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PREFERENCE EXTERNALITIES IN MEDIA MARKETS†

Abstract

Media industries typically exhibit two fundamental features, high fixed costs and heterogeneity of consumer preferences. Daily newspaper markets, for example, tend to support a single product. In other examples, such as radio broadcasting, markets often support multiple differentiated offerings. Both contexts can deliver preference externalities, when the options and well-being for consumers depend on the number and mix of consumers according to their content preferences. This chapter presents evidence on these fundamental features of media markets. We then incorporate these features into a suite of theoretical models to obtain both a description of media markets as well as predictions for how they would be expected to function. In a third section we turn to "results," i.e. empirical evidence on the questions illuminated by the theoretical models. We then explore the effects of technological change, and we suggest directions for future work.

Keywords: broadcasting, differentiation, entry, media markets and preference externalities

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1. Introduction

One of the basic intuitions about markets implicit in many elementary discussions – and explicit in the work of Friedman (1962) – is that markets, unlike political decision processes, avoid the tyranny of the majority. "Each man can vote, as it were, for the color of tie he wants and get it; he does not have to see what color the majority wants and then, if he is in the minority, submit" (p.15). To say this another way, the products that a consumer gets from the market depend only his own preferences and means, but they do not depend on the preferences of others. Yet, when fixed costs are substantial, this intuition is not correct. Consumers get products that they find appealing only to the extent that others share their preferences, giving rise to a phenomenon one might term "preference externalities" and which we define more precisely below.

Preference externalities are common in media markets for three reasons. First, media products tend to have high – and almost exclusively – fixed costs. In the absence of fixed costs then the market could provide a continuum of products catering to diverse preferences. That is, every taste type could have its own tailored service, provided at marginal cost (Mussa and Rosen, 1978, deliver a "quality" model along these lines). Then there is no preference externality problem, and no worry about product selection distortion. Of course, fixed costs are not zero, and whether a market is served at all depends on whether a firm or firms can extract sufficient net revenues to cover entry costs. A second important feature of media markets is that the structure of preferences differs substantially across groups of consumers. Men and women tend to prefer different types of media products, as do young and older people, as do blacks and whites, as well as Hispanics vs non-Hispanics. Preference cleavages are not by any means limited to the distinctions among US consumer groups. The different linguistic groups within Europe, for

example, provide excellent additional examples. The more that preferences differ across groups, the less that entry targeting one group will benefit members of another group. The more heterogeneous is the population in terms of tastes for different varieties, and the more intense the willingness to pay for different variants (and the less substitutable are the variants for consumers), the more types will be produced.[1]

Finally, in many media markets advertising finance is the sole, or at least a major source, of revenues. This means that if advertising demand is weak, then the market may not be served. This could be a major problem in market provision (and hence a role for government intervention, for example with a public broadcaster) in less developed nations, or in other contexts in which audiences have insufficient commercial value to advertisers to cover costs with revenue. When the market is served, markets provide content appealing to consumers whom advertisers covet rather than content appealing to consumers themselves, giving rise to another reason why the content one faces might depend on the preferences of others.

Prominent examples of media markets with preference externalities are newspapers, radio and television stations, magazine, and various kinds of web properties. The way that preference externalities operate depends largely on the magnitude of fixed costs in relation to market size and, consequently, the number of products in the market. At one extreme are daily local newspaper markets, many of which are literal monopolies. If consumers affect each other in daily newspaper markets, it will be through the quality and positioning of the sole product. Local radio markets, with about 20 products per market across large US metropolitan areas,

[1] Preference externalities are not specific to media markets and can arise whenever fixed costs are high and preferences differ across groups of consumers. See, for example, Bhattacharya and Packalen, M. (2008, 2011); Chevalier, Harrington, and Scott Morton, F. (2008). Related issues arise in Handbury (2011), Haurin and Rosenthal (2009); Rosenthal and Strange (2008); Choi and Bell (2011), as well as Cutler, Glaeser, and Vigdor (2008).

provide a contrasting example. With multiple products in the market, groups of consumers with heterogeneous tastes can affect each other by bringing forth additional products that may, or may not, appeal across groups.

This chapter lays out a framework for thinking about media products embodying fixed costs, heterogeneity of consumer preferences and product differentiation, and advertiser finance. First, we present some evidence on a few primitives: that making products available has significant fixed costs, how preferences differ across groups, and the important role of advertiser rather than user finance of products. We then incorporate these features into a suite of theoretical models to obtain both a description of media markets as well as predictions for how they would be expected to function. For example, how does the mix of consumers, by preference groups, affect the targeting of the product or products, as well as the well-being of market participants? How does market size affect entry and welfare? How do market outcomes relate to optimal configurations? We use these models both to illuminate how preference externalities operate in media markets as well as how ongoing changes in technology – reducing entry costs relative to market size – would be expected to change media markets. In a third section we turn to "results," i.e. empirical evidence on the questions illuminated by the theoretical models. We discuss empirical results on entry and preference externalities that speak to the predictions, we discuss the effects of technological change, and we suggest directions for future work.

2. Fixed Costs and Heterogeneous Preferences

2.1 Fixed Costs

Media outlets, such as newspapers and radio and television stations, have cost structures that are predominantly fixed. The cost of putting together a daily newspaper is based mostly on the staff of reporters and editors, and this cost does not vary directly with the number of copies produced (although a newspaper with more content might attract more readers). To a varying degree across different sorts of media products, these fixed costs are large, in the sense that markets can support few, or sometimes only one, product. In the late 1990s the *Columbus Dispatch*, the major newspaper serving a metropolitan area of roughly 3 million people, had 69 reporters and editors. At the same time, the *New York Times*, serving the 22 million person metro area around New York, had about 300 reporters and editors.[2] According to the Bureau of Labor Statistics, reporters and editors earn an average of $44,000 per year.[3] Hence, the annual fixed cost of putting together content at these two papers was roughly $3 million and $13 million, respectively. Radio stations have a similar cost structure, although their absolute level of fixed costs is much lower than for newspapers. One cost estimate for a rudimentary religious radio station puts the annual cost of operation at $142,000 per year.[4] Typical radio stations have more employees, including at least 6 on-air personalities, as well as other mangers, sales staff, and engineers, bringing their costs of operation to about $650,000 per year according to one estimate (without interest service on a license).[5] The budget of a public radio station serving

[2] See http://www.census.gov/population/cen2000/phc-t3/tab03.txt for 2000 population and Burrelle's Media Directory for information on newspaper staff size.
[3] See http://www.bls.gov/oes/current/oes273022.htm .
[4] http://www.christianradiohome.com/operating_costs.asp
[5] http://en.allexperts.com/q/Radio-Industry-2499/2008/10/radio-station-budget.htm

Garden City, Kansas (population 26,000) was reportedly $1 million in 2014.[6] The marginal cost of serving an additional listener to a radio station is, of course, zero.

These estimates are of course rough, but they provide clear substantiation of high fixed costs: it's clear that the availability of these media products depends on many others also wanting them.

2.2 Preference Heterogeneity

Theoretical characterizations of preferences commonly represent them as smooth distributions, such as consumers whose preference for some one-dimensional characteristic (such as the sweetness of cider) is distributed uniformly between, say, *a* and *b*. Such characterizations are of course useful for the development of tractable models; but they seem to miss much of the nature of preference heterogeneity in reality, particularly for media products.

For example, in the US, blacks and whites have starkly different preferences over most sorts of media products. The broadcasting industry tends to divides its radio stations into about 30 station types targeting different sorts of consumers. These formats include categories like "top 40" (or "contemporary hit radio"), "album oriented rock," "adult alternative," "country," and so on. Some formats, such as those with "urban" or "black" in their names are targeted explicitly at African American listeners. Racial differences in listening by format are stark. The most popular format overall is country music, which attracts 12 percent of listening among non-blacks. Yet, country music attracts only 1.5 percent of black listeners, so that the audience for country music is 97 percent non-black (see Waldfogel 2003). At the other end of the spectrum, stations whose format names include the word "black" (such as "black/adult contemporary" or

[6] Brad Cooper. "State subsidy to Kansas public broadcasting could disappear." Kansas City Star, April 29, 2014 http://www.kansascity.com/news/government-politics/article347706/State-subsidy-to-Kansas-public-broadcasting-could-disappear.html

"black/oldies") attract less than 3 percent of non-black listening and almost 60 percent of black listening, producing audiences that are about 90 percent black. Blacks and whites have starkly different preferences in radio programming.[7]

Hispanics and non-Hispanics, too, have starkly different preferences in radio programming. Stations broadcasting in Spanish attract roughly 50 percent of Hispanic listeners in the US markets with substantial Hispanic populations. These same stations attract only trace amounts of non-Hispanic listening.

Preference differences are not limited to radio. Newspaper and television preferences also differ by race. In markets with two daily papers – typically a broadsheet and a tabloid – the market share of the broadsheet is generally much larger in heavily white neighborhoods, which is suggestive of preferences that differ by race. While black and white television viewers both rank some television programming highly – such as football – many television shows that are top-rated among whites are often bottom-rated among blacks. For example, in 1998 when Seinfeld was the top-rated show among whites, it was ranked 50th among black viewers, while the comedy "Between Brothers" was ranked first among blacks and 112th among whites.[8]

Preferences also differ by gender and age. In 1993 less than 1 percent of listeners below age 45 listened to stations in the big band/nostalgia format, while these stations attracted 14 percent of listeners over age 65. By contrast, top 40 stations attracted 38 percent of under-18 listening, while such stations attracted less than 2 percent of over-65 listening. Album-oriented

[7] See also Aldrich, Arcidiacono, and Vigdor (2005).

[8] See James Sterngold. "A Racial Divide Widens on Network TV." New York Times. December 29, 1998.

rock stations attracted 20 percent of male listening but only 10 percent of female listening.[9] Two points bear emphasis however. First, these preference differences tend not to be as stark as those differences by race and Hispanic status. Second, while preferences differ across groups, the share of population does not differ much across markets according to age or gender, while the black and Hispanic shares vary greatly. This is important because the mechanisms we'll study – entry and consumption in response to population – are visible only by way of comparisons across markets.

While the shares of population by gender and age are quite similar across metropolitan areas, the shares of population in minority groups with different preferences for media content vary substantially. Across the top 100 US metro areas in 1993, the median black share was 6.3 percent, while the median Hispanic share was 2.1 percent. The metro area at the 90th percentile of the black share distribution was just under a quarter black, while the metro area at the 10th percentile was just under 1 percent black. The 90th percentile Hispanic share was 21 percent, while the 10th percentile Hispanic share was under a percent. These magnitudes of variation in the mix of consumers with different media product preferences raise the possibility of detecting impacts of preference group sizes on product targeting and consumption.

Just as preferences vary across demographic and ethnic groups within the United States, preferences for some kinds of media products vary across national groups. While German, French, and American consumers have access to almost all of the same music and movies, their consumption patterns are starkly different. Music consumption in each country exhibits a

[9] See Table 5, page 40, Joel Waldfogel, 1999. "Preference Externalities: An Empirical Study of Who Benefits Whom in Differentiated Product Markets," NBER Working Papers 7391, National Bureau of Economic Research, Inc.

substantial amount of home bias: 29 percent of French consumption is domestic, while only 3 of German consumption is French; 21 percent of German consumption is domestic music, while less than 2 percent of French consumption is German. Much of the difference in consumption patterns stems from language: Austrians consume German music at elevated rates, Belgians listen to French music; and vice versa. Two repertoires that all destinations consume at elevated rates are those of Great Britain and the United States, which make up 10-30 percent of consumption and 30-60 percent of consumption outside of their home markets.[10] We see very similar patterns in cross-national tastes for movies.[11]

It is a widespread phenomenon in media markets that preferences differ, sometimes starkly across, groups. And the mix of different preference groups differs across place, raising the possibility of both the operation and detection of preference externalities.

2.3 Willingness to consume second-choice products

While consumers from many groups prefer one sort of media product to another, there is also fairly clear evidence that consumers are, in many cases, willing to consume a second-choice product – rather than forgoing consumption in the category altogether – when a more desired product is not available. Consider again the example of race and radio in the US. Waldfogel (1999) documents that while black listeners clearly prefer black-targeted programming, blacks continue to the radio nearly as much in markets in markets that lack black-targeted programming. While 18.4 percent of blacks listened to radio (for at least 5 minutes during an average quarter hour in 1997) in markets with four or more black-targeted stations, 17.3 percent

[10] See Aguiar and Waldfogel (2014) and Ferreira and Waldfogel (2013).
[11] See Ferreira, Petrin, and Waldfogel (2013).

of blacks listened to the radio in markets with 0 or 1 stations in black-targeted formats. Patterns were similar for Hispanics. This strongly suggests that blacks and Hispanics are willing to consume second-choice alternatives when most preferred alternatives are unavailable.[12]

2.4 Advertiser Finance

Some media products are financed by users directly; others are financed by advertisers. Television and radio have traditionally been financed entirely by advertisers. Newspapers and many magazines have bee predominantly advertiser financed. In 1999, for example, roughly 80 percent of newspaper revenue was derived from advertisers. Magazines populate a spectrum from those that are predominantly financed by advertisers – such as bridal and photography magazines – and those that are mainly financed with subscription revenue, such as *US Weekly* or *Scientific American*.[13]

Since the advent of cable television in the 1970s, user finance has grown in prominence. Many channels – such as HBO and Showtime – are financed entirely by users and carry no advertising. The financial model for radio has also changed over time. While radio programming was user-financed at the dawn of the industry in the 1920s, it was entirely advertiser financed for most of the 20th century. Satellite radio, which emerged in the US in 2001, is user-financed and carries no ads.[14] Internet radio, is financed with a mix of advertiser and user finance.

When newspapers placed their content online, most initially relied only on revenue from advertisers. While the Wall Street Journal instituted a paywall in 1997, most newspapers did not

[12] See Waldfogel (1999), table 7.
[13] Authors' calculation using data from the Publisher's Information Bureau for 2000.
[14] http://en.wikipedia.org/wiki/Satellite_radio

immediately follow. Beginning around 2010, many newspapers began to put their content behind paywalls, shifting back toward a mix of user and advertiser finance.[15]

Reliance on advertiser finance also allows advertisers' potentially different valuation of audience demographic to influence the mix of available programming. See Napoli (2002, 2003).

2.5 Change in costs over time

Because of technological change – mostly due to digitization – fixed costs have been shrinking in relation to market size for many media products. Moreover, marginal costs for physical media products such as newspapers and magazines have fallen to zero. Fixed costs for media products fall in relation to market size, in turn, for two reasons. First, fixed costs may fall absolutely, as when new digital technology makes it less expensive to produce and publish a text product. A newspaper or magazine does not, in principle, need printing or distribution capabilities. Second, digitization enables broad geographic distribution, so that products that were once local can instead be available nationally or internationally.

The marginal cost of serving a household view newspaper has traditionally been the cost of printing and delivering a physical paper. More recently, as newspapers have moved toward digital distribution, the marginal cost has fallen toward zero.

New technologies have changed "radio" in a few important ways. First, US satellite radio has as its market footprint the entire country. Given the large market size, it is possible to offer a large number of program options, 151 on Sirius in the US.[16] This is far more varieties than are available over the air in even the largest markets. Second, satellite radio is user-

[15] See Chiou and Tucker (2013).
[16] See http://en.wikipedia.org/wiki/List_of_Sirius_Satellite_Radio_stations

financed, with monthly fees of $10-$15.[17] Third, the Internet has enabled distribution of audio programming online, with three features that differ from terrestrial radio: a) as with satellite, the market size is enlarged (an entire country rather than a metropolitan area); b) programming is customized to the user's taste. Services such as Pandora and Spotify allow users to listen to individualized "stations" that are customized to the users' preferences; c) these services have both ad-supported and user-supported versions.

Many media markets – newspapers, radio, television (outside of prime time) – have traditionally been local. The arrival of the Internet is in some ways like the dawn of free trade. Providers can make their text, audio, and video available to consumers anywhere, which creates opportunities to reach more consumers. But at the same time, products everywhere now face greater competition.

3. Theory

Preference externalities are part of the broader economic problem of product selection. We do not attempt to review that vast literature. One stream has followed from Hotelling's (1929) model of spatial competition, which provides a template for viewing the product specification as a choice variable. A second stream follows Chamberlin's (1933) work on monopolistic competition, and focused on the number of product variants. This vein was resurgent after Spence (1976) and Dixit and Stiglitz (1977) revisited it using representative consumer models (most centrally the CES), and it is currently employed in international trade research following Melitz (2005). Meanwhile, structural empirical work in industrial

[17] See http://www.siriusxm.com/ourmostpopularpackages-xm, accessed June 17, 2014.

organization is based on discrete choice models, and frequently on the logit model (following the seminal work of Berry, Levinsohn, and Pakes, 2005) that is closely related to the CES.

Below, in section 3.3, we elaborate upon models in these veins in order to concentrate on preference externalities in the context of media. First though, we describe (and extend) the classic contributions to media economics of Steiner (1952) and Beebe (1977). These authors, providing precursors to preference externalities, explicitly addressed market failures in ad-financed markets, and it is with them that we begin the narrative. Steiner's principle of duplication stressed excessive attention to majority preferences to the exclusion of minorities, while Beebe's lowest common denominator programming type stressed a tendency to cater to base levels of tastes.

Questions we seek to address through the models include the determinants of the number of products in the market, as well as their positioning, and the operation of positive and negative externalities. What determines when more media consumers make other media consumers better or worse off? How do different business-finance models (subscription / ads / mixed) affect predictions? What are the effects of mergers on product positioning and other outcomes? What can we say about the efficiency of the market outcomes?

We then describe some evidence in Section 4.

3.1 Classic Models

3.1.1 Preference externalities with spectrum constraints: Steiner and Beebe models

Steiner's (1952) model was explicitly directed at media markets with advertising finance. Assuming that each viewer is worth the same amount to advertisers, and that viewers single-

home, media platforms strive to deliver the maximal number of viewers to advertisers. Each viewer has one preferred genre choice, and will not watch/listen to another choice. If several platforms serve the same genre, viewers are split equally, so there is no interaction among the platforms (for example, they do not compete by restricting ad nuisance in order to be more attractive than rivals in the same genre).[18] There is a spectrum constraint on the number of channels that can be broadcast into the market: we shall see in the logit analysis that similar forces are at play without this.

The set-up gives rise to duplication of popular channels at the expense of those with fewer adherents. An ensuing preference externality is thus that a more popular genre attracts too many platforms. There thus can be a negative preference externality on small groups that cease to be served when numbers of viewers in a larger channel rise and platforms switch format. There is, though, a positive externality on own group members by having more variety (although Steiner suppressed this possible welfare benefit by assuming that more choice within a genre is purely duplicative).[19] The social cost is expressed through wasteful copying, although if there are many channels (low fixed costs), preference externalities disappear because each preference type will get what it wants.

[18] See the Anderson-Jullien Chapter in this Volume for extensive analysis of platform competition when ads are a nuisance to media consumers. The Steiner and Beebe models are also discussed in the Foros-Kind-Sorgard Chapter in this Volume.

[19] Notice that when there are no channel number restrictions (for example, in magazines), then a group's preferences are served only if fixed costs can be covered. In that sense, there remains only the traditional monopoly underserving problem that firms cannot extract the full social surplus from their creations, and so may not serve when they ought to. However, preference externalities might still arise if platform costs depend on the number (and scale) of other platforms. For example, input prices (journalists, say) might rise with the number of platforms. Then the preference externality problem might work in a manner similar to the spectrum restriction case: popular genres crowd out less popular ones, and more people in the popular genre may attract more platforms there and raise costs across the board and so strand less popular offerings.

Suppose that were just two groups of viewers in a TV market. Each viewer is worth the same amount to advertisers. 70% will watch only a game show, and 30% will watch only a reality show. With one market slot available, only the majority will be served. With two market slots, two private firms will both air game shows. This is Steiner's *Principle of Duplication* that the market solution doubles up on the more lucrative niche (as long as this is large enough).[20] Sharing a 70% market is more profitable than airing a reality show.[21] This wasteful competition is the simplest form of the *Tyranny of the Market* (Waldfogel, 2007): majority tastes override minority ones in a market-place of few alternatives. Notice that the market failure can be resolved in several ways. One is to set one channel aside for a public firm that would cater to those who want drama. Another resolution, surprisingly, is to allow the market to be served by a two-channel monopoly.[22] Such a situation, where the platform would not cannibalize its own reality show, was one of Steiner's chief findings: monopoly can out-perform (wasteful) competition.

Now modify the numbers so that 78% will listen only to rock, and the other 22% only to classical radio. With three slots (or indeed with fixed costs between 22 and 26% of total possible revenues), all will air rock programming, leaving the classicists unserved. With four stations and beyond, the classical listeners will be served (providing, of course, that fixed costs can be covered with a 20% market share). More generally: *minorities will be served providing there are*

[20] This duplication (and an unserved minority) prevails as long as $v_A/2>v_B$, where v_i is the viewership in segment $i=A,B$.

[21] If we had a subscriber price system, with subscribers all with the same willingness-to-pay, then we have very different outcomes: because of Bertrand competition, two media firms would never select the same channel. Instead, they differentiate to relax price competition, entailing a monopoly in each segment. Nuisance costs of advertising would also mitigate the tendency to duplicate.

[22] Yet another is by stipulating that the bidding process factor in not just which franchise would pay more for the slot, but also broadening the competition to require that other factors than pure profitability be decisive in awarding the franchise. For example, the fourth ITV slot in the UK also asked participants bidding for the prize to describe the program content they would provide.

enough stations, but resources will still be wasted through excessive duplication of the most popular genres. Notice that the assumption of a fixed number of slots was not important to generating the outcomes. For example, if fixed costs lay between 30 and 35% of the total possible market revenue in the first case, then the outcome is the duplication, with drama unserved.

3.1.2 The tyranny of the yuppies

In the advertising-financed business model, media firms aim to deliver bundles of consumers to advertisers. Firms then are paid by advertisers according to the dollar desirability of the audience delivered - different audiences involve different demographics of heterogeneous desirability to advertisers. Competition among platforms in providing genres is then governed by the tastes of advertisers for the audience composition. Consumer sovereignty is consequently *indirect* – the consumer's preferences are not counted directly, but rather it is the preferences of the advertisers that count. Consumer preferences only count to the extent that consumers are wanted by advertisers. Thus, some consumer groups can be disenfranchised in the market system for the twin reasons of fixed costs (or limited spectrum availability in the central examples below) and the desire to deliver consumers attractive to advertisers. Even with traditional market systems, we can have a majority tyranny, but the ad-finance system exacerbates this. A pay system (pay-per-view on TV, internet paywalls, or subscription to satellite radio) removes the latter distortion, but many media remain ad-financed, or with a mixed system (newspapers and magazines that carry ads and change a subscriber price too).

We can illustrate the indirect sovereignty of the ad-financed system in the context of the Steiner model. Suppose that in the original example that the watchers of reality are worth to

advertisers five times as much as game-show watchers. This could be because viewing preferences are correlated with willingness-to-pay for advertisers' wares: yuppies are particularly attractive to broadcasters because they are attractive to advertisers. They are just coming into incomes, and their early choices (e.g., Ford, or Bank of America) will likely persevere. Influencing their choices early on will likely have a high present value. Because they are worth five times as much, they are now the prime desired real estate. Accordingly, two private firms will now air reality shows. The simple mapping from dollar values and market shares to viewer attractiveness is to multiply each viewer segment by its economic weight. Thus, normalizing the game-show watchers to 1, the game show segment is worth 70 points in total, while the reality show segment is worth 150, thus flipping the pattern of duplication. The example is extreme, but it underscores the importance of the advertisers, and it shows the algorithm of converting viewer numbers into dollar terms and then performing the Steiner analysis with the economic weights.

Here then the tyranny is that of the economic majority, which may well be the numerical minority. Arguably, this is why we see sit-coms with 20-something yuppies living in New York lofts.[23]

3.1.3 Lowest common denominator

Steiner's set-up is extreme because he supposes that viewers will only watch one genre. Beebe (1977) extended Steiner's preference setup to allow viewers to have taste rankings over program types. Second choices will be watched if first choices are not available. A second choice that is shared by several viewer groups is a *Lowest Common Denominator* programming type. As

[23] Again, a public broadcaster's role may be to provide nature programs that might have a high consumption benefit that potential watchers cannot express through the ad-financed market system, especially if these watchers are older and perhaps less prone to altering their purchase behavior in response to ads.

we show, with few possible channels, LCD programming might prevail, even to the extent of being duplicated.

To illustrate, suppose 60% of the audience will listen to folk music, and country if folk is unavailable. The other 40% have bluegrass as first preference, and country as second. Here country is the (LCD) taste, the one people will listen to if their first preferences are not available. Now, a monopoly channel need air only country to get the whole market, and has no desire to set up a second channel. By contrast, competition with 2 slots will yield first preferences being aired. Then, in contrast to Steiner's set-up, the monopoly performs worse than competition, by aiming just for the minimum acceptable.

The LCD is not just a monopoly phenomenon. Suppose now that first tastes are drama, news, and sport for each third of the population. If the first choice is unavailable, viewers will all watch sitcoms. Now the equilibrium for two private stations is to both provide sit-coms. Doing so gives each half the market, while choosing any other genre gives a third. As with the Steiner analysis, the same points apply if it is fixed costs that determine the number of platforms. Also, if there are enough slots, then first preferences are satisfied by the market outcome, although duplication remains. Furthermore, LCD programming is supplanted in favor of first preferences. This suggests the pattern of how the market is catered as a function of overall market size: small markets get LCD programming, while the largest ones get programming catering to quite specialized tastes.

The framework above suggests a general tendency of offerings that get finer as the market expands, and positive externalities within own-group size, with possible positive spill-overs to similar groups (and such spillovers less likely for more dissimilar groups). These results

come from an “inverted pyramid” structure of preferences. On each level are genres, these getting finer from the bottom (the LCD) to the top (where each taste type is represented). The idea is that most people will tune-in if their most preferred option is available, fewer if a broader-based option is all that is available. For illustration, suppose that 80% of the population will listen to the lowest-level (LCD) program. If two middle-level programs are available, 45% of the population will listen to each. At the top level, all listen and the split is equal. So, let us trace how the market develops as we decrease fixed costs (equivalently, as we increase the number of consumers across the board – the market size effect. With a small market, just the LCD programming is provided. Then, as the market expands, the 2 mid-level ones are offered. This arises because, rather than sharing the smaller LCD base, stations do better going higher for a base-extension effect as they offer better-matched content. And, if the rival is doing so, it is better for a second station too, since the LCD loses half its potential audience when the rival “upgrades.” A further market size rise will double the number of offerings again, for similar reasons. Notice though that the “doubling” at the last stage here was an artifact of the assumed symmetry in the preference divisions. If instead the middle level were split say 55% to 40%, then the first market expansion effect above the LCD is to offer the two more specialty genres, but then a further across-the board increase will impact first the 55% who will get upgrades, and the 40% will be temporarily left behind until a further expansion makes them worth dividing.

The important take-aways from these models are therefore mainly for markets served by few platforms. A market served only by a single platform will tend to serve up a LCD offering. With two platforms, the LCD type might be duplicated, or a second popular genre (or another LCD) might be broached. As the number of platforms rises, more diverse preference types will be served, and pure LCD types will tend to be surpassed (although they may indeed represent the

first preferences of some viewers, in which case they will prevail). However, duplication will pile up in the most popular formats. Moreover, there is bias towards those viewers whom the advertisers most want to reach. Notice finally the positive preference externalities in the examples above. As own group size expands, it becomes more likely one's higher preferences get catered to. Moreover, by taking away some of the clientele of the erstwhile LCD, there is a greater likelihood that the other clients on the LCD base get an upgrade. Thus we expect positive preference externalities with respect to own types, with weaker spillovers to similar types.

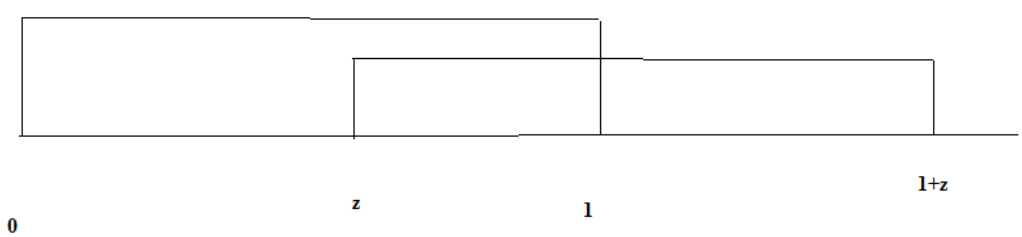
While the principles described above in the Beebe and Steiner analyses resonate, the models are too sparse. To gain more depth, we apply their insights into first a spatial model and then into a logit model. In both cases we explicitly introduce different consumer types so as to be able to track the effects of population composition on product selection (positioning and variety.) The former approach is well configured to deal with markets with very few firms, while the latter deals better with markets with larger numbers.

Our objectives in this section are to incorporate the fundamental features of media markets discussed above - fixed costs, product differentiation, tastes that vary across groups, and advertiser finance - into models of product differentiation. We discuss the ensuing empirical implications for the relationship between the size and mix of the number of potential consumers and the number and targeting of products, as well as the ensuing welfare of various kinds of consumers (i.e. the within-group and across-group preference externalities).

3.2 Spatial Models

3.2.1 Negative preference externalities under monopoly

We begin with a monopoly model with two types of consumers, illustrated by reference to daily newspaper markets. The two groups, whom we term "whites" and "blacks," have different product preferences, with their ideal products represented along a one-dimensional spectrum. Assume there is a continuum of W-type agents uniformly distributed on [0,1], with density f_w and a continuum of B-type agents uniformly distributed on [z,1+z] with density $f_b < f_w$. Let $z \in [0,1]$ so that the degree of overlap is 1-z. The probability of any type buying the newspaper, and hence getting exposed to any ads in the paper, is $d(p+t|x-x_n|)$, which is decreasing in its argument. Here p is the price of the newspaper (if any), x_n is its location in the content space, x is the "ideal" content location of an agent of type x, and t is the "transport" cost rate from not getting the ideal newspaper content. Furthermore, assume there is a mass *A* of advertisers. Each is willing to pay *w* to contact a W-type reader, and *b* to contact a B-type one. Let *w*>*b* so that the W-types are more attractive to advertisers. Therefore we have a majority group which is also worth more to advertisers, and its preferences overlap with the minority one: apart from the assumption that the majority is worth more, there is no loss in generality assuming they are on the left of the spectrum. The assumptions are illustrated in Figure 1.



We consider in turn the preference externalities under pure advertising finance, pure subscription pricing, and the mixed business model: see the Anderson-Jullien chapter for more details, along with a consideration of ad nuisance to consumers, which has here been suppressed. Loosely, the first case transpires if advertiser demand is strong enough.

The equilibrium has the (profit-maximizing) newspaper choose its content location, and price where appropriate. Each consumer is therefore worth *p* plus either *w* or *b* (depending on its type) times *A*, the mass of advertisers (and *A* ads will be placed in the paper, charging advertisers the full value of their surplus). In what follows, we eschew a full equilibrium description because the factors on which we focus are quite immediate in their impact on the price / location solution: the properties claimed are readily derived. Notice first that if all consumers are equally valuable to the advertisers, and their densities are the same, then the monopolist's profit-maximizing location (under each of the three business models) is the center of the full market, i.e., at (1+z)/2. This benchmark allows us to compare the externalities exerted under asymmetric advertiser preference to contacting the two types, or different densities of them.

Under pure advertising finance (e.g., commercial TV or terrestrial radio), the B-types are less valuable. If indeed *b*=0, then they have no commercial value and their preferences are irrelevant. The content format chosen is then $x_n = ½$ which is the mean of the W-type consumer distribution. As *b* rises, the chosen content location rises, reaching the benchmark point (1+z)/2 only when *b* gets as high as *w* and even then only when $f_b < f_w$. Equivalently, we can say that the larger is f_w or *w*, then the more is the content tilted towards the W-types, so that the preference externality of catering to the type of greater mass or greater value is detrimental to the other type (but is advantageous to the majority). The impact of the preference externality to the B-types is more severe the greater is z, corresponding to a greater preference divergence.

For pure subscription pricing, the difference in advertiser valuations is taken off the table, and the preference externality depends solely on the single source of differentiation between the two types, their different densities. The preference externality effect is therefore weaker. But still, the more W-types there are, the closer is the content location to their mean at ½, and the further away from the B-types' desiderata.[24]

With a mixed-finance model, the solution for the content location choice lies between the two cases noted above. Again, more W-types move the location away from the B-types, as does a higher advertiser preference for contacting the W-types. Moreover, the larger is *A*, the more reliance on advertising finance, and the lower the copy-price so as to attract more consumers to deliver to the advertisers. Then again, the closer is the location to the mean of the W-types. The problem is more severe the more tastes differ across groups.

To summarize, the bias against the B-types is greater the more W-types there are, the larger the discrepancy in their values to advertisers, the more different their tastes from the mainstream, and the greater the weight given to advertisers in the business model.

3.2.2 Preference externalities under duopoly

When demand is sufficiently strong, there will be more than one product. There remain some markets in the US with more than one paper, though this was quite common some decades ago. Accordingly, we next allow for 2 competing media outlets. To do so, we assume that subscription prices are fixed, or indeed zero (as per commercial TV or radio), so we take price

[24] Another possible driver impinging on locations would be differential purchase probabilities. They have been suppressed here but are readily introduced.

competition off the table.[25] We continue to assume there is no ad nuisance impinging on reader choices. These missing features are analyzed in detail in the Anderson-Jullien chapter, but our emphasis here is on preference externalities between different groups.

We simplify the spatial model above slightly by assuming that z=1, so that the B-types "start" where the W-types end. The total market length is now 2. Denote the media firms' locations as $x_1 < x_2$, so that firm 1 serves predominantly the W-types. We first characterize these via the first-order-conditions for equilibrium locations. The key condition is that a move in of δ by firm 1 (located at x_1) expands its loyal base by δ, while picking up only an extra base of δ/2 from the rival's consumers. The change in profits is thus the value gained on the LHS minus the value lost on the RHS (where its market length has decreased by δ /2). Thus its profit increases by corresponding values of the consumers gained and lost. In equilibrium, the marginal consumer is a W-type. Thus the local profit increment from moving in for Firm 1 is

$$[\delta\, d(p+t(x_1)) - (\delta/2)\, d(p+\tfrac{1}{2}t(x_1+x_2))]\, wf_w$$

which is the value of demand gained on its LHS minus the loss on the RHS.

The corresponding effect for the other firm from moving left is analogously

[25] There is a voluminous literature on equilibrium existence in prices and locations. Anderson, de Palma, and Thisse (1992, Ch.8) summarize the state of the art two decades back, and the field has not developed much more in the interim, at least as relates to the current application. In particular, Hotelling's (1929) claimed "minimum differentiation" result was shown to be incorrect by d'Aspremont, Gabszewicz, and Thisse (1979). Osborne and Pitchik (1987) solve his original two-stage location-then-price model with linear transport costs, by analyzing the mixed strategy equilibrium to the price sub-game and engaging this to the location stage. They find (pure strategy) equilibrium duopoly locations just inside the quartiles, at which locations the price equilibrium is in (non-degenerate) mixed strategies. D'Aspremont, Gabszewicz, and Thisse (1979) propose the "fix" used by most subsequent authors, by replacing linear transport costs with quadratic ones. This ensures tractable price sub-game solutions in pure strategies, but with a radical change in the equilibrium locations. Instead of "minimum differentiation", the locations are at the extremes. Therefore, fixing prices as we do here is hardly innocuous.

$\delta\, bf_b d(p+t(2- x_2)) - (\delta/2)\, wf_w d(p+½t(x_1+ x_2))$

For this firm, each gained consumer is worth less because they are B-types.

Setting both of these first derivatives to zero yields the equilibrium solution when firms are not back-to-back. Because the left sides of these expressions are the same (these are transfers at the interior margin), the equilibrium conditions imply that $wf_w\, d(p+t(x_1))= bf_b d(p+t(2- x_2))$. Then, because $wf_w > bf_b$ (by the assumption that W's are worth more than B's) the implication is that $x_1<2- x_2$. That is, Firm 1 is closer to the median W-type than Firm 2 is to the median B-type. Moreover, both are closer to the market center (here set to 1) than to the edges. The reason is that each firm picks up more demand on the interior boundary between them, and that demand is worth relatively more to the firm with the predominantly minority readership.

The implication is that the W's are better served than the B's, although each group would be better off in aggregate if the other were not there.[26] Note too that the presence of the B-types draws Firm 1's location inward even if few B-types actually read it. The induced bias toward middle-of-the-road coverage is greater for the minority paper than for the majority one.

The bias toward the center – and the minimum differentiation result associated with Hotelling (1929) is tempered by the elasticity of demand in the model above. The more inelastic is demand, then the closer together will the firms locate.[27]

[26] Modulo the possibility that the B types might not be served at all if they were alone: the existence of the W-types raises the profitability of the b-type paper and may thus enable the fixed costs to be covered. This form of "cross-subsidization" is discussed further below when we explicitly consider the model with entry.

[27] The term "Principle of Minimum Differentiation" is due to Boulding (1955). In the set up above, there is back-to-back location if demands are too inelastic, i.e. (from the location derivatives) if firms do not want to move outwards from a common location x_m satisfying $d(p+tx_m) > ½\, d(p)$ *and* $bf_b d(p+t(2- x_m)) > ½wf_w d(p))$. Note that x_m should further satisfy the condition that firms' profits are equal, so that neither firm wishes to flip its position with its rival.

We can now describe preference externalities at the differentiated outcome. The mechanism is quite interesting. Suppose the population of W's rises across the board (an increase in f_w), or, equivalently, if the value of the W's rises to advertisers (an increase in *w*). Then the first-order condition of outlet 1 remains unchanged, because the relative value of readers at each margin is unchanged. However, the other outlet's profit is now higher when it moves in because of the increased value of serving the marginal W-type. Thus outlet 2 moves left; this in turn causes the first outlet to cut left too. So the upshot is that both outlets are further left in the new equilibrium. The implication for the well-being of the two groups (in aggregate) is that the B's are worse off on average. The W's are better off for two reasons (although those just right of the erstwhile location of outlet 1 are worse off). First, those served by outlet 1 are better off on average because 1's location is more central to them. Second, those W's whose preferences are more extreme so that they chose before the outlet catering predominantly to B-types (the B-leaning W's) are also better off because their outlet now delivers content closer to their ideal.

Now consider the effects on locations of a merger (here to monopoly), and assume that the two-outlet firm keeps publishing both media. Then we can view the location choice for each outlet as internalizing the effect of its location choice on the demand of the other. The upshot is that equilibrium locations are further apart because they avoid cannibalization of the sibling outlet's readers. Therefore the prediction is that mergers lead to more diversification, moving away from the excessive tendency to centralize that is epitomized in the Hotelling model.

The model with two firms delivers two key results. First, we see an across-group preference externality: having more W-type consumers delivers such consumers better choices in the aggregate but makes the others worse off. Second, merger tends to spread the two products apart. Adding more firms to the linear depiction of preferences rapidly encumbers the structure,

so we eschew further development of this model in order to elaborate more subtle and intricate patterns of preference structures (albeit with significant simplifications).

3.3 Market size and equilibrium media diversity

Above we considered product positioning, consumption, and the well being of market participants in contexts with small and fixed numbers (1 or 2) of products. Here we shift the analysis to the number of firms or products operating. The first question to address is the determination of the number of entering products which, as we have suggested above, has an important impact on the way that preference externalities operate.

The logit model gives us a simple setup for illustrating this relationship. Begin with one category of products targeting the single group of consumers. Products are differentiated but symmetrically so. Hence, additional products will expand the market, but all varieties attract identical shares. Suppose the group has "economic mass" *M*, which is the product of the number of consumers and their economic weight to advertisers. Each product has entry cost *F*, and define *n* as the number of products that enter. The share of the population consuming any particular product *i* is then

$$\mathbb{P}_i = \frac{e^s}{1 + ne^s}.$$

This is the classic symmetric logit with an outside option, and s represents the attractiveness of listening.

Under free entry, products enter until profit opportunities are dissipated. Ignoring integer constraints, the free entry condition is $M\mathbb{P}_i = F$, or $M\frac{1}{n+e^{-s}} = F$, which determines the number of products as:

$$n = \frac{M}{F} - e^{-s}.$$

The resulting equilibrium number of firms is the integer component of n. Hence, we have monopoly if $\frac{M}{F} - e^{-s} \in (1,2)$, etc.

This simple setup yields a number of predictions relevant to preference externalities. For a given positive value of potential consumers to advertisers, a larger population gives rise to a larger economic mass M. So, first, as M rises, the number of products that can profitably operate (modulo integer constraints) rises as well. Second, consumption also rises with M (and with n). Note that overall revenue is $\frac{Mne^s}{1+ne^s}$. Finally, given that per capita consumer surplus is proportional to $\log(1 + ne^s)$, then consumer welfare also rises with the population size. That is, this simple entry model delivers a positive within-group preference externality: consumers benefit one another by bringing forth additional products which, in turn, attract a larger share of consumers to consume.

The equation $n = \frac{M}{F} - e^{-s}$ delivers another set of insights. As written it implies a particular relationship between market size (M) and entry. If the fixed costs associated with entry are constant across markets of different sizes, then for markets with many entrants, the relationship between M and n is nearly linear. On the other hand, if the fixed costs are higher in larger markets, then the number of products available will rise more slowly. Fixed costs may be higher in larger markets for two broad reasons. First, input prices may be higher in larger markets for cost-of-living reasons. Second, if quality is produced with fixed costs – as is plausible for media products – then firms in larger markets may have incentives to spend more in an attempt to attract a larger share of a larger market (see Sutton, 1991). The general point is

that while entry grows in market size across a range of plausible models, the positive relationship may be tempered by other factors affecting the determinants of fixed costs.

3.4 Optimum media diversity

The (first-best) optimum problem is to choose the set of products to maximize social surplus. As long as private and social marginal benefits coincide, this is the sum of all agents' surpluses. In particular, we shall assume for the present argument that social and private benefits from advertising coincide (the analysis is readily amended if there are advertising spillovers). Hence social surplus is equal to the sum of consumer surplus, advertiser net surplus, and firm profits. We can in general write the last two terms as advertiser gross surplus minus total fixed costs, because the price paid for advertising is a transfer from advertisers to firms. Moreover, for simplicity we assume that the advertiser willingness to pay is fixed at w per listener reached (and so advertiser net surplus is zero).

Then, given a mass of M listeners worth w each to advertisers, the social surplus is

$$SS = M\ln(1 + n\exp s) + wM(1 - \mathbb{P}_0) - nF$$

Here the middle term is the advertiser revenue (all those listening times w) and $\mathbb{P}_0$ is the non-listening probability, and so for the logit model we use,

$$1 - \mathbb{P}_0 = \frac{n\exp s}{1 + n\exp s}.$$

Differentiating with respect to n to find the optimal variety yields a quadratic function of the form

$$Mw\exp s + ZM\exp s - Z^2F = 0,$$

where we have set $Z = (1 + n\exp s)$. The relevant root is the positive one.

It is readily shown that the optimal number is increasing in w, which makes sense because then it is more important to ensure more communication from advertisers to listeners. Moreover, we can draw some pointers by comparison with the equilibrium solution we derived above, namely $n = \frac{wM}{F} - \exp(-s)$. First notice that if w is too low, then the market solution is zero, while the optimum can have positive numbers. This feature is just the point that an ad-financed system needs a strong enough ad demand to be viable, but the optimum also figures in the consumer benefits.

Indeed, the current example always involves under-entry in the equilibrium (this can be seen by inserting the equilibrium number into the expression for the optimum above). We should note that this is one theoretical solution to the question of whether free entry delivers the right amount of entry. Other models, e.g. Mankiw and Whinston (1986), with homogenous products and Cournot competition, delivers excess entry; their model with differentiated products delivers ambiguous results. In the end whether entry is excessive is an empirical question, but it is one that can only be addressed using some explicit modeling framework.

3.5 Cross-group externalities

Individual consumers may consume the content targeted mainly at others, and may benefit correspondingly, but not as much as if the content were targeted at their own type. Indeed, it may be that more individuals of the other type — even if there is some chance that the stations provided would be consumed — actually cause own-side welfare to fall. That is, there may be negative preference externalities from other side participation. This would stem from crowd out of own side media offerings. We now make these claims precise by showing them in a rigorous model (although it is clearly highly specific and parametric).

To this end, suppose that there are two types of individual (i.e., two groups), and two basic program types. Let the economic masses of the W and B types be M_W and M_B respectively. Stations/firms take one of two basic types. Listening to an "own-side" station is associated to an attractivity measure $s > 0$; listening to an "other-side" station garners attractivity $-s$. This symmetry assumption will be clear in the choice probability formulae below and is a sort of normalization: negative values are not negative utilities, and still have positive choice probabilities, although lower than own side stations. The formulation will generate "cross-over" across programming. The larger s (and hence the smaller is $-s$) the fewer people listen to other-side stations. Notice too that the formulation implies that the chance of listening to one's own side increases in the number of own-side stations available, and decreases in the number of other side ones.

Specifically, suppose that n_w denotes the number of w-type stations available, and similarly for n_b. The logit formulation gives us the chance that a W-type listens to a particular w station as

$$\mathbb{P}_w^W = \frac{\exp s}{1 + n_w \exp s + n_b \exp(-s)},$$

and the chance a W listens to a given b station is

$$\mathbb{P}_b^W = \frac{\exp(-s)}{1 + n_w \exp s + n_b \exp(-s)}.$$

From these we can calculate various statistics of interest. For example, the ratio of W's listening to b stations to those listening to w stations is

$$\frac{n_b \exp(-s)}{n_w \exp s} = \frac{n_b}{n_w} \exp(-2s),$$

which is small if s is large, but increases in the number of opposite-side stations, and decreases in own-side ones. Indeed, here the number of cross-overs is proportional to the relative number of stations on the "other" side. The more variety there is, the more likely the listener finds something that resonates.

The next key step is to find out how many stations of each type there are in the market, and how this depends on the numbers of listeners of each type. That is, we take the analysis of the single type we had earlier, and now we use the central ideas to find the break-down of numbers of each station stripe.

3.6 Variety

Before getting to "thick" markets with many stations of each types, we first look at "small" markets that can support one or two stations, and we ask what determines whether and when the market gets a station for each type, or if only one type is represented (so that here we are paying special attention to integer numbers of stations). Then we draw out the implications for the preference externalities.

To trace out a coherent picture, we shall fix M_B and vary M_W up from nothing to see how market provision changes. We concentrate on endogenously small station numbers, and this will ensue if fixed costs are quite high. Accordingly, assume that the entry cost, $F \in \left(M_B \frac{\exp s}{1+\exp s}, M_B\right)$. This will ensure that there is no station at all without at least some W's, and that there is at least one station when W's and B's have equal market weight. The lower bound condition already makes a useful point. In weak markets, even if they are preponderantly of one type, sometimes enough of the other type is needed to support a single station for the majority. Of course, some part of the minority needs to be willing to listen to an other-side station (i.e., s should not be too large). But, here is an elementary preference externality. If enough own-side

listeners are not available, then the other side can exert a positive influence by enabling service when none would be forthcoming in their absence. As one might expect, we cannot have too much of a good thing: if the minority gets too powerful, it may cause the market to tip to the other station type. Or indeed, in the benign case, it may simply lead to a station of its own type to be added.

There are thus two cases of interest. As we show, which one holds depends on whether F is larger or smaller than $M_B \frac{\exp s + \exp(-s)}{1+\exp s \exp(-s)}$ (note that this expression is larger than $M_B \frac{\exp s}{1+\exp s}$, which is the stand-alone profit from the B's). Even if the s taste parameter were the same across markets, the numbers of each type are not, and so we can see various different patterns in a cross-sectional analysis.

Consider first the case $F \in \left(M_B \frac{\exp s}{1+\exp s}, M_B \frac{\exp s + \exp(-s)}{1+\exp s \exp(-s)}\right)$. For low enough M_W there is no station at all, because there are not enough B's to cover the fixed cost on their own. As M_W rises, it becomes profitable to have a single station, and it is a b type (because the B's carry more economic weight). As M_W rises further, but still is below M_B, there is enough profit in the market for a station of each type to survive.[28] To summarize, the progression as M_W rises, is no firm, then a b-type, then a w-type too.[29]

The preference externalities for this case are all positive (at the switch-point between regimes — and zero elsewhere) for both types. The B's need enough W's to float a first station.

[28] To see that both survive, note indeed that the market can support one firm of each type (but no more) at $M_W = M_B$, where profit of each firm (by symmetry) is then $M_B \frac{\exp s + \exp(-s)}{1+\exp s \exp(-s)}$, which is below the entry cost by assumption in this case.

[29] What happens if M_W increases further? More and more w's enter, and at some point (depending on parameter values) the b actually switches type. This is the pattern suggested in the analysis below of the continuous case. In the next case considered, the type-switching occurs immediately (in the sense that there is no intervening regime where both types coexist.

Adding further W's enables another station to enter. It is a w-type, and this benefits both groups, though the W's benefit more than the B's for the addition. The next (complementary) case highlights the possibility of negative preference externalities.

Now consider the case $F \in \left(M_B \frac{\exp s + \exp(-s)}{1 + \exp s \exp(-s)}, M_B\right)$. Again, think of raising M_W; the first threshold crossed is again the market's ability to support a firm, and it is a b-type. However, now as M_W rises further, the fixed cost is quite large, and indeed (from the condition given) there is no room for two firms for $M_W < M_B$ (and for M_W at least a bit above M_B). However, once M_W passes M_B, a w-type is more profitable than a b-type. Thus the b-type is displaced. The equilibrium sequence (as a function of increasing M_W) is then no firm, b-type only, w-type only.

The preference externality is clearly beneficial to both types as $M_W$rises above the first threshold, and the market is served. However, the second threshold is where the b-type gets replaced by a w-type, and the market retains a single firm. This favors the W-types, but it is a negative externality on the B's. The subsequent analysis picks up the narrative with the simplification of neglecting integer constraints in the number of firms, but the broad story is coherent with that just outlined, and extends it to more firms.

3.7 Multiple stations

To analyze preference externalities in larger markets with two taste groups and with multiple stations of each type, we ignore the integer constraint, and first determine the equilibrium numbers of firms of each type. There are 2 equations in two unknowns (n_w and n_b):

$$M_W \mathbb{P}_b^W + M_B \mathbb{P}_b^B = F$$

$M_W \mathbb{P}_w^W + M_B \mathbb{P}_w^B = F$,which are the zero profit conditions for b and w stations respectively.

These equations define two entry reaction functions for the two station types in terms of numbers of each type. We solve for the numbers via a more indirect method. That is, we write

the second equation above in terms of the variables in the first one, which enables us to solve for the equilibrium market shares of each station. We then use the share expressions to solve for the equilibrium numbers, and with this information we can find the equilibrium consumer surplus for each viewer type.

First note that $\mathbb{P}_w^W = \mathbb{P}_b^W \exp 2s$ and $\mathbb{P}_w^B = \mathbb{P}_b^B \exp(-2s)$ (using the odds ratios of the different types)[30], and thus we can rewrite the two equations to be solved simultaneously as

$$M_W \mathbb{P}_b^W + M_B \mathbb{P}_b^B = F$$

$$M_w \mathbb{P}_b^W \exp 2s + M_B \mathbb{P}_b^B \exp(-2s) = F$$

The solution yields the two choice probabilities as $\mathbb{P}_b^W = \frac{F}{M_W} \frac{1}{\exp(2s)+1}$ and $\mathbb{P}_b^B = \frac{F}{M_B} \frac{\exp(2s)}{\exp(2s)+1}$ (with analogous expressions for the w stations). These expressions already give us the breakdown of listeners as $\frac{\mathbb{P}_b^B}{\mathbb{P}_b^W} = \frac{M_W}{M_B} \exp(2s)$. In equilibrium then, the ratio of own-side to other-side listening of any given station is proportional to the ratio of other side to own-side populations! The fraction of listeners to a b station is slanted more toward B-types when there are more W's around because then there are a lot of w stations so the W's are much more likely to find what the want among the w stations, and few will listen to the b station. So, while it may seem that the listenership is quite segregated by this metric of relative listenership, it is rather that the majority group has a lot of choices. Conversely, a population with a large B representation will have a more even listenership for each b station.

Now we can find the equilibrium numbers from the conditions

$$\mathbb{P}_b^B = \frac{\exp s}{1 + n_b \exp s + n_w \exp(-s)}$$

[30] Hence own type is preferred by the factor $\exp(2s)$.

$$\mathbb{P}_b^B = \frac{\exp(-s)}{1 + n_w \exp s + n_b \exp(-s)}.$$

These imply that

$$1 + n_b \exp s + n_w \exp(-s) = \frac{M_B}{F}(\exp s + \exp(-s))$$

$$1 + n_w \exp s + n_b \exp(-s) = \frac{M_W}{F}(\exp s + \exp(-s)),$$

and from there we can solve out for the equilibrium number of w-stations as

$$n_w = \left(\frac{-\exp s}{\exp 2s + 1} + \frac{M_W}{F}\frac{\exp 2s}{(\exp 2s - 1)} - \frac{M_B}{F}\frac{1}{(\exp 2s - 1)}\right).$$

The equilibrium n_b expression just transposes M_W and M_B.

Before we turn to the precise preference externality that we get from analyzing the equilibrium welfare of the two groups, there are several take-aways from these numbers. First of all, clearly the number of stations increases in own-side market presence, and decreases (linearly) in other-side market presence. That is, B presence crowds out w stations, ceteris paribus. This effect was already apparent in the monopoly analysis above. Below we look at the ratio of the two types of station as a function of the group populations. Second, if market presence is the same for both groups ($M_W = M_B$), then the total number of station is $\frac{-2\exp s}{\exp(2s)+1} + \frac{M}{F}$, where M is total population. Recalling the single market case had $n = \frac{M}{F} - \exp(-s)$ this implies that there are more stations in a homogenous market.[31] The reason is that the population's tastes as a whole are better matched on average. Of course, there are several caveats

[31] Comparing numbers, the statement holds if $\exp(-s) < \frac{2\exp s}{\exp 2s+1}$, which is true for $s > 0$.

to such conclusions: for example, the analysis has assumed that stations are symmetric. In many instances stations differ substantially in their profitability and listener base sizes.

Third, the equilibrium ratio of firms is

$$\frac{n_w}{n_b} = \frac{(\exp s\,(1-\exp 2s) + (\exp 2s + 1)\left(\frac{M_W}{F}\exp 2s - \frac{M_B}{F}\right))}{(\exp s\,(1-\exp 2s) + (\exp 2s + 1)\left(\frac{M_B}{F}\exp 2s - \frac{M_W}{F}\right))}.$$

To get some traction on how this depends on the total population make-up, if the M's are large then this is approximately $\frac{\left(\frac{M_W}{F}\exp 2s - \frac{M_B}{F}\right)}{\left(\frac{M_B}{F}\exp 2s - \frac{M_W}{F}\right)} = \frac{k\exp 2s - 1}{\exp 2s - k}$ where we have set $M_W = kM_B$. In the relevant range (for positive numbers of each station type), this is an increasing and convex function of k. Hence, the fraction of w-type stations increases with the fraction of W-types, and does so at an increasing rate. As with the monopoly analysis earlier, the b-stations get increasingly crowded out by w-types, which nonetheless attract B-type listeners as they provide more and more alternatives. The majority tastes increasingly dominate the market's offerings. However, this market tyranny is perhaps somewhat more benign than it might appear because in the model the B's do benefit from the increased variety of w stations.

To analyze this effect in more detail, we now turn to the groups' welfare. From the Log-Sum formula for consumer surplus in the Logit model, the expected welfare of an arbitrary W-type is $\ln(n_w \exp s + n_b \exp(-s) + 1)$. Using the equilibrium values for station numbers, this welfare is an increasing function of the expression

$$\left(\frac{-\exp s}{\exp 2s + 1} + \frac{M_W}{F}\frac{\exp 2s}{\exp 2s - 1} - \frac{M_B}{F}\frac{1}{\exp 2s - 1}\right)\exp s$$
$$+ \left(\frac{-\exp s}{\exp 2s + 1} + \frac{M_B}{F}\frac{\exp 2s}{\exp 2s - 1} - \frac{M_W}{F}\frac{1}{\exp 2s - 1}\right)\exp(-s).$$

Clearly per W welfare increases in W market presence, so there are positive own-side preference externalities. But the other striking feature of the expression is that it is independent of M_B. This says that there are zero preference externalities from the other side. Given the empirical findings in this regard (none or mildly negative cross effects), this is quite a compelling benchmark. Here two effects are cancelling out. First, a larger B presence would mean more b stations, which has a beneficial effect on W welfare through more choice. And indeed the total number of stations is higher. But more B's also implies some crowding out of more highly valued w stations, which depresses welfare.

To put this last point in a wider perspective, recall that the model has simplified by assuming strong symmetry in station valuations, namely that the other-side attractiveness is $-s$. If instead the other-side valuation were higher, then the preference externality would be positive: the first effect would dominate.[32] However, if the other-side valuation were lower, then the crowd-out effect would dominate, and the preference externality would be negative.

Finally, with the welfare analysis in hand, we can look at the equilibrium mix of listeners in the market, which is another empirically measurable statistic that can be tracked as a function of population composition. The fraction of W's listening is $\frac{n_w \exp s + n_b \exp(-s)}{1 + n_w \exp s + n_b \exp(-s)}$ while the B fraction is analogous. We already effectively determined the behavior of this expression in the welfare analysis. In particular, the numerator is independent of M_B and so therefore is the denominator. This means that the fraction of W's who listen to radio is independent of the number of B's. This is not because the W's do not listen to b stations. Rather, it is because the extra b stations crowd out w ones at exactly the rate that keeps overall W listening the same. As

[32] To see this, suppose both station types had the same attractiveness, s. Then more of the "other" type is good, because they are equally valued, and more other-side presence just increases variety.

noted above, this is an artifact of assuming valuation symmetry. If instead other-side valuations were less than $-s$, then there would be fewer W listeners as M_B rose. The reason is the dominant crowd-out effect. Put another way, negative cross preference externalities go hand-in-hand with decreasing listener shares. Regardless, the prediction for own-side presence is that more listen: the presence of more W's increases the equilibrium fraction of W's who listen.

4. Empirical results: facts relevant to predictions from theory

We now turn to assessing the state of empirical knowledge on the predictions arising from the theoretical models articulated above. There are both positive implications and normative implications. Among the positive predictions are the following.

First, the positive within-group preference externality: more valuable audiences – either because they are larger or more valued by advertisers – attract more entry and deliver group members more surplus. Second, as is implied above, ad prices matter. Third, there is an inverted pyramid of variety – larger markets have more variety, allowing consumers to trade up from lower second to higher choices. Fourth, when markets support few products (and most clearly with literally one product), positioning depends on the relative economic mass of the underlying demand groups. A single product locates nearer the larger mass of consumers, delivering them greater surplus. Fifth, as a result, there is a positive own-group effect and the possibility of a negative across-group effect; with N=1, the negative across-group effect is immediate; it can also arise with small numbers of products as a group grows large enough to attract targeted entry and consumers withdraw from second-choice products to newly available first choices. Finally, when markets support many products, own-group effects tend to be

positive while across-group effects tend to be zero. In addition to these positive predictions, we can also explore normative statements. Free entry can deliver a sub-optimal number of products as well as a sub-optimal mix of products.

This section of the paper proceeds via the following subsections. First we review what is known about the basic own-group preference externality. This is the relationships between market size and entry, between market size and variety, and between market size and consumption.

Second, we review what is known about analogous mechanisms in contexts with multiple groups. This, in turn, differs according to whether there are few (1 or 2) or many products. We discuss product positioning by monopolists as well as the ensuing own-group and cross-group preference externalities. We then review the evidence on how group sizes affect targeted entry and group consumption in contexts that can support multiple entrants. Third, we discuss the available evidence on ownership and product positioning. We then apply the empirical evidence to normative questions with a review of the empirical literature on the efficiency of entry into media markets.

4.1 The own-group preference externality

4.1.1 Market size and entry

One stark prediction emerging from both the models reviewed above (as well as common sense) is that, just as market size tends to promote entry in markets generally, this is also true in media markets. And this is indeed true for a variety of media. A variety of studies document that larger markets have more radio stations (Rogers and Woodbury, 1996; Berry and Waldfogel, 2001; Sweeting, 2010). Larger markets also have more daily newspapers (George,

2007; George and Waldfogel, 2003; Berry and Waldfogel, 2010), weekly newspapers, and local television stations (Waldfogel, 2004).

While all positive, the relationships between market size and entry differ substantially across media products; and these relationships reveal something about the relative size of fixed costs in relation to market size across products. The average number of daily newspapers per market in the top 283 markets was 3.23 in 2001.[33] Around the same time, the average number of radio stations, including only those broadcasting from inside the metropolitan area, was 24.5 across 246 US markets in 1997.[34]

4.1.2 Market size and variety

Larger markets can support more products. In general, entry might affect consumers through two mechanisms: prices might fall, or the appeal of the most appealing varieties might increase with entry. Both are possible with entry in media markets, although we focus on the second, in part because ad prices are often set outside of local media markets that are the focus of this chapter.

If entry delivers satisfaction through the variety channel, then it must be the case that large markets have not only more but more varied products. Radio markets provide an illustrative example. Using the 1997 data, while the elasticity of the number of stations with respect to population is 0.31, the elasticity of the number of varieties is 0.27. Hence, most of the

[33] Berry and Waldfogel (2010).
[34] Waldfogel (1999).

growth in the number of products available in larger markets arises from growth in variety as opposed to duplication.[35]

The relationship between market size and variety is related to the willingness of consumers to accept second-choice alternatives. The willingness to accept second choice programming means that a relatively small number of varieties can attract consumption from a large share of the market. Hence, a small market with few product options can have a high share of population consuming. As a market becomes large enough to support more varieties, some consumers formerly choosing the least common denominator will switch over to a more preferred variety. This has two possible consequences.

The first is that generalist (LCD) programming may lose support as a market becomes large enough to support specialist programming. It is possible that some generalist programming would be withdrawn as consumers with specialized tastes withdraw their support from generalist programming. This is a potential variant on a negative across-group preference externality.

A second set of consequence is that larger markets will have more varied programming and, moreover, that share of population listening to generalist format should fall in market size. Various studies confirm that larger markets have more formats as well as more stations. The most commonly available format, country music, garners a smaller share of listening in larger markets. The same is true for other generalist formats, such as "full service/variety" and oldies. The opposite is true for formats such as jazz and classical music, which are only supplied by the market in large markets.

[35] The evidence that the number of varieties increases in market size rests on the idea that differently-named broadcast formats are meaningfully different. There is some question about this. See Di Cola (2006).

4.1.3 Market size and quality

A feature of the relationship between market size and entry is the nonlinearity in the relationship between market size and entry. For example, a regression of the log of the number of daily newspapers in a US metropolitan area on the log of population yields an elasticity of entry with respect to population of 0.5 (Berry and Waldfogel, 2010). An analogous regression using 1997 US data across 260 US markets yields an elasticity of 0.3.[36] By contrast, Berry and Waldfogel (2010) show that the relationship between entry and population is nearly linear for the restaurant industry.

The deviation from linearity arising in media industries could arise for a variety of reasons, including price competition in the advertising market. Yet, radio ads have close substitutes in newspaper, television, and outdoor ads, suggesting a limited role for ad price competition to explain the nonlinearity. A second possibility is that the fixed costs themselves rise in market size, and indeed they do. We see strong direct evidence of this in daily newspaper markets. Berry and Waldfogel (2010) show that the number of pages and staff per daily newspaper rise across markets with market size: the elasticities of pages and staff with respect to population are 0.2 and 0.5 respectively.

Direct evidence on how the costs of radio station operation vary with market size are not systematically available, but we do have two pieces of evidence indicating higher costs in larger markets. First, Duncan (1994) reports some data on annual pay of on-air talent across about 100 US radio markets in 1993, including the highest reported salary per market and a typical range. A regression of the log of the top salary on log of population yields an elasticity of 0.87 (with a

[36] Authors' calculation for this chapter, using the data in Waldfogel (2003).

standard error of 0.04). Using the midpoint of the typical salary range, the elasticity of salary with respect to market size is 0.26 (0.02). These size differences in salary dwarf the cost-of living differences across markets and therefore clearly indicate higher costs in larger markets. Using the 16 markets for which a metro area CPI exists, the elasticity of the cost of living with respect to population is about 0.03. The pay-market size relationship also suggests that higher-quality talent gravitates to larger markets and that the stations in larger markets have higher quality.

Second, there is related indirect evidence: the relationship between the number of listeners per station and market size is strongly suggestive that costs are higher in larger markets. A regression on the average number of listeners per local US radio station on metro area population, using 1997 data, yields an elasticity of 0.8. Unless ad revenue per listener fell sharply with market size – and there is no evidence that it does –this would indicate that radio stations in larger markets have higher average revenue. With free entry, revenues tend to provide reasonable approximations for costs, so the fact that larger-market stations have more revenue indicates that their costs are higher as well.[37]

That larger markets have more media products provides a mechanism by which additional entry might deliver more valuable choices to consumers. That is, entry is a mechanisms for the delivery of the basic own-group preference externality. Costs that rise with market size seem on their face to mitigate the positive effect of market size on the desirability of options for media consumers, but that depends on what gives rise to higher costs in larger markets. For example, if larger markets had higher costs simply because of higher input prices

[37] One might worry that this is driven by large markets where spectrum scarcity delivers rents to stations that can enter; but this seems not to be the case. The elasticity is 0.65 even for markets with fewer than 1 million residents.

(land, etc), then the deviation from linearity of entry in market size would inhibit the welfare benefit of fellow consumers. On the other hand, if the higher costs in larger markets reflect higher investment – and associated higher-quality products – then the interpretation would be different.

There is a variety of reasons to see the higher costs in larger markets to be reflective of greater investment in quality and, moreover, that media markets provide good examples of Sutton's (1991) prediction that market structure need not grow fragmented as markets get large when quality is produced through investments in fixed costs. In newspapers, some of the direct input cost measures – page length and staff size – are directly suggestive of quality. Moreover, some other measures of quality, such as the number of Pulitzer Prizes per newspaper are also higher in larger markets (Berry and Waldfogel, 2010).

That quality rises in market size provides a second mechanism, in addition to variety itself whereby consumers might deliver more surplus to one another.

4.1.4 Market size and consumption

Larger markets have more – and higher-cost – products. If these products are more attractive relative to the outside good, then markets with more and/or better products should also have higher consumption. Such evidence would close the loop on the basic own-group preference externality.

A number of papers on radio broadcasting document that a higher share of the population is drawn to consumption in markets with more products. For example, Waldfogel (1999) shows

that AQH listening which averaged 14.8 percent of population across 246 US metro areas in 1997, was 0.3 percentage points higher in markets with one million more persons (or 0.2 if allowing for various controls such as region and the percent driving to work). OLS estimates show that listening is 0.07 percentage points higher in markets with one additional station and 0.12 percentage points higher in markets with one additional format. When stations and formats are instrumented with the level of population, the station and format coefficients rise to 0.10 and 0.18, respectively. This provides evidence that additional stations attract listeners through the greater product variety. George and Waldfogel (2000) provide direct evidence of this mechanism in daily newspaper markets. In a regression of the share of population subscribing to a local daily on MSA population and controls, they find a modest positive effect of about 2 percent per additional million population.[38]

4.2 Preference externalities with multiple consumer types

The evidence thus far presented concerned one group of consumer. Given the rather stark differences in preferences across groups outlined in section 1 – for example between blacks and whites and between Hispanics and non-Hispanics – it is useful to group consumers with similar preferences together, then to ask how preference externalities function both within and across groups. As the theoretical discussion of section 2 highlights, however, preference externalities work differently depending on the number of products in the market. Here, we begin with the evidence on monopoly (or near-monopoly) markets.

[38] George and Waldfogel (2000).

4.2.1 Preference externalities in markets with few products

Daily newspapers markets have few products per market. Most US metropolitan areas have only one. In such markets – as the Hotelling-style positioning model above indicated – the mechanism for preference externalities is the positioning of products, rather than entry.

George and Waldfogel (2000, 2003) examine daily newspaper markets in the US. They take the view that a local newspaper makes its targeting decision at the metropolitan area level. Thus, product characteristics should be a function of the distribution of consumer type sin the metropolitan area. Their consumption data, by contrast, are at the zip code level. If zip codes differ substantially in their composition by preference group, then they can determine which groups find the local paper's targeting appealing.

They present direct evidence on the relationship between the distribution of consumer types in the metropolitan area and the positioning of the newspapers. In particular, they characterize the local product according to the percentage local coverage that is "hard" news (news, business, government, etc) as a function of local demographics. They find that metropolitan areas with a higher black population share have a lower hard news share.

To measure own-group and cross-group effects, they regress the share of a zip code's population purchasing the local paper on consuming at the zip code level. To see their approach, imagine that they had group-specific consumption data (e.g. the share of a zip code's white or black consumers choosing the local paper). Then they could regress

$$s_z^w = \alpha_0 + \alpha_1 W_M + \alpha_2 B_M + \epsilon_z^w$$

$$s_z^B = \beta_0 + \beta_1 W_M + \beta_2 B_M + \epsilon_z^B$$

Where s_z^w shows the fraction of white population in zip code z consuming the paper, W_M is metro-area white population, B_M is metro area black population, the α's and β's are coefficients and the ϵ terms are errors. If targeting follows group preferences, then we would see positive own-group effects through $\alpha_1>0$ and $\beta_2>0$: e.g. whites would purchase the paper more in markets with larger white population, all else constant. Negative cross effects would emerge if, say, blacks purchased the paper less in markets with more whites, all else constant ($\alpha_2<0$ and $\beta_1<0$).

Extant data, which show total sales by zip code (s_z), do not allow this approach. However, if we note that the share of a zip code consuming the paper is the weighted sum of the unobserved shares of blacks consuming and the unobserved share of whites consuming:

$$s_z = b_z s_z^B + (1 - b_z) s_z^W,$$

then we can plug (1) and (2) into (3) to yield

$$s_z = \alpha_0 + \alpha_1 W_M + \alpha_2 B_M + (\beta_0 - \alpha_0) b_z + (\beta_1 - \alpha_1) W_M b_z + (\beta_2 - \alpha_2) B_M b_z + \nu_z.$$

That is, they estimate the coefficients of interest by regressing the zip code consumption share on the metro black and white population, as well as interactions of the metro area group populations on the zip code black share.

Using this approach George and Waldfogel (2003) find positive own effects, particularly for blacks. That is, in markets with larger white populations, all else constant, a higher share of whites are attracted to the newspaper, by about 5 percent per additional million whites. In markets with more blacks, a higher share of blacks are attracted to consumption, by about 40 percent per additional million blacks. Cross effects, by contrast, are negative. Adding a million

whites reduces black circulation by about 15 percent. Adding a million whites has a statistically insignificant impact on white newspaper consumption. Evidence on Hispanics and non-Hispanics is quite similar in direction and relative magnitudes. Higher non-Hispanic population raises non-Hispanic reading by a small amount. Higher Hispanic population raises Hispanic circulation substantially (by a substantial amount). The cross effect running from non-Hispanics to Hispanics is negative: an additional million non-Hispanics reduces Hispanic circulation by about 20 percent. The cross effect operating in the other direction is not significant.

The negative cross effects running from majority population to minority consumption tendencies are stark and constitute the fairly direct evidence of the tyranny of the majority in a market context. A single product courting the widest possible audience is drive by metropolitan area composition in a way such that larger population of one group reduces the other group's consumption.

Gentzkow and Shapiro (2010), while aimed at a different question, provides complementary evidence of an analogous tyranny of the majority (see the Gentzkow-Shapiro chapter of this Handbook). They show that local newspapers are positioned politically according to the preferences of consumers in the metropolitan area. Zip code level demand, by contrast, depends on more local preferences. Evidence for preference externalities operating through positioning is, for example, that newspaper circulation is high in heavily Republican zip codes of metropolitan areas that are also highly Republican.

4.2.2 Preference externalities with heterogeneous consumers in markets with many products

We documented above that larger markets have more and more varied radio stations. When we divide consumers into different groups according to their radio programming preferences we see more specific evidence of targeting. A regression reported in Waldfogel (1999) of the number of black-targeted radio stations in a metropolitan area on black population and white population shows that markets with a million more blacks have 7 more black-targeted stations, while an additional million whites reduces black entry by 0.6 stations. Similarly, white-targeted entry is 4.6 stations higher in a market with an additional million white consumers but 12.8 lower in a market with an additional million black consumers. That is, own effects on entry are positive, while cross effects on entry are negative. Similar own and cross effects appear among Hispanic and non-Hispanic stations. Positive own effect, larger for the minority group. Negative cross effects, larger for the impact of minority population on majority-targeted programming.

Group-targeted entry is particularly valuable to consumers. In a regression of white AQH listening on the numbers of white and black-targeted stations and controls (instrumenting entry with the levels of group population), an additional white station raises listening by 0.15 percentage points while an additional black station raises white listening by only 0.12. An additional black station raised black listening by 0.78 percentage points while an additional white station raised white listening only 0.19 percentage points. Patterns were similar for effects of Hispanic and non-Hispanic stations on group listening.

The direct relationship between group listening and the populations of the respective groups summarizes the preference externality. Using data on 100 US metro areas with separate data on black and overall listening in 1997, Waldfogel (1999) documents that own group listening is higher in markets with more members of the own group. White listening is 0.4 percentage points higher in metro areas with an additional million whites; and black listening is 2.7 percentage points higher in markets with an additional million blacks. Cross effects are insignificant, although the point estimate of black population on white listening is negative. These estimates confirm the prediction of the two group logit model, of positive own group and zero cross group preference externalities.

4.3 Efficient entry and preference externalities

Models of the efficiency of entry patterns, such the logit model articulated above and Mankiw and Whinston (1986), have implications related to preference externalities. With fixed costs, with one group of consumers and one type of symmetrically differentiated product, marginal entry reveals the market's implicit welfare weight on the marginal consumer. That is, suppose than the last entrant costs $1 million and raises overall consumption by 10 units. For the sake of discussion, assume that marginal entry has no effect on prices. This reveals that the market values consumers at $100,000. This characterization is a slight over-simplification in while marginal entry raises consumption by 10 on net, the gross consumption of the marginal entrant will typically exceed 10. Say it's 50. Then while 10 consumers are now getting some product rather than no product, the other 40 are getting a product better than a product they were already consuming.

Berry and Waldfogel (1999) study the efficiency of entry into US radio broadcasting, treating welfare as the value of advertising produced, less the fixed costs of station operation. That is, they examine the efficiency of the market from the standpoint of direct market participants, the buyers and sellers of advertising. They find that US radio markets had about three times too many stations than the number that would maximize the welfare of market participants. Understanding that radio programming has value to listeners, they also inferred the value that a marginal listener would need to have attached to programming to render observed entry patterns efficient. They found this to be $893 per year, while the ad revenue was $277 (both in 1993 dollars). Note that the implicit value is larger in larger markets, as they have more entry and a smaller net impact of the marginal station on total listening, as well as higher costs of station operation.

The market's welfare weight arise from a mechanism related to the preference externality: it shows how much firms in the market expend to deliver consumption to one additional individual (again, putting aside the benefit experienced by consumers finding a better product). One of the themes we have explored in this chapter is the potentially different treatment that media product markets can deliver to different groups.

Berry, Eizenberg, and Waldfogel (BEW, 2014) explore this question in a two-group extension of Berry and Waldfogel (1999). BEW develop an empirical model of entry into radio broadcasting with two groups of consumers and two groups of stations, where the groups considered are a) blacks and whites, and b) Hispanics and non-Hispanics. In the black-white model, BEW estimate group-specific nested logit models of radio listening, where blacks and whites have potentially different preferences for black and white targeted programming, respectively. Given data on ad prices by type of listener, the observed entry patterns can be used

along with the listening model to estimate the revenue of the marginal station – and therefore the fixed costs - of each station type. Estimated fixed costs, along with the listening demand functions, can be used to infer the welfare weights that the market attaches to listeners of the two types. They find that the market attaches 2-3 times higher welfare weight to white relative to black listeners. Weights are slightly higher for non-Hispanic than Hispanic listeners.

5. Technological Change, Fixed Costs, and Preference Externalities

The dependence of one's consumption options on the preferences of others has its starkest impact on isolated consumers. A lone black consumer in an otherwise white metropolitan area will face no options targeted to his or her group and will be delivered little satisfaction by the product market. Media products at their economic core are digitizable audio, video, and text. Given technological change of the past few decades, including the Internet, satellite radio, and even the earlier innovation of cable television, media products are easily transportable (easily communicated) across space.

This has important consequences for the operation of preference externalities. The basic idea of preference externalities is that consumers' options and ultimate satisfaction (in their capacity as product consumers) are limited by the economic mass and preference mix of the fellow consumers with whom they share the market. With the development of contemporary communication technologies, one's fellow consumers need not be geographically local.

Beginning in the late 1990s newspapers and radio programming began to be distributed online and therefore in non-local markets. For example, the *New York Times* and the *Wall Street Journal* began online distribution in 1996, while *USA Today* appeared online even earlier, in

1995.[39] Many local newspapers, ostensibly targeted to local consumers, also appeared online in the mid to late 1990s. With this development, consumers around the country (and the world) could get access to many products not specifically targeted to their local populations.

While Internet distribution was a radical departure from local physical distribution, it had a precursor in national physical distribution of papers such as the *New York Times* and the *Wall Street Journal*. The *New York Times*, a paper targeted at upscale New York residents as well as educated and cosmopolitan readers outside of the New York metropolitan area, launched a national edition in 1980 and expanded national distribution to 100 cities between 1996 and 2000.

George and Waldfogel (2006) document that as the *Times* became available – and purchased – across the US, the circulation of local papers declined among targeted readers. That is, the highly educated readers turned their attention away from local papers. At the same time, the local papers, ceding the readers lost to the *Times*, shifted their targeting toward more local issues. These changes increased circulation among less educated readers. With the national distribution of the *Times*, educated consumers in locales around the country had access to a more appealing product than could profitably have been made available by a product targeting one local community at a time.[40]

Effects need not have been unambiguously positive. While educated consumers gained access to a product with more extensive national and global coverage, those among them forgoing the local product for the Times would lose ready access to local news. Similarly, those

[39] See http://en.wikipedia.org/wiki/The_New_York_Times#Web_presence, http://en.wikipedia.org/wiki/The_Wall_Street_Journal#Internet_expansion, http://en.wikipedia.org/wiki/USA_Today .

[40] George (2013) and George and Hogendorn (2013) provided related evidence that the spread of the Internet has drawn younger and more educated readers away from traditional newspapers.

consumers continuing to purchase the now-more-locally-targeted local newspapers would have less ready access to non-local information.

The spread of the Internet, a conduit giving consumers access to both local and distant products and information, holds the promise of "liberating" consumers from the tastes of their neighbors. Sinai and Waldfogel (2004) provide some evidence of liberation along these lines. Despite the well known "digital divide," that blacks are less Internet-connected than whites, Sinai and Waldfogel (2004) document that blacks are more likely to connect as they are more geographically isolated. That is, blacks living in metropolitan areas with fewer fellow black consumers were more likely to connect than blacks in areas with larger local black populations, conditional on individual characteristics. Two mechanisms may have accounted for this result. First, the local within-group preference externality would tend to provide more products more appealing to blacks in local markets with large black populations. Second, those consumers lacking local preference compatriots would be more likely to find products of interest online, whose economic constituency was drawn from around the country. These examples show that technological change that links consumers and products across space have changed the way that preference externalities function.

The availability of nonlocal products in competition with products that had previously faced only local competition has had major effects. For example, according the Newspaper Association of America, combined subscription and advertising revenue fell by over 50 percent from 2000 to 2010.[41] According to Arbitron, radio listening fell 15 percent between 1998 and 2007.[42]

[41] http://www.naa.org/Trends-and-Numbers/Newspaper-Revenue.aspx
[42] http://wargod.arbitron.com/scripts/ndb/ndbradio2.asp .

Many local products have languished in the face of nonlocal competition. For example, many newspapers have folded in the past decade. Some have raised concerns that the decline of local newspapers will make it difficult for consumers and citizens to remain well informed. Yet, it should be noted that the Internet has also given consumers ready access to information that is not disintermediated. Whether consumers would grow less well informed is an open question.

Technological change has reduced the costs of producing media products and has increased market size by linking consumers together via the Internet. Together, of course, these developments reinforce the reduction in fixed costs relative to market size and may mitigate the occurrence of preference externalities. While new technology reduces the cost of delivering basic products, access to many consumers can give rise to costs that are endogenously large as firms vie for enlarged – and potentially global – audiences. Preference externalities are likely to be with us for some time, although the specific contexts where they arise may change.

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