

Preference externalities: an empirical study of who benefits whom in differentiated-product markets

Joel Waldfogel*

Theory predicts that in markets with increasing returns, the number of differentiated products, and the tendency to consume, will grow in market size. I document this phenomenon across 247 U.S. radio markets. By a mechanism that I term “preference externalities,” an increase in the size of the market brings forth additional products valued by others with similar tastes. But who benefits whom? I document sharp differences in preferences between black and white, and between Hispanic and non-Hispanic, radio listeners. As a result, preference externalities are large and positive within groups, and they are much smaller and nonmonotonic across groups.

1. Introduction

■ When fixed costs are large and preferences are heterogeneous, the number of products available—and the tendency for people to consume—can increase in the size of the market. Through a mechanism I term “preference externalities,” individuals’ consumption and perhaps satisfaction can depend on the distribution of consumer preferences in the market. When consumers share similar preferences, additional consumers increase the number of appealing options. When preferences differ across groups of consumers, then additional consumers in one group need not monotonically increase the number of options appealing to the other group.

Blacks and whites, and Hispanics and non-Hispanics, have starkly different preferences in media products. Radio programming formats collectively attracting 60% (46%) of black (Hispanic) listening attract 3% (.5%) of remaining (chiefly white) listening.¹ It is therefore interesting to ask how the numbers of radio stations targeting minorities and whites vary across local markets with the respective sizes of minority and white listener populations. If minority and white consumers have nonoverlapping preferences, i.e., they value entirely different products, then cross-group preference externalities will be zero. Additional blacks will attract more black-targeted

* University of Pennsylvania, and NBER; waldfogj@wharton.upenn.edu.

I am grateful to the Editor and referees for thoughtful comments that substantially improved the article. I am also grateful for much stimulating discussion to Jeff Milyo and Peter Siegelman, who is a coauthor on a related project, and to Spencer Glendon, Dennis Yao, and Severin Borenstein for comments. Thanks to seminar participants at Columbia, Wharton, Yale, the University of Pennsylvania Economics Department, MIT, the Federal Reserve Bank of New York, the University of Chicago, Dartmouth, the U.S. Department of Justice, and the Winter 2000 meetings of the NBER IO group at Stanford for helpful comments. Seminar participants at the FCC, the George Washington College of Law, and Cornell provided comments on a related article containing some results reported herein. All errors are my own.

¹ Black and white preferences in newspapers and television programming are similarly different. See George and Waldfogel (2000) and Waldfogel (2001).

entry, and additional whites more white-targeted entry. In principle, preference externalities need not be either positive or monotonic. If minorities accept white-targeted products when minority-targeted products are not available, then when minority consumers reach critical mass to support their first-choice product, they may switch away from white-targeted products. In this way additional black consumers can first increase, then reduce, the number of products aimed at whites.

These considerations raise a series of empirical questions. First, do preference externalities exist? Does the number of product offerings, and the overall tendency to consume, increase in the size of the market? Second, who benefits whom? Do all consumers generate the same preference externalities for each other? Are the effects of one group on another monotonic?

Although preference externalities can operate in the market for any differentiated product produced with fixed costs, the empirical portion of this article focuses on radio broadcasting for three reasons. First, fixed costs in radio are large relative to local market size. Second, as mentioned above, preferences differ sharply across groups. Finally, the relevant data, consumption by product type by consumer group by geographic market, are readily available for radio.

The article proceeds in five steps. Section 2 sketches a simple theoretical framework and connects arguments in the article with existing literature. Section 3 describes the data used in the study. Section 4 presents empirical results. I find evidence consistent with an overall preference externality: station entry and the average fraction of the population listening to radio increases in population. I then document that Hispanic and non-Hispanic, and especially black and white, preferences are quite different. As a result, group-targeted entry—and listening—increases in own-group size, while the minority population initially increases, then decreases, white-targeted entry. A brief conclusion follows.

2. Background

■ **Simple example.** A simple characterization in the spirit of Hotelling (1929) and Prescott and Visscher (1977) illustrates the theoretical ideas in this article. Radio stations are horizontally differentiated products with substantial exogenously fixed costs.² Consumers' ideal product types are distributed on a line. Rather than assuming a uniform distribution of preferences, suppose that there are two groups of consumers, say, whites and blacks, whose ideal product types have distributions centered at different points on the line. Because radio advertising is a fairly small component of the advertising market overall, it is not unrealistic in this context to assume that prices are set elsewhere.³ With prices fixed, the only determinant of product selection is the density of potential listeners at any location along the line, along with their "transport costs," or willingness to listen to products that deviate from their ideal.

A product is viable if it attracts enough total customers so that revenue covers fixed costs. If both types of persons are equally likely to listen, and all listeners are equally valuable to advertisers, then up to some integer constraint, the number of products in the market will be proportional to total population. The numbers of products serving different market segments will differ according to density. If the black population is small, there will be fewer (or possibly no) black-targeted stations, and they will be located fairly far apart.⁴ The larger white population will be targeted by more stations, located closer together. The tighter the spacing of stations, the greater tendency of a group to listen, because listeners will face lower transport costs to their nearest station.

If black and white ideal product distributions overlap, then fixed costs and the consequent lumpiness of products also introduce the possibility of nonmonotonic cross-group effects. If blacks have sufficiently low transport costs, they will listen to white stations when black-targeted options do not exist. At low levels of minority population, therefore, minorities can generate positive

² Although there is probably also some vertical differentiation in radio, my view is that the wide differences across consumers in their ideal programming leads to primarily horizontal competition.

³ According to Duncan (1994), radio advertising typically accounts for 15–20% of local ad revenue. See also Klein (1997).

⁴ Blacks may listen even in the absence of black stations if they have sufficiently low transport costs.

preference externalities for the majority. When black population increases beyond the threshold to support a first black-targeted product, blacks currently listening to white stations may switch from the available white options to the black-targeted option. This can render a white station uneconomic. If whites are unwilling to listen to black stations, this rearrangement may reduce white listening as well.

Similarly, as white population expands and the number of white-targeted options increases, the number of options in the region of product space where black and white distributions overlap will increase as well. This will reduce the size of the potential market for dedicated black-targeted options and may therefore reduce the number of black-targeted options.

To summarize, we would expect to see the following relationships: (1) the number of stations targeting each group increases in the size of the respective groups; (2) the tendency for individuals to listen increases in the number of stations targeting them and, therefore, in the size of the respective groups; and (3) at levels of minority population too low to support dedicated minority-targeted options, minority population may promote majority-targeted entry, while minority population may reduce majority-targeted entry at higher levels of minority population.

□ **Background.** Although a good deal of existing research examines questions related to those in this study, none looks at precisely these questions. A large group of studies examines effects of city size (or agglomeration) on productivity. Ciccone and Hall (1996) provide a recent example with citations to earlier literature. On the consumption side, Holmes (1998) uses the cross-MSA relationship between population (as a measure of market size) and the size of the local food wholesaling sector to infer the importance of increasing returns to scale in production and consumers' love of variety. A related literature consists of normative analyses of commercial broadcasting in general (see, for example, Spence and Owen, 1977; Borenstein, 1988; and Anderson and Coate, 1999, among others), as well as studies of minority broadcasting in particular (Spitzer, 1991; Wildman and Karamanis, 1997; and Siegelman and Waldfogel, 2001).

Economists have recently made substantial strides toward understanding competition in differentiated-products markets, taking the available menu of products as exogenous (see Berry, Levinsohn, and Pakes, 1995).⁵ My focus, by contrast, is on the process by which a market chooses what to produce, what Spence (1976a, 1976b) calls the "product selection problem."

3. Data

■ The basic dataset used in the study is a 1997 cross section of radio listening shares and population, by group, for 247 large U.S. radio markets. The data also include the number of stations, by programming format, along with a variety of city characteristics, for each market. The analysis in the article is done at the market level, but the underlying data are station level. The underlying data for all 247 markets include nearly 6,000 stations. The markets are very similar to MSAs.

The listening measure is Arbitron's average quarter hour (AQH) listening, the share of the population listening to radio for at least five minutes during an average quarter hour.⁶ Arbitron (1997) reports listening data by black/nonblack for 101 markets and by Hispanic/non-Hispanic for 54 markets. Data on stations' programming formats come from Duncan (1997), which classifies stations into over 40 formats.

(A slightly aggregated list of Duncan's formats includes the following: Adult Contemporary (AC), AC/Contemp. Hit Radio, Adult Contemp./New Rock, AC/Soft Adult Contemp., Album Oriented Rock (AOR), AOR/Adult Contemp., AOR/Classic Rock, Album Oriented Rock/New Rock, Album Oriented Rock/Progressive, Black, Black/Adult Contemp., Black/Gospel, Black/Oldies, Black/Talk, Big Band/Nostalgia, Big Band/Nostalgia/Religious, Country, Country/Full Service, Contemporary Hit Radio (CHR), CHR/Adult Contemp.,

⁵ Mazzeo (2002) allows firms to enter and to choose one of two types.

⁶ This measure reflects both the tendency to listen to radio as well as time spent listening. One person listening for two hours contributes as much to this measure as two persons listening each for one hour.

CHR/New Rock, CHR/Urban, Classical, Classic Album Oriented Rock, Classic Hits, Ethnic, Easy Listening, Full Service/Variety, Full Service/Variety/Talk, Gospel, Jazz, News, News/Talk, Oldies, Religious, Soft Adult Contemp., Spanish, Sports, Talk, Talk/Classic AOR, Talk/Full Service, Talk/Jazz.)

I am interested in characterizing the numbers of black and Hispanic-targeted stations in each market. Table 1 reports the listening distributions by selected formats, for blacks versus nonblacks (“whites”) and Hispanics versus non-Hispanics. Black and white preferences are sharply different, but they do overlap. While blacks make up an average of 18.7% of the population in the markets with black listening data, they make up over 50% of listeners at stations in six formats (Black, Black/Gospel, Black/Adult Contemp., Black/Oldies, Black/Talk, and Gospel). These formats, which I term narrowly black-targeted, collectively account for 61% of black listening but only 3% of white listening. Another three formats attract mixed but disproportionately black audiences. The black overlap formats—Contemp. Hit Radio/Urban, Jazz, and Religious stations—each have audiences over 30% black; together with the six narrowly black formats, these nine formats attract 77% of black listening and only 9% of white listening. I label these nine formats together as broadly black-targeted. A few formats, while appealing mainly to white audiences, also attract substantial shares of black listening: News, Contemp. Hit Radio, Soft Adult Contemp., Adult Contemp., Talk, Oldies, Country, and Sports collectively attract 16% of black listening, along with nearly half of white listening.

The differences between black and white preference distributions have a number of implications. First, the sharp differences between black and white preferences suggest that the effect of group size on group-targeted entry and listening will be larger within group than across group. Beyond that, the overlap of the two groups’ distributions raises the possibility that blacks would listen to white-targeted programming when black-targeted programming is not available. My data allow some direct examination of this: in the two markets with black listening data that are not served by black-targeted stations, black listening is nearly as high as elsewhere (17.3% versus 17.5% overall), and the following formats each attract over 5% of black listening: Contemp. Hit Radio (36%), Country (12%), Soft Adult Contemp. (10%), Album Oriented Rock (7%), Oldies (7%), and Adult Contemp. (6%). I term these the black second-choice formats.

Hispanics make up an average of 25% of the population in the 54 markets with Hispanic listening data, but they account for 96% of listening to Spanish-language radio. The only one that is narrowly Hispanic-targeted, this format attracts 46% of Hispanic listening and negligible non-Hispanic listening. No other format has mostly Hispanic listening, although Contemp. Hit Radio and Contemp. Hit Radio/Urban each have audiences that are 30% Hispanic, and I term these three the Hispanic overlap group. Together with Spanish-language radio, these three formats attract 61% of Hispanic listening and only 11% of non-Hispanic listening. I label these formats together as broadly Hispanic-targeted. The 15 formats that each attract at least 1% of Hispanic listening collectively attract 34% of Hispanic listening but 74% of non-Hispanic listening.⁷ Like black and white preferences, Hispanic and non-Hispanic programming preferences are quite different but contain substantial areas of overlap. In the four markets with Hispanic listening data that are not served by Spanish-language radio, Hispanics listen nearly as much as they do overall (15.6% versus 17.3% overall); the four Hispanic second-choice formats, each attracting over 5% of Hispanic listening, are Contemp. Hit Radio (22%), Black (13%), Adult Contemp. (12%), and Religious (7%).

Across all 247 markets, an average of 2.0 (3.7) stations are narrowly (broadly) black-targeted. An average of 1.2 (3.0) stations are narrowly (broadly) Hispanic-targeted. Population averages .70 million persons. Because much radio listening takes place in cars, I have data on the percentage of population driving to work, which averages about 42%, as well as average time spent commuting by commuters (20 minutes). The product of these two, the average time spent driving to work, is 7.9 minutes.

⁷ The formats attracting more than 1% of Hispanic listening are Oldies, Country, Adult Contemp., Soft Adult Contemp., Album Oriented Rock, Classic Album Oriented Rock, Talk, Jazz, Album Oriented Rock/New Rock, Black Adult Contemp., Black, Adult Contemp./Contemp. Hit Radio, Big Band, News, and News/Talk.

TABLE 1 Listening Preferences by Group and Format

Format	% of Group Listening		% of Format Listening That Is Hispanic	Cumulative % of Group Listening	
	Hispanic	Non-Hispanic		Hispanic	Non-Hispanic
Narrowly Hispanic-targeted					
Hispanic	45.74%	.53%	96.19%	45.74%	.53%
Hispanic overlap					
Contemporary Hit Radio	8.59%	6.01%	29.50%	54.33%	6.54%
Contemporary Hit Radio/Urban	6.36%	4.24%	30.51%	60.69%	10.79%
Other formats attracting substantial Hispanic listening					
Oldies	4.44%	6.08%	17.62%	65.13%	16.87%
Country	3.95%	8.71%	11.72%	69.08%	25.58%
Adult Contemporary (AC)	3.44%	5.41%	15.71%	72.53%	31.00%
Soft AC	3.16%	4.69%	16.45%	75.68%	35.69%
Album-Oriented Rock (AOR)	2.43%	4.86%	12.79%	78.12%	40.55%
Classic AOR	2.31%	3.85%	14.93%	80.43%	44.40%
Talk	2.21%	7.97%	7.52%	82.64%	52.38%
Jazz	1.95%	4.23%	11.92%	84.59%	56.61%
AOR/New Rock	1.88%	3.31%	14.24%	86.47%	59.92%
Black/AC	1.72%	4.57%	9.95%	88.20%	64.49%
Black	1.60%	3.99%	10.52%	89.80%	68.48%
AC/Contemporary Hit Radio	1.50%	2.94%	13.00%	91.30%	71.41%
Big Band	1.15%	4.07%	7.63%	92.44%	75.48%
News	1.14%	4.58%	6.77%	93.58%	80.06%
News/Talk	1.10%	3.44%	8.58%	94.68%	83.50%
Total	33.99%	72.72%	11.96%	94.68%	83.50%

Format	% of Group Listening		% of Format Listening That Is Black	Cumulative % of Group Listening	
	Black	Non-Black		Black	Non-Black
Narrowly black-targeted					
Black	32.52%	1.70%	81.70%	32.52%	1.70%
Black/Adult Contemporary	18.31%	.77%	84.79%	50.83%	2.47%
Gospel	3.84%	.09%	90.58%	54.67%	2.56%
Black/Oldies	2.42%	.07%	89.49%	57.10%	2.63%
Black/Gospel	1.77%	.03%	94.24%	58.87%	2.65%
Black/Talk	1.40%	.03%	91.33%	60.27%	2.68%
Black overlap					
Contemporary Hit Radio	7.68%	2.67%	40.17%	67.95%	5.35%
Jazz	6.47%	2.32%	39.44%	74.41%	7.67%
Religious	2.50%	1.19%	32.94%	76.91%	8.85%
Other formats attracting substantial black listening					
News	2.92%	3.04%	18.30%	79.83%	11.90%
Sports	1.02%	2.10%	10.22%	80.86%	14.00%
Soft AC	2.34%	5.13%	9.61%	83.20%	19.13%
Contemporary Hit Radio	2.49%	6.62%	8.05%	85.68%	25.75%
Adult Contemporary	1.99%	6.69%	6.49%	87.67%	32.44%
Talk	1.71%	6.12%	6.12%	89.38%	38.56%
Oldies	1.67%	6.68%	5.53%	91.05%	45.24%
Country	1.50%	11.90%	2.85%	92.55%	57.13%
Total	15.64%	48.28%	8.40%	92.55%	57.13%

An average of 24.5 commercial stations is received in each market.⁸ Of these, 16.3 are local stations (broadcasting from inside the metropolitan area), while 8.2 are broadcast from elsewhere. The distinction is useful because, based on previous research, inside stations are typically available to more local listeners. The simple average fraction of the population listening to radio for at least five minutes during an average quarter hour (the AQH listening share) is 15.8%. Blacks listen more than whites (17.9 versus 15.4 in the 101 markets with black data). Hispanics listen more than non-Hispanics (17.5 versus 15.8 in the 54 markets with Hispanic data). That blacks listen more than whites, and Hispanics more than non-Hispanics, despite facing far fewer stations targeting them, suggests greater tastes for radio listening among these communities. Moreover, minorities listen to radio nearly as intensely in markets without group-targeted alternatives as they do in markets with group-targeted options. This suggests that some minority listening to non-group-targeted options reflects minorities accepting second-choice alternatives.

4. Results

■ **Basic evidence of preference externalities.** In this section we ask whether entry and listening are higher in larger markets. Column 1 of Table 2 reports a regression of the number of inside stations in each metro area on measures of market size (log of metro area population and the number of stations received in the area but broadcasting from outside the metro area), along with other controls. Larger markets support more products, and a similar relationship holds for the number of different programming formats as opposed to the number of stations (see Berry and Waldfogel, 1999b).

The second question is whether the larger menu of products attracts a larger fraction of population to listening. A simple way to test this is to regress a measure of listening tendency, the log odds ratio of the listening share, on a measure of the number of stations. Column 2 shows that the listening tendency is higher in markets with more stations. Inside stations have a larger effect than outside stations. This is encouraging evidence, but it is possible that station entry is endogenous with respect to listening. In column 4 I address this concern by instrumenting inside stations with the measures of market size, population and outside stations (as in column 1). Market size measures are employed throughout the empirical entry literature as determinants of the number of firms in local markets. They are reasonable instruments in this context as long as market size has no direct effect on the tendency to listen to radio. The effect of inside stations remains significant and is almost identical to its OLS counterpart in column 2.

It is possible that tastes for listening are correlated with market size through channels other than the additional entry that larger markets allow. To examine this, I tried including both stations and population directly in the regression. With both included, in column 3, population has no effect. This suggests that population works its effect on listening through entry rather than other channels.⁹

Consumers in larger markets face more programming options, drawing more listening. For radio listeners, preference externalities across consumers as a whole are positive. Because radio listening is unpriced, it is difficult to make welfare statements. The dependent variable is essentially the per-capita quantity consumed in a context with a zero price. If the shape of the demand curve were the same everywhere, then the higher per-capita consumption in larger markets would reflect more consumer surplus per capita in larger markets. In that case we could say that people benefit each other in their capacity as radio listeners.

□ **Group-targeted entry and group size.** We know (i) that larger markets support more stations, and (ii) that different groups prefer substantially different programming. In this subsection

⁸ Noncommercial radio accounts for a negligible amount of total radio listening. See Berry and Waldfogel (1999a) for evidence about the relationship between commercial and public radio.

⁹ Of course, in this straight cross-sectional design, unobserved factors may still account for the results. I am able to surmount this problem in my main “who benefits whom” results below, where I have two group-specific listening measures per market.

TABLE 2 Market Size, Entry, and Listening

	Inside Stations OLS (1)	Listening $\ln(s/(1-s))$ OLS (2)	Listening $\ln(s/(1-s))$ OLS (3)	Listening $\ln(s/(1-s))$ IV (4)	Listening $\ln(s/(1-s))$ OLS (5)
Inside stations		.0049 (.0010)**	.0048 (.0015)**	.0049 (.0013)**	
Outside stations	-.3875 (.0288)**	.0025 (.0008)**	.0025 (.0009)**	.0026 (.0009)**	
Log population	5.1540 (.2871)**		.0009 (.0100)		.0233 (.0065)**
Average commute \times % driving	.1254 (.2848)	.0068 (.0063)	.0066 (.0067)	.0066 (.0069)	.0088 (.0067)
Median family income (\$)	-.0001 (.0001)	-.0000 (.0000)	-.0000 (.0000)	-.0000 (.0000)	-.0000 (.0000)
Northeast	-.8983 (.7689)	.0664 (.0174)**	.0664 (.0175)**	.0666 (.0175)**	.0648 (.0175)**
North central	-1.5728 (.7342)**	.0609 (.0168)**	.0609 (.0168)**	.0611 (.0169)**	.0526 (.0170)**
South	-1.9032 (.7704)**	.0014 (.0179)	.0014 (.0180)	.0018 (.0184)	-.0089 (.0181)
% Black	3.5541 (2.9642)	.1374 (.0672)**	.1370 (.0674)**	.1364 (.0681)**	.1545 (.0686)**
% Hispanic	5.5734 (2.1414)**	.2167 (.0491)**	.2163 (.0494)**	.2153 (.0516)**	.2511 (.0491)**
Constant	27.3282 (1.9545)**	-1.8717 (.0341)**	-1.8674 (.0598)**	-1.8721 (.0343)**	-1.7517 (.0433)**
Number of observations	248	247	247	247	247
R ²	.81	.35	.35	.35	.32

* Significant at 5% level; ** significant at 1% level. Standard errors in parentheses.

I examine how the pattern of entry (into group-targeted formats) varies across markets with the joint distribution of product-preferring types.

Column 1 (2) of Table 3 reports regressions of the fraction of stations that are black- (Hispanic-) targeted on the percentage black (Hispanic) in local population, along with controls. Markets with higher minority concentration have proportionately more minority-targeted stations, although inspection of scatter plots also confirms that sufficiently small markets have no minority stations regardless of their percentage minority.

Columns 3–6 report regressions of the number of group-targeted stations on local minority and majority populations. In these regressions I use narrow definitions of minority-targeted programming and the broad definition of majority-targeted programming as dependent variables. A number of results stand out in these columns. First, group-targeted entry measures increase in the size of the group. Markets with larger black populations have more black-targeted stations, etc. Second, own effects on entry are uniformly larger than cross effects. Black population has a much larger positive effect than white population on black-targeted entry; white population has a larger effect than black population on white entry. Results are analogous for Hispanics and non-Hispanics. It is clear from columns 1–6 that the distribution of available products is sensitive to the distribution of product-preferring types. Finally, most cross-group effects are negative (except the coefficient on Hispanic population in the non-Hispanic entry regression in column 5).

Given the overlap in preferences across groups, and the fact that minorities listen to second-choice options when group-targeted options are not available, it is not clear that cross effects would be monotonically negative. In particular, we might expect the first minority-targeted stations appearing in a market to draw audiences from the most appealing majority-targeted stations

TABLE 3 Group Population and Group-Targeted Entry

	% Stations Black (1)	% Stations Hispanic (2)	White Entry (3)	Black Entry (4)	Non-Hispanic Entry (5)	Hispanic Entry (6)
% of population black	.7782 (.0377)**					
% of population Hispanic		.6582 (.0173)**				
Log white population			5.5329 (.3430)**	-.3033 (.1463)*		
Log black population			-.5153 (.1899)**	.7176 (.0823)**		
Log non-Hispanic population					4.5477 (.3131)**	-.5629 (.1431)**
Log Hispanic population					.0089 (.1536)	.9128 (.0763)**
Average commute × % driving	.0070 (.0033)*	.0024 (.0023)	-.1398 (.2665)	.2102 (.1107)	.1297 (.2716)	.1593 (.1165)
Median family income (\$000)	-.0007 (.0008)	-.0003 (.0006)	-.0612 (.0572)	-.0431 (.0237)	-.0869 (.0581)	-.0645 (.0252)*
Northeast	-.0120 (.0097)	-.0057 (.0074)	-1.4305 (.7053)*	-.1895 (.2931)	.1862 (.7517)	-.4813 (.3231)
North central	.0001 (.0092)	.0021 (.0071)	-2.3272 (.6696)**	.2180 (.2788)	-.7083 (.7373)	-.0072 (.3219)
South	.0049 (.0102)	-.0023 (.0069)	-2.1256 (.7458)**	.5364 (.3112)	-.6167 (.6886)	-.1767 (.3006)
Outside stations			-.3541 (.0291)**	-.0957 (.0988)	-.3870 (.0284)**	.0552 (.1011)
Constant	-.0313 (.0198)	-.0107 (.0145)	26.7956 (1.9924)**	3.5972 (.8139)**	26.0320 (1.8252)**	5.6481 (.7778)**
Number of observations	249	251	249	249	251	251
R ²	.77	.88	.78	.54	.79	.55

Notes: Dependent variable in columns 1 and 2 is the fraction of local stations that are minority-targeted, using the narrow definition. Inside and outside stations are included in the numerator and denominator. Dependent variable in columns 3–6 is the number of inside stations targeting the group. The “Outside Stations” measure is the number of outside stations targeting the group.

* Significant at 5% level; ** significant at 1% level. Standard errors in parentheses.

formerly available. I explore this with regressions of various measures of group-targeted entry on dummies for group population quintiles (and controls) in Table 4. Column 1 reports a regression of broadly white-targeted stations on dummies for white and black population quintiles. Not surprisingly, white-targeted entry increases sharply and monotonically in white population. The relationship between black population and white-targeted entry is not monotonic. Markets in the second black population quintile have 2.3 more white stations than markets in the lowest black population quintile, and this difference is statistically significant. Thereafter, increases in black population reduce white-targeted entry. We would expect this nonmonotonic relationship to be more acute for the black second-choice formats; using entry into these formats as the dependent variable (in column 2), we again see the monotonic relationship clearly, although less significantly than in column 1. Column 3, a regression of narrowly black-targeted entry on group population quintiles, shows that black entry increases monotonically in black population and decreases in white population, particularly at high white population levels.

The latter three columns repeat the exercise for Hispanics and non-Hispanics. In column 4 we see that broadly non-Hispanic entry increases monotonically in non-Hispanic population but bears no clear relationship to Hispanic population. Entry in Hispanic second-choice formats appears to bear a nonmonotonic relationship with Hispanic population, rising to the third quintile and falling

TABLE 4 Group-Targeted Entry and Group-Size Quintiles

	Broadly White- Targeted (1)	Black Second Choices (2)	Narrowly Black- Targeted (3)	Broadly Non-Hispanic- Targeted (4)	Hispanic Second Choices (5)	Narrowly Hispanic- Targeted (6)
Black quintile 2	2.6149 (1.1507)*	1.2853 (.6777)	.2992 (.2993)			
Black quintile 3	1.7463 (1.2700)	-.2398 (.7480)	1.5430 (.3303)**			
Black quintile 4	.4832 (1.4065)	-.3260 (.8283)	3.2201 (.3658)**			
Black quintile 5	-.5567 (1.7844)	-1.3750 (1.0509)	5.3901 (.4641)**			
White quintile 2	4.4994 (1.1153)**	2.1758 (.6569)**	-.1505 (.2901)			
White quintile 3	6.5681 (1.2125)**	2.5851 (.7141)**	-.2349 (.3153)			
White quintile 4	9.5871 (1.2933)**	3.3649 (.7617)**	-.7646 (.3364)*			
White quintile 5	11.3787 (1.6653)**	2.9701 (.9808)**	-2.4983 (.4331)**			
Hispanic quintile 2				-1.2258 (1.1146)	.3507 (.4352)	.2487 (.3770)
Hispanic quintile 3				.5552 (1.2165)	.6249 (.4750)	.8770 (.4115)*
Hispanic quintile 4				1.6225 (1.2485)	.3575 (.4875)	1.4301 (.4223)**
Hispanic quintile 5				1.2918 (1.4733)	-.6812 (.5753)	6.0113 (.4984)**
Non-Hispanic quintile 2				4.0110 (1.1043)**	1.0900 (.4312)*	-.2805 (.3735)
Non-Hispanic quintile 3				7.9337 (1.1968)**	2.3059 (.4673)**	-.4799 (.4048)
Non-Hispanic quintile 4				8.4287 (1.3040)**	1.9793 (.5092)**	-.9545 (.4411)*
Non-Hispanic quintile 5				8.4026 (1.6063)**	1.9584 (.6273)**	-2.0288 (.5434)**
Number of observations	249	249	249	251	251	251
R ²	.56	.29	.64	.57	.34	.59

Notes: All regressions include the controls in Table 3. Second-choice formats each attract at least 5% of black (or Hispanic) listening in markets without group-targeted options. See text.

* Significant at 5% level; ** significant at 1% level. Standard errors in parentheses.

in the fourth and fifth. These relationships, while suggestive, are not statistically significant. The last column shows that Hispanic entry rises monotonically in Hispanic population, although fairly little until the fourth and fifth quintiles.

□ **Group-targeted programming and listening.** The results above indicate that the products crowd the regions of product space where the potential listeners are. Do people prefer programming targeted to their group? When I examine the relationship between group listening and the numbers of own and other-group-targeted stations for the 101 (54) markets with black (Hispanic) listening data, I find that (i) inside stations have bigger effects than outside stations, and (ii) the tendency for blacks to listen increases more sharply in the number of black-targeted options than in the number of white options, and vice versa. Hispanic listening increases in the number of Hispanic

TABLE 5 Group Size and Group Listening

	White Listening (1)	Black Listening (2)	Black-White Listening (3)	Hispanic Listening (4)	Non-Hispanic Listening (5)	Hispanic-Non-Hispanic Listening (6)
Log white population	.0696 (.0176)**	-.0271 (.0279)	-.0966 (.0279)**			
Log black population	-.0190 (.0174)	.0967 (.0276)**	.1158 (.0276)**			
Log Hispanic population				.0367 (.0183)	.0083 (.0101)	.0285 (.0201)
Log non-Hispanic population				-.0375 (.0211)	-.0044 (.0117)	-.0330 (.0231)
Average commute × % driving	-.0052 (.0119)	.0018 (.0188)	.0070 (.0189)	.0695 (.0253)**	.0365 (.0140)*	.0331 (.0277)
Median family income (\$000)	-.0008 (.0024)	-.0031 (.0038)	-.0023 (.0038)	-.0134 (.0063)*	-.0097 (.0035)**	-.0037 (.0069)
Northeast	.1202 (.0486)*	.1308 (.0769)	.0106 (.0769)	.0720 (.0729)	.1665 (.0403)**	-.0945 (.0799)
North central	.0830 (.0477)	-.0027 (.0754)	-.0856 (.0754)	-.0217 (.1331)	.0887 (.0734)	-.1103 (.1458)
South	.0338 (.0478)	.0285 (.0755)	-.0053 (.0756)	-.0225 (.0475)	-.0400 (.0262)	.0175 (.0521)
Constant	-1.6794 (.0998)**	-1.2757 (.1578)**	.4037 (.1579)*	-1.5818 (.1351)**	-1.6063 (.0746)**	.0246 (.1481)
Number of observations	101	101	101	54	54	54
R ²	.46	.31	.28	.25	.44	.16

Notes: Listening measure is $\ln(1/(1-s))$, where s is each group's AQH share of population listening to radio.

*Significant at 5% level; ** significant at 1% level. Standard errors in parentheses.

stations. Non-Hispanic listening does not vary with the number of Hispanic and non-Hispanic options among the 54 markets with Hispanic data, possibly because all these markets have many non-Hispanic options.¹⁰

□ **Who benefits whom? Direct evidence.** Table 5 examines the direct relationship between group listening and respective group sizes for the 101 markets with black listening data and the 54 markets with Hispanic listening data. The first two columns report black and nonblack regressions. Own-group effects on listening are positive and significant. They are especially large for blacks. Own-group effects are also substantially larger than cross effects, which are negative and insignificant, although the effect of blacks on whites is nearly significant. Negative cross effects, if they operate, are muted in these regressions for two reasons. First, the markets included in these regressions have comparatively large minority populations. Virtually all of them have minority-group-targeted entry, so there is less scope for finding negative cross-group effects than in the markets included in the entry regressions. Second, because people tend to listen to radio even when their first choice is not available, the negative cross effects in entry will not necessarily be reflected in strong negative listening cross effects.

It is possible that black and white listening in each MSA are both related to an unobserved factor that is correlated with, say, market size. If we subtract white listening from black listening to calculate the black-white listening gap in each market, we remove the local unobservable common to both groups. A regression of this gap on white and black population (and controls), in column 3 of Table 5, shows that the black-white listening gap is larger in markets with higher black populations and smaller in markets with higher white populations. These effects are statistically

¹⁰ See Waldfogel (1999) for additional evidence.

significant. The last three columns of Table 5 report results for Hispanics and non-Hispanics. Sign patterns are similar but significance levels are lower, possibly due to the small sample of markets with Hispanic listening data.

5. Conclusion

■ I document that blacks and whites—and Hispanics and non-Hispanics—have sharply different preferences in radio programming. Because there are fixed costs of providing radio stations in local markets, the number of stations targeting each group generally increases in the size of the group. Finally, I document that black and white listening tendencies increase in own-group populations, and cross effects are typically negative but are not necessarily monotonic. Increased minority population from a low level raises majority entry, while continued increases in black or Hispanic population reduce majority-targeted entry. The nonmonotonicity is statistically significant only for blacks. At sufficiently high levels of minority population, additional consumers bring forth additional products appealing only to members of their own groups.

Are these important effects in the economy, or a curious feature of radio markets? While only additional research can answer this question, we can speculate here about other markets where such effects might also operate. The fundamental conditions needed to produce compartmentalized preference externalities are large fixed costs and preferences that differ sharply across groups of consumers. These conditions are likely to hold, to greater or lesser extents, in a variety of media markets—newspapers, magazines, television, and movies. Outside of media markets, we would expect to see similar effects for other goods involving large sunk investments, such as pharmaceuticals.

In this article I have documented certain descriptive facts about the operation of differentiated-product markets with large fixed costs and preferences that differ sharply across consumer groups. A logical next step for this research is the estimation of models tied more closely to theory. For example, one might estimate a nested logit listening demand model, as outlined by Berry (1994), with minority and nonminority nests. The more difficult task is to formulate an entry model (possibly building on Mazzeo (2002)) in which firms choose not only whether to enter but whether to broadcast minority or majority programming.

References

- ANDERSON, S.P. AND COATE, S. "The Welfare Economics of Commercial Broadcasting Systems: A Fresh Look." Mimeo, Department of Economics, Cornell University, 1999.
- THE ARBITRON COMPANY. *Radio Metro Market Guide, 1993–1994*. New York: The Arbitron Company, 1994.
- . *Radio USA, Spring 1997*. New York: The Arbitron Company, 1997.
- BERRY, S.T. "Estimating Discrete-Choice Models of Product Differentiation." *RAND Journal of Economics*, Vol. 25 (1994), pp. 242–262.
- AND WALDFOGEL, J. "Free Entry and Social Inefficiency in Radio Broadcasting." *RAND Journal of Economics*, Vol. 30 (1999a), pp. 397–420.
- AND ———. "Public Radio in the United States: Does It Correct Market Failure or Cannibalize Commercial Stations?" *Journal of Public Economics*, Vol. 71 (1999b), pp. 189–211.
- , LEVINSOHN, J.A., AND PAKES, A. "Automobile Prices in Market Equilibrium." *Econometrica*, Vol. 63 (1995), pp. 841–890.
- BORENSTEIN, S. "On the Efficiency of Competitive Markets for Operating Licenses." *Quarterly Journal of Economics*, Vol. 103 (1988), pp. 357–385.
- CICCONE, A.F. AND HALL, R.E. "Productivity and the Density of Economic Activity." *American Economic Review*, Vol. 86 (1996), pp. 54–70.
- DUNCAN, J.H. *Duncan's American Radio*. Indianapolis: Duncan's American Radio, Spring 1993, 1997.
- . *Duncan's Radio Market Guide 1994*. Indianapolis: Duncan's American Radio, 1994.
- GEORGE, L.M. AND WALDFOGEL, J. "Who Benefits Whom in Daily Newspaper Markets?" NBER Working Paper no. 7944, 2000.
- HOLMES, T. "How Important Is Variety and Returns to Scale: What Can We Learn from Local Demand?" Mimeo, University of Minnesota, 1998.
- HOTELLING, H. "Stability in Competition." *Economic Journal*, Vol. 39 (1929), pp. 41–57.
- KLEIN, J.I. "DOJ Analysis of Radio Mergers." Address, Washington, D.C., February 19, 1997. Available at <http://www.usdoj.gov/atr/public/speeches/jik97219.htm>.

- MAZZEO, M.J. "Product Choice and Oligopoly Market Structure." *RAND Journal of Economics*, Vol. 33 (2002), pp. 221-242.
- PRESCOTT, E.C. AND VISSCHER, M. "Sequential Location among Firms with Foresight." *Bell Journal of Economics*, Vol. 8 (1977), pp. 378-393.
- SIEGELMAN, P. AND WALDFOGEL, J. "Race and Radio: Preference Externalities, Minority Ownership, and the Provision of Programming to Minorities." In M.R. Baye and J.P. Nelson, eds., *Advances in Applied Microeconomics, Vol. 10: Advertising and Differentiated Products*. Amsterdam: JAI/Elsevier, 2001.
- SPENCE, A.M. "Product Differentiation and Welfare." *American Economic Review*, Vol. 66 (1976a), pp. 407-414.
- . "Product Selection, Fixed Costs, and Monopolistic Competition." *Review of Economic Studies*, Vol. 43 (1976b), pp. 217-235.
- AND OWEN, B. "Television Programming, Monopolistic Competition, and Welfare." *Quarterly Journal of Economics*, Vol. 91 (1977), pp. 103-126.
- SPITZER, M.L. "Justifying Minority Preferences in Broadcasting." *Southern California Law Review*, Vol. 64 (1991), pp. 293-418.
- WALDFOGEL, J. "Preference Externalities: An Empirical Study of Who Benefits Whom in Differentiated Product Markets." NBER Working Paper no. 7391, 1999.
- . "Who Benefits Whom in Local Television Markets?" Mimeo, The Wharton School, University of Pennsylvania, 2001.
- WILDMAN, S.S. AND KARAMANIS, T. "The Economics of Minority Programming." Paper presented at 1997 Aspen Institute Forum, "Delivering on Diversity: New Approaches to Marketing Minority Programming." November 1997.