greater potential advertising revenues and greater expected growth in those revenues. Similarly, the extent to which radio stations are able to exercise market power in the advertising market and thus earn greater profits will also be reflected in a station's sale price.

Empirical Model

Our test for efficiencies resulting from combination operation of an AM and an FM station is the ratio of the predicted price of the two stations operating as a combination and the predicted sum of the prices of the two stations operating on a stand-alone basis.[23] That is the measure of efficiencies from joint operation (EFF) is:

$$EFF = P_c \,/\, P_n \qquad (1)$$

where

P_c = the predicted price of an AM and an FM station sold as a combination and

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[23] This technique is similar to one that has been used in estimating the extent of discrimination in wage markets. (See Blinder (1973), Malkiel and Malkiel (1973), and Oaxaca (1973).) In the context of discrimination analysis, it has been suggested that the technique may provide biased estimates of discrimination as a result of the need to use proxies for productivity and the inability to include all relevant variables in the regression equations. While we have included all of the measures that should effect the price of a station for which we have data, the possibility remains that we may have omitted one or more relevant variables.

P_n = the predicted sum of the prices of an AM station sold as a stand-alone station and an FM station sold as a stand-alone station.

A value of EFF greater than 1.0 is evidence that operation as a combination is more efficient than operation on a stand-alone basis.

The predicted prices of stations as combinations and as stand-alones are based on the following equation:

$$P_i = f_i(MS^e_i, (MS / MS^e_i), X_m) \qquad (2)$$

where

i = c or n depending on whether the price is the price for stations operated on a combination or stand-alone basis;

MS^e_i = $f(X_a, X_f)$ is the sum of the expected market shares of an AM station with technical characteristics X_a and an FM station with technical characteristics X_f when operated either as a combination (i=c) or as separate stand-alone stations (i=n);

MS = the sum of the observed market shares of the AM station and the FM station; and

X_m = a vector of market characteristics that are expected to affect the price of radio stations.

The Expected Market Share Equation: Variables and Data

In order to estimate equation (2), we first required estimates of the expected market shares, MS^e, for the stations whose sales prices are used to estimate equation (2).[24] These expected shares, however, are not directly

[24] We could have estimated a version of equation (2) directly by including the X_i in that equation. In fact, we did so in an earlier version of this paper (Anderson and Woodbury (1987)), the results of which are noted subsequently. But as we discuss below, our sample of (in particular) stand-alone AM and FM stations within the same market that were sold is quite limited. By using the intermediate step of equation (5), we can use data on all stations regardless of whether they are sold and thereby expand the information available for estimating the effect of station characteristics on station prices. In addition, this approach allows us to test directly the impact of expected market share and of the divergence between expected and observed market share on the price paid for stations.

observable. We therefore used an instrumental variables technique to develop estimates of MS^e. We assumed that

$$MS_i^e = a_i X_i \tag{3}$$

and further

$$MS_i = MS_i^e + e_i \tag{4}$$

where

MS_i^e = the expected market share of a station, where i indicates an AM or FM station;

MS_i = the observed market share of a station of type j; and

X_i = a vector of station and market characteristics that determine the expected market share of a station of type i.[25]

Assuming rational expectations, equations (3) and (4) can be rewritten as

$$MS_i = a_i X_i + e_i. \tag{5}$$

As our instrumental variable for MS^e, we use the sum of the predicted values for an AM station and an FM station derived from a logit estimation of equation (5).[26] The use of these instruments can be shown to yield consistent estimators of the parameters needed to estimate equation (2) provided the vector X_i contains the full information set available in forming market share expectations.[27]

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[25] In addition to the normal assumptions about the error terms, we assume that the error terms e_i are independent of each other and of the error term in the price equations (equation (2)), P_i, MS_i^e, X_i, and X_m.

[26] A logit estimator was used because expected market shares, like market shares, must lie between 0 and 1.

[27] The assumption that equation (3) is non-stochastic is made in order to assure the consistency of all of the coefficients in the station price equation (equation (2)). A similar assumption is made in Woodbury, et al. (1983), where a similar technique is employed. Raines (1980) has shown, in the context of the model used by Woodbury, et al., that the estimate of the coefficient on the difference between observed and expected market share in (continued...)

Equation (5) was estimated separately for AM and for FM stations.[28] MS is measured as the station's average quarter-hour share of listeners over age 12 between Monday and Sunday, between 6 AM and midnight, for the Spring of 1985 -- a period prior to the sales we use in estimating equation (2).[29] The vector X_i includes the following station characteristics (appearing as appropriate in the AM or the FM equation):[30]

LAMF = the log of the frequency of an AM station;

LAMD = the log of the power with which an AM station broadcasts during daylight hours;

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[27](...continued)
the second stage estimation -- the equivalent of our price equation -- is not consistent if the equivalent of our equation (3) is assumed to be stochastic. However, the estimates of the other coefficients in the price equation would still be consistent. In addition, the addition of an error term to equation (3) would not affect the consistency of the coefficients in the market share equations.

The statistical properties of the estimators are further addressed in Raines. In particular, it is shown that OLS estimators of the standard errors in equation (2) will be asymptotically greater than the true standard errors and the appropriate corrections for this bias requires information on the unobservable expected shares. Therefore, one might consider relaxing the usual levels of statistical significance.

[28] We tested for the appropriateness of using the same equation to estimate AM and FM shares with the AM (FM) power variables set equal to zero where the observation was for an FM (AM) station. The F-test for the appropriateness of this type of pooling was significantly different from zero and we therefore used separate equations.

[29] By assuming that it is a market share for a period prior to the date of sale that influences the sale price, we make our model recursive in the sense that market share and expected market share are pre-determined in the price equation. This approach is similar to that used in Woodbury, et al. (1983).

Unless otherwise noted, all data are from *Investing in Radio 1987*, with the share data used with the permission of the Arbitron Company.

[30] While a station's market share may be affected by its format, format is endogenous in the sense that the station's owner can select that format which maximizes his market share given the technical characteristics of the station. We therefore do not include any variables representing format in our equations for expected market share.

LAMN = the log of the power with which an AM station broadcasts at night;

LFMP = the log of the power with which an FM station broadcasts; and

LHAAT = the log of the height of an FM station's antenna above the surrounding terrain.

Each of these variables measures an aspect of a station's power. The greater a station's power, the more potential listeners a station is able to reach, and hence the higher the station's expected share.[31]

Many AM stations are required by the FCC to operate at reduced power during nighttime hours in order to avoid interfering with other stations. As a result, it is necessary to include two measures of an AM station's power (*i.e.*, daytime and nighttime). In addition, a given level of AM daytime power allows a station's signal to be received over a greater distance if the station is located in the low frequency end of the AM broadcast band. Thus, frequency is another measure of an AM station's power.[32]

FM stations broadcast at the same level of power throughout the day. However, since FM signals can be received only within the line of sight of the transmitter, the height of the antenna may be an important determinant of a station's potential audience. We therefore expect the coefficient on LAMF to be negative, while LAMD, LAMN, LFMP, and LHAAT should each have a positive effect on the expected share.

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[31] The independent variables in the logit equations are expressed in logarithmic form because logarithmic variables did a better job of explaining market shares than the use of linear variables.

[32] See Brown (1982), p. 12.

In addition to the station's characteristics, we also include in both the AM and FM share equations the reciprocal of the number of stations (NSTA) in the market and a dummy variable (COMBO) taking a value of one when the station is part of an AM-FM combination. If all stations had the same power characteristics, we would expect each station to have a market share equal to NSTA. We, therefore, expect that this variable will have a positive coefficient.[33] To the extent that joint operation of an AM and FM station leads to savings in the marginal cost of station operation (thereby reducing the cost of attracting an additional listener), we would predict that the expected share of either or both an AM and FM station would be greater when each station is part of an AM-FM combination.[34]

To control for the "quality" of the competition faced by a station, we include as variables the average value of each of our technical characteristics variables for all stations in the market. These variables are LAMFMN, LAMDMN, LAMNMN, LFMPMN, and LHAATMN.[35] Since an increase in the power of a station's competitors should reduce that station's market share, we expect a positive sign on the coefficient on LAMFMN, and negative coefficients on the other variables. We also included two other characteristics of the local market, PCOM -- the percentage of the stations in the

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[33] We are able to treat the number of stations as an exogenous variable because the number of stations in any market is limited by the FCC's spectrum allocation policies.

[34] We did test to determine whether COMBO slope dummies as well as a COMBO intercept dummy were statistically appropriate. However, we could not reject the null hypothesis that the set of slope dummies were equal to zero.

[35] Each variable is the logarithm of the average across all AM or FM stations located in the local market, depending on the characteristic. Thus, LAMFMN is the log of the average frequency for AM stations located in the local market, while LFMPMN is the log of the average power of FM stations in the market.

market that are part of an AM-FM combination -- and PFM -- the percent of the stations in a market that operate on the FM band. If stations that are parts of combinations are more efficient than stand-alone stations, a higher value of PCOM will suggest that on average a station's competitors are stronger. Therefore, the sign on PCOM should be negative. PFM is included because an FM station may not be a perfect substitute for an AM station and therefore the strength of the competition one faces may depend on the percentage of the competitors that operate on the FM band.

The AM and FM share equations were estimated using a random sample of approximately 20 percent of all AM and FM stations, regardless of whether they were sold.[36] For the AM equation, there are 230 observations and for the FM equation, there are 241 observations.

Regression Results: The Market Share Equations

Table 1 presents the results for the logit equations for the AM and FM market share equations. Both equations are highly significant: the log-likelihood tests are significant at the one percent level. The coefficients on the individual station characteristics confirm the hypothesis that a station's characteristics are significant determinants of a station's market share. In the AM equation, frequency (LAMF) and daytime power (LAMD) have the expected signs and are significant at the one percent level. The coefficient on nighttime power (LAMN) has the expected positive sign, but is only

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[36] It is an approximate 20 percent sample because only incomplete data were available for some stations. In addition, we limited the sample to stations in markets for which the stations located in that market account for at least 75 percent of total listenership in the area. This was done in order to insure that the average characteristics of the stations in the market are reasonably accurate measures of the actual conditions in the market.

Table 1: Estimated Logit Equations for Market Share[1]

	AM Shares	FM Shares
Constant	-6.5731	-2.6242
COMBO	----	0.3128 (3.42) ***
LAMF	-0.9637 (-5.10) ***	----
LAMD	0.2401 (4.25) ***	----
LAMN	0.0556 (1.89) *	----
LFMP	----	0.12227 (3.04) ***
LHAAT	----	0.5857 (3.98) ***
LAMFMN	1.7660 (2.21) **	0.0074 (0.01)
LAMDMN	-0.1812 (-1.18)	-0.0644 (-0.60)
LAMNMN	0.1253 (1.32)	-0.1610 (-2.53) **
LFMPMN	-0.1335 (-1.54)	-0.1185 (-1.29)
LHAATMN	-0.3363 (-1.57)	-0.5394 (-2.32) **

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[1] * denotes significance at the ten percent level;
** denotes significance at the five percent level;
*** denotes significance at the one percent level.
(All significance levels are for two tailed tests.)

Table 1: Market Share Equations (Continued)

	AM Shares	FM Shares
PFM	-0.9852	-0.6914
	(-1.11)	(-0.98)
PCOM	-0.0677	-0.7180
	(-0.18)	(-2.17) **
NSTA	20.4095	11.9079
	(8.37) ***	(5.78) ***
Likelihood Ratio Test	129.07 ***	122.06 ***
n	230	241

significant at the 10 percent level. In the FM equation, both LFMP and LHAAT are positive and significant at the one percent level. As expected, the coefficient on the reciprocal of the number of stations in the market has a positive sign and is significant at the 1 percent level.

The COMBO variable is positive and significant at the one percent level in the FM equation. This suggests that FM stations that are part of a combination will have higher market shares, ceteris paribus, than stations that are not parts of a combination. In the AM equation, the COMBO variable was found to have no significant effect, and therefore it was not included in the final equation.[37]

The performance of the "quality of competition" variables is more ambiguous. For AM stations, only the coefficient of the mean AM frequency is significantly different from zero. It has the expected positive sign. The coefficients on the other measures of average power -- AM day, AM night, and FM -- and on average FM antenna height are insignificant with the coefficient on average AM night power having an unexpected positive sign. For the FM equation, the coefficient of the mean FM antenna height and on mean AM night power carry the expected signs and are significant. The coefficients on the other measures of market average power are insignificant though they all have the expected signs. The percentage of the stations in a market that were parts of AM-FM combinations -- PCOM -- had a

[37] We maintained insignificant variables measuring station power and the average power of competing stations in the estimating equations because there appeared to be a theoretical reason for including them in the model. However, we did not have a theoretical reason to believe that COMBO did or did not belong in the model. We therefore included it only when it was statistically significant. We also tested for the appropriateness of allowing the slopes of the included variables to differ for combination and stand-alone stations. However, the F-tests for inclusion of these interaction variables were insignificant.

significant negative effect on market shares of FM stations. In the AM equation, the coefficient was negative but not significant. The percentage of the stations in a local market that are FM stations -- PFM -- had an insignificant negative effect in both equations.

Using the estimated relationships in Table 1 and the characteristics associated with a sample of stations that were sold we can predict the expected market shares for AM and FM stations. For a pair of stations, one AM and one FM, the expected share is simply the sum of the expected share of the AM station and the expected share of the FM station.

The Sales Price Equation: Variables and Data

With our estimates of expected market share, we now turn to the estimation of the prices of stations using equation (2). This equation was estimated in a log-log form, because we expect that the independent variables will have a multiplicative effect on the price paid for radio stations. For example, the same increase in market share should cause a greater increase in the price of a station in a large market than in a small one. Similarly, the effect of a higher growth rate should be greater in larger markets. Using a logarithmic form of the regression permits us to obtain this multiplicative affect; a linear regression would not.[38] The estimated version of equation (2) is therefore:

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[38] Beyond suggesting that a linear form is not appropriate, theory does not suggest much about the correct functional form. Therefore, we also experimented with other functional forms of the regression equation. We ultimately chose the log-log specification because it was most successful in explaining prices. The specification finally decided upon also parallels that of other studies of broadcast prices. Our results might, of course, have been somewhat different if we had used a different functional form.

$$\log(P_i) = b_i [\log(MS^e_i)] + c_i [\log (MS / MS^e_i)] + d_i X_m + e_{Pi} \qquad (6)$$

where all variables are as previously defined. This equation was estimated for pairs of stations that were in fact sold as combinations and for pairs of stations that were sold on a stand-alone basis.[39]

The variables comprising the vector X_m are:

LRET = the log of 1985 retail sales in the local market;

GROW = the projected rate of growth in local market retail sales over the period 1985 to 1990; and

LHERF = the log of the Herfindahl index of concentration based on radio listenership shares in the local market.[40]

Finally, the actual market share of the sold stations was that recorded during the last spring rating period prior to sale.

Larger local retail sales and higher anticipated future growth should lead to increases in the price of a radio station. Therefore, the coefficients on both LRET and GROW should be positive. If an increase in the concentration of radio station ownership leads to an increase in the price of

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[39] In order to estimate a stand-alone price equation in the logarithmic form and to be able to compare the prices from this equation with those from the combination equation, it is necessary to estimate the prices for pairs of stations that were not sold as combinations. One could, of course, estimate a price equation for AM stand-alone stations and another equation for FM stand-alones. However, given the logarithmic form in which we are estimating the equation, the statistical properties of the sum of the predicted prices would be unknown; and we would be unable to determine whether any differences in predicted prices are statistically significant. By estimating the sum of the prices for a stand-alone AM and a stand-alone FM station in one equation, we are able to perform statistical tests on the ratio of the price of a combination and the sum of the prices of independently-owned stations.

[40] The Herfindahl index is equal to the sum of the squares of the market shares of firms owning radio stations in a local market.

advertising charged to local advertisers, the coefficient on LHERF would also be expected to be positive. As suggested by the previous discussion, we expect that the coefficients of the expected share variable and the ratio of the actual to the expected market shares to be positive.

Samples of sales of AM-FM combinations and of stand-alone stations were limited to sales that occurred during the 19 month period between June 1, 1985, and December 31, 1986.[41] By so doing, we avoid the effects of other regulatory changes which may have affected the value of radio stations. In particular, in May 1985, the Federal Communications Commission relaxed its rules concerning ownership of multiple stations located in different markets, permitting one firm to own 12 AM, 12 FM, and 12 television stations as opposed to the previous limit of seven of each type of facility.[42] Because this regulatory change likely increased the demand for radio stations, we wanted to insure against the possibility that this change would generate spurious results.

It was not difficult to generate a sample of sales of AM-FM combinations. Between June 1985 and December 1986, ownership of more than 200

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[41] Because our sample of stations is drawn solely from those stations sold between June 1985 and December 1986 (rather than all stations, sold or not), we do not have a random sample of radio stations. This lack of randomness can introduce biases into the results (see Heckman (1979)), although a study similar to the one here suggests that the bias is not large (see Brown (1982)). We also note that the sample of sold AM-FM combinations is random, while the sample of paired stand-alone AM and FM sales represents virtually the universe of all stand-alone sales for those markets in which both an AM station and an FM station were sold as stand-alones during the 18 month period. While we have no reason to believe that the stand-alone sample is not representative, it is obviously not a random sample of stand-alone sales because there were some markets in which only one or more stand-alone stations of a single type (AM or FM) was sold.

[42] See Memorandum Opinion and Order in General Docket No. 83-1009, 100 FCC 2d (1985).

pre-existing AM-FM combos located in the 259 largest local radio markets changed hands.[43] Approximately 150 of these transfers involved a single pair of stations; and we began with a one-third random sample of these transactions.[44] After deleting sales that did not satisfy the 75 percent market coverage criterion discussed above and deleting three observations for which sales prices could not be verified,[45] we had a final sample of 39 sales.

Developing a sample of pairs of stand-alone stations that had been sold was a bit more difficult. Since we have several variables representing market characteristics in our regression equations, we needed both an AM and an FM station in the same local market. Further, in order to have a sample of stations whose apparent best use was as stand-alones, we eliminated stations that became part of a combo after they were sold. There were plenty of sales involving AM or FM stations which continued to

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[43] See *Investing in Radio (1987)*.

[44] The other 50 transfers were parts of group sales where stations located in a number of markets were sold in a single transaction. As a result we did not have prices for the individual combinations and therefore deleted such stations from our sample.

[45] Sales prices for influential observations were confirmed in telephone conversations with Mr. Dave Schutz of ComCapital, Inc. In two cases, observations were deleted because we were informed that the sale involved a sale of the firm's stock rather than a sale of the firm's assets. Since a stock sale can involve the acquisition of a firm's liabilities in addition to its radio facilities, such transfers may not reflect the future discounted value of radio station profits. A third observation was deleted because our two sources disagreed on the sales price by $1 million.

We sought to verify sales prices for observations that appeared to be highly influential in determining the price regression. We considered an observation to be influential if it had a strong effect on predicted values. The statistic used to identify influential observations was the DFFITS statistic discussed by Belsley, Kuh, and Welsch (1980). Since we did not confirm the prices of all observations, it is possible that there are problems with other observations, in particular observations that lie close to the fitted regression equation. Consequently, it is possible that the estimated standard errors are biased downward.

operate on a stand-alone basis after they were sold. Between June 1985 and December 1986, 148 stand-alone AM stations were sold that continued to be independently operated as of December 1986. During the same time period, 158 FM stations were sold and continued to operate on a stand-alone basis.[46] However, in only 33 cases could an AM stand-alone station be combined with an FM stand-alone in the same market.[47] These 33 observations make up the data set used to estimate the non-combination price equation.

<u>Regression Results: The Price Equations</u>

Equation (6) was initially estimated separately for the sample of 39 AM-FM combinations and for the sample of 33 pairs of stand-alone stations. However, we found no significant difference in the coefficients in the two equations and therefore estimated a single equation using the pooled data set. The regression results are reported in Table 2. Clearly, the equation possesses reasonably good explanatory power, with the R^2 being 0.783. With the exception of the Herfindahl index, all of the coefficients have the

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[46] *Investing in Radio (1987).* An additional 28 AM stations and 49 FM stations were sold to parties who combined them with another station they already owned or subsequently acquired to form a combo. There also were 8 AM and 27 FM stand-alone stations that were transferred as part of a sale involving stations in more than one local market.

[47] In those few markets in which there were multiple sales of both AM and FM stand-alones, observations were created by randomly combining AM stand-alone stations and FM stand-alone stations in the same market that had been sold between June 1985 and December 1986 that continued to operate independently.

As with the combination data set, we checked the prices of influential observations with Mr. Dave Schutz. In the case of the non-combination sales, only one price could not be verified. We replaced this station with another in the same market in our data set.

Table 2: Estimated Price Equation[1]

CONSTANT	-4.6437
$\log (MS^e)$	1.3116 (6.02) ***
$\log (MS/MS^e)$	0.2926 (6.15) ***
LRET	1.1148 (9.69) ***
GROW	0.2186 (2.73) ***
LHERF	-0.1955 (-0.56)
R^2	0.783
F	47.51 ***
n	72

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[1] Dependent variable is the logarithm of the price of an AM-FM combination or of the sum of the price of an AM station and the price of an FM station in the same market.

expected signs and are significant at the one percent level.[48] The coefficient of the Herfindahl index is insignificant and has an unexpected negative sign.[49]

A Comparison of Combination and Stand-Alone Prices

To test for the presence of economies we compare the prices paid for an AM-FM combination with the prices that would have been received if the two stations had been sold separately and operated on a stand-alone basis. Given that the same equation explains the relationship between sales price and MS^e, (MS / MS^e), and Xm for combinations and stand-alone pairs, the difference in the logs of the prices -- which is the log of the ratio of the prices -- is simply a function of the difference in expected market share from selling a pair of stations as a combination rather than separately and the difference in (MS / MS^e). That is, using the relevant coefficients from Table 2:

$$\ln (P_c/P_n) = 1.3116 \, d\ln(MS^e) + 0.2926 \, d\ln(MS / MS^e) \qquad (7)$$

where

$d\ln(X) = \ln(X_c) - \ln(X_n)$, *i.e.*, the difference between the log of the variable X when the stations are assumed sold as a combination and the log of the variable X when the stations are assumed to be sold separately.

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[48] In addition, the coefficient on MS^e is significantly different from that on (MS/MS^e). This confirms that the use of MS^e and (MS/MS^e) provides more information on expected price than simply using MS.

[49] It is possible that our definition of the relevant market, *i.e.*, including only radio stations, is too narrow; and this may contribute to the unexpected behavior of the coefficient. We note that similar unexpected signs on concentration indexes were found by Fournier and Martin (1983) in their study of television advertising rates. As we have, Fournier and Martin used a media specific market definition.

For each of the 39 combination sales in our sample the estimated value of $\ln(P_c/P_n)$ was obtained from equation (7). Taking the anti-log of the average values from equation (7) provides the geometric mean of the ratio of the predicted prices.[50]

Based upon the calculations described above, we estimate that, on average, the prices paid for AM-FM combinations were 20.8 percent greater than they would have been if the stations had been sold separately and operated independently. Further, this average efficiency effect is statistically significant.[51] This evidence is consistent with the hypothesis that operating as an AM-FM combination results in lower operating costs and/or larger revenues for those stations that are combinations. To the extent that we have controlled for market power via the Herfindahl index in our regression equations, our results suggest that any price premium paid for stations as part of combinations as compared to the stand-alone value of those stations is the result of increased efficiencies, not the profits that may flow from increased market power.

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[50] The average of the differences in the predicted log of the prices is equivalent to the geometric mean of the ratio of the prices. We note that this technique assumes that the expected value of the ratio of prices is the same for all observations. For example, we are assuming that the expected percentage price premium of joint ownership compared to independent ownership is the same for all combination observations. While it is possible to test this assumption, we have not attempted to do so because of the limited degrees of freedom in our regressions.

[51] The geometric mean of the ratio of the combination price to the sum of the stand-alone prices is 1.208. The null hypothesis that the difference between the logs of the combination prices and of the sum of the stand-alone prices is equal to zero can be rejected at the 1 percent level of significance; the calculated t-statistic is 34.57.

We note that in an earlier version of this paper (Anderson and Woodbury (1987)), essentially the same results for combination stations were attained by substituting the actual combined market share and the station characteristics for MS^e and (MS / MS^e) in the price equations.

We also performed the same set of calculations for the 33 pairs of stations in our sample that currently operate as stand-alones. If the prices of pairs of stand-alone stations are greater than the prices that would have been realized if the pairs had been pre-existing combinations, we have support for the hypothesis that operation as a combination is only more efficient for stations with some set characteristics. If the prices these pairs of stations would receive if sold as pre-existing combinations are greater than their prices as stand-alones, then either the market is not doing a good job of placing assets in their highest valued use or else the transactions costs incurred in creating a new combo are responsible for the observed price differences.

Our results suggest that operation as a pre-existing combo is always more efficient than stand-alone operation. The geometric mean of the ratio of combination to non-combination price was 1.2367 for the 33 stand-alone pairs. That is, on average, their estimated prices were 23.67 percent higher as combinations than as the stand-alone form in which we observe them operating. This difference is statistically significant.[52]

Conclusion

This paper has described an empirical analysis of possible efficiencies in group ownership of radio stations. If such efficiencies are present, we expect the number of combinations to increase over time. In addition, we expect the efficiencies to be reflected in the sales prices of stations. Examining the prices paid for commonly-owned AM-FM combinations located

[52] The t-ratio for the significant difference between this ratio and 1 is 40.90.

in the same market -- the only type of co-located common ownership among comparable broadcast outlets currently permitted by the FCC, we find that, on average, the prices paid exceed the prices that would have been paid if the stations had been sold separately and compelled to operate as stand-alones. This difference is statistically significant, permitting rejection of the null hypothesis that there are no economies associated with joint ownership of stations in those cases where joint ownership is observed. In addition, we find statistically significant evidence that the number of combinations is increasing over time.

One puzzle remains. If the efficiencies arising from AM-FM combinations are as great and as pervasive as our regression results would seem to imply, why do so many stations continue to operate as stand-alones? At the end of 1987, 42 percent of the 4447 operating stations were stand-alones.[53] Of the 448 stations sold during 1986, 173, almost 40 percent of the total, were operating as stand-alones at the end of 1987. Further, 26 stations that were parts of combinations prior to their sale during 1986 were operated as stand-alones at the end of 1987. Does this suggest that our results are incorrect or that the market is not doing a very good job of organizing radio stations in the most efficient ownership patters?

The resolution of this issue must remain a topic for additional research. However, a couple of less-dire possibilities would appear to exist. First, as noted above, our estimated efficiencies do not reflect any transactions costs

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[53] *Investing in Radio, 1988.* Of course, it is inevitable that some stations will operate on a stand-alone basis where the number of AM stations in a market differs from the number of FM stations. For example, in Cape Cod, MA, there are two AM stations and nine FM stations. Both of the AM stations are part of combos. Thus, there can be no additional AM-FM combinations formed in this market and the remaining FM stations must operate as stand-alones.

incurred in combining the operations of two stand-alone stations. In at least some cases, these transactions costs may be greater than the present value of the efficiencies that would result from combination operation. As a result, it would not be economical to combine the stations. Alternatively, it may just take a long time to place resources in their best use. The evidence does show some increase in the number of combinations and theory does not tell us much about the time that must elapse in reaching a final equilibrium.

While the results reported here conflict with other studies generally concluding that there is no evidence of an efficiency gain from a relaxation of the FCC's ownership rules, the analysis here differs in significant respects from these studies. First, while previous studies have examined common ownership of comparable media across different markets or common ownership of different media in the same market, this paper has focused on the common ownership of comparable media within the same market. Second, previous studies have typically relied upon the behavior of either advertising prices or accounting profit margins to infer efficiency effects. As noted earlier, these inferences have at best been ambiguous. By relying on data on actual station sales prices and by controlling for the degree of concentration in the local market, our analysis at least in part resolves the ambiguity.

Of course, these results apply directly only to the common ownership of an AM and a FM station in the same market. Since other common ownership configurations are not presently permitted by the FCC on any widespread basis (for example, the ownership of multiple AM, FM or television stations in the same market), it is not possible to empirically determine whether common ownership in these other instances would result in significant efficiencies. The efficiencies in such cases may vary from those estimated here, but our results do suggest that the potential for efficiency gains from a relaxation of the FCC's local ownership rules could be nontrivial.

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