Media Mergers with Preference Externalities and Their Implications for Content Diversity, Consumer Welfare, and Policy*

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Abstract

One of the primary concerns regarding media mergers involves their potential adverse effect on content/viewpoint diversity. This paper presents a formal treatment of the influence that within-group consumer preference externalities over media content has on a media outlet’s incentive to engage in product repositioning both before and after merging with another media outlet. We first present a model of consumer behavior under preference externalities and derive aggregate consumer expenditure functions for media output. It is shown that even assuming the merged entity sets a uniform price and content mix across market areas, the relative access to some minority (majority) group subscribers will increase (decrease) post-merger (and vice versa). We derive sufficient conditions under which the merged entity will in fact have an incentive to homogenize its post-merger price/content mix. And while the post-merger repositioning effects arguably suggest the consumer welfare implications of such mergers are ambiguous a priori, it is posited that the observed idiosyncratic preferences for media content among demographic groups may translate into significant losses to consumer welfare in some instances and may also adversely affect some individuals’ participation in civil affairs, such as voting. Finally, the relation of the model to previous empirical work on media mergers and diversity, and the potential for non-traditional policy interventions of offset the competitive harms of such transactions, are also discussed.

Key words: Diversity; Media ownership; Merger policy; Preference externalities; Product repositioning; Welfare

JEL Classification: K21; K23; L41; L82

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Abstract

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1. Introduction

The impact of higher media market concentration levels on the “diversity” of media coverage remains a controversial topic that lies at the forefront of national and local regulatory policy agendas. For instance, in 2002 the U.S. Federal Communications Commission (“FCC”) released a number of academic studies to evaluate the effect of media consolidation on various market outcomes. The FCC then released an order and notice of proposed rulemaking in June, 2003, that partially repealed its regulation of mass media outlets (FCC, 2003). The resulting public outcry against the FCC’s proposed actions were based in part on the fear that further consolidation of the media industry would lead to the foreclosure of programming variety in various media markets, which led to Congressional legislation imposing stricter rules on mergers between television stations. Subsequently, in Prometheus vs. FCC, the U.S. Third Circuit Court of Appeals remanded several of the FCC’s deregulatory proposals. Today the FCC continues its investigation into how changing media ownership rules may affect the diversity of media content.

Several empirical studies have explored the relationship between media ownership concentration and product variety. Some suggest a variety-enhancing effect of consolidation while others reach the opposite conclusion. Another body of empirical literature examines the role of “preference externalities” on content diversity in media markets. These studies demonstrate that for industries characterized by high fixed costs of entry and heterogeneous consumer preferences over product variety (which is an accurate depiction of most media

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2 See Shelanski (2006) for further discussion of the history and controversy surrounding the FCC’s 2003 Order.
3 Prometheus Radio Project vs. FCC, 373 F.3d 372,382 (3d Cir. 2004).
5 See, inter alia, Dertouzos and Trautman (1990); Rogers and Woodbury (1996); Berry and Waldofgel (2001); and DiCola (2006).
markets), the larger the number of individuals belonging to a group with a given preference characteristic the more likely suppliers (i.e., media outlets) will choose to target these consumers. That is, as the number of consumers of a given “type” increases, the more likely they will have the type of products they desire supplied to them.\footnote{This effect may occur by way of new product introduction or the repositioning of existing products (George and Waldfogel, 2003).} It is in this sense that consumers with similar tastes exert a positive preference externality on one another: individuals are more likely to consume their preferred output if the market contains more persons with similar preferences and \textit{vice versa}.

This study adds to the above body of literature from a theoretical perspective by examining the effect of media consolidation on pricing and content diversity in the presence of consumer preference externalities. Section 2 begins by introducing a model of consumer choice with two groups of consumers that differ in both size and the type of media output each prefers. The presence of preference externalities and the consumption of preferred versus non-preferred content by consumer type are taken into account within the consumer choice problem. From there expressions for each consumer group’s expenditure function for media output, as well as the corresponding aggregate expenditure function, are derived.

Relying on the latter expressions, a model of firm behavior is then developed where, in equilibrium, a representative price- and content-setting media outlet optimally responds to changes in the mix of subscribers by engaging in product repositioning. That is, the outlet devoting a greater proportion of the total content it provides to consumers in the “group” with the relatively greater number of members post-merger. Thus, the model formalizes the conceptualization of preference externalities initially set forth and tested in Waldfogel (2004) and George and Waldfogel (2003). In addition, we demonstrate how the elasticity of demand for media output depends on both quality and price margins in the presence of preference
externalities, and explore how this elasticity responds to changes in the proportion of content offered by the media outlet to a particular subscriber group.

The potential loss in content or “viewpoint” diversity is arguably the most significant concern raised regarding the impact of media mergers. Section 3 considers a merger between two media outlets (each of which serves a distinct customer base pre-merger) that results in the merged firm “homogenizing” its content mix. We show that despite this (presumed) behavior on the part of the merged entity, due to preference externalities, some minority (majority) consumer types will nonetheless have greater (lesser) access to their “preferred” content while others will necessarily have less (more) post-merger. Finally, we derive sufficient conditions under which the merged entity will in fact possess the incentive to homogenize its content mix, which suggests this particular realization of product repositioning may be empirically relevant in some circumstances.

Section 4 then briefly discusses the relation between the model’s theoretical predictions and recent empirical work exploring the effect of media mergers on content diversity. Evidence from a large, recent media merger that appears consistent with the model’s predictions is also presented.

Section 5 discusses the model’s implications for subscriber welfare. Although the results suggests that subscriber welfare effects are likely to be ambiguous a priori, the fact that several recent empirical studies have shown distinct differences in the type of media content consumed across demographic groups suggests that such transactions may result in significant losses in consumer welfare for some subscribers. Further, the potential influence that media mergers (through their effect on content access to a group’s preferred content) may have on other non-price margins such as voter participation (e.g., as suggested by Oberholzer-Gee and Waldfogel (2005, 2006)) and the resultant implications for consumer welfare are also considered.

Given the potential adverse price and/or content (diversity) effects to some subscriber groups resulting from media mergers as predicted by the model, Section 6 discusses possible
antitrust and/or regulatory policies. “Traditional” antitrust remedies, such as asset divestiture, may not be effective in ameliorating the harms from media mergers in some instances since they do not address the effect of media mergers on content or other non-price margins. Other policy interventions, such as the subsidization of minority-owned media outlets and behavioral remedies that require merged media entities to offer minority-oriented content on an à la carte basis, may preserve consumers’ access to their preferred content while also potentially protecting them from any anticompetitive price increase post-merger. Finally, Section 7 concludes.

2. The Model

2.1 Consumers

The purchasers (or “subscribers”) of media have differing preferences regarding the type of content they prefer to view. In the context of the ensuing discussion, individual subscriber content preferences are indexed by $\theta = \{m: \text{minority} ; M: \text{majority}\}$. These preferences are not necessarily determined by the demographic characteristics of subscribers (although they may be). For instance, some newspaper readers may prefer stories devoted to national and international issues, while others might prefer relatively more local content. Alternatively, the viewing population served by a given cable company might consist of a group of households primarily interested in family-oriented programming and another primarily interested in channels devoted to sports coverage.

When subscriber preferences externalities are present it is the relative sizes of minority- and majority-types that determine the availability of each group’s preferred content (i.e., the number of subscribers that belong to each group) and thus the overall “diversity” of media. Let $N_{j,\theta}$ denote the number of subscribers with $\theta$-type media content preferences that reside in Area $j = \{1, 2\}$. As such, there are two distinct “market areas,” and within each area there are two
populations of media subscribers that differ in their preferences for content. These areas may correspond, e.g., to MSAs, city boroughs, states, counties, etc.

Before proceeding, the following conditions are assumed to hold throughout the analysis.

**Condition 1.** There is a greater number of majority-type subscribers than minority-type subscribers in each area, or \( N_{j,M} > N_{j,m} > 0 \) \( \forall j \).

**Condition 2.** The ratio of minority- to majority-type subscribers is greater in Area 1 than in Area 2, or \( \frac{N_{1,m}}{N_{1,M}} > \frac{N_{2,m}}{N_{2,M}} \).

Condition 1 simply defines the notion of a “majority” in the context of media markets with subscriber preference externalities. Condition 2 allows for a more generalized notion of subscriber mixes across different geographic areas relative to assuming constant proportions. Specifically, this condition allows us to consider how the relative size of consumer types across areas affects media mergers in addition to absolute group-size effects.

### 2.1.2 Preference Externalities and Consumer Behavior

We model the consumer choice problem with preference externalities over media output based on Bush’s (1994) theoretical formulation of interdependent preferences. Individual consumers (or “media subscribers,” who may be either in the majority or minority group) are indexed by \( z = 1, \ldots, Z \), where \( Z = N_{j,m} + N_{j,M} \). Media consumers of type \( \theta = m \) correspond to ordering \( z = 1, \ldots, N_{j,m} \), while subscribers of type \( \theta = M \) correspond to ordering \( z = N_{j,m} + 1, \ldots, N_{j,m} + N_{j,M} \). Following Bush, subscriber \( z \) has a continuously differentiable

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8 Bush (1994) models interdependent preferences within the context of Veblen (1899) effects, and motivates the construct of a status utility function that is defined over own consumption and expectations of expenditures on goods by individuals in the next highest “social class” (where income levels are used as a proxy of class determination). (See also Charles et al. (2008) and Bagwell and Bernheim (1996) for formal treatments of utility maximization with Veblen effects.) The model presented here modifies Bush’s status utility function by abstracting from Veblen effects but accounting for the presence of within-group preference externalities. Bush shows that under certain conditions the status-maximization model will correspond to the neoclassical utility-maximization framework of consumer behavior.
status objective function that is defined on combinations of expenditures over individual products (including media output).

For simplicity, subscribers are assumed to consume only a single “format” of media (e.g., newspaper, television, radio, etc.). Let $j$ index the subscribers’ expenditures on purchasing this media format as well as the specific outlet (i.e., firm) that offers the content. The media outlet operates in a local geographic area where there are $n$ other goods, such that there are $k=1,\ldots,n+1$ distinct offered for sale in total. Let $l_i \geq 2$ denote the firms producing (non-media) good $i \neq j$, $i = 1,\ldots,n$.

Firms choose prices (i.e., play pure Bertrand strategies), save for the media outlet who (as discussed further below) selects both the price and the “content mix” (which is perceived by subscribers as “quality”) of its output. Let $p_i$ and $p_j$ denote the prices of goods $i$ and $j$, respectively, and $v_{k}^{(z)}$ subscriber $z$’s total expenditure on good $k$. For good $k \neq j$ (i.e., all non-media goods), the type of consumer has no meaning in consumption of the output.

Subscriber $z$’s problem is to choose expenditures on individual products, $v_{j}^{(z)}, v_{1}^{(z)}, v_{2}^{(z)}, \ldots, v_{n}^{(z)}$, that maximize the consumer’s status objective function $SV^{(z)}$, which is of the Stone-Geary form, subject to the constraint $v_{j}^{(z)} + v_{1}^{(z)} + v_{2}^{(z)} + \ldots + v_{n}^{(z)} = I^{(z)}$ where $I^{(z)}$ is the income of subscriber $z$. Let $g(p_j)$ denote a well-behaved concave function on the price of media outlet $j$ that captures the effect of $p_j$ on preferences and expenditures for the media good.

Formally, subscriber $z$’s constrained optimization problem is

$$
\max_{\{v_{j}^{(z)}, v_{1}^{(z)}, v_{2}^{(z)}, \ldots, v_{n}^{(z)}\}} SV^{(z)} = (v_{j}^{(z)} - \psi_j g(p_j) - \alpha_z \Omega_j)^\beta \left( \prod_i^n (v_i^{(z)} - \psi_i p_i)^\beta \right)
$$

subject to

$$
\sum_{k=1}^{n+1} v_k^{(z)} = I^{(z)}
$$

---

\[9\] In this model it is assumed that each firm supplies only a single good.
where \( \alpha > 0, \psi > 0, \beta > 0 \), and \( \sum \beta_z = 1 \). The expression

\[
\Omega_j = \tau_z S_j^\alpha + \eta (N_{j,m} \ln S_{j,m} + N_{j,M} \ln S_{j,M})
\]

(3)
captures the effects of subscriber groupings (preference externalities) on the mix of content offered by the media outlet. The variable \( S_{j,\theta} \) denotes the share of total content “capacity” preferred by \( \theta \)-type subscribers that is provisioned by the media outlet. Let \( \tau_z > 0, 0 < S_j^\alpha \leq 1 \), and \( \eta > 0 \). The parameter \( S_j^\alpha \) is \( z \)'s “idealized” or most preferred mix of the media outlet. That is, if a consumer could personally arrange the mix of the media outlet to suit his/her taste the optimal content mix would be \( S_j^\alpha \). This preference in turn implies that the function \( \Omega_j \) partially reflects the “subsistence” or “permanent” level of media expenditures associated with the market provided non-individualized mix of the media outlet. A subscriber’s media expenditures are therefore determined by the idealized value of her mix of the media outlet ( \( \tau_z S_j^\alpha \) ) relative to the content mix actually provisioned by the media outlet.

Subscriber \( z \)'s equilibrium expenditure on media output is given by

\[
v_j^{(z)} = ag(p_j) + \sum_{i=1}^{n} a_{ji} p_i + \tilde{T}_z + \tilde{\alpha}_z (N_{j,m} \ln S_{j,m} + N_{j,M} \ln S_{j,M}) + \beta_j I_j^{(z)},
\]

(4)

where \( a = (1 - \beta_j) \psi_{j, \theta} \), \( a_{ji} = -\beta_j \times \psi_i \), \( \tilde{T}_z = (1 - \beta_j) \alpha_z \tau_z S_j^\alpha \), and \( \tilde{\alpha}_z = (1 - \beta_j) \alpha_z \eta \).\(^{10}\) Equilibrium market expenditures on media output for type \( \theta = m \) subscribers are then

\[
X_{j,m} = \sum_{z=1}^{N_{j,m}} v_j^{(z)}
\]

\[
= \sum_{z=1}^{N_{j,m}} ag(p_j) + \sum_{i=1}^{n} a_{ji} p_i + \sum_{z=1}^{N_{j,m}} \tilde{T}_z + \sum_{z=1}^{N_{j,m}} \tilde{\alpha}_z (N_{j,m} \ln S_{j,m} + N_{j,M} \ln S_{j,M}) + \beta_j \sum_{z=1}^{N_{j,m}} I_j^{(z)}
\]

\[
= N_{j,m} ag(p_j) + \sum_{i=1}^{n} a_{ji} p_i + \sum_{z=1}^{N_{j,m}} \tilde{T}_z + \sum_{z=1}^{N_{j,m}} \tilde{\alpha}_z (N_{j,m} \ln S_{j,m} + N_{j,M} \ln S_{j,M}) + \beta_j \sum_{z=1}^{N_{j,m}} I_j^{(z)}
\]

\[
= a^{(m)} g(p_j) + \sum_{i=1}^{n} a_{ji}^{(m)} p_i + \sum_{z=1}^{N_{j,m}} \tilde{T}_z + \sum_{z=1}^{N_{j,m}} \tilde{\alpha}_z (N_{j,m} \ln S_{j,m} + N_{j,M} \ln S_{j,M}) + \beta_j \sum_{z=1}^{N_{j,m}} I_j^{(z)}
\]

\(^{10}\) Appendix 1 contains the derivation of Eq. (4) for the case of a media outlet and one composite good with a composite price.
where $a^{(m)} = N_{j,m}a$ and $a^{(M)} = N_{j,M}a_{ji}$. Similarly, media expenditures for type $\theta = M$ subscribers are given by

$$X_{j,M} = \sum_{z=N_{j,m}+1}^{N_{j,m}+N_{j,M}} v_z^{(z)}$$

$$= a^{(M)}g(p_j) + \sum_{i=1}^{n} a^{(M)} a_{ji} p_i + \sum_{z=N_{j,m}+1}^{N_{j,m}+N_{j,M}} \tilde{T}_z + \sum_{z=N_{j,m}+1}^{N_{j,m}+N_{j,M}} \tilde{\alpha}_z (N_{j,m} \ln S_{j,m} + N_{j,M} \ln S_{j,M}) + \beta_j \sum_{z=N_{j,m}+1}^{N_{j,m}+N_{j,M}} f^{(z)}$$

where $a^{(M)} = N_{j,M}a$ and $a^{(M)}_{ji} = N_{j,M}a_{ji}$.

Let $\tilde{I} = \sum_{z=1}^{N_{j,m}+N_{j,M}} f^{(z)}$. Total market expenditures on media across all subscribers are then

$$X_j = X_{j,m} + X_{j,M}$$

$$= (a^{(m)} + a^{(M)})g(p_j) + \sum_{i=1}^{n} a^{(m)} a_{ji} p_i + \sum_{i=1}^{n} a^{(M)} a_{ji} p_i + \sum_{z=1}^{N_{j,m}+N_{j,M}} \tilde{T}_z$$

$$+ \sum_{z=1}^{N_{j,m}+N_{j,M}} \tilde{\alpha}_z (N_{j,m} \ln S_{j,m} + N_{j,M} \ln S_{j,M}) + \beta_j \tilde{I}$$

Define:

$$G_j(p_j) = (a^{(m)} + a^{(M)}) \times g(p_j),$$

$$\tilde{a}_{ji} = (N_{j,m} + N_{j,M})a_{ji},$$

$$\beta = \sum_{z=1}^{N_{j,m}+N_{j,M}} \tilde{\alpha}_z (> 0),$$

and

$$T = \sum_{z=1}^{N_{j,m}+N_{j,M}} \tilde{T}_z.$$  

The variable $\beta$ maps the influence of preference externalities into their dollar equivalents.

Substituting Eqs. (8)-(11) into Eq. (7) gives
\[ X_j = G_j(p_j) + \sum_{i=1}^{n} \tilde{a}_{ij}P_i + \{T + \beta(N_{j,n} \ln S_{j,n} + N_{j,M} \ln S_{j,M})\} + \beta I. \]

(12)

The intuition behind Eq. (12) is straightforward. When consumers maximize with respect to relative expenditures in consumption across all goods, aggregate market expenditure is composed of four components. The first component is an own-price expenditure component, \( G_j(p_j) \), which captures the effect of the media outlet’s price on subscriber expenditures. The second component, \( \sum_{i=1}^{n} \tilde{a}_{ij}P_i \), is the cross-price affect of consumption of other goods on consumption of the media outlet. The third component is the permanent level of consumption of the media outlet, and this component consists of consumers’ valuations of their idealized mix of the media outlet, \( T \), and the effect of preferences externalities on the media outlet’s market provision of the mix of the media \([i.e., \beta(\cdot)]\). The final component, \( I \), is the effect aggregate income on media expenditures.

2.2 Preference Externalities and Media Outlet Behavior

In this subsection we consider the optimizing behavior of media outlets servicing a population of subscribers whose purchase decisions are influenced by preference externalities. The representative media outlet (which may be a newspaper, cable operator, radio station, etc.) is assumed to sell advertisers access to their subscribers in a perfectly competitive market.\(^{12}\) Let

\[ r_j(p_j, q_j) = p_j \times q_j \]

(13)

\(^{11}\) Note that Eq. (12) is similar to a Stone’s (1954) Linear Expenditure System (“LES”) with a consumer expenditure function that allows for habit formation. With regard to Eq. (11), terms for quality/diversity and preference externalities enter in a similar fashion. Habits are, however, incorporated into the LES on an \textit{ad hoc} basis. In the Stone-Geary utility function there is no term for habits. It is only after the LES is derived that a habit term is added. Again, under specific conditions the status-maximization model of Bush (1994) will reduce to the neoclassical framework of consumer behavior. As such, the bundling of content by a given media outlet can be viewed as a habit that consumers desire “less” \([i.e., \text{since the bundle will contain some fraction of content that is not preferred by either the majority or minority subscribers}].\)

\(^{12}\) This assumption obviates the need to explicitly model the outlet’s advertising price decision and allows us to focus more directly on the outlet’s decisions regarding price and content to the ultimate subscribers of the media, which is the fundamental goal of the analysis.
denote expected sales/revenue where \( q_j \) denotes expected demand.\(^{13}\) From Eq. (12), expected sales for (expenditures on) the media outlet (product) can be expressed as

\[
r_j(p_j, q_j) = G_j(p_j) + \beta(N_{j,m} \ln S_{j,m} + N_{j,M} \ln S_{j,M}).
\]

That is, expected revenues or sales (which are also expected consumer expenditures) consist of two components: (1) a price component and (2) a component capturing the effect of the level of diversity contained with the content bundle for minority consumers and majority consumers (conditional on price). Again, the function \( G_j(p_j) \) corresponds to the “price sensitive” component of expected revenues. As such, the second term on the right-hand-side of Eq. (14) gives the “content sensitive” component of revenues, i.e., the effect of the firm’s chosen level of content diversity on its expected revenues (conditional on price).\(^{14}\)

A media outlet does not directly produce its content per se. Rather, the outlet purchases its (minority- and majority-oriented) content from a competitive upstream content market and then bundles this content in the form of media output it provides to subscribers.\(^{15}\) Content providers then charge the (downstream) outlet a flat price for content, i.e., each media firm has a fixed cost for acquiring content denoted \( f_{j,\text{CONT}} > 0 \). There is also a fixed “network” cost, denoted \( f_{j,\text{NET}} > 0 \), which an outlet incurs for transmitting or distributing its output to

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\(^{13}\) We will abuse notation somewhat by allowing \( j \) to index both the geographic area and the (representative) media outlet supplying it.

\(^{14}\) Equation (14) implicitly subsumes that a given media outlet cannot price discriminate between minority- and majority-type subscribers. This is not an unrealistic notion given that many types of media cannot easily observe the characteristics of the customers purchasing their output (e.g., a large-circulation local newspaper firm cannot determine what kind of consumers are purchasing its output at a news stand without incurring the potentially high cost of monitoring). In addition, the output produced by some media outlets (e.g., cable systems) may be price-regulated by state/local licensing bodies, which also prevents the firms from charging different prices to different customers.

\(^{15}\) Thus, one may think of firm \( j \) purchasing all of its content from a representative firm in the upstream content market.
subscribers. Finally, the outlet incurs a constant marginal cost of content transmission, which is denoted by \( c > 0 \).\(^{16}\)

The media outlet’s constrained profit-maximization problem is given by

\[
\max_{(p_j, s_{j,m}, s_{j,m})} E\{\Pi_j\} = r_j - c\left(\frac{1}{p_j}\right)r_j - (f_{j,\text{CONT}} + f_{j,\text{NET}})
\]

subject to

\[
S_{j,m} + S_{j,m} = 1.
\]

We first present a preliminary result: when, in the presence of preference externalities, consumers make purchasing decisions based on both the price and content of a given media outlet, the elasticity of demand for that media outlet will (necessarily) reflect each of these margins.

**Lemma 1.** Let \( \gamma_j = \frac{\partial G_j(p_j)}{\partial p_j} \times p_j / G_j(p_j) \) denote the own-price elasticity of the price-sensitive component of expected revenues and \( \omega_j = G_j(p_j) / r_j \) the fraction of total expected revenues generated from the price-sensitive component of demand. Then the quality-adjusted price elasticity of demand for the media output is \( \varepsilon_j = (\gamma_j \times \omega_j) - 1 \).

**Proof:** Note that \( \ln(r_j) = \ln(p_j q_j) = \ln p_j + \ln q_j \). Differentiating this latter expression with respect to \( p_j \) gives

\[
\frac{1}{r_j} \frac{\partial r_j}{\partial p_j} = \frac{1}{r_j} \frac{\partial G_j(p_j)}{\partial p_j} = \frac{1}{p_j} + \frac{1}{q_j} \frac{\partial q_j}{\partial p_j}
\]

\[
\Rightarrow \frac{p_j}{r_j} \frac{\partial G_j(p_j)}{\partial p_j} = 1 + \frac{p_j}{q_j} \frac{\partial q_j}{\partial p_j}
\]

\[
\Rightarrow \frac{G_j(p_j)}{r_j} \frac{p_j}{G_j(p_j)} \frac{\partial G_j(p_j)}{\partial p_j} = 1 + \frac{p_j}{q_j} \frac{\partial q_j}{\partial p_j}
\]

\[
\Rightarrow \omega_j \gamma_j = 1 + \varepsilon_j
\]

\[
\Rightarrow \varepsilon_j = (\gamma_j \times \omega_j) - 1.
\]

\( \Box \)

\(^{16}\) For example, in the newspaper industry the marginal costs of distribution/transmission would include those involved with home delivery services. In other media industries, such as cable, these costs are likely to be very small.
The economic intuition behind the above result is straightforward. A media outlet’s revenues are
determined by both the price and the type of content it chooses for its bundle. The more
responsive are the firm’s revenues to changes in the price it assesses for its content bundle
holding quality constant, the larger (i.e., more elastic) the firm’s quality-adjusted price elasticity
of demand will be. Similarly, the larger the fraction of the firm’s total revenue generated from
the price-sensitive component of revenue, the larger the quality-adjusted elasticity of demand.

As demonstrated below, Lemma 1 implies that the media outlet’s optimal prices will be
determined in part by the quality-adjusted price elasticity of demand and, therefore, by the
equilibrium content mix offered to minority and majority subscribers (i.e., through
expression \( \omega_j \)). This result in turn implies a quality-adjusted price-markup rule (Lerner Index)
for the firm’s equilibrium pricing decisions.

But before proceeding to the latter result, it is worth further exploring some of the
implications regarding Lemma 1. The following lemma considers how changes in the firm’s
content mix affect the firm’s quality-adjusted price elasticity of demand.

**Lemma 2.** If \( p_j > p_j^{**} \) such that
\[
\left. \frac{\partial G_j(p_j)}{\partial p_j} \right|_{p_j = p_j^*} = 0, \text{ then } \varepsilon_j < -1 \text{ and } \left. \frac{\partial \varepsilon_j}{\partial S_{j,0}} \right|_{S_{j,0} \in (0,1)} > 0.
\]

**Proof:** Again, \( \varepsilon_j = (\gamma_j \times G_j(p_j) \times r_j^{-1}) - 1 \). Let \( \theta = m \). First, we show that demand is price
elastic. Since \( \gamma_j = \frac{p_j 
abla G_j(p_j)}{G_j(p_j)} \), then for \( p_j > p_j^* \):
\[
\frac{\partial G_j(p_j)}{\partial p_j} < 0 \Leftrightarrow \omega_j \gamma_j < 0 \Leftrightarrow \varepsilon_j = \omega_j \gamma_j - 1 < -1.
\]

Then
\[
\frac{\partial \varepsilon_j}{\partial S_{j,m}} = \gamma_j \times \frac{G_j(p_j)}{r_j^2} \times (-1) \times \left[ G_j(p_j) + \beta(N_{j,m} \ln S_{j,m} + N_{j,m} \ln S_{j,m}) \right] \times \beta \frac{N_{j,m}}{S_{j,m}}
\]
\[
= \gamma_j \times \frac{G_j(p_j)}{r_j^2} \times (-1) \times \beta \frac{N_{j,m}}{S_{j,m}} = \left. \frac{p_j}{r_j^2} \times \frac{\partial G_j(p_j)}{\partial p_j} \times \beta \frac{N_{j,m}}{S_{j,m}} \right|_{S_{j,m} \in (0,1), p_j > p_j^*} > 0.
\]

The result is symmetric for \( \theta = M \).

*Q.E.D.*
Lemma 2 suggests that when the media outlet prices above the price that maximizes the price sensitive component of revenue (i.e., which it will choose to do given the non-price or content margin underlying the firm’s decision), demand is price elastic. Moreover, when the media outlet increases quality for type θ subscribers in this region, the fact that the derivative of ε_j with respect to S_{j,m} is positive implies there will be less price sensitivity on the part of all subscribers. As S_{j,m} rises, minority consumers obtain (from their perspective) access to a higher quality media bundle, which, all else equal, will lower their price sensitivity relative to a bundle that is comprised of a higher proportion of their non-preferred (majority content). That is, since the bundle that the media outlet offers minority subscribers is closer to their idealized/preferred content mix, these subscribers will place a relatively greater value on the output and thus be less price responsive. On the other hand, as the proportion of total programming content devoted to majority subscribers decreases (which it must given the binding equality constraint expressed in Eq. (16)), their idealized/preferred bundle is farther from that actually provided. In response, expenditures on media among majority subscribes will constitute a smaller proportion of their total expenditures, which in turn lowers their price sensitivity.

**Convention 1.** Let an asterisk (“*”) denote equilibrium values of the media outlet’s choice variables.

**Proposition 1.** In pre-merger equilibrium: (i) the optimal price in the j-th market area is:

\[ p_j^* = \frac{c \epsilon_j}{1 + \epsilon_j}, \]

where the right-hand side of the above expression denotes the quality-adjusted Lerner Index; (ii) the optimal share of total content that the media outlet allocates to minority-oriented content is:

\[ S_{j,m}^* = \frac{N_{j,m}}{N_{j,m} + N_{j,m}}; \]

(iii) the optimal share of total channels media outlet allocates to majority-oriented content is:

\[ S_{j,M}^* = \frac{N_{j,M}}{N_{j,m} + N_{j,M}}; \]

and (iv) the share of majority-oriented content is greater than the share of minority-oriented content, or:

\[ S_{j,M}^* > S_{j,m}^*. \]
Proof: Parts (i), (ii), and (iii) are the solution to the constrained optimization problem of Eq. (1). To show part (iv), note that

\[ S_j^* - S_{jm}^* = \frac{N_{j,M} - N_{j,m}}{N_{j,m} + N_{j,M}} > 0 \]

by Condition 1.

Q.E.D.

**Corollary 1.** If the quality-adjusted price elasticity of demand is price elastic, \( \varepsilon_j < -1 \), the media outlet’s equilibrium price is: (i) strictly positive and (ii) increasing in marginal cost.

Proof: Note that \( p_j^* = \frac{c\varepsilon_j}{1 + \varepsilon_j} \), which is clearly positive for \( \varepsilon_j < -1 \), and \( \frac{\partial p_j^*}{\partial c} = c \times \frac{1}{1 + \frac{1}{\varepsilon_j}} \).

Since \( \varepsilon_j < -1 \), \( -\varepsilon_j > 1 \Rightarrow -1 > \frac{1}{\varepsilon_j} \Rightarrow 0 > 1 + \frac{1}{\varepsilon_j} \Rightarrow \frac{\partial p_j^*}{\partial c} > 0 \).

Q.E.D.

To implement the optimal shares of minority and majority programming channels the media outlet contracts with upstream content providers until the contracted share of minority/majority-oriented programming channels (out of total program channel capacity) is equal to the optimal share of minority/majority-oriented programming. As suggested by Proposition 1, in equilibrium the presence of preference externalities implies that the share of the total content mix that is geared towards the preferences of the majority group of subscribers will be greater than the share that is geared towards the preferences of the minority group.

Recall that a number of empirical studies suggest that the presence of other subscribers with similar preferences to one’s own preferences for media content will increase the likelihood that one’s preferred content is offered in the market. All else equal, the presence of within-group preference externalities increases the availability of the “preferred” content choice corresponding to the subscriber group with a growing number of members while decreasing the preferred content available to other non-group members. The following proposition formally demonstrates this result.

---

17 The complete proof is shown in Appendix 2.
18 The result may be approximate due to the specific form of media outlet considered and rounding. For example, with respect to the cable industry, upstream content providers may “share” channels so, e.g., there might be 40.5 channels of majority-oriented programming.
**Proposition 2.** The media outlet will increase (decrease) the preferred content of \( \theta \)-type subscribers with an increase (decrease) in the number of \( \theta \)-type subscribers through product repositioning (which results in a change to the equilibrium content mix).

**Proof:** The proof is demonstrated by the following partial derivatives.

\[
\frac{\partial S^*_{j,M}}{\partial N_{j,M}} = \frac{N_{j,m}}{(N_{j,m} + N_{j,M})^2} > 0
\]

\[
\frac{\partial S^*_{j,M}}{\partial N_{j,m}} = \frac{-N_{j,m}}{N_{j,m} + N_{j,M}} < 0
\]

\[
\frac{\partial S^*_{j,m}}{\partial N_{j,m}} = \frac{N_{j,M}}{(N_{j,M} + N_{j,m})^2} > 0
\]

\[
\frac{\partial S^*_{j,m}}{\partial N_{j,M}} = \frac{-N_{j,M}}{N_{j,M} + N_{j,m}} < 0
\]

Q.E.D.

Thus, Proposition 2 shows that the firm responds to changes in the mix of subscriber types by optimally reallocating the relative group-specific program shares through product repositioning.

We now turn attention to the effects of media mergers within the model outlined above on the equilibrium price of content and its diversity.

**3. Price and Diversity Effects of a Media Merger with Subscriber Preference Externalities over Content**

In this section we turn to a formal model of mergers in media markets where the demand of media subscribers (e.g., newspaper readers, radio listeners, cable television viewers, etc.) exhibits preference externalities. We consider the case of a merger between the media firms operating in the two distinct geographic areas (markets), where each outlet is assumed to produce the same “form” of media.\(^{19}\) The set of questions the following analysis seeks to answer include the following. When or under what conditions would the merged media outlet offer the same percentage of majority programs or the same distribution mix of program channels in both

\(^{19}\) For example, the firms may be newspaper outlets operating in different cities, or they may be cable companies operating in adjacent franchise areas. This assumption is made only for the sake of conceptual ease, and does not qualitatively affect the results.
franchise areas? If the same percentage of majority content or the same distribution mix of content is offered in both areas, what is the optimal share of majority or minority content? Will majority-type subscribers have more content oriented to their preferences in the presence of preference externalities – i.e., will there be less content diversity overall post-merger?

By definition there are $N_{post,\theta} = N_{1,\theta} + N_{2,\theta}$ total $\theta$-type subscribers across the merged media markets. The newly combined media firm chooses content shares that are oriented to $\theta$-type subscribers in Area $j$ and the corresponding price of its output. Let $f_{post,CONT} > 0$ denote the post-merger fixed cost of network content, and $f_{post,NET} > 0$ the corresponding network cost.

The consummation of the transaction is assumed to result in various merger-specific fixed-cost efficiencies (which may be either small or large in magnitude). For example, workforce reductions, department consolidations, and the elimination of redundant capital investments lower the fixed costs of production post-merger. In addition, efficiencies could arise from discounts on content offered to larger downstream media firms by upstream content providers.

**Condition 3.** Fixed cost efficiencies from the merger generate a new average total cost for the merged firm denoted $ATC_{post}$, such that $ATC_{post} < \sum_j ATC_j$ over all levels of output, where $ATC_j$ denotes the pre-merger average total cost of the media outlet operating in Area $j$.

That is, we assume that the merger does not result in any marginal cost reductions per se, but does allow for efficiencies in the level of fixed costs incurred by the merged firm. It is well understood any welfare loss resulting from the increased market power possessed by the merged firm may be more than offset from efficiencies realized through reduced marginal costs of production (which directly affect the firm’s pricing decisions) (Williamson, 1968). Abstracting from this possibility allows us to focus the analysis on those competitive effects arising from changes in diversity holding marginal costs constant. Further, the attainment of fixed cost efficiencies is often cited by the applicants in media mergers as one of the potential benefits of
these transactions, and as such, it seems appropriate to consider such cost reductions in any model of media consolidation.

The potential effect that media mergers will impart on the mix of minority- and majority-oriented content — e.g., a net loss in content/viewpoint diversity — is perhaps the most significant concern raised regarding these transactions. For example, such concerns have been raised in the context of transactions involving local television broadcast stations stemming from less stringent local media cross-ownership rules, which some critics have alleged will result in fewer news stories relating to local events being aired. Similar allegations have been raised with respect to radio mergers, in particular, with large radio enterprises such as Clear Channel. Indeed, a report released by the Project for Excellence in Journalism in 2007 asserts “[competitors and consumers complained] that Clear Channel’s domination [of the radio industry] was diminishing the quality of AM/FM radio dial by monopolizing key markets and homogenizing content.”

We assume a priori that the merged entity chooses to homogenize its price/content mix across the two market areas in the following sense.

**Condition 4.** The merged firm homogenizes its price and content mix by choosing a common set of content shares (e.g., the share of minority/majority-oriented program offered in Area 1 post-merger is the same as that offered in Area 2) and a single (uniform) price to charge subscribers across each area (denoted \( p \)).

Assuming this condition is initially satisfied allows us to examine the implications for the access of minority- and majority-group subscribers to their preferred content under the “worst case” post-merger scenario suggested above (i.e., one in which the merged outlet chooses to homogenize its content mix). Propositions 3 and 4 below then consider the concomitant

---

22 Clearly, if the merged firm continued to treat each market area “separately,” then one would not expect any change in the pre- and post-merger content shares or prices set in each area given the assumption of no marginal cost efficiencies. Of course, this latter outcome would also tend not raise any anticompetitive concerns and be of no inherent interest from an academic or policy perspective. Thus, the approach taken here is to assume upfront that the merged firm possesses an incentive to homogenize its output (which, again, is one of the key concerns regarding media transactions) and then explore the implications for the relative access to preferred content across groups given the presence of within-group preference.
implications for the change in minority- and majority-oriented programming in each market area post-merger under Condition 4. These propositions show that even if the firm repositions its content mix in such a manner some minority (majority) group subscribers will nonetheless have increased (decreased) access to their preferred content post-merger. Finally, in Observation 1 we derive sufficient conditions under which a firm will in fact choose to homogenize its price/content mix across market areas, thereby suggesting that such behavior may be empirically relevant in some circumstances.

We begin by introducing appropriate notation reflecting consolidation of the media outlets. Consumers are again indexed by $z = 1, \ldots, Z$. Let

$$Z = (N_{1,m} + N_{2,m}) + (N_{1,M} + N_{2,M})$$

$$= N_{\text{post},m} + N_{\text{post},M}.$$  

Media consumers of type $\theta = m$ correspond to ordering $z = 1, \ldots, N_{\text{post},m}$ while subscribers of type $\theta = M$ correspond to ordering $z = N_{\text{post},m} + 1, \ldots, N_{\text{post},m} + N_{\text{post},M}$. In the post-merger consolidated market the price sensitive component of revenue is

$$\tilde{G}(\tilde{p}) = (N_{\text{post},m} + N_{\text{post},M}) \times a \times g(\tilde{p})$$  \hspace{1cm} (17)

where $\tilde{G}(\tilde{p}) > 0$ is the portion of total revenue realized by the firm from charging a single price $\tilde{p}$ in both geographic areas under Condition 4 (the variable $a$ is as previously defined). The parameter that converts preference externalities into dollars is

$$\tilde{\beta} = \sum_{z=1}^{N_{\text{post},m} + N_{\text{post},M}} \tilde{\alpha}_z.$$  \hspace{1cm} (18)

externalities. In any event, the sufficient conditions under which the merged entity will possess the incentive to homogenize its output are derived below, which suggests that such post-merger behavior has some theoretical foundation.
Again, the firm maximizes its expected profit subject to the adding-up restriction of its content shares. The merged firm’s constrained profit-maximization problem can be formally expressed as

\[ \max_{\{\bar{p}, S_{\text{post,m}}, S_{\text{post,M}}\}} \left[ \bar{G}(\bar{p}) + \bar{B}(N_{\text{post,m}} \ln S_{\text{post,m}} + N_{\text{post,M}} \ln S_{\text{post,M}}) \right] \left(1 - \frac{c}{\bar{p}}\right) - \left(f_{\text{post,CONT}} + f_{\text{post,NET}}\right) \]  

subject to

\[ S_{\text{post,m}} + S_{\text{post,M}} = 1. \]  

The proportion of total content geared towards \( \theta \)-type subscribers post-merger is denoted by \( S_{\text{post,0}} \). In a similar fashion to the pre-merger environment, define \( \gamma_{\text{post}} = \bar{p} \frac{\partial \bar{G}(\bar{p})}{\partial \bar{p}}, \omega_{\text{post}} = \frac{\bar{G}(\bar{p})}{r_{\text{post}}}, \) and \( \epsilon_{\text{post}} = (\gamma_{\text{post}} \times \omega_{\text{post}}) - 1. \)

**Proposition 3.** In the post-merger equilibrium: (i) the optimal (uniform) price is

\[ \bar{p}^* = \frac{c \epsilon_{\text{post}}}{1 + \epsilon_{\text{post}}}; \]

(ii) the optimal share minority-oriented content provided by the merged firm is

\[ S_{\text{post,m}}^* = \frac{N_{\text{post,m}}}{N_{\text{post,m}} + N_{\text{post,M}}}; \]

(iii) the optimal share of majority-oriented content supplied by the merged firm is

\[ S_{\text{post,M}}^* = \frac{N_{\text{post,M}}}{N_{\text{post,m}} + N_{\text{post,M}}}; \]

and (iv) the share of minority-oriented programming is less than the share of majority-oriented programming, or \( S_{\text{post,m}}^* < S_{\text{post,M}}^* \).

**Proof:** The proof is analogous to that pertaining to Proposition 1 and therefore omitted.

We now examine the resultant post-merger level of content diversity in programming for the different viewing populations.

**Proposition 4.** Relative to the pre-merger equilibrium, post-merger:

(i) minority subscribers in Area 1 have less access to their preferred content, or \( S_{\text{post,m}}^* < S_{1,m}^* \);

(ii) majority subscribers in Area 1 have greater access to their preferred content, or \( S_{\text{post,M}}^* > S_{1,M}^* \); (iii) minority subscribers in Area 2 have greater access to their preferred content,
or $S^*_{post,m} > S^*_{2,m}$.

(iv) majority subscribers in Area 2 have less access to their preferred content, or $S^*_{post,M} < S^*_{2,M}$.

Proof: To show parts (i) and (ii) note that

$$S^*_1 - S^*_{post,1} = \frac{N_{1,m}}{N_{1,m} + N_{1,M}} - \frac{N_{post,1}}{N_{post,1} + N_{post,M}}$$

$$= \frac{N_{1,m}}{N_{1,m} + N_{1,M}} - \frac{N_{1,m} + N_{2,m}}{N_{1,m} + N_{2,m} + N_{1,M} + N_{2,M}}$$

$$= \frac{N_{1,m}^2 + N_{1,m}N_{2,m} + N_{1,m}N_{1,M} + N_{1,m}N_{2,M} - N_{1,m}^2 - N_{1,m}N_{2,m} - N_{1,m}N_{1,M} - N_{1,m}N_{2,M}}{(N_{1,m} + N_{1,M})(N_{1,m} + N_{2,m} + N_{1,M} + N_{2,M})}$$

$$= \frac{N_{1,m}N_{2,M} - N_{1,M}N_{2,m}}{(N_{1,m} + N_{1,M})(N_{1,m} + N_{2,m} + N_{1,M} + N_{2,M})} > 0$$

since there are relatively more minority subscribers in Area 1. Condition 2 implies

$$N_{1,m}N_{2,M} - N_{1,M}N_{2,m} > 0 \Rightarrow S^*_{post,m} < S^*_1,$$

thus

$$-1 \times S^*_{post,m} > -1 \times S^*_1 \Rightarrow 1 - 1 \times S^*_{post,m} > 1 - 1 \times S^*_1 \Rightarrow S^*_{post,M} > S^*_1.$$ 

The proof to parts (iii) and (iv) is analogous to the proof to parts (i) and (ii).

Q.E.D.

The intuition behind the results contained in Proposition 4 stems from the fact that Condition 2 implies $N_{1,m}N_{2,M} > N_{2,m}N_{1,M}$. Note that the two subscriber groups on the right-hand side of the inequality are those that realize a relative increase in access to their preferred content post-merger. Because the media outlet sets the same proportions of minority- and majority-oriented programming in both areas (i.e., effectively choosing a “single” output content mix), consumers on the right-side of the inequality are able to realize some benefit from the fact that the firms bases its uniform content mix on the higher levels of $N_{m,post}$ and $N_{M,post}$ instead of $N_{2,m}$ and $N_{1,M}$, respectively, which increases the availability of their preferred content relative to that.
available pre-merger. Further, due to the firm’s binding equality constraint over program shares [i.e., Eq. (6)], the relative access to subscribers in groups $N_{1,m}$ and $N_{2,M}$ must therefore fall post-merger. As such, in this sense subscribers in the latter groups have relatively less access to their preferred content (or increased access to only a “lower quality” product) as a result of the transaction.

The question remains whether the merged firm would in fact ever choose to homogenize its price/content mix in the context of our model. The following observation demonstrates sufficient conditions under which the merged media outlet will possess the incentive to engage in such behavior.\footnote{That is, homogenization of price/content will not necessarily occur in our model, but will so long as the sufficient conditions laid out after Observation 1 are satisfied. Again, the goal here is to analyze the welfare implications of media mergers with preferences externalities assuming the merged entity chooses to engage in such behavior, which, e.g., is consistent with the post-merger decisions of Sirius-XM discussed above.}

Observation 1. If the post-merger gain in equilibrium profits to the firm from selling at a uniform price and increasing the shares of preferred content to majority subscribers in Area 1 and to minority consumers in market Area 2 exceeds the post-merger loss in equilibrium profits from decreasing the preferred content of minority subscribers in Area 1 and to majority subscribers in Area 2, then the merged firm has sufficient incentive to homogenize its price and content (diversity) mix across both areas (i.e., behave in accordance to Condition 4).

To see this, let $\beta^{(j)}$ denote the aggregate scalar coefficient associated with preference externalities in expected market revenue for Area $j$. (See supra Eq. (10) for the development of $\beta^{(j)}$.) The post-merger gain from selling at a uniform price (i.e., relative to setting a different price in each area) is

$$GAIN_p = \bar{G}(\bar{p}^*) (1 - \frac{c}{\bar{p}}) - \{ G_1(p_1^*) (1 - \frac{c}{p_1}) + G_2(p_2^*) (1 - \frac{c}{p_2}) \}.$$ 

The post-merger gain from increasing the preferred content to majority consumers in Area 1 is

$$GAIN_{1,M} = \bar{\beta}(1 - \frac{c}{\bar{p}}) N_{1,M} \ln S_{post,M}^* - \beta^{(1)} (1 - \frac{c}{p_1^*}) N_{1,M} \ln S_{1,M}^*.$$ 

and in Area 2 minority gain is

$$GAIN_{2,m} = \bar{\beta}(1 - \frac{c}{\bar{p}}) N_{2,m} \ln S_{post,m}^* - \beta^{(2)} (1 - \frac{c}{p_2^*}) N_{2,m} \ln S_{2,m}^*.$$ 

The post-merger loss from decreasing the preferred content to minority consumers in Area 1 is
\[ \text{LOSS}_{1,m} = \beta^{(1)} (1 - \frac{c}{p_1}) N_{1,m} \ln S_{1,m}^* - \tilde{\beta}(1 - \frac{c}{p}) N_{1,m} \ln S_{\text{post},m}^* , \]

and in Area 2 majority loss is

\[ \text{LOSS}_{2,M} = \beta^{(2)} (1 - \frac{c}{p_2}) N_{2,M} \ln S_{2,M}^* - \tilde{\beta}(1 - \frac{c}{p}) N_{2,M} \ln S_{\text{post},M}^* . \]

Define \( GAIN = GAIN_p + GAIN_{1,M} + GAIN_{2,m} \) and \( LOSS = LOSS_{1,m} + LOSS_{2,M} \). After substitution and some arithmetic manipulation of the above expressions, it can be shown that \( GAIN > LOSS \Rightarrow \) :

\[
\begin{align*}
\{ \tilde{G}(p^*) + \tilde{\beta} (N_{\text{post},m} \ln S_{\text{post},m}^* + N_{\text{post},M} \ln S_{\text{post},M}^*) \} (1 - \frac{c}{p}) \\
\{- [G_1(p_1^*) + \beta^{(1)} (N_{1,m} \ln S_{1,m}^* + N_{1,M} \ln S_{1,M}^*)] (1 - \frac{c}{p_1}) \\
\{- [G_2(p_2^*) + \beta^{(2)} (N_{2,m} \ln S_{2,m}^* + N_{2,M} \ln S_{2,M}^*)] (1 - \frac{c}{p_2}) > 0. \}
\end{align*}
\]

Finally, the (presumed) effect of the merger on the firm’s level of fixed costs can be also considered in this same context. Again, given the presence of fixed cost efficiencies (Condition 3):

\[
\begin{align*}
f_{1,\text{CONT}} + f_{2,\text{CONT}} + f_{1,\text{NET}} + f_{2,\text{NET}} > f_{\text{post,CONT}} + f_{\text{post,NET}} \Rightarrow \\
f_{1,\text{CONT}} + f_{2,\text{CONT}} + f_{1,\text{NET}} + f_{2,\text{NET}} - f_{\text{post,CONT}} - f_{\text{post,NET}} > 0.
\end{align*}
\]

After accounting for this inequality constraint in Eq. (21) and rearranging terms it follows that:

\[
\begin{align*}
\{ \tilde{G}(p^*) + \tilde{\beta} (N_{\text{post},m} \ln S_{\text{post},m}^* + N_{\text{post},M} \ln S_{\text{post},M}^*) \} (1 - \frac{c}{p}) - f_{\text{post,CONT}} - f_{\text{post,NET}} \\
\{- [G_1(p_1^*) + \beta^{(1)} (N_{1,m} \ln S_{1,m}^* + N_{1,M} \ln S_{1,M}^*)] (1 - \frac{c}{p_1}) - f_{1,\text{CONT}} - f_{1,\text{NET}} \\
\{ [G_2(p_2^*) + \beta^{(2)} (N_{2,m} \ln S_{2,m}^* + N_{2,M} \ln S_{2,M}^*)] (1 - \frac{c}{p_2}) - f_{2,\text{CONT}} - f_{2,\text{NET}} \} > 0.
\end{align*}
\]

It warrants emphasizing that the assumption of post-merger fixed cost efficiencies (Condition 3) is not required for the result in Observation 1 to hold. That is, the result is not dependent on the assumed changes in the merged media outlet’s cost structure (which, again, was only made because claims of fixed cost savings are often advanced by merging media outlets) – suggesting that changes in content diversity for some subscribers may be a relevant concern with some media mergers. Observation 1 holds because of the demand side of the market and the presence of within-group preference externalities. Indeed, this fact is clearly evident upon inspection of Eq. (21), which does not rely upon the imposition of Condition 3.
In summary, our model provides a formal demonstration of product repositioning due to demand-side preference externalities in media markets (Proposition 2) as empirically documented by Waldfogel (2004), George and Waldfogel (2003), and Wang and Waterman (2008). We then show that even assuming the merged media outlet has an incentive to homogenize its content mix, it is still possible for some minority (majority) group subscribers to realize relatively more (less) access to their preferred content depending on the particular composition of group sizes across markets (Propositions 3 and 4). Finally, we derive the sufficient conditions under which one of the primary concerns voiced against media mergers – that they will result in more homogenized output or a loss in overall content/viewpoint diversity – will occur (Observation 1), which suggests the result (and thus those contained in Propositions 3 and 4) may be empirically relevant in some circumstances.

Before turning to the consumer welfare implications of our analysis, it is worth briefly considering the nexus between the predictions of our theoretical analysis and some of the previous empirical literature examining the relationship between media (ownership) consolidation and product variety. The next section addresses this topic.

4. **Empirical Evidence on Media Mergers and Content Diversity**

As mentioned previously, some (but not all) empirical studies find a positive relation between the extent of concentration in a given local media market and the number of “products” offered within a given format of media. Perhaps the best known of these studies is the recent contribution of Berry and Waldfogel (2001). This study explores the effect of increased local consolidation in local radio markets as stemming from enactment of the Telecommunications Act of 1996, which the authors employ as a natural experiment to identify the effect of mergers on local programming variety.\(^{24}\)

\(^{24}\) A related study is George (2007), which documents a positive relation between the extent of ownership concentration in local newspaper markets and the extent of product differentiation and variety as based
The authors find that consolidation reduced the rate of radio station entry while concurrently increasing the number of music formats (both absolutely and relative to the number of stations). The authors argue that this finding can be explained by owners of jointly owned local stations “positioning” content aired over those stations so as to preempt entry. Berry and Waldfogel (2001, p. 1024) also find that “[p]airs of jointly owned local stations are substantially more likely to than jointly owned nonlocal stations to program in different, albeit nearby, formats.”

There appear to be a number of aspects to this study’s research design that would seem to limit its applicability in terms of a “direct” test of the predictions of the model presented herein. Again, while the Berry and Waldfogel (2001) study finds an increase in the variety (number of station formats) following consolidation, it does not differentiate per se between stations (music formats) that might be perceived as relatively similar conditional on subscribers’ characteristics (e.g., demographic groupings); thereby abstracting from the interactive effect of consolidation (joint ownership) and preference externalities highlighted in our model. That is, the measure of variety employed by Berry and Waldfogel (i.e., the change in the absolute or relative number of radio formats) does not otherwise account for the degree to which said formats may be viewed as close substitutes within groups for which preference externalities over content may be operational. Since variety in the context of our model is essentially measured from the perspective of individual consumers (i.e., as determined by their particular subscriber group’s upon the allocation of reporters to various news topics. The points raised herein with regard to the Berry and Waldfogel (2001) study also generally apply to George’s study.

25 See Berry and Waldfogel (2001, p. 1014) (“Our measure of programming variety is the number of different programming formats broadcast in a market.”).

26 For example, post-merger there may have been an increase in the number of formats geared to listeners in the “majority” group (e.g., white listeners), which might include formats such as “country,” “big band,” and “oldies.” At the same time, there may have been a decrease in the number of formats preferred by the “minority” group (e.g., blacks), which might include “gospel,” “jazz,” and “black talk” radio stations. (See Waldfogel (2003) for empirical evidence of these demographic-specific preferences in radio formats). If the increase in majority-oriented stations increased post-merger was significantly greater than the decrease in minority-oriented stations, then there could still be an absolute or relative increase in the number of formats (and thus diversity as considered by Berry and Waldfogel) even though the minority-group would clearly have less access to their preferred content.
relative access to its preferred content, which in turn is affected by the post-merger subscriber mix facing the merged firm), the findings of Berry and Waldfogel are not necessarily inconsistent with our model’s predictions.  

But there is also some evidence to suggest that the post-merger product repositioning effects predicted by the model – e.g., a relative increase (decrease) in majority-oriented (minority-oriented) content and the potential homogenization of content across markets – may in fact be empirically relevant. Shortly following the final approval by the FCC of their agreement to merge licenses in mid-2008, satellite radio operators Sirius Satellite Radio Inc. (“Sirius”) and XM Satellite Radio Holdings Inc. (“XM”) were reported to have begun changing their programming content mix.  

XM’s chief executive officer allegedly planned to merge the XM and Sirius programming into one “stream” on or around early November 2008, thereby contradicting the companies’ apparent willingness to keep the companies station line-ups separate and diverse for some time as stated prior to the merger’s consummation.

Further, by October 2008 the merged Sirius-XM entity had apparently initiated efforts to discontinue several of XM’s “niche” programming stations, which are arguably geared to the preferences of “minority-type” subscribers. These efforts included dropping producers and deejays on so-called “decades channels” (which broadcast the music from the 1940s, 1950s, etc., and which were not offered by Sirius) and most of the staff serving XM’s black-oriented music channels. This behavior on the part of Sirius-XM is at least suggestive that the theoretical predictions of the model presented in this paper may be empirically relevant in some media transactions, although further evidence is required in order to draw more dispositive conclusions.

27 The same can also be said of the finding regarding the greater propensity for local versus non-local siblings to broadcast in different formats, although at the same time this finding appears somewhat more in-line with our model’s predictions. However, it is worth noting that Berry and Waldfogel attribute this effect to strategic product positioning motives to preempt entry into a particular format (i.e., as opposed to the influence of preference externalities), an effect that is not considered in our model.  


29 According to Fisher, supra note 29, XM was perceived by many satellite radio subscribers as offering more “creative” programming compared to Sirius.
5. **Subscriber Welfare Implications**

One of the central activities in antitrust review is the quantification of both merger related harms and benefits. The consumer welfare standard is the most commonly adopted welfare metric employed by U.S. and international antitrust agencies (Heyer, 2006).\(^{30}\) In evaluating the potential benefits and costs of a given transaction, this standard translates into measuring the losses (gains) in consumer as stemming from any post-merger *price* increases (decreases). However, the model presented herein formally demonstrates the central concern raised by some commenters regarding such transactions; namely, that they may potentially affect both prices and the type of content made available to different subscriber types. As such, any “appropriate” welfare standard applied to media mergers with preference externalities (as well as any remedy enacted to offset the harms stemming there from) should take into account these transactions’ potential impacts on content and other factors such as civic participation (*i.e.*, non-price effects) *in addition to* their ultimate effect on the prices paid by subscribers.\(^{31}\)

The model also suggests that conducting any sort of welfare analysis in media markets with preference externalities will be inherently complex due to the fact that some subscribers (either within- or across-groups) may be made worse off (*i.e.*, have relatively less access to their preferred content post-merger) while others will be better off. Recall that Proposition 4 states minority consumers in Area 1 and majority consumers in Area 2 have decreased post-merger quality/diversity in program channels, while majority consumer in Area 1 and minority consumers in Area 2 have *increased* post-merger quality/diversity in cable channels.

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\(^{30}\) See Heyer (2006) for a discussion and critique of various welfare standards used in the antitrust assessment of mergers. Note also that review of many media mergers in the U.S. falls under the jurisdiction of both the antitrust enforcement agencies and the FCC; the latter of which uses a broader “public interest” standard to evaluate transactions. This standard may include consideration of content diversity and the deployment of services based on economic status, race, and ethnicity (among other factors) in addition to traditional antitrust concerns. *See, e.g.*, FCC (2006b, paragraphs 4 and 192).

\(^{31}\) We do not provide a complete formal analysis of welfare effects since doing so would also require explicit consideration of the price and access effects of media mergers on advertisers as well as consumers (Berry and Waldfogel, 2001). It is almost certainly the case, however, that the ambiguous (subscriber) welfare effects discussed herein would also pertain to advertisers, and as such, not provide any further illumination of effects on overall welfare.
Further, merger-specific efficiencies resulting in marginal cost reductions may lower post-merger prices relative to the separate pre-merger prices assessed in each areas (thereby resulting in a gain to consumer surplus). Assume for the moment that a uniform price is set by the media outlet post-merger that is lower than the original prices set in each market pre-merger. Subscriber groups that have increased access to their preferred content and pay a lower price post-merger are clearly better off. On the other hand, there is an arguably ambiguous effect on the welfare of groups that have less access post-merger since they too would receive the “benefit” of the lower (uniform) post-merger price.32

The potential loss in welfare for those subscriber groups that have less access to their preferred content post-merger may, of course, be exacerbated by the extent their preferred content cannot be readily substituted for that of the other group’s (i.e., those whose preferred content increased). In other words, if, say, minority subscribers have preferences for media content that tend (on average) to “overlap” the preferences of majority consumers, media mergers might benefit even these subscribers if the post-merger price increase is sufficiently low.

However, several studies document relatively wide disparities in the media consumption preferences across some racial groups. See, e.g., Spitzer (1990), Dubin and Spitzer (1994), Siegelman and Waldfogel (2001), Waldfogel (2003), Baynes (2005), and Lee (2006). Thus, the potential for some groups to be harmed as a result of media mergers (either in terms of price or content availability) may well be significant, and as such, this fact raises an argument for the use of specific (but non-traditional) structural and/or behavioral antitrust or regulatory remedies to counteract the potential harm to some subscriber groups (as discussed further in the following section).

32 The welfare ambiguity is not necessarily obviated in the case where the post-merger (uniform) price rises relative to its pre-merger levels. While subscribers with less access to preferred content would be worse off, those subscribers who received greater access would effectively be receiving a product that they perceive has having higher quality (and thus would potentially be willing to pay some “premium” for).
An important strand of recent empirical literature provides support for the notion that media mergers, to the extent that they affect content diversity, may also exert an impact on individuals’ cost of participating in civil affairs (such as voting in local elections).33 Oberholzer-Gee and Waldfogel (2005) present empirical evidence that blacks are more likely to vote in jurisdictions containing a larger number of other blacks (who are presumed to share similar preferences for media content) and more black-oriented newspapers and radio stations. The causal mechanism by which this effect operates is, again, the high fixed costs associated with entry into media markets. Because only a relatively small number of firms will be sustainable in high-fixed cost industries, the availability of, say, black-oriented media outlets (e.g., newspapers, radio) will be a function of the number of blacks residing in the relevant market.

Thus, markets with relatively high black populations will tend to have more media content directed at their preferences (i.e., due to preference externalities), which includes content pertaining to local elections that may contain information giving potential black voters greater confidence in identifying the “right” candidate (and thereby increasing their propensity to vote). On the other hand, in markets where there is little black-oriented media political candidates will have difficulty attracting potential black voters to their platforms – thereby increasing the cost of these voters to acquire information and decreasing their probability of voting.

In a similar vein, Oberholzer-Gee and Waldfogel (2006) provide evidence that Hispanics are more likely to vote in local elections in areas where there are more Hispanic residents and greater access to Spanish-language television stations that carry local news coverage. To the extent that media mergers affect the provisioning of content that is oriented to minorities, such transactions may also entail significant impacts on minority civic participation rates.34 Clearly

33 Indeed, this sentiment is eloquently expressed by Howard Shelanski (2006, p. 381): [A] merger among telephone companies might lead to slightly higher prices or poorer customer service. Such harms are important but are largely limited to pecuniary considerations and periodic inconveniences. Consolidation among major media providers, in contrast, implicates more than economic concerns. Ownership changes that threaten or that people perceive to threaten the availability of diverse news and information sources … strike at the heart of civic governance and political debate ...

34 See also George and Waldfogel (2002).
these (and other) second-order effects on such non-price margins (besides content diversity) may exacerbate the tendency for media mergers to result in losses to consumer welfare, and thus highlight the particular need for careful scrutiny of, and consideration of the appropriate policy remedies for, these types of transactions. We turn next to the latter issue.

6. Policy Implications

The formal analysis presented herein suggests that media mergers will tend to impact the level of diversity/preferred content of different consumer groups, with some subscribers of a given type realizing more of their preferred content post-merger and others less. These results may provide one way of rationalizing the seemingly contradictory findings of the empirical literature that examines the relationship between market concentration and diversity. Media mergers may result in significant welfare losses to some subscriber groups stemming from either price or non-price (e.g., content) effects (or both), especially when across-group preferences for content are relatively idiosyncratic (again, a notion that is supported by the recent empirical literature cited above). The question then arises regarding the types of antitrust and/or regulatory policies that should be implemented to address the potential subscriber harms associated with media mergers.

Structural remedies, such as the divestiture of competitive assets to a third-party, are commonly used by the antitrust authorities in attempts to remedy the potentially anticompetitive outcomes of (media) mergers. For instance, in U.S. vs. McClatchy/Knight-Ridder, the U.S. Department of Justice (“DOJ”) conjectured that the merger of two large local newspaper publishers/distributors would result in competitive harms in Minneapolis/St. Paul, where McClatchy published the Star Tribune and Knight-Ridder the St. Paul Pioneer Press (each of these companies owned local papers in other cities). These two papers accounted for the vast majority of local newspaper circulation and advertising revenues in Minneapolis/St. Paul, leading

to the DOJ’s opinion that the transaction would “likely result in higher prices and lower levels of quality and service.” A final judgment was entered whereupon the merged entity was forced to divest the *St. Paul Pioneer Press*.

While the divestiture remedy considered above addresses the antitrust concern of greater unilateral *pricing* power of the merged firm post-merger, our model suggests it may not address the potential impact of such measures on the relative access to *content* across consumer groups following its implementation. As such, traditional metrics to evaluate the likely competitive harms of mergers (such as changes in the Herfindahl-Hirschman Index) may be especially ill-suited for developing even a presumptive assessment of the potential harms of mergers between media outlets. Indeed, with the presence of subscriber preference externalities, in some instances the harms (*i.e.*, loss in consumer welfare) associated with a post-merger price increase may be smaller than the harms realized through losses in some groups’ access to their preferred content. However, by focusing only on how changes in market concentration may reduce consumer welfare primarily through its impact on prices, it is possible that the content-welfare nexus may be completely overlooked. As such, media mergers that actually reduce subscriber welfare may still go through without any appropriate remedy.

Assume for the moment that both the *Star Tribune* and the *St. Paul Pioneer Press* both offered the same relative shares of majority- and minority-oriented content pre-merger (since both papers operated in the same city and thus faced the same mix of subscriber types). Following consummation of the transaction, the merged entity would not be expected to change its content mix since it would still face the same set of subscribers, but might have the ability and incentive to raise the price of newspapers somewhat. Because of this antitrust concern, the merged firm is forced to spin-off the *St. Paul Pioneer Press* to a third-party. Assume that this latter party is also a daily newspaper publisher, but one who operates a nearby city with a *different* ratio of minority-to majority-type subscribers.
The model suggests that the third-party publisher might have the incentive to base its content mix on the aggregate number of minority and majority consumers residing in its base city and in Minneapolis/St. Paul (effectively offering the “same” paper in each city, although possibly under two different names). This effect implies that the proportion of content directed towards majority consumers in the base city will either rise or fall based upon the ratio of majority-to-minority subscribers in the base city relative to Minneapolis/St. Paul (and *vice versa*). As such, consumer welfare in the base city may still be reduced due to lower availability of content directed toward the preferences of majority/minority subscribers. Overall, consumer welfare might have been higher had the merged party been allowed to retain the *St. Paul Pioneer Press* and raise prices (*e.g.*, if majority and minority subscribers had content preferences that were sufficiently similar). If, on the other hand, the third-party acquirer was *not* a media outlet, then they would likely have less incentive to change the content of the *St. Paul Pioneer Press*, and thus consumer harms would only arise primarily from the potential market concentration-price effect. As such, it is clear that the *identity* of the purchaser of the divested assets may be critical in ensuring that any consumer welfare losses resulting from media mergers are minimized.

Of course, some media mergers involve outlets that were *not* initially serving the same geographic space or set of customers. For example, a cable monopolist operating in one county may decide to merge with another cable monopolist operating in an adjoining county. Since the market structure does not actually change post-merger there may be no first-order effect on prices (except through potential efficiencies). Again, however, post-merger the combined cable operator may possess the incentive to set its content (*i.e.*, channel programming) mix based upon the aggregate populations of majority and minority subscribers across the two franchise areas, resulting in a decrease in the proportion of programming directed towards some minority and majority cable subscribers and thus a potential loss in consumer welfare. Divestiture is obviously not an applicable remedy in this instance. Assuming that the merged entity cannot be required to offer particular types of programming (although this may be a realistic remedy in some
instances), other policies by which to mitigate the loss in subscriber welfare arising from loss of preferred content must be explored.

Potential entrants into media industries must incur substantial sunk costs, which might function as a barrier to entry. Siegelman and Waldfogel (2001) suggest that minority-owned media outlets may be more capable to ascertain the kind of content desired by subscribers of the same type, and may thus efficiently specialize in making such content available. Given this possibility, if potential minority-owners of media outlets are (at least initially) subsidized to an extent that they can be expected to earn a normal rate-of-return on their business investments, then such policies may be effective in retaining (or even enhancing) the level of content offered to minority subscribers pre-merger. But even under this policy the notion of the “third-party’s” identity (in this example the media entrant being owned and controlled by a minority) may be critical to achieving the desired policy outcome.

Subsidizing the entry of some forms of media, such as a minority-owned cable company, may not be economically feasible as it would require redeploying a separate cable system (and one that might reach relatively few households) alongside an entrenched one (although this same concern would be probably be less relevant to other forms of media, such as newspapers or radio stations). In addition, cable programming is ordinarily provisioned in terms of various tiers of channels (e.g., basic or premium). As such, the cost, distribution, and marketing structure associated with the cable industry and mergers within it may warrant specific remedies that are not applicable to other forms of media. We briefly consider one possible remedy below.

A recent FCC report suggests that requiring cable and other multichannel video programming distributors (“MVPDs”) to offer channels on an à la carte basis might lower subscribers’ cable expenditures (FCC, 2006a). This report generated a great deal of controversy since its conclusions were in direct opposition to a report released by the FCC just two years earlier (FCC, 2004). While this issue has typically been framed in the context of MVPDs provisioning either bundled or unbundled programming exclusively, requiring MVPDs to
unbundle some of their content as a possible merger remedy in the more narrow case of cable
mergers may be one avenue by which the consumer welfare losses suggest may be reduced.
Again, our model suggests that the within-group share of programming will rise in one area and
fall in the other area post-merger. Allowing subscribers residing in the former area to purchase
the same “additional” channels/content that are/is offered to their corresponding group-type in the
latter area on an à la carte basis (i.e., in addition to the particular bundle offered within the area
post-merger) may offset some of the potential reduction in consumer surplus without imposing
the additional costs that channel unbundling may entail (assuming the channel prices are beneath
subscribers’ reservation prices).36

7. Conclusion

This paper presents a formal treatment of the influence that within-group consumer
preference externalities over media content has on a media outlet’s incentive to engage in product
repositioning both before and after merging with another media outlet. We present a model of
consumer behavior under preference externalities and derive aggregate consumer expenditure
functions for media output. It is shown that even assuming the merged entity sets a uniform price
and content mix across market areas, the relative access to some minority (majority) group
subscribers will increase (decrease) post-merger (and vice versa). Finally, we derive sufficient

36 See, e.g., Owen (2006) for a critique of FCC (2006a) and a discussion of the various potential harms
associated with requiring MVPDs to completely unbundle their programming content. Some commenters
have argued that MVPD channel unbundling in itself may diminish the extent of diversity. For example,
unbundling may affect the extent to which small niche program networks can remain economically viable if
offered outside of a diverse tier of channels (Owen 2006, p. 14). Unbundling may also diminish the ability
of MVPD subscribers to “surf” across various program channels, which might expose them to alternative
media and viewpoints (Owen 2006, p. 15). To some extent, the remedy considered here may lessen some
of these concerns since all subscribers would still have access to a “range” of programming channels post-
merger, but at the same time would be allowed to purchase those preferred channels that were “removed”
from their tier post-merger (and/or to obtain the new channels geared toward their group’s preferences that
are offered to the area that realizes an increase in the preferred programming post-merger). We leave
investigation of these issues to future research while noting Uri’s (2005, p. 108) observation that:
[There are too many unknown factors to equivocally conclude whether subscribers will be better off under a la carte
pricing. These include how cable systems would price their services under an a la carte system, the distribution of
subscribers’ purchasing patterns, and whether niche networks would cease to exist and, if so, how many would exit the
industry.]
conditions under which the merged entity will in fact have an incentive to homogenize its post-
merger price/content mix, suggesting such post-merger behavior may be a valid issue of concern
for regulators. Indeed, such behavior may have been borne out following the recent consolidation
between Sirius and XM.

While the post-merger repositioning effects arguably suggest the consumer welfare
implications of such mergers are ambiguous \textit{a priori}, it is posited that the observed idiosyncratic
preferences for media content among demographic groups may translate into significant losses to
consumer welfare in some instances and may also adversely affect some individuals’ participation
in civil affairs, such as voting. These factors in turn may call for the punctilious review of media
transactions by the relevant agencies. “Non-traditional” antitrust and/or regulatory policy
interventions (\textit{e.g.}, the subsidization of minority entry or content unbundling) may be required to
offset the potential post-merger diminution in preferred content to some subscriber groups.
References


FCC (2002), In the Matter of Applications for Consent of the Transfer of Control of Licenses from Comcast Corporation and AT&T Corp., Transferors, to AT&T Comcast Corporation, Transferee, Memorandum Opinion and Order, MB Docket No. 02-70 (November 14, 2002).


FCC (2006b), *In the Matter of Applications for Consent to the Assignment and/or Transfer of Control of Licenses: Adelphia Communications Corporation to Time Warner Cable Inc., etc.* Memorandum Opinion and Order, MB Docket No. 05-192 (July 21, 2006).


Uri, N. D. (2005), “The Implicit Marginal Valuation of Cable Service in the United States,” 


Availability of Foreign Language Radio Programming in the U.S.,” Department of 
Telecommunications, Indiana University, working paper.

Commission, Media Bureau Staff Research Paper No. 3, available at 


Wharton Papers on Urban Affairs: 257-284.

Appendix 1

In this appendix we derive the media expenditure function for a given subscriber type. We assume that there is a single composite good with a price $p_z$. Subscriber $z$’s optimization problem is

$$
\max_{v^{(z)}_j} SV^{(z)} = (v^{(z)}_j - \gamma_j g(p_j) - \alpha_z \Omega_j)^{\beta_j} (I^{(z)} - v^{(z)}_j - \gamma_z p_z)^{\delta_z}
$$

subject to $v^{(z)}_j + v^{(z)}_z = I^{(z)}$ where $\beta_j > 0$ and $\beta_z > 0$, $i = 1, \ldots, n$. We assume that $\beta_j + \beta_z = 1$ and $\alpha_z > 0$, $\gamma_j > 0$, $\gamma_z > 0$.

Substituting the budget constraint into the objective function gives

$$
SV^{(z)} = (v^{(z)}_j - \gamma_j g(p_j) - \alpha_z \Omega_j)^{\beta_j} (I^{(z)} - v^{(z)}_j - \gamma_z p_z)^{\delta_z}.
$$

The first-order condition associated with the above problem is given by

$$
\frac{dSV^{(z)}}{dv^{(z)}_j} = \beta_j (v^{(z)}_j - \gamma_j g(p_j) - \alpha_z \Omega_j)^{\beta_j-1} (I^{(z)} - v^{(z)}_j - \gamma_z p_z)^{\delta_z} v^{(z)}_j
$$

$$+ \beta_z (v^{(z)}_j - \gamma_j g(p_j) - \alpha_z \Omega_j)^{\beta_j} (I^{(z)} - v^{(z)}_j - \gamma_z p_z)^{\delta_z-1} (-1) = 0.
$$

Rearranging the above expression gives:

$$
\Rightarrow \beta_j (I^{(z)} - v^{(z)}_j - \gamma_z p_z) + \beta_z (v^{(z)}_j - \gamma_j g(p_j) - \alpha_z \Omega_j) (-1) = 0
$$

$$\Rightarrow \beta_j I^{(z)} - \beta_j v^{(z)}_j - \beta_j \gamma_z p_z - \beta_z v^{(z)}_j + \beta_z \gamma_j g(p_j) + \beta_z \alpha_z \Omega_j = 0
$$

$$\Rightarrow \beta_j I^{(z)} - \beta_j v^{(z)}_j - \beta_j \gamma_z p_z - (1 - \beta_j) v^{(z)}_j + (1 - \beta_j) \gamma_j g(p_j) + (1 - \beta_j) \alpha_z \Omega_j = 0
$$

$$\Rightarrow \beta_j I^{(z)} - (\beta_j + \beta_z) v^{(z)}_j - \beta_j \gamma_z p_z + (1 - \beta_j) \gamma_j g(p_j) + (1 - \beta_j) \alpha_z \Omega_j = 0
$$

$$\Rightarrow \beta_j I^{(z)} - v^{(z)}_j - \beta_j \gamma_z p_z + (1 - \beta_j) \gamma_j g(p_j) + (1 - \beta_j) \alpha_z \Omega_j = 0
$$

$$\Rightarrow v^{(z)}_j = (1 - \beta_j) \gamma_j g(p_j) - \beta_j \gamma_z p_z + (1 - \beta_j) \alpha_z \Omega_j + \beta_j I^{(z)}
$$

$$\Rightarrow v^{(z)}_j = (1 - \beta_j) \gamma_j g(p_j) - \beta_j \gamma_z p_z + (1 - \beta_j) \alpha_z [\tau_j S_j + \eta (N_{j,m} \ln S_{j,m} + N_{j,M} \ln S_{j,M})] + \beta_j I^{(z)}
$$

$$\Rightarrow v^{(z)}_j = a g(p_j) + a_j p_z + \tilde{T}_z + \tilde{\alpha}_z (N_{j,m} \ln S_{j,m} + N_{j,M} \ln S_{j,M}) + \beta_j I^{(z)}
$$

where $a = (1 - \beta_j) \gamma_j$, $a_j = -\beta_j \times \gamma_z$, $\tilde{T}_z = (1 - \beta_j) \alpha_z \tilde{S}_j$, and $\tilde{\alpha}_z = (1 - \beta_j) \alpha_z \eta$. The above expression is analogous to Eq. (4) in the text.
Appendix 2

In this appendix we prove Parts (i), (ii), and (iii) of Proposition 1. The media outlet maximizes its expected profits:

\[ E\{\Pi_j\} = G_j(p_j) + \beta(N_{j,m} \ln S_{j,m} + N_{j,M} \ln(1 - S_{j,m})) - \frac{c}{p_j} \{G_j(p_j) + \beta(N_{j,m} \ln S_{j,m} + N_{j,M} \ln(1 - S_{j,M}))\} \]

\[-f_{j,CONTR} - f_{j,NET}. \]

The first-order condition is given by:

\[ \frac{\partial E\{\Pi_j\}}{\partial p_j} = \frac{\partial G_j(p_j)}{\partial p_j} - c\left[\frac{(-1)}{p_j^2} (G_j(p_j) + \beta(N_{j,m} \ln S_{j,m} + N_{j,M} \ln(1 - S_{j,m})) + \frac{\partial G_j(p_j)}{\partial p_j}\right] = 0. \]

Rewriting the above expression gives

\[ \Rightarrow p_j \frac{\partial G_j(p_j)}{\partial p_j} - c\left[\frac{(-1)}{p_j^2} (G_j(p_j) + \beta(N_{j,m} \ln S_{j,m} + N_{j,M} \ln(1 - S_{j,m})) + \frac{\partial G_j(p_j)}{\partial p_j}\right] = 0 \]

\[ \Rightarrow \frac{p_j}{G_j(p_j)} \frac{\partial G_j(p_j)}{\partial p_j} - c\left[\frac{(-1)}{p_j^2} (G_j(p_j) + \beta(N_{j,m} \ln S_{j,m} + N_{j,M} \ln(1 - S_{j,m})) + \frac{\partial G_j(p_j)}{\partial p_j}\right] = 0 \]

\[ \Rightarrow \gamma_j - \frac{c}{p_j} \left[\frac{(-1)}{\omega_j} + \gamma_j\right] = 0 \]

\[ \Rightarrow p_j - c\left[\frac{(-1)}{\gamma_j \omega_j} + 1\right] = 0 \Rightarrow p_j = c\left[\frac{1}{\gamma_j \omega_j}\right] + 1 \]

\[ \Rightarrow p_j = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] \]

\[ \Rightarrow p_j = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] \]

\[ \Rightarrow p_j = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] \]

\[ \Rightarrow p_j = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] \]

\[ \Rightarrow p_j = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] = c\left[\frac{1}{\gamma_j \omega_j} + 1\right] \]

The optimal shares of minority- and majority-oriented programming are derived as follows.

\[ \frac{\partial E\{\Pi_j\}}{\partial S_{j,m}} = \beta \frac{N_{j,m}}{S_{j,m}} \frac{N_{j,M}}{(1 - S_{j,m})} \times (-1) - \beta \times \frac{c}{p_j} \frac{N_{j,m}}{S_{j,m}} \times 1 + \frac{N_{j,M}}{1 - S_{j,m}} \times (-1) = 0 \]
\[ (\beta - \beta \frac{c}{p_j}) \times \left( \frac{N_{j,m}}{S_{j,m}} - \frac{N_{j,M}}{1 - S_{j,m}} \right) = 0 \]

\[ \Rightarrow \frac{N_{j,m}}{S_{j,m}} - \frac{N_{j,M}}{1 - S_{j,m}} = 0 \Rightarrow S_{j,m} = \frac{N_{j,m}}{(N_{j,m} + N_{j,M})} \]

\[ \Rightarrow S_{j,M} = 1 - S_{j,m} = 1 - \frac{N_{j,m}}{N_{j,m} + N_{j,M}} = \frac{N_{j,M}}{N_{j,m} + N_{j,M}}. \]

It is straightforward to show that at optimum values \( \frac{\partial E\{\Pi_j\}}{\partial p_j} < 0; \frac{\partial E\{\Pi_j\}}{\partial S_{j,m} \partial p_j} < 0; \) and

\[ \frac{\partial E\{\Pi_j\}}{\partial S_{j,m} \partial p_j} = 0. \]

Q.E.D.