The Effects of Mergers on Product Positioning: Evidence from the Music Radio Industry

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Abstract

This article shows that mergers between close competitors in the music radio industry are followed by important changes in product positioning. Firms that buy competing stations tend to differentiate them and, consistent with the change in positioning being motivated by a desire to reduce audience cannibalization, their combined audience tends to increase. However, the merging stations also become more like competitors, so that aggregate variety does not increase, and the gains in market share come at the expense of other stations in the same format. These results have implications for our understanding of both mergers in differentiated product markets and, more broadly, how multi-product firms can use product positioning as a competitive tool.

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1 Introduction

Most differentiated product industries are characterized by several dimensions of product differentiation and multi-product firms. Unfortunately, little is understood about how firms choose to position their products in this type of environment, and as a result, we have very limited knowledge of what happens after mergers where repositioning is possible. The lack of understanding is partly explained by the fact that most of our intuitions come from one-dimensional Hotelling models. These models mechanically restrict how a firm can position its products relative to each other and relative to competitors, and standard versions yield stark but possibly misleading results. For example, in a two-product Hotelling model with price competition, independent firms choose maximal differentiation to soften price competition, so that a merger decreases differentiation and variety, and raises prices. On the other hand, with no price competition, independent firms choose minimal differentiation (Hotelling's (1929) classic result), and a merger increases variety as the merged firm reduces cannibalization. In reality, these extremes are almost certainly not chosen. In choosing how to reposition its products, a merged firm will balance the effects of location on price competition, its ability to attract customers from competitors and its ability to attract new customers who would not otherwise purchase.

This article provides empirical evidence on how mergers affect positioning in the music radio industry. I focus on the relative positioning of close competitors, defined as stations in the same local market-format (e.g., Rock stations in Chicago), using detailed playlist data to compare stations' locations in a rich, multi-dimensional product space. I find that, following a merger, a common owner differentiates its stations, reducing how much their playlists overlap, even though independently-owned stations are not minimally differentiated. The merged firm also chooses to position its products closer to competitors, whereas it could have chosen to move its stations into unserved areas of the product space to try to attract new listeners or soften price competition. Consistent with these changes, there is a redistribution of market share towards the merging stations but the aggregate

format audience remains unchanged. In contrast to the quite large effects that ownership has on positioning, commercial loads, which represent the prices paid by listeners for programming, remain almost unchanged. I do not have an instrument for changes in station ownership, so I use the timing of changes in positioning and market shares, as well as the similarity of the results across different types of transaction, to argue that there is a causal relationship between the changes in ownership and the changes in market outcomes.

These results have important implications for how we should think about mergers in differentiated product markets. For reasons of simplicity, most analyses treat the set of products as fixed and focus on the possible price effects of a merger. If firms compete in prices, then a merger without marginal cost synergies will increase both prices and the profits of all firms. However this result may not hold once repositioning is allowed, and my results are consistent with, instead, merging firms choosing to locate closer to competitors rather than to raise prices, and competitors becoming less profitable because they face more intense competition. My results can therefore help to explain why models that treat product locations as fixed often do poorly at predicting how prices change after mergers (Peters (2006), Whinston (2006), p. 115-127, Ashenfelter and Hosken (2008)) and why competitors may choose to lobby an antitrust authority to prohibit a merger even when synergies are unlikely.

The paper is structured as follows. The rest of the introduction reviews the related literature. Section 2 describes the data and how I use playlists to measure differentiation. Section 3 presents the main results. Section 4 discusses several alternative specifications and robustness checks, with a focus on the possible endogeneity of ownership changes. Section 5 concludes and considers whether similar results are likely to be observed in other industries.

Related Literature. Several empirical papers have looked at how firms locate their products in one-dimensional product spaces that approximate Hotelling-line or Salop-circle models. Corts (2001) shows that a movie distributor tends to differentiate the release dates of its movies relative to the dates chosen by competitors. This is consistent with Hotelling's minimal differentiation result as price

competition between movies is largely absent. Borenstein and Netz (1999) show that airlines tend to cluster the departure times of their flights relative to the times chosen by competitors, consistent with strategic differentiation to soften price competition. Neither of these papers look explicitly at how mergers affect positioning. Davis (2006) shows that when a movie theater chain opens a new theater, it takes patrons from competitors rather than from its own existing theaters. This suggests that a chain positions new theaters, either geographically or by choosing which movies to screen, closer to theaters owned by competitors than its own venues.[1]

The issue of whether repositioning could affect the outcomes of mergers has been the subject of several recent papers. Gandhi et al. (2008) use computational methods and a one-dimensional location game where locations and prices are chosen simultaneously to show that a merged firm may choose to reposition its products to take customers from competitors, and that, as a result of repositioning, price increases may be smaller than they otherwise would be. My empirical results are qualitatively similar to Gandhi et al.'s findings, and suggest that their results may also be found in settings that are more general than the one-dimensional model they consider.

Two empirical papers have taken a structural approach to evaluating whether post-merger changes in repositioning can be important. Fan (2009) estimates a vertically differentiated model of the newspaper industry, where newspapers choose several aspects of quality. She simulates the effects of hypothetical mergers on quality choices, and finds that quality changes by both merging and non-merging papers can have significant effects on welfare. Draganska et al. (2009) model the discrete assortment choices of two ice cream manufacturers to look at whether they would change the set of available flavors after a merger. Neither paper examines whether the changes predicted by the model are observed following mergers. In contrast, the current article takes a descriptive approach, examining what happens after a large number of ownership changes, and one of my aims is to provide some stylized facts that can be compared to the predictions of structural models. Structural models that can match these stylized facts could then be used to estimate the welfare consequences

[1] Davis finds that new theaters increase total attendances. The mergers that I consider do not directly affect the number of stations that are available, and I do not find that they have a market expansion effect.

of repositioning.

Several theoretical models have examined how mergers could affect market outcomes in broadcast media markets (Steiner (1952), Beebe (1977), Spence and Owen (1977), Gabszewicz et al. (2001), Dukes and Gal-Or (2003), Cunningham and Alexander (2004) and Anderson and Coate (2005)). Several of these articles use two-station models, that preclude an analysis of whether a merged firm would try to take business from competitors. The current article contributes to this literature by providing empirical evidence on the effects of mergers in a more general setting.

The rapid consolidation of the industry following the 1996 Telecommunications Act ("1996 Act") has led to some previous analysis of the relationship between ownership concentration and aggregate variety, where variety is measured by the number of different formats available in a market. Berry and Waldfogel (2001) find that between 1993 and 1997 this measure of variety rose by more in large markets where the 1996 Act allowed greater increases in concentration, although this did not significantly increase radio listenership (Berry and Waldfogel (1999b)). Using a different format classification, the Federal Communications Commission (2001) finds that the number of formats increased by less in large markets in the years following the 1996 Act.

The current article has a different focus. Instead of looking at the relationship between aggregate variety and aggregate ownership concentration, I use detailed station-level data to look at changes in positioning among stations in the same format following mergers. There are three advantages to this approach. First, it depends less on the peculiarities of particular format classifications. Second, format switches are relatively rare and may happen some time after changes in ownership, so it is hard to identify the causal association.[2] On the other hand, within-format playlist changes happen quite quickly. Finally, and most importantly, I can identify changes that do not affect aggregate measures. In particular, I find that mergers have significant effects on positioning and market shares without affecting aggregate variety or format listenership, because changes affecting the merging parties and

[2]Format moves typically require a station to replace all of its on-air staff, many of its advertising sales staff and to negotiate with syndicators for programming (although this is less important in music formats), and it can take up to a year for a format switch to be planned and implemented.

competitors offset. Williams et al. (2002) provide an earlier attempt to use playlist data to look at differentiation with weak results. However, their sample sizes were too small to allow them to look at the effects of common ownership of stations in the same market-format, which is where competitive interactions should be most important.

2 Data

The data comes from two sources. BIAfn's *MediaAccess Pro* database (2002 version, hereafter BIAfn) tracks all commercial stations in the U.S. and I use it to provide information on the geographic location, format, ownership and market share of each station. This data is matched to playlist data, in the form of airplay logs, for a sample of 1,094 music stations from April 1998 to December 2001. The logs were provided by Mediabase 24/7, a company that collects airplay information using electronic monitoring equipment and sells it to the radio and music industries.

Playlist Data. Table 1 shows an extract from the airplay log of a Classic Hits (Rock) station. The log lists the artist and title of each song and the position of commercial breaks. The logs provide no information on non-commercial talk programming, so the maintained assumption will be that ownership concentration does not have important effects on the quality of this programming (e.g., the humor of the DJs).

The full playlist sample includes logs from the first week (Monday-Friday) of each month from April 1998 to December 2001 for 1,094 stations (the Mediabase universe at the end of 2001). The panel is unbalanced in several dimensions. First, Mediabase's sample expanded over time, starting with 702 stations in April 1998. Second, one week in 1998 and 10 weeks in 1999 have only one day of data (the other weeks have at least four days), and, finally, there are a large number of missing days for individual stations. These sources of incompleteness reflect issues with how the data was collected and stored by Mediabase, and should not reflect anything about the music played. Overall, there are 133,994 station-day logs and 766 stations have data for at least 30 weeks.

I use BIAfn to allocate each station to a particular local market-format. I follow BIAfn by allocating each station to its geographic, Arbitron-defined 'home' market, based on its city of license.[3] BIAfn allocates stations to 20 format categories (formats).[4] Format information is available in the Spring and Fall quarters each year so I allocate each station to a format in a particular week based on BIAfn's listing for the closest quarter. The sample stations are distributed across 7 contemporary music formats (Adult Contemporary (AC), Album Oriented Rock/Classic Rock (AOR), Contemporary Hit Radio/Top 40 (CHR), Country, Oldies, Rock and Urban), and 148 geographic markets.

While the sample covers an important part of the radio industry - the sample stations had revenues of $6.5 billion and an average audience of 13 million people in 2001 - its coverage is not complete.[5] Table 2 summarizes the coverage of the sample in Fall 2001. For example, there is at least one sample Adult Contemporary station in 66 of the largest 70 Arbitron markets. In these 66 market-formats, the sample includes 75% of stations (162 out of 221) and, on average, 90% of the format's audience. Coverage is less complete in smaller markets.

Estimation Sample and Ownership Changes. Most of the analysis in this paper will focus on a subsample of 740 stations in market-formats with more than one sample station (these market-formats are listed in Appendix Table A), and will look at the effects of changes in whether a pair of stations has a common owner. BIAfn provides an ownership history for each station, listing the completion date for the most recent transaction and the deal announcement data, together with an indicator for whether the deal was completed, for earlier transactions. There are 688 distinct pairs in the same market-format, and 46 changes in common ownership, with 6 pairs affected by two changes (e.g., a firm buys two stations but later divests one of them). Appendix Table A identifies the market-formats where these changes occur. There are some changes in every format except Oldies. Three of

[3] Arbitron Company defines markets to estimate station ratings. They correspond to MSAs with some exceptions reflecting historic industry usage.

[4] BIAfn uses two levels of format classification: a detailed format label (of which there are several hundred) and a format category that groups similar labels. In this article, I use format categories. Earlier versions of this paper showed that changes in format labels only capture a small part of the changes in programming that I measure using playlists.

[5] Based on author's calculations using BIAfn's revenue estimates for 2001 and Arbitron ratings data for Spring and Fall 2001.

the six pairs that experience two changes in common ownership are Rock stations in Denver, CO. 31 changes are switches from separate to common ownership (i.e., a merger), reflecting the trend towards consolidation. The changes result from a variety of different types of transaction: 24 changes were part of deals affecting a single market-format, while 8 resulted from transactions involving more than 7 market-formats. 14 occurred as part of divestitures required by the Department of Justice before a transaction was approved. It is important to note that the Department has not challenged mergers because of their possible effects on listeners or variety; instead, the sole criterion is whether the prices paid by advertisers for commercial time are likely to increase.

Measures of Differentiation Between Station-Pairs. I use station-pairs to examine whether a common owner tends to differentiate its stations. To measure differentiation, I aggregate stations' playlists to the weekly level (recall my data comes from the first week of each month), as most music stations review their playlists every few weeks.[6] On average, a sample station plays 1,367 songs (standard deviation 195) by 177 (67) artists during a five day week. 10,542 artists are observed at least once.

The first measure of differentiation, which I will call the 'unique artists measure', is the average proportion of each station's songs recorded by artists who are not featured at all on the other station. This measure varies between 0 (all artists in common) and 1 (no artists in common). The second measure ('angle measure') is slightly more complicated. Each station is located in a product space, where each artist is a separate dimension, by a vector listing the proportion of the station's playlist devoted to each artist.[7] The distance between a pair of stations is measured by the angle (in radians) between these vectors, divided by $\frac{\pi}{2}$ so that it lies between 0 and 1. The angle measure has the property that two stations playing the same artists are not identical if they play them in different

[6] As noted above, there are less than five days of data for some weeks. All of the specifications below include week*format dummies that should control for any differences in differentiation generated by this incomplete coverage. Some individual stations also lack data for some days in certain weeks. All of the differentiation results are robust to including additional controls for how many days of data are available for each station or restricting the sample to exclude stations that have incomplete coverage.

[7] For example, if there were only three artists (X, Y and Z) and station i played X, Y and Z 10, 0 and 5 times respectively i's vector would be $(\frac{2}{3}, 0, \frac{1}{3})$.

proportions. This is a valuable feature for formats such as Contemporary Hit Radio/Top 40 where almost all stations will play artists currently in the charts at least once. The within-pair correlation between the two measures is 0.65. I will place more weight on the results for the angle measure, which is a better measure of differentiation, but I use the unique artists measure to illustrate some magnitudes.[8] Note that cost differences are unlikely to affect how much playlists overlap because music stations purchase blanket performing rights licenses that allow them to play any song in a rights organization's library. The fees for these licences are a fixed proportion of station revenues and are not affected by station ownership.

Table 3(a)(i) shows how the angle measure varies across formats and the common ownership status of the pair. I exclude the Oldies format as no pairs are commonly owned. In every other format except Country, pairs with the same owner are more differentiated than those with different owners. The average values of the unique artists measure for pairs with common and separate owners are 0.66 and 0.55 respectively, so that, on average, a commonly owned station devotes 20% more of its playlist to artists that are not played on its sister station. This cross-sectional pattern provides some initial evidence that common owners choose to differentiate their stations.

If common owners differentiate their stations, do separately owned stations choose minimal differentiation as suggested by Hotelling? If so, the data would be consistent with stations not competing on price. To test this hypothesis I compare the degree of differentiation for two groups of station-pairs. The first group consists of separately-owned pairs that are the only stations in their market-format (based on all stations, not just stations in the playlist sample). If price competition is absent and format listenership is inelastic then these stations should face a location problem that is similar to the one described by Hotelling. The second group contains pairs of market-format monopolists (i.e., they are the only stations in their market-formats) located in *different geographic markets* in the same

[8] Earlier versions of this paper examined results based on locating stations in a product space defined to allow for some artists to be more similar than others. The results were consistent with those presented here, but this approach suffered from the problem that in most formats he product space has to be redefined from week to week as artists release new songs. This also makes it difficult to test whether it is the merging stations or competitors that are moving, because with a fixed product space most stations appear to move significantly from month-to-month.

geographic Census division. If tastes are similar across markets within a division, these stations should want to locate at approximately the same location (presumably somewhere in the center of the format). The differentiation measures between these stations should therefore provide a benchmark for how minimally differentiated stations should look. If tastes differ across markets, then these stations should be more differentiated than minimally differentiated stations in the same market. Table 3(a)(ii) shows the opposite pattern, with same-market pairs more differentiated than pairs in the comparison group. This suggests that independent stations do strategically differentiate to some extent, even though common owners differentiate their stations more. These patterns are inconsistent with both a Hotelling line model with no price competition and standard specifications (e.g., quadratic transport costs) of a two-product Hotelling model with price competition.

Measures of Differentiation Between Pairs and Other Stations. I use market-formats with at least three observed stations to examine whether multi-station firms position their stations closer to competitors. I measure the distance from competitors by taking a station-pair (call them A and B) and a third station in the same market-format (C). The distance from the pair to C is defined as the minimum of the A to C and B to C distances, calculated using either the angle or unique artist measure.

Table 3(a)(iii) shows summary statistics for the distance to competitors, distinguishing cases where A and B have the same owner, who does not own C. In four of the six formats, commonly owned pairs are positioned significantly closer to competitors, although for Rock they are located slightly further away.

Format Switching and Entry/Exit. While I focus on within-format positioning, one might also expect to observe stations switching formats following mergers if format switching is not too expensive. However, there is little evidence of this for the sample stations. For example, I only observe three instances where one of the merging stations switches formats in the 12 months following a merger between stations in the same market-format, which is less than one would expect given the

rate of format switching for the sample as a whole.[9] However, I will show that mergers may cause competitors, who face greater competitive pressure, to switch formats.

One might also expect that multi-station firms would choose to close down similar stations to avoid duplicating fixed costs. However, no sample stations were closed between 1998 and 2001, a pattern which reflects the scarcity value of broadcast licenses created by spectrum constraints and licensing restrictions. These factors also explain why entry is rare, and none of the stations affected by ownership changes went on-air after January 1998.

Market Shares. I use market shares to test whether the observed changes in positioning are associated with a redistribution of listeners across stations. BIAfn reports Arbitron's estimates of each station's share of radio listening (known as the AQH share) in the Spring and Fall quarters each year, based on listeners aged 12 and above during a broadcast week of Monday-Sunday 6 am to midnight. I convert these shares to market shares by defining the market as the total time available to people aged 12 and above during the broadcast week, and multiplying the AQH share of each station by the average proportion of time spent listening to radio (known as the APR).[10,11]

Table 3(b) shows how the combined market shares of station-pairs in the playlist sample, depending on whether the pair have the same owner. In four formats, the audiences are similar across the two groups, whereas in Rock and Urban the commonly owned stations have significantly more listeners. The analysis below will use fixed effects specifications to control for the fact that other station characteristics (signal strength and station age) can also have significant effects on audiences.

[9] An informal analysis of directories that list station addresses and staff suggest that commonly owned stations in the same format often share facilities and off-air personnel, while firms often maintain separate facilities for stations in different formats. This suggests that firms may want to keep stations in the same format to reduce fixed costs.

[10] The APR numbers are not reported in the BIAfn database, so they were collected from Duncan's *American Radio* publications for 1998 to 2001. *American Radio* was also used to track the historical market shares of those non-sample stations that closed between 1998 and 2001, as these stations are not listed in the 2002 version of the BIAfn database.

[11] BIAfn also lists estimates of annual advertising revenues. However, these are based on BIAfn's proprietary formula, so it is not clear that they can be used to reliably estimate the effects of mergers.

3 Empirical Results

This section presents the main empirical results, examining the effects of ownership on positioning, market shares and commercial loads in turn. Section 4 considers several robustness checks.

Common Station Ownership and Differentiation. The first set of regressions examine how a common owner positions its stations relative to each other. I use a linear fixed effects specification

$$d_{ijw}^{PAIR} = X_{ijw}\beta_1 + N_{ijw}\beta_2 + T_{ijw}\beta_3 + FE_{ij} + \varepsilon_{ijw} \tag{1}$$

where observations are station-pairs in the same market-format, d_{ijw}^{PAIR} is the distance between stations i and j in week w, T are week*format dummies and FE_{ij} are station pair-format fixed effects.[12] X is a dummy variable equal to 1 if i and j have the same owner in week w and β_1 is the coefficient of interest. N are dummies for the number of stations in the market-format, and I include separate dummies for the total number of stations in the format and the number of sample stations in the format (whether or not they are in the data in a particular week). This distinction allows for the fact that sample stations may be more significant competitors. The sample includes all station-pairs in the same market-format, with pairs that never experience ownership changes helping to identify the coefficients on the time and number of station dummies.[13] Standard errors are clustered on the market-format. This allows for heteroskedasticity, time-series correlation within a pair and cross-sectional correlation across pairs in the same market-format. This type of cross-sectional correlation will exist because a station will be a member of multiple pairs when I observe three or more stations in the same market-format.

The first column of Table 4(a) shows the estimated ownership coefficients for each measure of differentiation. The coefficients are positive and statistically significant at the 0.1% level, indicating that common owners differentiate their stations. The unique artist coefficient indicates that a common

[12] The week*format dummies allow the degree of differentiation to vary across formats over time. For example, in December many Adult Contemporary stations devote a large proportion of their playlists to holiday music.

[13] The estimated values of β_1 are very similar if one restricts the sample to pairs experiencing ownership changes.

owner increases the proportion of a station's playlist devoted to artists not played on the other station by 7 percentage points (13% relative to the mean for separate owners).

Figure 1(a) looks more closely at the timing of the increase in differentiation, based on pairs that experience a switch from separate to common ownership (i.e., a merger). Pairs experiencing the opposite change are excluded. The regression specification includes a set of dummies to measure differentiation relative to the three months prior to the transaction.[14] The figure shows the estimated coefficients and 95% confidence intervals using the angle measure as the dependent variable. There is no trend in differentiation prior to a merger. This provides some reassurance that mergers are not caused by some pre-existing, but unobserved, factor that also affects positioning. Differentiation increases in the six months following a merger, remaining fairly constant thereafter. The fact that the increase in differentiation does not happen as step function may be explained by deal announcement dates being used for some early mergers, managers' incentives changing some time after a merger is formally concluded or stations choosing to update their playlists gradually to avoid annoying or surprising listeners.[15]

The evidence that common owners locate their stations closer to competitors is based on market-formats with at least three observed stations. Column (2) reports the estimated coefficients for this subset of observations and column (3) reports the coefficients for the remaining observations. Common owners differentiate their stations in both cases, with slightly larger effects when more stations are observed, even though one might have expected that a common owner's ability to reposition its stations would be constrained by the presence of more significant competitors.[16]

[14] The specification is the same as (1) except that the timing dummies replace the same owner dummy. The sample includes all station pairs except those which experience a switch from common to separate ownership. The set of mergers that identify a particular coefficient will vary depending on the timing of mergers relative to the beginning and end of the sample.

[15] Several people I have spoken to in the industry have noted that many stations believe that it is important to maintain predictable programming to attract casual listeners who play radio in the background while doing some other activity.

[16] I have also estimated specifications using pairs that are the only stations in their market-format counting non-playlist sample stations. Eight changes in ownership identify the ownership coefficient in this case, and the estimated angle coefficient falls to 0.036 (0.033). For the remaining observations the coefficient is 0.073 (0.018).

Common Station Ownership and Differentiation Relative to Competitors. When a common owner differentiates its stations, it could also make them less similar to competitors to attract new listeners to the format or to soften price competition. Alternatively, it could make them more similar to competitors to try to take their listeners.

I test whether a common owner positions its stations closer to competitors using a fixed effects specification similar to (1) where the dependent variable is the minimum distance between a station pair and a third station (calculation explained in Section 2) and the ownership variable is a dummy for whether the pair is commonly owned by a firm that does not own the third station. The fixed effects are defined for each 'pair-third station' combination and 28 ownership changes identify the ownership coefficient.

The results for the two distance measures are shown in Table 4(b), columns (1) and (2). The point estimates indicate that a common owner tends to locate at least one of its stations closer to a competitor, although only one of the coefficients is statistically significant at the 10% level. The unique artist coefficient indicates that a common owner increases the proportion of at least one of its stations' playlists devoted to artists who are also played by the competitor by 6 percentage points (12%).

Figure 1(b) shows how differentiation between a pair and a competitor changes around the time of a merger affecting the pair, using the angle measure. 15 changes identify the coefficients. There is no trend in differentiation prior to the merger, while the pair become more like the competitor in the following six months. The finding that differentiation falls is striking, because one might have expected that the ability of a common owner to make its stations more like some competitors and less like others would make it hard to find any average effect.

An alternative approach that avoids using groups of three stations is to look at how ownership concentration affects variety measured at the market-format level. I measure variety using the total number of artists played on the sample stations during a week (mean 293, standard deviation 122)

and estimate a market-format fixed effects specification.[17] In addition to week*format dummies and number of station controls, I include dummies for how many stations' playlists are observed in a particular week as this directly affects the calculation of the variety measure. Ownership concentration is measured by a count of how many firms own the observed stations and a dummy variable for whether all of them have the same owner. Column (3) of Table 4(b) reports the estimated ownership coefficients. When mergers lead to all stations having the same owner, variety increases by 7%, However, in the absence of monopolization ownership concentration has no significant effect on variety. This result is consistent with common owners preferring to make their stations' playlists more like those of competitors.

Common Station Ownership and Market Shares. I use market share data to examine whether the changes in positioning are associated with a redistribution of listeners. The first specification is the same as (1) except that the dependent variable is the log of the pair's combined market share, and quarter*format dummies replace the week*format dummies. It is important to control for time effects in the market share specifications, because radio listening fell throughout the sample period, continuing a decline that began prior to the relaxation of ownership rules. The biannual frequency of the market share data means that only 34 changes in ownership identify the ownership coefficients.

The estimates in column (1) of Table 4(c) imply that common ownership increases a pair's combined market share by 3%, a change that is statistically significant at the 10% level. Figure 1(c) shows how a pair's audience changes around a merger, with 23 mergers identifying the coefficients.[18] There is no clear pre-merger trend in market share, while the pair's market share increases by almost 10% relative to its pre-merger level in the year following a merger. The market share increase appears to lag the change in positioning by a few months, suggesting that listening patterns may slowly adjust

[17] Alternative dependent variables, such as an HHI-like measure of the aggregate concentration of the combined format playlists, give similar qualitative implications for how concentration affects variety.

[18] Ratings quarters occur at fixed times during the year, so I define the quarter dummies based on the nearest ratings quarter. For example, Fall 1999 is defined as 0-6 months after all mergers that took place between May and November 1999.

to playlist changes.

The next question is whether market share gains come from competitors or from the merging stations adding new listeners to the format. To examine this question, I first test whether stations that face competitors tend to gain more listeners than stations that do not. The specification in column (2) excludes pairs that experience a change in common ownership when they are the only stations in the format (based on all stations), while column (3) excludes pairs that have competitors when they experience a change. To make it easier to compare gains and losses in market shares, the dependent variable is in levels rather than logs, and, based on Figure 1(c), I exclude the first two quarters following an ownership change. I do not include dummies for the number of stations as some of the market share gain may result from other stations exiting the format, an issue that I examine below.[19] Common ownership increases the market share of stations that face competitors by 0.0011 percentage points (8% for the average pair). There is no significant increase for stations that do not face competitors, although the large standard errors mean that quite large effects cannot be rejected.

Column (4) repeats the column (2) specification, using the combined market share of *all other* stations in the format as the dependent variable. The estimated coefficient implies that the market share gain for the merging stations is offset by a loss to competitors. Figure 1(d) shows the timing of the decline in other stations' market share relative to a merger. The confidence intervals are wider than in the other specifications, but, consistent with the other results, other stations lose listeners in the twelve months following a merger.

The observed changes in positioning and market shares suggest that common ownership may increase the competitive pressure on other stations. If format switching costs are not too high, this increased pressure may encourage them to switch to an alternative format.[20] In columns (5) and (6) of Table 4(c), I use a pair fixed effects specification with the number of competing stations in the

[19] The coefficients in columns (2) and (3) are almost identical if the number of station dummies are included. In contrast, the estimated loss to competitors in column (4) is smaller and not significantly different from zero. This is consistent with part of the loss resulting from format exit by competitors.

[20] An interesting question that cannot be answered with a purely descriptive approach is whether a common owner repositions its stations in order to induce exit by competitors.

format as the dependent variable (in column (5), the total number of other stations and in column (6), the total number of other (ever) sample stations). The coefficients indicate that common ownership is associated with statistically significant declines in the number of competitors. The coefficients imply that the number of sample competitors falls by an average of 0.26, relative to a mean of 1.1, while the total number of competitors falls by 0.36, relative to a mean of 2.6.

Changes in Commercial Loads. Listeners pay an implicit price for programming when they listen to commercials. A standard merger analysis would predict that prices should change following a merger, although the direction of the change in a two-sided market will depend on whether the merged firm gains market power over listeners or advertisers.[21] It is relevant to ask whether mergers affect prices (commercial loads) as well as positioning and whether changes in commercial loads can provide a competing explanation for the changes in market shares. This would require common owners to reduce their commercial loads relative to competitors.

The airplay logs (Table 1) identify when commercials are played, although only a subset of the logs in 1998 and 1999 contain commercial information.[22] I use two measures of a station's commercial load in a particular hour: a count of the number of commercial blocks listed in the log and an estimate of the number of minutes of commercials during the hour based on the length of time between songs where commercials are indicated.[23] The estimation sample consists of station-hours between 10 am and 7 pm that have at least 8 songs listed in the log. This excludes evening hours when radio audiences are low, and hours with a lot of non-music programming where the number of blocks or minutes may be measured inaccurately.[24,25] The average load is 11.95 minutes per hour (standard deviation 4.69),

[21] Specifically, if a merger allows a firm to exercise greater market power in the advertising market, it may reduce the number of commercials played in order to increase the revenue received per commercial.

[22] 393 and 648 stations have some logs with commercial information recorded in 1998 and 1999, respectively.

[23] The first step in this procedure is the estimation of the length of each song. This is done using the median number of minutes between the start time of the song and the start time of the next song where no commercial breaks are indicated. The number of minutes of commercials in a particular block is calculated assuming that the song is played its full length and that there is no other non-commercial programming.

[24] If two blocks of commercials are separated by only non-music programming the log will only list one block. The eight song criterion was chosen after reviewing some more detailed transcripts (also collected by Mediabase) that list exactly what happens (e.g., what the DJ says and the exact length of each commercial) for a small sample of station-hours. 50% of station-hours in the morning drive time period (6 am-10 am) do not meet the 8 song criterion.

[25] The final sample contains 53,955 hours in 1998, 41,050 in 1999, 408,643 in 2000 and 456,986 in 2001. The average

consistent with industry estimates that music stations played an average of 12 minutes of commercials per hour in 2000.[26]

Columns (1) and (2) of Table 4(d) report estimates for a station-format-hour fixed effects specification. An observation is a station-day-hour (e.g., WWWW-FM on May 2, 2001 4-5 pm), and the ownership variables are a count of how many stations the station's owner has in the market-format and a dummy for whether other stations in the market-format are commonly owned by a different firm. Because observations are stations, not pairs, and common ownership with stations that are not in the playlist sample can change the ownership variables, there are 152 and 79 changes that identify the count and dummy variable coefficients, respectively. The specification also includes number of station dummies and several types of time*format interactions to allow for advertiser demand to vary over time.

The estimated ownership coefficients are statistically insignificant, but the point estimates indicate that common owners slightly increase commercial loads, while stations faced by common owners slightly reduce them.[27] These changes are the opposite of those required to explain the changes in market shares, and as the standard errors are quite small, I conclude that changes in commercial loads cannot explain the redistribution of listeners, leaving the observed changes in positioning as the favored explanation. The fact that the mergers do not lead to commercial loads falling is also consistent with the Department of Justice blocking mergers that might have given firms market power over advertisers.[28]

number of blocks per hour is 2.2 (standard deviation 0.78) with 24,840 commercial-free hours, which are identified by a station playing commercials in other hours of the day but not during the hour in question. Most hours have either 2 blocks (562,043) or 3 blocks (238,518).

[26] Radio and Records (April 21, 2000) quoted by SchardtMedia's "Listener Choice Radio Study", http://www.listenerchoice.com/research/RS2000.html.

[27] The coefficients become slightly larger, but remain statistically insignificant, if observations for six months following a change in ownership are excluded from the regression.

[28] Brown and Williams (2002) examine the effect of consolidation on advertising prices, measured by a market average price per ratings point. They find a very small but positive effect of ownership concentration measured at the market level on advertising prices. These small effects are not necessarily inconsistent with the results here, as firms may be able to extract more revenue by offering packages of advertising across different stations even if they do not significantly reduce the quantity of commercials aired.

4 Robustness Checks

The above results suggest that a common owner repositions its stations so that they become more differentiated from each other but more similar to competitors, causing a redistribution of market share in favor of the commonly owned stations. In this section, I consider several issues that might cast doubt on this interpretation.

Effects of National Ownership and Signal Coverage on Station Quality Many of the mergers in the sample result in stations becoming owned by large national radio companies. If there are economies of scope in providing quality programming on stations in different markets, then these companies may tend to increase quality, providing an alternative explanation for why these stations gain market share.[29]

I investigate the effects of national ownership on audiences using a station-format fixed effects specification. The dependent variable is the log of the station's market share. The ownership variables are the same as in the specification for commercials, but I also include the log of the number of stations in the same format that the station's owner controls nationwide. The observations are station-quarters in the playlist sample, but identification will come partly from transactions involving markets and stations that are not in the sample. Observations in the two quarters following changes in the local ownership variables are excluded. Table 5(a) reports the estimated coefficients. The local ownership coefficients are consistent with the earlier results (the control for the number of stations reduces the estimated loss from competing with commonly owned stations), while the national ownership coefficient is very close to zero and precisely estimated. Therefore, changes in national ownership do not explain the redistribution of market shares associated with changes in local common ownership.

[29] The relatively successful music stations that are in the Mediabase sample remain locally programmed even when they are bought by large national radio firms such as Clear Channel. However, radio companies do encourage program directors to share research about which songs are most popular with listeners. Sweeting (2004) provides a model and supporting evidence that illustrate the role that sharing research may play, including the fact that nationally owned stations in the same format tend to be more homgenous playlists, although the differences are relatively small.

Changes in signal coverage could also affect market shares. Unfortunately, BIAfn only records stations' signal power and transmitter height in 2001. To investigate whether investment may be important, I found the 1997 values of these characteristics for the set of stations experiencing changes in common ownership using the *Broadcasting and Cable Yearbook*. Ten stations increased their signal power or transmitter height, while nine reduced them, although the changes are often small. Excluding pairs where one or both stations experienced a technical change, the estimated coefficient in a market share specification paralleling Table 4(c) column (1) increases to 0.038 (0.022), and 0.098 (0.017) when the two quarters following a change in ownership are excluded. This suggests that changes in signal coverage cannot explain the observed changes in market shares.

Results By Format The baseline specifications pool ownership changes from different music formats. Table 5(b) shows how the results vary across formats. The division of the observations into six groups acts as a check that the results are not influenced by one or two extreme outliers. The columns in the table correspond to the specifications in Table 4(a) column (1, angle measure), 4(b) column (1), 4(c) columns (1) and (4), dropping the two quarters following the change in ownership. Even though there are only a small number of ownership changes in each format, the results are qualitatively consistent with the pooled results: 19 out of 21 estimated coefficients have the same sign and the majority of these coefficients are statistically significant. The results are probably the weakest for the Rock format, which may reflect the fact that 8 out of the 12 ownership changes affect four station-pairs that experience both mergers and demergers. Rock may also not be a very well-defined format. For example, the Classic Hits station whose log is listed in Table 1 is classified by BIAfn as a Rock station, even though its playlist has more in common with Classic Rock stations in the Album Oriented Rock/Classic Rock format and some Oldies stations than Rock stations that play recently released songs.

Possible Endogeneity of Ownership Changes My analysis assumes that ownership changes are exogenous. There are two potential problems with this assumption. First, some unobserved

factor may cause the changes in both ownership and market outcomes, without ownership having a causal effect. The lack of pre-merger trends in outcomes (Figure 1) provides some evidence against this concern. Second, even if ownership changes cause the observed changes in market outcomes, the set of stations experiencing ownership changes may not be representative. This would be true if, for example, stations that engage in unusually direct competition are more likely to merge. I now look more closely at the data to see if these concerns are valid.

I can assess whether stations that merge are representative by testing whether they have similar observable characteristics to separately owned stations prior to a merger. To do this, I regress the observed market outcomes for separately owned pairs on the relevant control variables (e.g., week*format dummies and number of station controls) and a dummy variable for whether the pair experiences a change in common ownership (no pair fixed effects are included). A statistically significant coefficient indicates that a pair experiencing a merger is different to other pairs before the merger takes place. Row (1) of Table 5(c) shows the coefficients for the four market outcomes related to positioning and market shares.[30] In three cases the coefficient is statistically insignificant. The coefficient is statistically significant when the dependent variable is the combined market share of other stations in the format, and the sign suggests that the observed mergers are in market-formats where competitors have relatively few listeners. However, this pattern also suggests that the observed decline in this variable following a merger (Figure 1(d)) does not simply reflect mean reversion in competitor audiences. Row (2) repeats the analysis using commonly owned pairs. In this case, none of the coefficients are statistically significant at the 5% level.

A second approach to dealing with endogeneity concerns is to examine whether the results are similar across different types of transaction with different degrees of endogeneity concern. For example, it is more plausible that competitive conditions in a particular market-format cause a transaction involving a single station than a merger between two companies operating in many different markets. I define a large transaction, for which endogeneity concerns should be less relevant, as a transaction

[30] I exclude pairs that switch from common to separate ownership. The specification in row (2) excludes pairs that switch from separate to common ownership.

which involves stations in at least 7 market-formats (median for this group is 54 market-formats). The first two rows of Table 5(d) report the results for the same set of specifications used in the by-format analysis, excluding pairs affected by small transactions and large transactions respectively. The standard errors are large when small transactions are excluded because only a small number of ownership changes remain, but the coefficients for the two groups are qualitatively similar.

The observations can also be split based on the direction of the change in common ownership. Mergers and de-mergers may occur for different reasons, so similar coefficients may suggest that it is the change in common ownership itself that causes the change in market outcomes. The third row of Table 5(d) excludes pairs that ever switch from common to separate ownership, while the fourth row excludes pairs that ever experience the opposite switch. Pairs that makes both changes are excluded from both specifications. The coefficients are similar across the rows although the reduction in the combined audience of other stations associated with common ownership is smaller for pairs that merge. This result is consistent with the wide confidence intervals in Figure 1(d), and it may reflect the fact that the stations that merge are in market-formats where the combined audience of other stations is already relatively low.

External Validity The results are based on a sample of relatively successful contemporary music stations in large markets. While the Mediabase sample represents an important part of the radio industry, one might question the general importance of the results if similar patterns do not hold for the industry as a whole.

While positioning data is not available for all stations, I can examine market share data from all formats and all Arbitron-rated markets.[31] The first specification is a station-format fixed effects specification where the dependent variable is the log of the station's market share, and the variables of interest are a dummy for whether the station's owner has other stations in the same market-format and a dummy for whether there are other stations in the market-format commonly owned by a different

[31] I exclude data from Puerto Rico and markets that are only rated for one year of the data. This leaves 281 markets. I use the same quarters (Spring 1998-Fall 2001) as the earlier specifications. The number of station-quarters is more than five times larger than the playlist sample.

firm. Quarter*format (20 formats) and number of station dummies are also included, and, in light of the earlier results, I drop the two quarters following a change in one of the ownership variables. Column (1) of Table 5(e) reports the estimated ownership coefficients, and they indicate that common ownership increases a station's audience by over 4.5%.

To examine whether ownership concentration affects format listenership, I estimate a market-format fixed effects regression where the dependent variable is the combined market-share of all of the stations in the format and the explanatory variables are a count of the number of owners, quarter*format dummies and number of station dummies. The coefficient on the number of owners, reported in column (2) of Table 5(e), is almost identically equal to zero. This is consistent with the earlier results that showed that while commonly owned stations gain listeners, this comes at the expense of other stations in the same format.

5 Conclusion

This article has examined how station ownership affects product positioning among close competitors in the music radio industry. The main findings are that common owners differentiate their stations, but also tend to make them more similar to competitors. Consistent with these changes in horizontal positioning, listeners are redistributed from competitors to the merging parties. As a result of these changes, mergers do not increase variety when competitors are present and they do not increase the total number of people listening to a format. The observed changes in positioning help to explain why mergers are profitable for the merging parties, why mergers may increase competitive pressure on other firms even if there are no synergies, and why models that treat product locations as fixed often fail to predict post-merger changes in prices. More generally, the results illustrate how one-dimensional, two-product location models may provide incomplete guidance about product positioning in richer environments.

The article has looked at a single industry, so it is relevant to ask which features of the industry drive the results. Four characteristics are likely to be important. First, horizontal differentiation

is an essential feature of competition between music radio stations because any playlist change will be popular with some listeners and unpopular with others. In contrast, the scope for changes in vertical differentiation is more limited because music stations spend most of the time playing music and the same songs are available to every station that purchases blanket performing rights licenses. Second, both aggregate and format listening are likely to be inelastic (Borenstein (1986), Rogers and Woodbury (1992), Berry and Waldfogel (1999a)), so the easiest way for a station to increase its listenership will be to take listeners from competitors. Third, while stations can attract listeners by playing few commercials, the intensity of price competition is probably more limited than in most industries because listeners can always avoid listening to too many commercials by temporarily switching stations.[32] If price competition was more intense, a merging firm might have stronger incentives to differentiate from competitors. Finally, within-format playlist changes should not affect costs. In other industries, firms may prefer to make their products more similar to exploit economies of scale or scope in the development or purchasing of components.

While other industries may not share all of these characteristics, examples suggest that similar post-merger changes can take place. For example, the merger of Hewlett-Packard and Compaq Computer was followed by the Compaq brand being repositioned to compete with less branded, cheaper competitors (Song (2009)). Gandhi et al. (2008) also describe how the merger of Carnival Corporation and P&O Princess Cruises, was followed by a reallocation of assets so that the Cunard and P&O brands could focus on different market segments.

[32] Abernethy (1991) estimates that the average in-car listener switches stations 29 times per hour, primarily to avoid commercials. Sweeting (2009) studies how stations may try to play commercials at the same time to reduce commercial avoidance.

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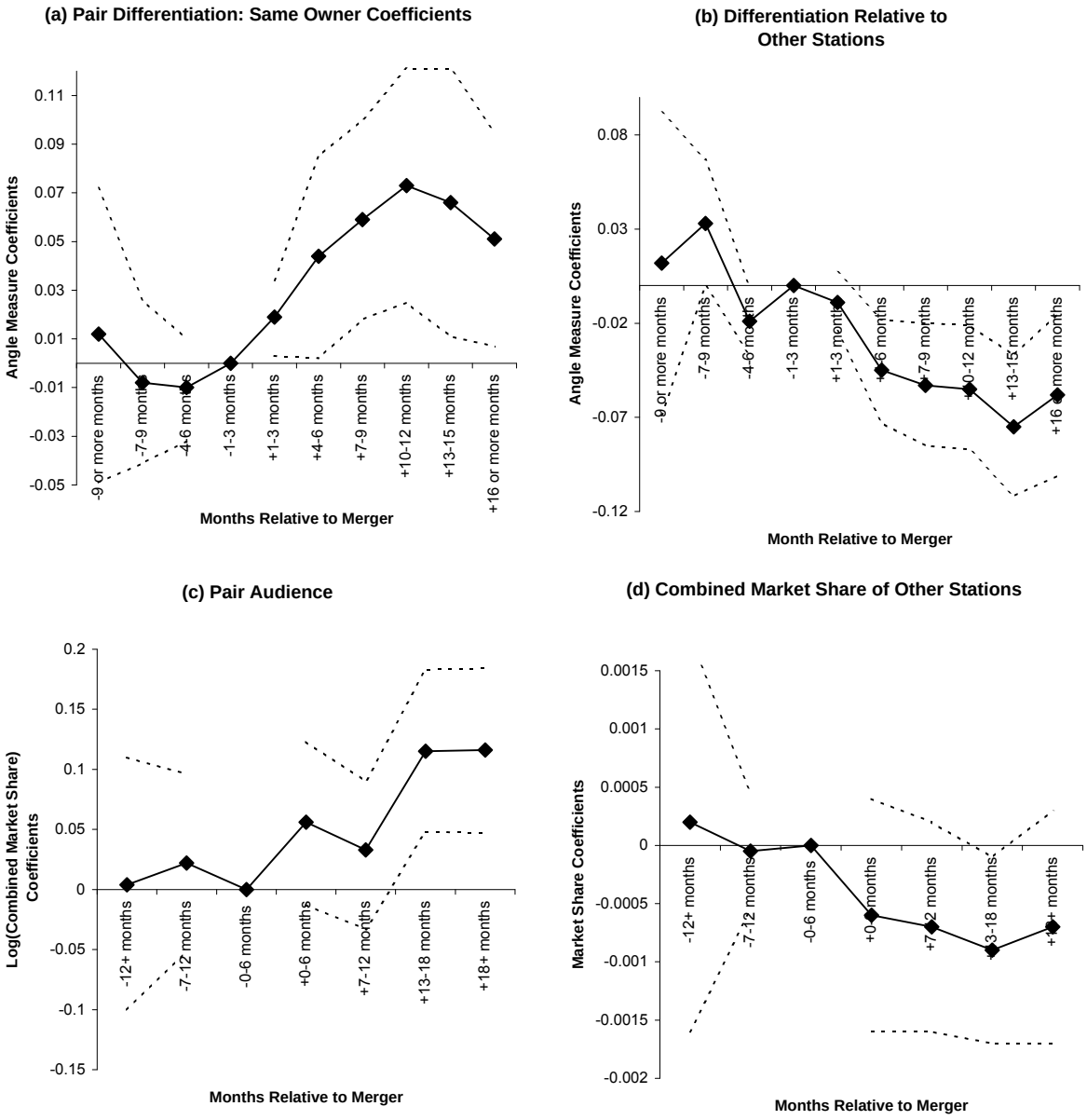
Figure 1: Timing of Changes in Differentiation and Market Shares for Mergers



Notes: dashed lines show 95% confidence intervals. Coefficients taken from regressions that exclude pairs ever switching from common to separate ownership. The underlying differentiation data is monthly and the market share data quarterly, so the months for the market share regressions reflect the nearest ratings quarter.

Table 1: Extract from a Daily Log of a Classic Hits (Rock) Station

Time	Artist	Song Title	Release Year
5:00PM	CLAPTON, ERIC	Cocaine	1980
5:04PM	BEATLES	While My Guitar Gently Weeps	1968
5:08PM	GRAND FUNK	Some Kind of Wonderful	1974
5:12PM	TAYLOR, JAMES	Carolina in My Mind	1976
5:16PM	RARE EARTH	Get Ready	1970
5:18PM	EAGLES	Best of My Love	1974
Stop Set	BREAK	Commercials and/or Recorded Promotions	-
5:30PM	BACHMAN-TURNER	Let It Ride	1974
5:34PM	FLEETWOOD MAC	You Make Loving Fun	1977
5:38PM	KINKS	You Really Got Me	1965
5:40PM	EDWARDS, JONATHAN	Sunshine	1971
5:42PM	ROLLING STONES	Start Me Up	1981
5:46PM	ORLEANS	Dance with Me	1975
Stop Set	BREAK	Commercials and/or Recorded Promotions	-
5:56PM	JOEL, BILLY	Movin' Out (Anthony's Song)	1977

Table 2: Coverage of the Playlist Sample (Fall 2001)

Format	Number of Market-Formats	Number of Sample Stations	Number of Stations Not in Sample	Average % of Format Listening Covered By Sample
70 Largest Arbitron Markets (New York City-Ft. Myers, FL)				
Adult Contemporary (AC)	66	162	59	89.2
Album Oriented Rock/Classic Rock (AOR)	65	98	13	95.9
Contemporary Hit Radio/Top 40 (CHR)	64	112	19	95.6
Country	64	94	47	92.1
Oldies	44	44	20	92.1
Rock	61	122	25	94.0
Urban	44	88	45	86.0
Smaller Arbitron Markets (Knoxville, TN and smaller)				
Adult Contemporary (AC)	56	78	57	78.7
Album Oriented Rock/Classic Rock (AOR)	34	45	21	82.5
Contemporary Hit Radio/Top 40 (CHR)	59	75	21	91.4
Country	60	76	61	85.7
Oldies	1	1	2	40.7
Rock	42	60	20	87.5
Urban	27	39	20	85.9

Table 3(a): Summary Statistics - Angle Measure of Differentiation

(i) Pairs in Same Market-Format

	Pairs with Different Owners		Pairs with Same Owner		
	Observations	Average (Std. D) Distance Measure	Observations	Average (Std. D) Distance Measure	t-test of difference p-value
Adult Contemporary	4,081	0.759 (0.183)	1,119	0.870 (0.098)	0.000***
Album Oriented Rock/ Classic Rock	1,070	0.751 (0.191)	475	0.868 (0.103)	0.000***
Contemporary Hit Radio/Top 40	1,689	0.730 (0.181)	187	0.843 (0.153)	0.000***
Country	1,304	0.382 (0.223)	419	0.338 (0.175)	0.000***
Rock	2,674	0.828 (0.160)	749	0.898 (0.083)	0.000***
Urban	1,230	0.730 (0.197)	763	0.824 (0.090)	0.000***

(ii) Comparison to Test Whether Duopolists Are Minimally Differentiated

	Pairs in Same Market-Format Separately Owned Duopolists		Pairs Made up of Market-Format Monopolists in Different Markets		
	Observations	Average (Std. D) Distance Measure	Observations	Average (Std. D) Distance Measure	t-test of difference p-value
Adult Contemporary	643	0.721 (0.166)	320	0.619 (0.191)	0.000***
Album Oriented Rock/ Classic Rock	452	0.724 (0.172)	2826	0.535 (0.169)	0.000***
Contemporary Hit Radio/Top 40	632	0.695 (0.168)	4839	0.532 (0.129)	0.000***
Country	110	0.313 (0.184)	1573	0.273 (0.053)	0.000***
Rock	353	0.776 (0.176)	2359	0.581 (0.189)	0.000***
Urban	35	0.662 (0.109)	107	0.631 (0.149)	0.258

(iii) Differentiation Between a Pair and Third Station in Same Market-Format

	Pair Separately Owned		Pair Commonly Owned By Firm Not Owning Other Station		
	Observations	Average (Std. D) Distance Measure	Observations	Average (Std. D) Distance Measure	t-test of difference p-value
Adult Contemporary	3,873	0.725 (0.174)	954	0.654 (0.173)	0.000***
Album Oriented Rock/ Classic Rock	528	0.688 (0.182)	156	0.509 (0.146)	0.000***
Contemporary Hit Radio/Top 40	665	0.701 (0.166)	40	0.690 (0.150)	0.656
Country	665	0.393 (0.198)	127	0.322 (0.065)	0.000***
Rock	4,797	0.570 (0.229)	615	0.596 (0.230)	0.011**
Urban	1,600	0.423 (0.226)	455	0.271 (0.156)	0.000***

Table 3(b): Summary Statistics - Combined Market Shares for Pairs in Same Market-Format

	Pairs with Different Owners		Pairs with Same Owner		
	Observations	Average (Std. D) Distance Measure	Observations	Average (Std. D) Distance Measure	t-test of difference p-value
Adult Contemporary	777	0.0144 (0.0044)	212	0.0143 (0.0046)	0.818
Album Oriented Rock/ Classic Rock	222	0.0131 (0.0045)	94	0.0139 (0.0036)	0.110
Contemporary Hit Radio/Top 40	318	0.0149 (0.0042)	35	0.0145 (0.0034)	0.606
Country	245	0.0154 (0.0048)	79	0.0156 (0.0035)	0.708
Rock	512	0.0098 (0.0034)	136	0.0124 (0.0038)	0.000***
Urban	240	0.0141 (0.0048)	145	0.0186 (0.0064)	0.000***

Note: tables do not include Oldies stations, because no commonly owned Oldies stations in the same market are observed.
***, **, * denote p-values statistically significant at the 10%, 5% and 1% levels respectively.

Table 4: Baseline Results
(a) Differentiation of Pairs Experiencing a Change in Common Ownership

Observations	(1) Format-Station Pair-Weeks	(2) Format-Station Pair-Weeks in Market-Formats with 3 or More Observed Stations	(3) Format-Station Pair-Weeks in Market-Format with 2 Observed Stations
Dep. Variable: Angle Measure of Differentiation			
Pair Same Owner	0.055***	0.068***	0.043**
	(0.014)	(0.022)	(0.018)
Adjusted R-squared	0.93	0.91	0.94
Dep. Variable: Proportion of Unique Artists Measure of Differentiation			
Pair Same Owner	0.072***	0.080***	0.069**
	(0.019)	(0.024)	(0.033)
Adjusted R-squared	0.92	0.92	0.93
Controls			
Week*Format Dummies	Y	Y	Y
Number of Station Dummies	Y	Y	Y
Fixed Effects	Station-Pair	Station-Pair	Station-Pair
Number of Observations	15,792	10,216	5,576

Note: standard errors clustered on the market-format in parentheses. ***, **, * denote statistical significance at the 1, 5 and 10% levels respectively. Regressions include observations in the same market-format.

Table 4(b): Differentiation of Commonly Owned Stations and Competitors

	(1)	(2)	(3)
Dep. Variable	Angle Distance	Proportion Measure	Log(Number of Artists)
Observations	Pair-Third Station Triplet-Weeks	Pair-Third Station Triplet-Weeks	Market-Format-Weeks
Pair Same Owner	-0.055*	-0.061	-
	(0.033)	(0.040)	
All Stations Have Same Owner	-	-	0.069**
			(0.030)
Number of Owners	-	-	0.009
			(0.025)
Controls			
Week*Format Dummies	Y	Y	Y
Number of Station Dummies	Y	Y	Y
Number of Observed Station Dummies	N	N	Y
Fixed Effects	Pair-Third Station Triplet	Pair-Third Station Triplet	Market-Format
Adjusted R-squared	0.91	0.92	0.92
Number of Observations	14,475	14,475	8,942

Notes: see Table 4(a).

Table 4(c): Market Shares

	(1)	(2)	(3)	(4)	(5)	(6)
Model	Linear Fixed Effects	Linear Fixed Effects	Linear Fixed Effects	Linear Fixed Effects	Conditional Fixed Effects Poisson	Conditional Fixed Effects Poisson
Observations	Format-Pair-Quarters	Format-Pair-Quarters	Format-Pair-Quarters	Format-Pair-Quarters	Format-Pair-Quarters	Format-Pair-Quarters
		Exclude Pairs Which Change Ownership When Format Duopolists	Exclude Pairs Which Change Ownership When ≥3 Stations in Format	Exclude Pairs Which Change Ownership When Format Duopolists		
Dep. Variable	Log(Combined Mkt. Share)	Combined Market Share	Combined Market Share	Combined Market Share of Other Stations	Number of Other Stations in Format	Number of Other (Ever) Sample Stations in Format
Exclude 2 quarters following ownership change?	N	Y	Y	Y	N	N
Pair Same Owner	0.031*	0.0011***	0.0003	-0.0012**	-0.140*	-0.252***
	(0.018)	(0.0003)	(0.0007)	(0.0005)	(0.076)	(0.081)
Controls						
Quarter*Format Dummies	Y	Y	Y	Y	Y	Y
Number of Station Dummies	Y	N	N	Y	N	N
Fixed Effects	Station-Pair	Station-Pair	Station-Pair	Station-Pair	Station-Pair	Station-Pair
Adjusted R-squared	0.91	0.93	0.92	0.92	-	-
Number of Observations	3,015	2,911	2,835	2,911	2,939	2,939

Notes: see Table 4(a). In columns (5) and (6) standard errors calculated using a non-parametric bootstrap where markets are resampled.

Table 4(d): Ownership and Commercial Loads

	(1)	(2)
Dep. Variable	Number of Commercial Blocks in Hour	Minutes of Commercials in Hour
Observations	Station-Hour-Day	Station-Hour-Day
Exclude 2 quarters following ownership change?	N	N
Owns other stations in same market-format	0.044	0.178
	(0.044)	(0.193)
Commonly owned market-format competitors	0.008	-0.056
	(0.062)	(0.370)
Controls		
Year*Format	Y	Y
Month*Format	Y	Y
Day of Week*Format	Y	Y
Number of Stations	Y	Y
Fixed Effects	Station-Format-Hour	Station-Format-Hour
Adjusted R-squared	0.42	0.39
Number of Observations	960,634	960,634

Notes: see Table 4(a).

Table 5(a): Effects of National Ownership on Market Shares

	(1)
Dep. Variable	Log(Market Share)
Observations	Station-Quarter
Owns other stations in same market-format	0.0554**
	(0.0230)
Commonly owned market-format competitors	-0.0200
	(0.0401)
Log(Number of stations owned nationally in format)	-0.0003
	(0.0070)
Controls	
Quarter*Format	Y
Number of Stations	Y
Fixed Effects	Station-Format
Adjusted R-squared	0.89
Number of Observations	6,406

Notes: see Table 4(a). Observations within 2 quarters of a change in one of the local ownership variables are excluded.

Table 5(b):Results By Format

		(1) Pair Differentiation (Angle Measure)	(2) Differentiation Between Pair and Other Station (Angle Measure)	(3) Pair Market Share	(3) Combined Market Share of Other Stations
Specfication Corresponding to		Table 4(a), col. (1)	Table 4(b), col. (1)	Table 4(c), col. (1)†	Table 4(c), col. (4)
Format	Number of Pairs Changing Common Ownership	Coefficient on Same Owner	Coefficient on Pair Commonly Owned	Coefficient on Same Owner	Coefficient on Same Owner
Adult Contemporary	13	0.083*	-0.146***	0.145***	-0.0018***
		(0.043)	(0.050)	(0.026)	(0.0005)
Album Oriented Rock	5	0.076***	-0.101***	0.054**	-0.0031***
		(0.025)	(0.026)	(0.026)	(0.0011)
Contemporary Hit Radio	4	0.101***	no observations	0.149***	no observations
		(0.022)		(0.037)	
Country	6	0.013	no observations	0.061**	0.0006
		(0.012)		(0.024)	(0.0004)
Rock	12	0.029**	0.018	0.045	-0.0005
		(0.011)	(0.009)	(0.036)	(0.0006)
Urban	6	0.083**	-0.047***	0.135*	-0.0024
		(0.035)	(0.013)	(0.079)	(0.0021)

Notes: see earlier tables. † : drop 2 quarters following ownership change. Coefficients from separate regressions.

Table 5(c): Tests of Whether Pairs Experiencing Ownership Changes are Representative

	(1)	(2)	(3)	(4)
Dep. Variable	Pair Differentiation (Angle Measure)	Differentiation Between Pair and Other Station (Angle Measure)	Pair Market Share	Combined Market Share of Other Stations
	Coefficient on Same Owner	Coefficient on Pair Commonly Owned	Coefficient on Same Owner	Coefficient on Same Owner
Separately Owned Pairs				
Coefficient on Pair	-0.040	0.022	0.0017	-0.0045***
Becomes Commonly Owned	(0.032)	(0.051)	(0.0011)	(0.0011)
Commonly Owned Pairs				
Coefficient on Pair	-0.025	-0.061*	-0.0011	0.0011
Becomes Separately Owned	(0.030)	(0.036)	(0.0010)	(0.0012)

Note: specifications include week or quarter*format controls and specifications (1), (2) and (3) include number of station controls. Pairs experiencing switches both types of switch excluded in both cases. Coefficients from separate regressions.

Table 5(d): Results By Type of Transaction

		(1) Pair Differentiation (Angle Measure)	(2) Differentiation Between Pair and Other Station (Angle Measure)	(3) Pair Market Share	(4) Combined Market Share of Other Stations
Specfication Corresponding to		Table 4(a), col. (1)	Table 4(c), col. (1)	Table 4(b), col. (1)†	Table 4(b), col. (4)
	Number of Remaining Pairs Changing Common Ownership	Coefficient on Same Owner	Coefficient on Pair Commonly Owned	Coefficient on Same Owner	Coefficient on Same Owner
<u>Size of Transaction</u>					
Exclude pairs involved in small transactions affecting common ownership	7	0.094* (0.057)	-0.179*** (0.054)	0.061* (0.033)	-0.0007 (0.0008)
Remaining Pairs	39	0.081*** (0.040)	-0.111*** (0.019)	0.090*** (0.023)	-0.0012** (0.0006)
<u>Direction of Ownership Change</u>					
Drop pairs which ever switch from common to separate ownership	24	0.051*** (0.157)	-0.058*** (0.013)	0.095*** (0.023)	-0.0008* (0.0005)
Drop pairs which ever switch from separate to common ownership	10	0.083** (0.040)	-0.062 (0.076)	0.046 (0.039)	-0.0021** (0.0011)

<u>Notes:</u> see earlier tables. † : drop 2 quarters following ownership change.

Table 5(e): External Validity Test Using Market Share Data for All Formats and Markets

	(1)	(2)
Dep. Variable	Log(Market Share)	Total Format Market Share
Observations	All Station-Quarters in 281 Arbitron Markets	All Market-Format-Quarters in 281 Arbitron Markets
Exclude 2 quarters following ownership change?	Y	Y
Owns other stations in same market-format	0.046**	-
	(0.022)	
Commonly owned format competitors	0.008	-
	(0.026)	
Number of owners	-	-2.96E-07
		(0.0002)
Controls		
Quarter*Format	Y	Y
Number of Stations	Y	Y
Fixed Effects	Station-Format	Market-Format
Adjusted R-squared	0.89	0.93
Number of Observations	32,643	15,777

Notes: see Table 4(a). Specification in column (2) excludes market-formats with no stations.

Appendix Table A: Market-Formats with 2 or More Observed Stations

Number of playlist sample stations in format**, number of ownership changes affecting station-pairs**

Arbitron Market Rank	Market Name	Adult Contemporary	Album Oriented Rock/ Classic Rock	Contemporary Hit Radio/ Top 40	Country	Oldies	Rock	Urban
1	New York	2	-	2	-	-	-	4
2	Los Angeles	3,**2**	2	2	-	-	-	3
3	Chicago, IL	4	-	3	-	-	5	3
4	San Francisco	4	2	2	-	-	3	2
5	Dallas - Ft. Worth	3	-	2	2	-	3, **1**	4, **1**
6	Philadelphia	3	-	-	-	-	5, **2**	3
7	Washington, DC	3	-	3	-	-	2	3
8	Boston	3	-	2	-	-	6	-
9	Houston-Galveston	3, **1**	-	2	3	-	3	2
10	Detroit	4	3	-	2	-	2	5
11	Atlanta, GA	2	2	3	2	2	2	3
12	Miami-Ft. Lauderdale-Hollywood	2	-	3	-	-	-	2, **1**
14	Seattle-Tacoma	6	2	2	-	-	3	-
15	Phoenix, AZ	2	3, **2**	3, **2**	2	-	3	-
16	Minneapolis - St. Paul	3	-	3	-	-	4	-
17	San Diego	-	3	3	3	-	4	-
18	Nassau-Suffolk	3, **1**	-	-	-	-	-	-
19	St. Louis	4	2	-	2	2	3	3
20	Baltimore, MD	2	2	-	-	2	-	2
21	Tampa-St. Petersburg-Clearwater	5, **2**	2	3	2, **1**	2	2	-
22	Denver - Boulder	4, **1**	3	2	-	-	4, **6**	-
23	Pittsburgh, PA	3	-	2	-	2	3	-
24	Portland, OR	4	2	2	2	-	2	-
25	Cleveland	3, **1**	-	-	-	-	2	3, **2**
26	Cincinnati	2	2	2	2, **1**	-	-	2
27	Sacramento, CA	3	2	3	-	-	-	-
29	Kansas City	3	3, **3**	2	3	-	-	2
30	San Jose	2	-	-	-	-	-	-
31	San Antonio, TX	2	2	3	3	-	-	-
32	Milwaukee - Racine	3	2	-	-	-	-	2
34	Salt Lake City - Ogden	3	2	3	3	2	2	-
35	Providence-Warwick-Pawtucket, RI	2	-	2	-	-	-	-
36	Columbus, OH	2	4	-	2	-	3	-
37	Charlotte-Gastonia-Rock Hill	3	2	-	2	2	3	3
38	Norfolk-Virginia Beach-Newport News	2	-	2	2, **1**	-	3	3
39	Orlando	4	-	3	-	-	2	3
40	Indianapolis, IN	4	-	3	-	-	2	2
41	Las Vegas, NV	3	2	2	2	-	2	-
42	Greensboro-Winston Salem-High Point	3	-	-	2	-	-	2
43	Austin, TX	-	2	2	-	-	4	-
44	Nashville	-	2	-	4	-	3	2
45	New Orleans	4	-	-	-	-	2	2
46	Raleigh - Durham, NC	2	-	-	2	-	-	2

47	W. Palm Beach-Boca Raton	3	-	-	-	-	-	-
48	Memphis	2	2	-	-	-	3	3
49	Hartford-New Britain-Middletown	2	2	2	-	-	3	-
50	Buffalo-Niagara Falls, NY	3	-	2	-	-	2	-
51	Monmouth-Ocean, NJ	2, **2**	-	-	-	-	-	-
52	Jacksonville, FL	-	-	2	2, **1**	-	2	2
53	Rochester, NY	4	-	2	-	-	2	-
54	Oklahoma City	2	2	2	2	-	-	-
55	Louisville, KY	-	3	2	-	-	-	2, **1**
56	Richmond, VA	2	2	-	-	-	-	2, **1**
57	Birmingham, AL	3	-	2	2	-	2	-
58	Dayton, Ohio	2	-	-	2	-	2	3
60	Greenville-Spartanburg, SC	2	-	-	2, **1**	-	-	-
61	Albany-Schenectady-Troy	-	-	-	-	-	3, **3**	-
62	Honolulu	4	-	3	-	-	-	-
64	Tucson, AZ	2	2	2, **1**	-	-	-	-
65	Tulsa, OK	2	2	2	2	-	2	-
66	Grand Rapids, MI	-	2	2, **1**	-	-	2	-
67	Wilkes Barre - Scranton	-	-	2	-	-	2	-
68	Fresno	3	-	-	-	-	-	-
70	Ft. Myers-Naples-Marco Island	-	-	-	3	-	2	-
71	Knoxville, TN	-	-	2	-	-	2	-
72	Albuquerque, NM	3	3	2	2	-	3	-
74	Omaha - Council Bluffs	2	-	2	2	-	4	-
76	Monterey-Salinas-Santa Cruz	2	-	2	-	-	-	-
77	El Paso, TX	2	2	-	-	-	-	-
78	Harrisburg-Lebanon-Carlisle, PA	-	2	-	2	-	-	-
79	Syracuse, NY	-	-	2	-	-	-	-
81	Toledo, OH	2	-	-	-	-	-	-
82	Springfield, MA	2	-	-	-	-	2	-
83	Baton Rouge, LA	-	-	-	2	-	-	2
84	Greenville-New Bern-Jacksonville	-	2	2	-	-	-	-
85	Little Rock, AR	2	2	4	2	-	-	-
86	Gainesville - Ocala, FL	-	-	-	-	-	2	-
88	Columbia, SC	-	-	-	-	-	-	3
89	Des Moines, IA	4	2	-	2, **1**	-	-	-
90	Bakersfield, CA	2	-	2	-	-	-	-
91	Mobile, AL	-	-	-	-	-	-	2
92	Wichita, KS	-	2	2	2	-	-	-
93	Charleston, SC	2	2	2	2	-	-	3
94	Spokane, WA	3, **1**	-	2	2	-	2	-
96	Colorado Springs, CO	2, **1**	2	-	2	-	-	-
97	Madison, WI	-	-	-	-	-	3	-
98	Johnson City-Kingsport-Bristol	-	2	2	-	-	-	-
101	Ft. Wayne, IN	2	-	-	-	-	2	-
102	Lexington-Fayette, KY	-	-	-	2	-	-	-
103	Lafayette, LA	-	-	-	2	-	-	-
106	Chattanooga, TN	-	-	-	-	-	2	-
108	Youngstown - Warren, OH	-	-	2	-	-	-	-

109	Roanoke-Lynchburg, VA	2	-	2	2	-	-	-
112	Augusta, GA	-	-	-	-	-	-	2
118	Worcester, MA	2	-	-	-	-	-	-
119	Portsmouth-Dover-Rochester, NH	-	-	-	-	-	2	-
120	Lansing-East Lansing, MI	-	2	-	-	-	2	-
121	Boise, ID	-	-	2	2	-	2	-
122	Jackson, MS	-	-	-	2	-	-	3
123	Modesto, CA	2	-	-	-	-	-	-
125	Pensacola, FL	-	-	-	-	-	2	-
126	Fayetteville, NC	-	-	-	-	-	-	2
127	Reno, NV	2	-	-	-	-	3	-
128	Canton, OH	2	-	-	-	-	-	-
132	Shreveport, LA	-	-	-	2	-	-	3
134	Corpus Christi, TX	2	-	-	-	-	-	-
135	Atlantic City - Cape May, NJ	3	-	-	-	-	2	-
140	Quad Cities, IA-IL	-	-	2	-	-	-	-
185	Green Bay, WI	-	-	2	-	-	-	-