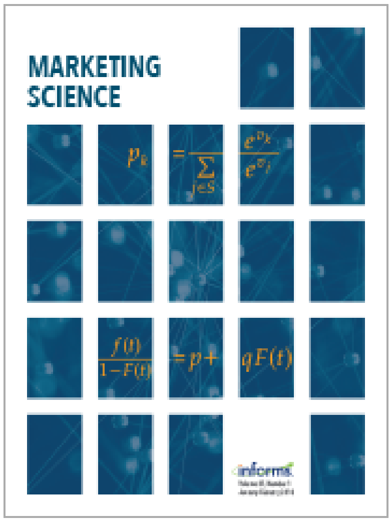


Marketing Science

Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

Negotiations and Exclusivity Contracts for Advertising

Anthony Dukes, Esther Gal-Or,

Negotiations and Exclusivity Contracts for Advertising

Anthony Dukes • Esther Gal-Or
Graduate School of Industrial Administration, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, Pennsylvania 15213
Katz Graduate School of Business, University of Pittsburgh, 210 Mervis Hall, Pittsburgh, Pennsylvania 15260
ajdukes@andrew.cmu.edu • esther@katz.pitt.edu

Exclusive advertising on a given media outlet is usually profitable for an advertiser because consumers are less aware of competing products. However, for such arrangements to exist, media must benefit as well. We examine conditions under which such exclusive advertising contracts benefit both advertisers and media outlets (referred to as *stations*) by illustrating that exclusive equilibria arise in a theoretical model of the media, advertisers, and consumers who participate in both the product and media markets. In the model, stations sell advertising space to advertisers and broadcast advertising messages to consumers.

Conditions leading to higher equilibrium levels of advertising can be unprofitable for advertisers because high levels of advertising make consumers better informed and thus lead to fiercer product price competition. As a result, media stations may be less profitable as well because their payoff is determined as a fraction of the advertiser surplus generated in the product market.

Stations mitigate this effect by offering advertisers exclusive advertising contracts. With such contracts, consumers are less informed about competing products, yielding higher producer surplus. It is profitable for stations to offer exclusivity when commercial advertising is an important means for advertisers to inform consumers about their products.
(*Advertising; Market Structure; Media*)

1. Introduction

Commercial media are supported largely, if not fully, by revenues generated by selling advertising space. Advertisers, who wish to reach many potential customers with each advertising message, seek media who air popular broadcasts. Consequently, media with a large audience have negotiating leverage vis-à-vis advertisers over the contract price for advertising slots. On the other hand, producers with potentially successful products are willing to pay high prices for advertising space because their marginal return to advertising is high. The media, therefore, seek to sell advertising space to these high-demand producers.

An implication of this relationship is that the competitive structure of the media industry can affect advertising agreements reached by media stations and advertisers. For example, industry specialists, citing the 1999 merger of CBS and Viacom, suggested that the merger's ability to attract advertisers was the key factor in bringing these two companies together ("They Have It All Now," *Business Week*, September 20, 1999). This implies that decisions in the media market can influence the price of advertising and, consequently, producers' advertising choices.

One objective in the present paper is to investigate how the competitive structures of the media and product markets determine advertising agreements,

0732-2399/03/2202/0222$05.00
1526-548X electronic ISSN

as negotiated between media stations and advertisers. We wish to understand, in particular, how the extent of competitiveness of the two markets affects the strength of the negotiating position of the parties and the resulting terms of the advertising contracts agreed among them. One particular type of contract we emphasize is an exclusivity contract, whereby broadcasters agree to air one producer's advertising messages and exclude its competition.

Selling exclusive advertising rights during popular network broadcasts has been common for some time. Recently, for example, the Fox television network sold exclusive advertising rights during the 2002 Super Bowl to beer producer Anheuser-Busch. (See *Advertising Age*, AdAge.com, December 20, 2001.) These rights guaranteed Anheuser-Busch that Fox would sell no national advertising space to any competing beer producer during the game.

Certainly, from the beer producer's perspective, entering such an exclusive deal is usually profitable because it can give the beer producer a competitive advantage over rivals by limiting the amount of consumer information about competing brands. However, for such an exclusive arrangement to exist, it must also be profitable to the broadcaster.

This example illustrates the second objective of this paper, which is to determine the conditions under which broadcasters find it profitable to offer exclusive advertising contracts. In general, the ultimate source of broadcaster revenues is from consumer purchases in the product market. Thus, the distinct ability of a broadcaster to help the advertiser achieve an advantage in the product market determines whether it can claim a profitable share of the additional surplus extracted from product sales generated by the exclusive contract.

In the present paper, both the product and the media markets are assumed to be differentiated duopolies, with the degrees of differentiation between the product producers and the media stations determining the extent of competitiveness of their respective markets. Media stations negotiate with advertisers over the price of advertising space and, upon agreement, broadcast advertising messages at the intensity requested by advertisers to consumers who participate in the product market. We assume that advertising plays an informative role whereby advertising messages deliver information about product price and characteristics.

Considering the nonexclusive regime first, when stations cannot exclude any advertiser from their programs, we conduct a comparative statics analysis to investigate how changes in the parameters affect the characteristics of the equilibrium. We find that the overall level of advertising of each producer increases when the degree of differentiation between broadcasters is larger. Advertising levels are independent, however, of the degree of differentiation between product producers. Under a certain reasonable restriction on the advertising response function, we find that both advertisers and media stations may actually be worse off when advertisers choose higher levels of advertising at the equilibrium. As a result, the profits of each station may decline when the extent of differentiation between the programs of different stations is larger. Intensified advertising that is implied by greater differentiation between stations yields better-informed consumers and intensified price competition between product producers. Because the only source of revenues for stations and advertisers stems from the producer surplus generated in the product market, intensified price competition in this market reduces the surplus available, to the disadvantage of both negotiating parties.

We demonstrate that exclusivity contracts between stations and advertisers enable a station–advertiser pair to limit the amount of information consumers receive about competing products, thereby alleviating price competition in the product market relative to the nonexclusive regime. The rise in prices is especially pronounced when stations offer exclusivity rights to different advertisers. When given more control over the amount of information available via an exclusive contract, each advertiser in this case faces a reduced threat of customer stealing by competitors. As a result, each lowers its investment in advertising, thus leading to less-informed consumers and alleviated price competition.

Most previous models that address producers' advertising choices in oligopoly do not incorporate media stations as strategic decision makers. Instead, advertising technology is determined by an exogenous production function and the price of advertising is fixed in those models. For example, Grossman and Shapiro (1984) examine oligopolists' choices of informative advertising without explicitly evaluating the interaction between producers and broadcasters. In other oligopoly models of advertising such as those by Fruchter and Kalish (1997), Fruchter (1999), and von der Fehr and Stevik (1998), the role of broadcasters in determining the price of advertising is ignored as well. However, as exemplified above, the industrial structure of the media market can influence advertising decisions and product market outcomes. This issue is likely to become even more relevant for advertisers and commercial media given the recent trends of deregulation in certain media industries in the United States and Europe.[1]

Several recent papers have incorporated the structure of the media market in analyzing producer's advertising decisions. Similar to our focus in the present manuscript, two working papers (Dukes 2002, Nilssen and Sørgard 2001) consider stations as strategic decision makers in an oligopolistic media market.[2] In contrast to our approach, however, where advertising agreements are negotiated between media agents and producers, in Dukes (2001) advertising prices are set by an auctioneer to equate the demand for advertising messages with the supply of advertising space, and in Nilssen and Sørgard (2001) media stations have the market power to dictate the prices of advertising slots. The negotiation-based approach enables us to study the incentives for exclusivity contracts by examining a station's bargaining position when it offers such a contract. Neither one of the abovementioned working papers considers exclusivity agreements between stations and producers.

Marketing researchers, however, have recognized the important role that media play in the advertising and promotion decisions of the firm. One line of research is concerned with optimal media schedules with regard to maximizing advertising effectiveness (see, for example, Naik et al. 1998). Another line of media research in marketing focuses on consumers' media choices when faced with commercials (*zapping* behavior). (See Siddarth and Chattopadhyay 1998.) The current paper provides a new direction to marketing research by addressing how competition within the media and product industries affects advertising decisions.

The issue of exclusive dealings in marketing has been largely in the context of channel management between manufacturers and retailers as in Lal and Villas-Boas (1996), Dutta et al. (1994), O'Brien and Shaffer (1997), and Purohit (1997). Our focus on exclusivity in advertising and the media is distinct from channel management, however, because of the circular (rather than vertical) relationship among the three agents: Advertisers—media—consumers—advertisers. A second distinction from the channel management literature is that, in our context, exclusion is in the form of withholding information; whereas in channel management, exclusivity refers to withholding products from a retailer or withholding shelf space from a manufacturer. By entering exclusive advertising contracts, media stations and advertisers can improve their joint payoffs by withholding from consumers information concerning competing products. Exclusive advertising contracts have been examined previously in Villas-Boas (1994). However, our study focuses on an advertiser's exclusive dealings with a media station rather than with an advertising agency.[3]

Using a formulation developed in Gal-Or (1999), we model the exchange of advertising space as a bargaining outcome in bilateral negotiations between media stations and producers. Other marketing models have also incorporated bargaining (Shaffer and Zettelmeyer 2002, Iyer and Villas-Boas 2003, Shaffer 2001). These

[1] In the United States, Congress relaxed ownership limits for certain forms of mass communication with the 1996 Telecommunications Act. In Europe, the E.U. Directive "Television without Frontiers," was aimed at liberalizing media industries.

[2] Other notable working papers that model advertising and media decisions include Anderson and Coate (2002), Gabszewicz et al. (2001), and Häckner and Nyberg (2000). In contrast to our paper, product market competition is not explicitly modeled in these papers. Product market competition is explicitly modeled in Baye and Morgan (2000, 2001), but these latter papers focus on a monopoly media market, whereas ours focuses on duopoly.

[3] Silk and Berndt (1993) use data from ad spending on media in order to measure economies of scale and scope in ad agencies.

studies examine the distribution of profits in distribution channels as determined through bilaterally negotiated contracts between a retailer and manufacturer.[4] Despite the distinctions between our focus and that of channel management, as discussed above, our modeling approach to negotiations is similar to that taken in Shaffer and Zettelmeyer (2002) and Shaffer (2001). In particular, each station–producer pair jointly agrees on a price for advertising messages by engaging in bilateral negotiations over the mutual gain from reaching an agreement.

There is realistic appeal to using this negotiation-based approach, given the common occurrence of bilateral negotiations for advertising price in the television industry. An NBC affiliate in Pittsburgh, for example, uses recent television-viewing ratings to construct a quarterly *rate card*. The rate card specifies an advertising price for each ad spot in the station's broadcast schedule. These prices serve as a starting point in negotiations with advertisers. If the demand for an ad space during an upcoming program is relatively low, for instance, negotiations can result in a price lower than that specified by the rate card.

Our paper is organized as follows. In the next section we describe the assumptions of our model. In §3, we derive the equilibria under the assumption that exclusivity clauses are not feasible. In §4, we investigate the implications of stations offering exclusivity rights to producers, and in §5 we conclude.

2. The Model

Assume a differentiated product market consisting of two producers and a differentiated media market consisting of two media stations. The preferences of the consumers between the product producers are distributed independently of their preferences between media stations. We model the distribution of preferences by using a location model, with the population of the consumers uniformly distributed on a line of unit length and the firms (either product producers or media stations) located at the endpoints of this line. Figure 1 clarifies the location of the producers and stations on the distribution of preferences.

[4] See also Srivastava et al. (2000) for an experimental study of bargaining in channels with uncertainty.

We designate the address of the consumer in the distribution by y and x to identify her preferences between products and media stations, respectively. Because preferences between producers are determined independently of preferences between stations, the distances y and x need not coincide for a given consumer.

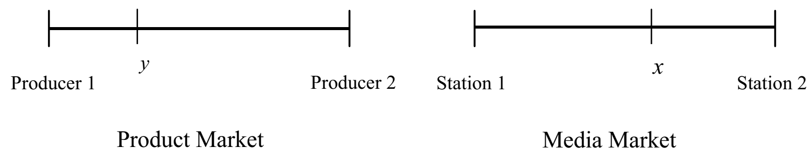
Each consumer derives the level of utility v_p when purchasing a product whose characteristics exactly match her location on the line. Similarly, she derives the level of utility v_s when listening to the station whose programming constitutes the best match with her preferences. When a consumer buys a product or views a station with characteristics different from her "ideal point" on the line, her utility declines by t_p and t_s, respectively, per unit of distance. The transportation parameters t_p and t_s measure the extent of differentiation between product producers and media stations, respectively.

A higher t_p means that consumers pay greater attention to product location—how close the product is to their ideal. Given fixed product locations, therefore, a higher t_p implies that it will be harder to compete for customers who prefer a competitor's product. Similarly, a higher t_s implies that consumers tend to be more loyal to their preferred station, making it more difficult to attract listeners who prefer the programs offered by a competing station. Higher transportation parameters imply, therefore, increased differentiation and, as a result, less-intense competition between product producers and media stations.

The approach we utilize to characterize the market structures of the media and product markets is the simplest way of introducing competition in each market while still incorporating a market parameter that measures the market's extent of competitiveness. Two participants is the minimal number necessary to introduce competition in each market, and the parameters t_p and t_s provide a vehicle to vary the extent of competition of the product and media markets, respectively.[5]

[5] In an earlier version of this paper two different parameters were utilized to measure the extent of competition in each market: the number of competitors and the extent of differentiation among them. Because the comparative statics with respect to the number of competitors turns out to be qualitatively similar to those with

Figure 1 **The Location of Producers and Stations on the Distribution of Preferences**



respect to the degree of differentiation among competitors, in the present version we focus only on the degree of differentiation as a measure of the extent of competitiveness of each market.

Each product producer decides on its level of advertising with each media station.[6] We designate by φ_i^j the number of advertising messages producer i chooses to place with station j. We assume that when a producer intensifies its advertising with a given station it raises the probability that the listeners of this station become aware of its product. Specifically, in the absence of any advertising by this producer there is probability $\alpha_i \in [0, 1)$ that a given consumer is familiar with its product. This probability is increased by $G(\varphi_i^j)$ for a consumer who listens to station j. We assume that $G(\cdot) \in [0, 1-\alpha_i]$, $G(0) = 0$, and $G'(\cdot) > 0$. Hence, the feasible range of advertising levels for each firm is bounded from above by $G^{-1}(1-\alpha_i)$, and the probability of reaching consumers is increasing with the level of advertising. We refer to the function $G(\cdot)$ as the *advertising response function*. The parameter α_i measures the extent to which alternative sources of information about product i are available to consumers. Those sources may include other media markets, such as newspapers, or recommendations of friends and relatives. We refer to α_i as the *base awareness level* of product i.

The utility that a given consumer derives from viewing a certain station depends upon the overall level of advertising messages that this station chooses to put on the air, as well as the location of the consumer on the distribution of preferences between the two stations. We designate by $\overline{\Phi}^j$ the aggregate level of advertising of station j (namely, $\overline{\Phi}^j = (\varphi_1^j + \varphi_2^j)$) and specify the functional relationship between the listener's utility and the aggregate level of advertising of the station as follows:

$$U^j(x) = v_s - t_s x - \overline{\Phi}^j, \tag{1}$$

where x is the distance of the viewer from station j, and $U^j(x)$ designates her net utility when viewing this station.

According to Equation (1), the utility the consumer derives from viewing a given station declines the farther away the programming choice of the station from that most preferred by the consumer (i.e., the larger x is) and the higher is the aggregate level of advertising aired by the station. In essence, advertising is considered a nuisance because it leads to interruptions of the regular programming of the station.[7]

The specification in Equation (1) implicitly assumes that consumers are informed of the aggregate level of advertising of the different stations before deciding on their listening behavior. One can interpret this assumption by supposing viewers have come to learn

[6] Even though the pool of advertisers in our model comes from a single product market, our analysis remains identical if advertisers from different product markets were considered in addition. Our focus in the paper is on identifying the relative bargaining position of each station vis-à-vis a given product producer from a certain industry. It is easy to show that this negotiating position depends upon the nature of competition in the selected industry but is independent of the existence of advertisers from other, unrelated industries.

[7] In a previous version of this paper, we considered the possibility that because of the informational benefits derived from advertising in the product market, the utility of the consumers is initially increasing with the aggregate level of advertising aired by the station. Specifically, we assumed that for low levels of aggregate advertising falling short of a certain threshold, Φ^*, the marginal benefit derived from the informational content of advertising exceeds the marginal cost inflicted on the consumer due to commercial interruptions of the regular programming of the station. In the previous setup, we demonstrated that stations will always choose to offer levels of advertising in the region, where it is considered a nuisance by consumers (i.e., in the region where $\overline{\Phi}^j > \Phi^*$). Hence, our present specification in Equation (1) can be made without any loss of generality. One can simply interpret the willingness to pay parameter, v_s, as containing the informational benefits derived by the consumer from the optimal level of advertising Φ^*.

how often their programs are interrupted to air commercials during different time periods of the day. For example, viewers in the early 90s came to expect higher amounts of commercial time on the FOX network than on the other three networks (ABC, CBS, and NBC) during primetime broadcasts (*TV Dimensions* 2000, published by Media Dynamics, Inc., p. 51). As well, viewers can anticipate, on average, 7.5% more advertising time on any of the "big four" broadcasters compared to cable networks (Myers Report, published by Myers Publishing Company, August 10, 2000).

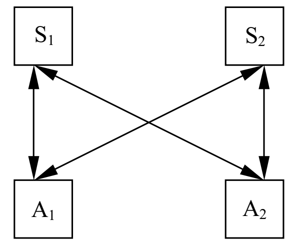
Note that the net utility specification in Equation (1) presumes that each consumer can view only one station during an interval period of time. She chooses this station to obtain a higher level of net utility. Moreover, she bases her decision on the aggregate level of advertising at the station rather than on the distribution of advertising across advertisers.

A given station negotiates with each advertiser a price for placing advertising messages. We designate by a_i^j the price per message that is negotiated between station j and advertiser i. Accordingly, if the advertiser chooses to advertise at the level φ_i^j with station j its payment to this station amounts to $a_i^j \varphi_i^j$.

We assume that each station incurs only fixed costs, f, to operate the station, which are unrelated to the number of ads it puts on the air. This assumption is quite reasonable because most of the variable costs associated with the production of advertising messages are borne by advertising agencies and not the TV or radio stations that broadcast those messages.[8] The production cost of each product producer consists of a per-unit variable cost, c, and fixed cost k. We designate by p_i the price of brand i as selected by this product producer.

As a starting point, we model the game as consisting of only two stages, not allowing for exclusivity in advertising. In the first stage, each station negotiates separately with each advertiser, as illustrated in Figure 2. The pairwise negotiations among stations and advertisers determine the prices for placing advertising messages, a_i^j. Simultaneously with the negotiations, each advertiser chooses its level of advertising with each station, φ_i^j, as well as the price it charges from consumers, p_i. In the second stage of the game, consumers decide on their viewing behavior. Subsequently, based upon the information they have gathered from commercials aired on their selected station, they decide if and which brand of the product to buy. As mentioned earlier, at the time the consumer chooses her preferred station she knows her location x in the distribution of preferences between stations as well as the aggregate levels of advertising of both stations. In the process of viewing, the consumer can become aware of one or both products through either the advertising messages on that station or through word of mouth. Regardless of the informational source, if she becomes aware of a given product, she learns of the price of this product and her location y relative to it.

Figure 2 **Pairwise Negotiations between Stations S_1, S_2 and Advertisers A_1, A_2**



Even though we model the negotiations in the first stage of the game as taking place simultaneously with the pricing and advertising decisions of the producers, it can be shown that introducing a restricted form of sequential choice in the first stage does not change any of our derivations. Specifically, if the first stage is broken into two, with negotiations and advertising levels determined first and pricing of products subsequently, then the results remain identical as long as the outcome of the negotiations between any pair of negotiators remains unobservable to competing

[8] It is also possible to incorporate commission fees into the model, whereby producers pay a commission to an advertising agency for each advertising message. Modifying the model in this way does not affect the qualitative results. This is discussed in more detail in Footnotes 18 and 19. However, to simplify the analysis, we exclude commission fees from the main model.

parties.[9] The assumption that stations or advertisers are unable to observe the agreements signed between competing pairs is consistent with secrecy practices in the advertising industry. In fact, a potential violation of such secrecy recently inspired Pepsi to sue the advertising agency Foote, Cone, and Belding to prevent them from dealing with rival Coca-Cola for fear of revealing Pepsi's marketing strategies, such as media buying (*Wall Street Journal*, November 23, 2001). If brand producers can observe the level of advertising selected by competitors when choosing the prices of their products, introducing sequential decisions in the first stage will significantly change our present results. With such observability, additional strategic considerations aimed at alleviating price competition in the product market will affect the levels of advertising selected by the product producers.[10] Irrespective of whether or not we introduce sequential pricing choice in the first stage, we maintain the assumption that the negotiations over the price of advertising occur simultaneously with the advertisers' decisions concerning their intensity of advertising.[11]

To model the negotiations between a given producer–station pair, we utilize the Nash bargaining solution. This cooperative solution concept implies that the parties to the negotiation agree to split evenly the surplus generated in the trade between them. If C_j and F_i designate the payoffs that accrue to station j and advertiser i, respectively, in case they can reach an agreement and C_j^{-i} and F_i^{-j} designate their respective payoffs when they are unable to reach an agreement (their "outside options"), then the gain from trade is equal to $(F_i + C_j) - (F_i^{-j} + C_j^{-i})$. The Nash bargaining solution splits this gain (if positive) evenly between the two parties.[12] In spite of being a cooperative solution concept, the Nash bargaining solution does not prevent us from capturing the competitive pressures that exist among the parties in the media and product markets. Because the outside options C_j^{-i} and F_i^{-j} depend upon the nature of competition among product producers and media stations, this competition is reflected in the outcome of the negotiations.[13] Another modeling issue that arises as a result of the multiparty bargaining arrangement is the fact that each agent in our model can negotiate with multiple parties, thus yielding complex interdependencies across negotiation outcomes.[14] Any equilibrium bargaining outcome in such a setting should have the

[9] With a sequential choice, a given advertiser can adjust the price of its product if it fails to reach an agreement with one of the stations in an earlier stage. It cannot adjust prices, however, if the competing advertiser fails to reach an agreement, given our assumption concerning the secrecy of negotiation outcomes. It is possible to show that even though the advertiser can adjust its price upon its own disagreement with one of the stations, it does not find it optimal to do so. Hence, none of the derivations changes when prices are selected subsequently to the negotiations. If a given advertiser could observe the failure of its competitor to reach an agreement with one of the stations, it would adjust its price under the restricted sequential choice formulation described above.

[10] In §5 we conjecture the effect of such strategic considerations on the advertising equilibrium.

[11] It might be suggested that the more desirable formulation is the one in which advertising rates and quantities are negotiated between the parties. However, as we demonstrate in Appendix C, such a formulation yields the unrealistic result that maximum levels of advertising (up to 100% awareness) are negotiated. For reasonable advertising response functions $G(\cdot)$, this would result in some viewers tuning off. In the current demand formulation, media stations would become local monopolies, in this case. To avoid such undesirable results, we maintain the assumption in the main text that only advertising rates, and not quantities, are negotiated.

[12] The generalized Nash bargaining solution extends this even split to allow for different shares accruing to the parties contingent upon their relative bargaining positions. For instance, if a station has a stronger position in the negotiation, then its share exceeds one-half and that of the producer falls short of one-half. To simplify the derivation, we focus on an even split of the gains from trade and use other parameters of the model to capture the relative bargaining position of the stations vis-à-vis the producers. The parameters that are especially important relate to the extent of competitiveness of the media and product markets as reflected by the degree of differentiation between stations and products, respectively.

[13] It is possible to consider other solutions to our multiparty bargaining problem. For example, a cooperative solution using Shapley values could be used in the context of coalitional bargaining. However, in our institutional setting, antitrust law may constrain bargaining to be bilateral, between one station and one producer. For coalitions limited to size two, the Shapley value is equivalent to the Nash solution used here.

[14] See Shaffer (2001) for a general treatment of bargaining with multiple buyers and sellers in distribution channels. In contrast to our formulation, which allows each pair to negotiate only over price, Shaffer (2001), in a multiparty bargaining model of vertical channel

property that no station–advertiser pair would want to renegotiate after learning the negotiated outcome between any other negotiating pair.

To derive the agreement and disagreement payoffs of the negotiations, we first identify the segment of the market that is covered by each station and product producer as a function of the number of media messages aired by the stations and the prices paid by consumers. Using the utility specification (1), we can obtain the market share of station j as implied by the advertising decisions of the producers as follows:

$$X^j = \frac{1}{2} - \frac{\sum_{k=1}^{2} \varphi_k^j}{2t_s} + \frac{\sum_{k=1}^{2} \varphi_k^i}{2t_s}, \qquad i, j = 1, 2;\ i \neq j. \quad (2)$$

The above derivations imply that the market share of station j declines if advertisers decide to place additional ads with this station or reduce their advertising with the competing station.

The derivation of the market share of advertiser i is complicated by the fact that consumers become informed of the different brands available in the market probabilistically. From our earlier assumption, the probability that the viewers of station j are informed about product i is equal to $\alpha_i + G(\varphi_i^j)$. Hence, the expected share of station j's viewers who end up purchasing brand i in the product market can be expressed as follows.

$$D_i^j = \left\{ [1 - (\alpha_k + G(\varphi_k^j))] + (\alpha_k + G(\varphi_k^j)) \left[\frac{1}{2} + \frac{p_k - p_i}{2t_p} \right] \right\} \times (\alpha_i + G(\varphi_i^j)) \qquad i, k = 1, 2;\ i \neq k. \quad (3)$$

The first term of Equation (3) corresponds to i's expected share if a given consumer is informed only about i's product and not about that of its competitor. The second term corresponds to i's expected share when the consumer is familiar with both products. In the latter case, the consumer compares the prices of the two products and, contingent upon those prices and her location on the distribution of preferences, chooses the brand that offers her the higher net utility. This comparison yields the expected market share expressed by the second term of Equation (3). Note that, similar to Grossman and Shapiro (1984), a consumer in our model may end up buying her least-preferred brand if she is familiar only with this brand. The consumers represented by the first term of Equation (3) purchase brand i irrespective of their location on the distribution of preferences between the two brands. The underlying assumption is that the prices of the products are sufficiently low so that the consumer's willingness to pay for the product, v_p, exceeds the cost she incurs (product price and transportation cost), irrespective of her location on the line.

3. Nonexclusive Equilibria

In this section we derive the equilibrium conditions implied by the formulation specified in the previous section. Recall that we are considering the nonexclusive case, where each advertiser is permitted to advertise on both stations.

Using the expressions for the market shares, we can now state the agreement and disagreement payoffs relevant to the negotiations between station j and advertiser i as follows:

$$C_j = \sum_{l=1}^{2} a_l^j \varphi_l^j - f,$$

$$F_i = \sum_{r=1}^{2} X^r D_i^r (p_i - c) - \sum_{r=1}^{2} a_i^r \varphi_i^r - k, \qquad \text{for } i, j = 1, 2. \quad (4)$$

The payoff of station j, C_j, consists of the payments it receives from the advertisers for airing their advertising messages net of its fixed cost.[15] The payoff of advertiser i, F_i, consists of the expected revenues it

structures, allows each pair to negotiate over both the price and quantity of the product transferred between them (via the use of two-part tariff agreements). It is shown, in particular, that this type of negotiation results in channel profit maximization. Such an outcome is unlikely to be valid in our context of negotiations between commercial media and advertisers, due to the informational role that advertising plays in determining the extent of price competition in the product market. Our derivations in Appendix C in particular, demonstrate that advertising levels tend to be higher when negotiated rather than selected unilaterally by producers. Such higher levels yield intensified price competition and reduced joint profits of each negotiating pair.

[15] It is not uncommon in the television industry for stations to receive additional revenue from other sources, such as from license

generates from consumers net of its advertising and production costs. If station j cannot reach an agreement with i, it obtains advertising revenues from the remaining advertiser, and advertiser i can advertise its product with the remaining station. The disagreement payoffs that accrue to the parties in this case are

$$C_j^{-i} = a_l^j \varphi_l^j - f \qquad l = 1,2;\ l \neq i.$$
$$F_i^{-j} = \big(\widetilde{X}^j \widetilde{D}_i^j + \widetilde{X}^r D_i^r\big)(p_i - c) - a_i^r \varphi_i^r - k \qquad r = 1,2;\ r \neq j, \tag{5}$$

where

$$\widetilde{X}^j = \frac{1}{2} - \frac{\varphi_l^j}{2t_s} + \frac{\varphi_1^r + \varphi_2^r}{2t_s}, \qquad \widetilde{X}^r = 1 - \widetilde{X}^j,$$
$$\widetilde{D}_i^j = \left[1 - [\alpha_l + G(\varphi_l^j)] + [\alpha_l + G(\varphi_l^j)]\left(\frac{1}{2} + \frac{p_l - p_i}{2t_p}\right)\right]\alpha_i.$$

Notice that upon disagreement between station j and advertiser i the market shares of the stations change. The market share of j increases and that of j's competitor declines because more viewers switch to station j, whose programs are interrupted less frequently as a result of the decline in the number of advertisements aired on this station. Note also that in spite of the fact that i is unable to advertise on station j, there is still a share of this station's viewers who buy product i, as expressed by $\widetilde{D}_i^j$, because there is an exogenous probability α_i that consumers know about product i even in the absence of exposure to commercials about its existence.

Utilizing Equations (4) and (5), one can derive the added benefit that each party obtains from the negotiations as follows:

$$C_j - C_j^{-i} = a_i^j \varphi_i^j,$$
$$F_i - F_i^{-j} = (p_i - c)\left[\frac{G(\varphi_i^j) D_i^j X^j}{\alpha_i + G(\varphi_i^j)} + \frac{\varphi_i^j}{2t_s}(D_i^r - \widetilde{D}_i^j)\right] - a_i^j \varphi_i^j, \qquad \text{where } r \neq j. \tag{6}$$

fees paid by cable providers, which are tied to the number of viewers. We examine this case in Gal-Or and Dukes (2002) and find that many of the stations' incentives with respect to advertising remain valid despite the inclusion of this outside source of revenue.

At the Nash bargaining solution the negotiated rate a_i^j maximizes[16] the product $(C_j - C_j^{-i})(F_i - F_i^{-j})$, implying that the parties split evenly the surplus generated in the negotiations so that $(C_j - C_j^{-i}) = (F_i - F_i^{-j})$ and

$$a_i^j \varphi_i^j = \frac{(p_i - c)}{2}\left[\frac{G(\varphi_i^j) D_i^j X^j}{\alpha_i + G(\varphi_i^j)} + \frac{\varphi_i^j}{2t_s}(D_i^r - \widetilde{D}_i^j)\right] \qquad i, j = 1,2;\ r \neq j. \tag{7}$$

Condition (7) expresses the outcome of the negotiations between four different pairs of negotiators. The payment transferred between each $\{i, j\}$ pair, as expressed in Condition (7), guarantees that each negotiator obtains half of this pair's gains from trade, as required by the Nash bargaining solution.[17] An interpretation of the right-hand side of Condition (7) illustrates the distribution of surplus that is implied by the Nash bargaining solution. The first term in the bracketed expression times $(p_i - c)$ denotes the expected surplus extracted through product sales from consumers' viewing station j. The second term in the bracketed expression times $(p_i - c)$ is a premium paid to station j for the net number of additional sales of product i sold to consumers *not* viewing station j that occur as a result of the agreement between station j and advertiser i. These are the sales of product i to those marginal listeners who switched to station $r \neq j$ due to the increased advertising on station j implied by its agreement with advertiser i.

The advertisers choose their level of advertising with the stations and their prices simultaneously with the negotiations, implying that they consider the negotiated rate a_i^j fixed when making this choice.[18]

[16] The product $(C_j - C_j^{-i})(F_i - F_i^{-j})$ is a concave function of a_i^j for fixed values of φ_l^k and p_i, where $i, k, l = 1, 2$. Hence, the first-order necessary condition for a maximum (i.e., Condition (7)) is also a sufficient condition.

[17] Note that the pair $\{i, j\}$ would have no reason to disband their relationship even after learning the terms of the agreements between other pairs of negotiators. Given the derivation of a_i^j in Condition (7), both i and j are better off executing their agreement than disbanding it, since their added payoffs in Equation (6) are positive.

[18] Assuming that advertisers must also pay a per-ad commission R to an advertising agency in addition to payments made to stations, then the advertiser's added benefit from negotiations is reduced by

Advertiser i chooses its level of advertising on station j, φ_i^j, and the price of its product p_i to maximize its agreement payoff, F_i, thus yielding the following two first-order conditions at an interior equilibrium:

$$\frac{\partial F_i}{\partial \varphi_i^j} = (p_i - c)\left[\frac{D_i^j X^j G'(\varphi_i^j)}{\alpha_i + G(\varphi_i^j)} - \frac{1}{2t_s}(D_i^j - D_i^r)\right] - a_i^j = 0, \quad r \neq j, \qquad (8)$$

$$\frac{\partial F_i}{\partial p_i} = \sum_{k=1}^{2} X^k D_i^k + \sum_{k=1}^{2} X^k \frac{\partial D_i^k}{\partial p_i}(p_i - c) = 0. \qquad (9)$$

It can be shown that the above system of first-order conditions yields a unique interior solution as long as the advertising response function $G(\cdot)$ is not "too convex." In particular, if $G(\cdot)$ is concave, second-order conditions guaranteeing such uniqueness hold.

Notice that because the two brands are not characterized by identical levels of base awareness on the part of consumers (i.e., $\alpha_1 \neq \alpha_2$), the solution to System (7)–(9) can potentially yield different levels of advertising ($\varphi_1^r \neq \varphi_2^r$) and different prices ($p_1 \neq p_2$) selected by advertisers. However, because stations face identical advertising response functions, and consumers' preferences are uniformly distributed, we restrict attention to equilibria that exhibit symmetry with respect to stations. Specifically, a given brand producer advertises equally across stations ($\varphi_i^1 = \varphi_i^2 \equiv \varphi_i$), and the negotiated price of advertising with a given producer is identical across stations ($a_i^1 = a_i^2 \equiv a_i$). To simplify the exposition, we use this assumed symmetry to define $G_i \equiv G(\varphi_i)$ for $i = 1, 2$. Our analysis can be easily extended to allow for asymmetries between stations as well. For instance, if the consumers' distribution of preferences between stations is skewed in favor of one of the stations, at the equilibrium advertisers will naturally not allocate their advertising efforts equally across stations anymore. We focus on stations' symmetry because our main objective in the present section is to conduct a comparative statics analysis to evaluate how the equilibrium is affected by the intensity of competition in the product and the media markets and by the extent of customer awareness of the two products.

To characterize the advertising equilibrium, we define a function $T(\cdot)$ that serves as a proxy of the net marginal contribution of advertising to an advertiser as follows:

$$T(\varphi) \equiv \left[\frac{G'(\varphi)}{G(\varphi)} - \frac{1}{2\varphi}\right].$$

The *gross* marginal contribution of advertising is measured by $G'(\varphi)$. However, at the Nash bargaining solution any surplus generated in the negotiations must be shared equally between the advertiser and the station. In particular, the added surplus $G(\varphi)$ has to be split evenly between the parties, translating to an increased negotiated rate of $G(\varphi)/(2\varphi)$ per unit of advertising. Note that if $T(\varphi) < 0$ for all φ, the marginal contribution of advertising net of the added payment to the station is negative, implying that the producer has no incentive to advertise. Hence, to guarantee a positive and finite level of advertising at the equilibrium we make the following two assumptions concerning the function $T(\cdot)$.

Assumption 1 (A1). $T(\varphi) > 0$.

Assumption 2 (A2). $T'(\varphi) < 0$.

The above assumptions guarantee that the net marginal contribution of advertising is positive (A1) and diminishing (A2) with the level of advertising. It can be demonstrated that the latter property guarantees, in particular, stability of advertising and price reaction functions. Such stability, in turn, yields convergence to a unique interior equilibrium when advertisers adjust their "best responses" along their reaction functions. Note also that the function $T(\varphi)$ is related to the magnitude of the elasticity of the advertising response function. In particular, Assumption (A1) holds only if this elasticity is larger than one-half.

Consider, for instance, the following two examples: $G(\varphi) = \varphi^\eta$ and $G(\varphi) = \varphi^2 e^{-\varphi}$. In the first example, both (A1) and (A2) hold provided that $\eta > 1/2$. In the second example, (A1) holds if $\varphi < 3/2$, which is equivalent to the elasticity exceeding one-half, and (A2) is always valid.

Substituting into Equation (8) the negotiated payment determined by the Nash bargaining solution

$R\varphi_i^j$. The negotiated rate for advertising is, therefore, obtained by subtracting $(R/2)\varphi_i^j$ from the right-hand side of Condition (7). As a result, stations bear half of the commission fees, as implied by the Nash bargaining solution.

from Condition (7), as well as the expressions derived for the product prices from Equation (9), yields the characterization of the equilibria reported in the following lemma. We use the subscript *NE* to designate the values of the variables at the nonexclusive equilibrium. Exclusive equilibria are considered in the next section.

Lemma 1. *Under* (A1) *and* (A2):

(i) *At an interior, nonexclusive equilibrium* ($\alpha_i + G_i < 1$ *for* $i = 1, 2$)*, advertisers choose identical intensities of advertising with the stations even when* $\alpha_1 \neq \alpha_2$*. This intensity per station is given by*[19,20]:

$$\varphi^*_{NE} = T^{-1}\left(\frac{1}{2t_s}\right). \tag{10}$$

(ii) *The product prices are:*

$$(p^*_{iNE} - c) = t_p\left(\tfrac{2}{3}H^*_k + \tfrac{1}{3}H^*_i\right) \qquad i, k = 1, 2;\ i \neq k, \tag{11}$$

where

$$H^*_i = \frac{[2 - (\alpha_i + G^*_{NE})]}{\alpha_i + G^*_{NE}} \quad \textit{and} \quad G^*_{NE} \equiv G(\varphi^*_{NE}).$$

(iii) *The payoffs of each station and advertiser are expressed, respectively, as follows:*

$$\begin{aligned} C^*_{NE} = {} & \frac{t_p G^*_{NE}}{8}\left(1 + \frac{\varphi^*_{NE}}{t_s}\right) \\ & \times \left[\left(\frac{2}{3}H^*_k + \frac{1}{3}H^*_i\right)^2 (\alpha_k + G^*_{NE}) \right. \\ & \left. + \left(\frac{2}{3}H^*_i + \frac{1}{3}H^*_k\right)^2 (\alpha_i + G^*_{NE})\right] - f. \end{aligned} \tag{12}$$

$$\begin{aligned} F^*_{NE} = {} & \frac{t_p G^*_{NE}(\alpha_k + G^*_{NE})}{4}\left(\frac{2}{3}H^*_k + \frac{1}{3}H^*_i\right)^2 \\ & \times \left[\left(1 + \frac{2\alpha_i}{G^*_{NE}}\right) - \frac{\varphi^*_{NE}}{t_s}\right] - k. \end{aligned} \tag{13}$$

The results reported in Proposition 1 are implied by the expressions obtained in Lemma 1.

[19] When producers must also pay a commission R to an advertising agency, the equilibrium level of advertising is less than that specified in Lemma 1 because a commission fee raises the producer's marginal cost of advertising.

[20] Because $T(\cdot)$ is strictly decreasing from (A2), an interior solution exists if $T(0) > 1/(2t_s)$ and $T(1 - \alpha_i) < 1/(2t_s)$ for $i = 1, 2$.

Proposition 1. *Under* (A1) *and* (A2):

(i) *The level of advertising per station that is selected by each producer at an interior equilibrium is identical and is determined independently of the basic awareness parameters* α_1 *and* α_2.[21] *This level is higher the more highly differentiated the media market is.*

(ii) *If* $\alpha_i > \alpha_k$*, then* $(p_i - c) > (p_k - c)$*. The price margin* $(p_i - c)$ *declines with the awareness level parameter of either one of the two products and with the extent of differentiation between stations. It is an increasing function of the degree of differentiation between products.*

(iii) *The payoff of each station is an ambiguous function of the awareness parameters and the degree of differentiation between stations. It is increasing with the degree of differentiation between products.*

According to part (i) of Proposition 1, the two advertisers choose the same levels of advertising in spite of the differing base awareness levels that characterize their products. This result stems from the additive form that we have selected for the combined probability of reaching a consumer (i.e., $\alpha_i + G_i$). This additive form implies that the marginal contribution to the advertiser is independent of the awareness parameter α_i. This result could possibly change if a multiplicative form were specified (e.g., $\alpha_i(1 + G_i)$) or if a corner solution arose due to a very high base awareness level for one of the products (i.e., $\alpha_i + G_i = 1$). Part (i) of the proposition claims also that the intensity of advertising per station is higher the more highly differentiated the two stations are. When stations are more highly differentiated, they do not lose many viewers when they advertise more intensely (given the increased loyalty of viewers to their preferred stations). As a result, an advertiser can expand his advertising with a given station without having to worry about significantly hampering the effectiveness of this station in reaching consumers. Because the implied marginal benefit from advertising is enhanced, each advertiser advertises more intensely when stations are more highly differentiated.

[21] If the base awareness level of i is much larger than that of its competitor, the solution to Equation (10) may violate the requirement that $G^* + \alpha_i < 1$. If this latter constraint is binding, the intensity of i's advertising is equal to $G^{-1}(1 - \alpha_i)$. This level falls short of that chosen by $j \neq i$, whose advertising level still satisfies Equation (10), if $\alpha_j + G^* < 1$.

Part (ii) asserts that the possible asymmetry in their awareness levels yields asymmetry in the prices of the two products. Specifically, the brand producer whose product is better known to consumers charges higher prices. Part (ii) of the proposition also asserts that price competition between products is more intense whenever consumers are better informed about the products. The improved information can be the result of higher basic awareness on the part of consumers or intensified advertising that is selected by the advertisers when stations are more highly differentiated. Price competition is alleviated, however, when products are more highly differentiated.

Other than the extent of differentiation between products, which tends to enhance the payoffs of both stations and advertisers, part (iii) claims that the remaining parameters of the model may have ambiguous implications on the payoff of the stations. For instance, differentiating the expression for C^*_{NE} with respect to either one of the awareness parameters implies that the payoff of each station declines with increased awareness, provided that consumers are equally familiar with the two products. If, however, consumers are much more likely to be familiar with one product than with the other, each station can actually benefit if the awareness parameter of the more familiar product is further increased. As explained earlier, the magnitudes of the awareness parameters determine the extent of price competition in the product market, with increased awareness yielding lower prices and a smaller producer surplus generated in the product market. Because the payoff of each station is determined as a fraction of this surplus, one would expect the payoff of the stations to decline with increased awareness on the part of consumers. However, this intuition ignores the possibility that great asymmetries between products may improve the negotiating position of each station vis-à-vis the producers. Indeed, the comparative statics indicate that stations may benefit when one of the awareness parameters increases, if asymmetries between products are large (i.e., $\alpha_k \gg \alpha_i$).

To simplify the discussion and resolve some of the ambiguities reported in Proposition 1, from this point onward we restrict attention to the symmetric case when $\alpha_1 = \alpha_2 = \alpha$. Evaluating the expressions of Lemma 1 at such symmetry yields

$$p^*_{NE} - c = \frac{t_p[2-(\alpha+G^*_{NE})]}{\alpha+G^*_{NE}}, \tag{14}$$

$$C^*_{NE} = \frac{t_p G^*_{NE}[2-(\alpha+G^*_{NE})]^2}{4(\alpha+G^*_{NE})}\left[1+\frac{\varphi^*_{NE}}{t_s}\right] - f, \tag{15}$$

$$F^*_{NE} = \frac{t_p G^*_{NE}[2-(\alpha+G^*_{NE})]^2}{4(\alpha+G^*_{NE})}\left[1+\frac{2\alpha}{G^*_{NE}}-\frac{\varphi^*_{NE}}{t_s}\right] - k. \tag{16}$$

As we have already reported in Proposition 1, price competition intensifies when either α or t_s increases, because an increase in these parameters yields better information for consumers. The effect of changes in the parameters on the payoff of each station can be obtained from Expression (15). Better awareness on the part of consumers, as measured by α, is unambiguously bad for stations because their role in informing consumers is diminished. Greater differentiation between stations, which yields from Equation (10) higher levels of advertising per station, has ambiguous effects on each station's payoff. On the positive side, the enhanced advertising that is implied by greater differentiation between stations improves the bargaining position of each station vis-à-vis the producers, thus permitting the station to secure better terms in the negotiations. The term $G/(\alpha+G)$ in Equation (15) expresses the importance of advertising (measured by G) in informing consumers about products relative to other sources of information that consumers may have (measured by α). The larger the relative importance of advertising in informing consumers, the larger the share of the gains from trade that stations can command. The relative importance expression is increasing when producers advertise more heavily at the equilibrium. Intensified advertising also has a negative effect on the profits of each station because price competition in the product market is more intense when consumers are better informed. The total available surplus that can be shared between the stations and advertisers shrinks as a result of such intensified price competition. The above-discussed ambiguity implies that a change in the parameter of differentiation between stations, t_s, has ambiguous effects on the profits of each station. In contrast, the profits of both stations and advertisers are unambiguously higher when products are more highly differentiated as reflected by the parameter t_p.

Even though the above derivations indicate that it is impossible, in general, to predict whether or not stations benefit from greater differentiation in the media market, part of the ambiguity can be resolved if the parameter α is sufficiently small. When α is very small, consumers have very little external information about both products. (Recall that we restrict attention to $\alpha_1 = \alpha_2 = \alpha$.) As a result, the relative importance of advertising in informing consumers is significant even when producers advertise only moderately (i.e., $G/(G+\alpha)$ is large even when G is small). Stations can benefit, therefore, from the favorable effect that reduced levels of advertising have on the extent of price competition between producers. In Corollary 1, we derive a condition to guarantee that this intuition is indeed valid.

Corollary 1. *Under* (A1), *when α is sufficiently small and the elasticity of the advertising response function $G(\varphi)$ is nonincreasing, each station earns lower profits at the symmetric equilibrium if producers advertise more aggressively.*[22] *Hence, the profitability of each station declines when stations are more highly differentiated.*

The condition stated in Corollary 1 guarantees that the term φ^*_{NE}/t_s inside the brackets of Expression (15) increases when t_s declines. A decline in the parameter t_s implies that advertisers cut back on their level of advertising. Hence, even though t_s is smaller, the direction of change in φ^*_{NE}/t_s is ambiguous. When $G(\varphi)$ becomes less elastic for higher values of φ, the percentage of decrease in φ^*_{NE} falls short of the percentage of decrease in t_s, thus implying that the ratio of the two increases when the degree of differentiation between stations is smaller. Note that the condition of the corollary is actually stronger than is necessary in order to support the result that stations benefit from reduced differentiation between them. This is the case because the expression multiplying the brackets in Expression (15) is a decreasing function of G^*_{NE} (and, therefore, of t_s) when α is very small.

The result reported in Corollary 1 can provide an additional explanation to the observation that the major television networks in the United States tend to make very similar programming choices. According to this corollary, the profitability of stations may increase when they reduce the extent of differentiation among their programs. This is especially the case when commercials pertain mostly to new products that consumers know very little about in the absence of advertising. Note that the reason for this result is completely different from that generating the principle of minimum differentiation in the Hotelling model.[23] Whereas in the Hotelling model this result stems from the benefit of increasing the size of the "captive market" of each competitor, in the present formulation the result is implied by the informational role of advertising in dictating the extent of competition in product markets.

Consider, for instance, the two examples for $G(\cdot)$ that we discussed earlier. Solving for the intensity of advertising in each case yields that

$$\varphi^*_{NE} = \min\{(2\eta-1)t_s, (1-\alpha)^{1/\eta}\} \qquad \text{when } G(\varphi)=\varphi^\eta,$$

and

$$\varphi^*_{NE} = \min\left\{\frac{3t_s}{1+2t_s}, G^{-1}(1-\alpha)\right\} \qquad \text{when } G(\varphi)=\varphi^2 e^{-\varphi}.$$

Note that in both cases the elasticity of the advertising response function is nonincreasing, with φ implying that the condition of Corollary 1 holds and the profits of each station should decline with t_s when α is sufficiently small. Specifically,

$$C^*_{NE} = \frac{t_p \eta[2-[\alpha+G(\varphi^*_{NE})]]^2 G(\varphi^*_{NE})}{2[\alpha+G(\varphi^*_{NE})]} - f \qquad \text{when } G(\varphi)=\varphi^\eta,$$

[22] The condition requiring that the elasticity of $G(\cdot)$ is nonincreasing is stronger than Condition (A2). Specifically, if the elasticity of $G(\cdot)$ is nonincreasing and (A1) holds, then the validity of Condition (A2) is implied. However, (A1) and (A2) do not necessarily imply that the elasticity of $G(\cdot)$ is nonincreasing.

[23] In a related paper (Gal-Or and Dukes 2003), we have considered a model where stations can endogenously choose their locations on the line. We find that both stations may have incentives to locate at the center, thus miminizing the extent of differentiation between them.

and

$$C^*_{NE} = \frac{t_p[2-[\alpha+G(\varphi^*_{NE})]]^2 G(\varphi^*_{NE})}{4[\alpha+G(\varphi^*_{NE})]}\left(\frac{4+2t_s}{1+2t_s}\right) - f$$

$$\text{when } G(\varphi) = \varphi^2 e^{-\varphi}.$$

Both of the above expressions for C^*_{NE} are diminishing in t_s when α is sufficiently small.

4. Exclusivity Contracts

Until now we have not considered the possibility that a given station permits one of the advertisers to be the only sponsor of its programs. Such sole sponsorship is quite common for primetime programs aired on the major television channels. To capture this possibility, we extend our original formulation to consist of an additional initial stage, before negotiations and pricing take place. At this initial stage, each station decides on whether and to which advertiser to offer exclusivity rights.[24] Following the stations' decisions concerning exclusivity rights, the game proceeds as described in the previous sections. Specifically, negotiations, choice of advertising levels, and prices all occur simultaneously in the second stage of the game, and consumers decide between stations and products in the third stage of the game.

In the first stage, each station has three possible actions: offer exclusivity to Advertiser 1, offer exclusivity to Advertiser 2, or offer exclusivity to neither advertiser. As a result, there are nine (3^2) possible subgames starting at the second stage. Symmetry among stations and among advertisers simplifies the subsequent analysis, reducing to four the number of analytically distinct cases. For example, the equilibrium outcome (in the subgame) when station i offers exclusivity to advertiser i, $i = 1, 2$ is analytically equivalent to the equilibrium outcome when station i, $i = 1, 2$ offers exclusivity to advertiser j, $j \neq i$. Because each station is offering exclusivity to different advertisers, we denote the outcome in this case as *ED* (exclusive-different) regime.

[24] Note that in the current model formulation, a given station simply decides whether or not (and to whom) to offer advertising rights and does not allow advertisers to compete for exclusivity.

The other three cases are denoted similarly. The case when both stations choose to offer exclusivity to the same advertiser is denoted *ES* (exclusive-same), the case when one station offers exclusivity while the other does not is denoted *AS* (asymmetric), and the case when both do not offer exclusivity to any advertiser is denoted *NE* (as was analyzed in §3). Given our emphasis on the derivation of symmetric equilibria, we will focus in the main text on the characterization of the symmetric configurations (*ED, ES*, and *NE*). The asymmetric configuration (*AS*) will be discussed mainly in Appendix B.

Considering the *ED* regime first, assume without any loss of generality that station i awards exclusivity to advertiser i, where $i = 1, 2$. The agreement and disagreement payoffs are still expressed by (4) and (5), with the market shares D^j_i and $\widetilde{D}^j_i$ modified as follows:

$$D^i_i = \left[(1-\alpha) + \alpha\left(\frac{1}{2} + \frac{p_j - p_i}{2t_p}\right)\right][\alpha + G(\varphi^i_i)],$$

$$D^j_i = \left[[1-\alpha-G(\varphi^j_j)] + [\alpha + G(\varphi^j_j)]\left(\frac{1}{2} + \frac{p_j - p_i}{2t_p}\right)\right]\alpha,$$

$$\widetilde{D}^i_i = \left[(1-\alpha) + \alpha\left(\frac{1}{2} + \frac{p_j - p_i}{2t_p}\right)\right]\alpha$$

for $i, j = 1, 2;\; i \neq j$. It follows, therefore, from (4) and (5) that

$$C_i - C^{-i}_i = a^i_i \varphi^i_i$$

$$F_i - F^{-i}_i = (p_i - c)\left[\frac{X^i D^i_i G(\varphi^i_i)}{\alpha + G(\varphi^i_i)} - \frac{\alpha \varphi^i_i G(\varphi^j_j)}{2t_s} \times \left(\frac{1}{2} + \frac{p_i - p_j}{2t_p}\right)\right] - a^i_i \varphi^i_i.$$

The Nash bargaining solution satisfies; therefore,

$$a^i_i \varphi^i_i = \frac{(p_i - c)}{2}\left[\frac{X^i D^i_i G(\varphi^i_i)}{\alpha + G(\varphi^i_i)} - \frac{\alpha \varphi^i_i G(\varphi^j_j)}{2t_s}\left(\frac{1}{2} + \frac{p_i - p_j}{2t_p}\right)\right]. \quad (17)$$

Optimizing the agreement payoff F_i with respect to the decision variables φ^i_i and p_i yields Conditions (8) and (9). Given the symmetry between the two advertisers and the two stations under the *ED* regime, we substitute symmetry (i.e., $G_1 = G_2$ and $p_1 = p_2$) into the above expressions for D_i^i, D_i^j, $\widetilde{D}_i^i$, and a_i^i and plug them back into Conditions (8) and (9) to obtain

$$\left.\frac{\partial F_i}{\partial \varphi_i^i}\right|_{\text{sym}} = (p-c)\frac{(2-\alpha)G}{4} \times \left[\frac{G'}{G} - \frac{1}{2\varphi} - \frac{4-\alpha}{2t_s(2-\alpha)}\right] = 0, \quad (18)$$

$$\left.\frac{\partial F_i}{\partial p_i}\right|_{\text{sym}} = \frac{2\alpha - \alpha^2 + G - \alpha G}{2} - (p-c)\frac{\alpha(\alpha+G)}{2t_p} = 0. \quad (19)$$

Equation (18) implies that $T(\varphi_{ED}) > 1/(2t_s)$. A comparison with the level of advertising obtained under the nonexclusive regime in Equation (10) yields that lower levels of advertising per station are selected by advertisers under the *ED* regime. Comparing Equations (19) and (14) indicates that the reduced advertising levels under *ED* yield higher prices than under *NE*.

Next, consider the *ES* regime and, without any loss of generality, assume that both stations offer exclusivity to Producer 2. In the negotiations between station j and Producer 2, the agreement and disagreement payoffs are still expressed by Equations (4) and (5), with D_2^j and $\widetilde{D}_2^j$ modified as follows:

$$D_2^j = \left[(1-\alpha) + \alpha\left(\frac{1}{2} + \frac{p_1 - p_2}{2t_p}\right)\right][\alpha + G(\varphi_2^j)],$$

$$\widetilde{D}_2^j = \left[(1-\alpha) + \alpha\left(\frac{1}{2} + \frac{p_1 - p_2}{2t_p}\right)\right]\alpha.$$

The Nash bargaining solution is obtained from Equations (4) and (5), therefore, as follows:

$$a_2^j\varphi_2^j = \frac{(p_2-c)}{2}\left[\frac{X^j D_2^j G(\varphi_2^j)}{\alpha + G(\varphi_2^j)} + \frac{\varphi_2^j}{2t_s}\left(\frac{D_2^r G(\varphi_2^r)}{\alpha + G(\varphi_2^r)}\right)\right] \quad j, r = 1, 2;\ j \neq r. \quad (20)$$

Optimizing F_2 with respect to φ_2^j and p_2 yields Conditions (8) and (9). Substituting the above expressions into these conditions yields

$$\frac{\partial F_2}{\partial \varphi_2^j} = (p_2 - c)G(\varphi_2^j)\left[(1-\alpha) + \alpha\left(\frac{1}{2} + \frac{p_1 - p_2}{2t_p}\right)\right] \times \left[X^j\left(\frac{G'(\varphi_2^j)}{G(\varphi_2^j)} - \frac{1}{2\varphi_2^j}\right) - \frac{1}{2t_s}\left(1 - \frac{G(\varphi_2^r)}{2G(\varphi_2^j)}\right)\right] = 0, \quad (21)$$

$$\frac{\partial F_2}{\partial p_2} = [X^1(\alpha + G(\varphi_2^1)) + X^2(\alpha + G(\varphi_2^2))] \times \left[-\frac{\alpha(p_2-c)}{2t_p} + (1-\alpha) + \alpha\left(\frac{1}{2} + \frac{p_1 - p_2}{2t_p}\right)\right] = 0. \quad (22)$$

Note that the two producers need not choose identical prices under the *ES* regime (i.e., $p_1 \neq p_2$) because, in contrast to Producer 2, Producer 1 is excluded from advertising. However, the two stations behave symmetrically in this case in offering exclusivity to the same producer. At the equilibrium, therefore, $\varphi_2^1 = \varphi_2^2$ and $X^1 = X^2 = 1/2$. Substituting the latter into Equation (21) implies that $T(\varphi_{ES}) = 1/(2t_s)$, which is identical to the condition obtained under the *NE* regime in Equation (10). Hence, the producer who is awarded exclusivity by both stations advertises at the same intensity per station as under the *NE* regime.

Because the excluded producer cannot advertise, his only decision variable pertains to the price of his product. He chooses this price p_1 to maximize his agreement payoff F_1, yielding the following first-order condition:

$$\frac{\partial F_1}{\partial p_1} = -(p_1 - c)\frac{\alpha}{2t_p}\left[X^1[\alpha + G(\varphi_2^1)] + X^2[\alpha + G(\varphi_2^2)]\right] + (X^1 D_1^1 + X^2 D_1^2) = 0, \quad (23)$$

where

$$D_1^j = \left[[1 - \alpha - G(\varphi_2^j)] + [\alpha + G(\varphi_2^j)]\left(\frac{1}{2} + \frac{p_2 - p_1}{2t_p}\right)\right]\alpha.$$

Based on the derivations in Equations (17)–(23), we characterize in Lemma 2 the exclusive outcomes *ED* and *ES*.[25]

[25] Given (A1) and (A2), the existence of a unique interior equilibrium in the *ED* regime is guaranteed if $T(0) > (4-\alpha)/[2t_s(2-\alpha)] > T(1-\alpha)$. The *ES* regime requires the additional condition that $\alpha > 0$.

LEMMA 2. *Given* (A1) *and* (A2),

(i) *When stations offer exclusivity rights to different advertisers* (*ED*), *at the symmetric, interior equilibrium the advertising level chosen by each producer is*:

$$\varphi^*_{ED} = T^{-1}\left[\frac{4-\alpha}{2t_s(2-\alpha)}\right].$$

The identical price chosen by the advertisers is

$$(p^*_{itED} - c) = \frac{t_p(2\alpha - \alpha^2 + G^*_{ED} - \alpha G^*_{ED})}{\alpha(\alpha + G^*_{ED})}, \quad \text{where } G^*_{ED} = G(\varphi^*_{ED}),$$

and the profits of each station are

$$C^*_{ED} = \frac{t_p G^*_{ED}}{8}\left[\frac{2-\alpha}{\alpha} - \frac{\varphi^*_{ED}}{t_s}\right]\frac{(2\alpha - \alpha^2 + G^*_{ED} - \alpha G^*_{ED})}{(\alpha + G^*_{ED})} - f.$$

(ii) *When both stations offer exclusivity rights to Advertiser* 2 (*ES*) *and* $\alpha > 0$, *the level of advertising per station chosen by this advertiser is given as*

$$\varphi^*_{ES} = T^{-1}\left(\frac{1}{2t_s}\right).$$

The prices charged by the two advertisers are expressed as

$$(p^*_{1ES} - c) = \frac{t_p(6\alpha - 3\alpha^2 - 3\alpha G^*_{ES} + 2G^*_{ES})}{3\alpha(\alpha + G^*_{ES})},$$

$$(p^*_{2ES} - c) = \frac{t_p(6\alpha - 3\alpha^2 - 3\alpha G^*_{ES} + 4G^*_{ES})}{3\alpha(\alpha + G^*_{ES})}, \quad \text{where } G^*_{ES} = G(\varphi^*_{ES}),$$

and the profits of each station are

$$C^*_{ES} = \frac{\alpha t_p G^*_{ES}}{18}\left[1 + \frac{\varphi^*_{ES}}{t_s}\right]\left[\frac{2-\alpha}{\alpha} + \frac{2 - (\alpha + G^*_{ES})}{2(\alpha + G^*_{ES})}\right]^2 - f.$$

A comparison of the exclusive equilibria with the nonexclusive equilibrium derived in the previous section is provided in Proposition 2.

PROPOSITION 2. *Given* (A1) *and* (A2),

(i) $\varphi^*_{ED} < \varphi^*_{ES} = \varphi^*_{NE}$,

(ii) $(p^*_{NE} - c) < (\bar{p}^*_{ES} - c) < (p^*_{ED} - c)$, *where* $\bar{p}^*_{ES} = (p^*_{1ES} + p^*_{2ES})/2$.

(iii) *For sufficiently small values of* $\alpha > 0$ *and large values of* t_s

$$C^*_{ED} > C^*_{ES} > C^*_{NE}.$$

For sufficiently large values of α *and small values of* t_s,

$$C^*_{NE} > C^*_{ES} \quad \text{and} \quad C^*_{NE} > C^*_{ED}.$$

According to Proposition 2, among the three regimes we have considered, advertisers have the lowest incentive to invest in advertising when each is awarded exclusivity with a different station. Advertisers in the nonexclusive regime choose the same level of advertising per station as the advertiser who is awarded exclusivity on both stations. When an advertiser in the *ED* regime increases its advertising with the station that awards it exclusivity, the market share of this station declines. Because this advertiser is excluded from the competing station, the decline of this station's market share implies that the advertiser is able to reach fewer consumers. In contrast, in the *NE* or *ES* regimes the advertiser advertises on both stations. Hence, when the advertiser increases its advertising with one of the stations it need not be as concerned about the decline of this station's market share because its overall ability to reach consumers is not necessarily hindered. Given that both stations air messages on behalf of this advertiser, it is still able to reach the consumers who decide to switch to the competing station. The above discussion implies that the marginal benefit that an advertiser derives from advertising is higher in the *NE* and *ES* regimes than in the *ED* regime.[26]

Notice that even though the exclusive advertiser in the *ES* regime advertises at the same intensity per station as each advertiser in the nonexclusive regime, the latter regime is characterized by higher aggregate levels of advertising per station. Specifically, because with *NE* both producers advertise, each sta-

Moreover, convergence to this unique equilibrium can be assured if advertisers' reaction functions are stable in a neighborhood of the equilibrium. It can be shown that such stability, in both *ES* and *ED* regimes, is implied by (A1) and (A2).

[26] The same conclusion is valid even when advertising levels are negotiated instead of being unilaterally selected by the advertiser (see Appendix C). With negotiated advertising levels, each pair is still concerned about the decline in the station's market share because the product is not advertised on the competing station under the *ED* regime.

tion airs twice as many commercials in the nonexclusive regime than in the regime that awards exclusivity on both stations to the same producer. Aggregate levels of advertising per station are even lower in the regime that awards exclusivity to different producers because, as explained earlier, the marginal benefit that each producer derives from advertising is smaller in this case. The above discussion implies that the extent of information about the products that is available to consumers is highest under the *NE* regime, lowest under the *ED*, with the *ES* regime yielding an intermediate case between the two. The different levels of information that are available in the three regimes explain the differing intensities of price competition that arise in the product market. Because the intensity of price competition is directly related to the extent of information that consumers have, part (ii) of the proposition asserts that product prices are the lowest under *NE*, highest under *ED*, with *ES* constituting the intermediate case once again.

To understand the results reported in the last part of the proposition, recall the two counteracting effects that increased advertising levels may have on the profits of each station. On the positive side, increased advertising raises the relative importance of stations in transmitting information to consumers. (Increasing the ratio $G/(\alpha+G)$ guarantees an improved negotiating position to each station.) On the negative side, increased advertising leads to intensified price competition among products and a smaller total surplus available to be shared among the parties. The size of the ratio α/G determines which of the abovementioned two counteracting effects dominates. When α/G is relatively small, which happens for small values of α and/or large values of t_s, advertising is the main source of information about products that is available to consumers. Hence, the negotiating position of each station is strong even with reduced levels of advertising at the equilibrium. Stations can focus, therefore, on the benefit they can derive from alleviating price competition among producers. The *ED* regime is the most successful in accomplishing this task. Between the remaining two regimes the *ES* regime is more profitable because it yields higher

Table 1 Comparison of Regimes When $G(\varphi)=\varphi^2 e^{-\varphi}$ for Low Values of t_s

t_s	α	$\varphi_{NE}=\varphi_{ES}$	φ_{ED}	C^*_{NE}	C^*_{ED}	C^*_{ES}
0.5	0.10	0.750	0.491	1.2129	0.4337	1.6640*
0.5	0.20	0.750	0.482	0.8394*	0.1993	0.8367
0.5	0.30	0.750	0.472	0.6039*	0.1135	0.5324
0.5	0.60	0.750	0.438	0.2468*	0.0277	0.1977
1.0	0.10	1.000	0.740	0.9228	0.7020	1.7409*
1.0	0.20	1.000	0.730	0.6643	0.3285	0.8607*
1.0	0.30	1.000	0.718	0.4887	0.1936	0.5446*
1.0	0.60	1.000	0.677	0.2024*	0.0540	0.2015

prices at the equilibrium of the second-stage game.[27] The argument is reversed when the ratio α/G is relatively large, which happens for large values of α and/or small values of t_s. Since stations play only a minor role in informing consumers, in this case their negotiating position is relatively weak. Stations prefer, therefore, the nonexclusive regime, which is characterized by the highest overall level of aggregate advertising aired by each station.

To illustrate our intuition, we present numerical calculations when $G(\varphi)=\varphi^2 e^{-\varphi}$ in Tables 1 and 2. The last three columns of Table 1 correspond to the profits of each station as a function of various values of the parameters t_s and α. As predicted by our earlier discussion, the calculations in Table 1 indicate that for a fixed and low value of t_s, the *NE* regime is the most profitable when α is relatively large. (Profit entries denoted by the superscript * indicate highest value among all regimes.) On the other hand, the exclusive outcomes are more profitable for sufficiently high values of t_s, as revealed in Table 2. In particular, for a fixed α value, the *ES* regime is the most profitable (over *ED*) for smaller, but sufficiently large values of t_s, and the *ED* regime is the most profitable (over *ES*) for larger t_s values.

Any one of the symmetric regimes we have considered can arise as an equilibrium of the entire game if in the first stage stations cannot benefit by deviating from the behavior attributed to them at the

[27] When $\alpha_1 \neq \alpha_2$, the *ES* equilibrium differs contingent upon which of the producers is awarded the exclusivity. In future research, we plan to investigate whether or not stations benefit by jointly awarding the exclusivity to the producer whose base awareness parameter is larger.

Table 2 Comparison of Regimes When $G(\varphi) = \varphi^2 e^{-\varphi}$ with High Values of t_s

t_s	α	$\varphi_{NE} = \varphi_{ES}$	φ_{ED}	C^*_{NE}	C^*_{ED}	C^*_{ES}
14.5	0.07	1.450	1.401	0.4972	1.7548	1.7556*
15.0	0.07	1.452	1.405	0.4955	1.7570*	1.7514
14.5	0.10	1.450	1.400	0.4525	1.2240	1.2281*
15.0	0.10	1.452	1.404	0.4510	1.2256*	1.2251
14.5	0.20	1.450	1.398	0.3341	0.5874	0.5959*
15.0	0.20	1.452	1.401	0.3331	0.5883	0.5944*

given regime. Hence, at the exclusionary regimes a station that awards exclusivity to one of the producers should not benefit by awarding exclusivity to the other or by withdrawing exclusivity rights altogether. Similarly, to sustain the nonexclusive regime as an equilibrium, a station should not benefit by unilaterally offering exclusivity to one of the producers. Because a deviation from a given symmetric regime may result in an asymmetric configuration where one station offers exclusivity while the other does not, the derivation of the equilibria requires comparing the profits of the stations at the proposed symmetric regime with their profits in the asymmetric configuration (the *AS* regime). In the next lemma, we describe circumstances under which such a comparison is relatively simple.

Lemma 3. *Under* (A1) *and* (A2), *if* $\lim_{\varphi\to 0} T(\varphi)G(\varphi) = 0$, *then the AS and ES regimes are equivalent. That is, under the above conditions, the producer who is not awarded exclusivity in the asymmetric configuration* (*AS regime*) *chooses to withdraw from advertising altogether* ($\varphi = 0$ *for this producer*).

According to Lemma 3, circumstances may arise in the asymmetric regime under which one of the producers is placed in a very weak negotiating position vis-à-vis the station that is willing to advertise its product. Recall from the definition of T that the product $T(\varphi)G(\varphi) = G'(\varphi) - (G(\varphi))/(2\varphi)$ is the marginal contribution of advertising for an advertiser net of its negotiated rate. The condition of the lemma implies, therefore, that when Advertiser 1 does not advertise, then the benefit it can derive from advertising falls short of the price it is being asked to pay for each commercial. If $G(\varphi) = \varphi^{\eta}$ the condition is valid if $\eta > 1$, and if $G(\varphi) = \varphi^2 e^{-\varphi}$, the condition is always valid.

In view of Lemma 3, we characterize the equilibria of the entire game in Proposition 3.

Proposition 3. *Under* (A1) *and* (A2), *if* $\lim_{\varphi\to 0} T(\varphi)G(\varphi) = 0$, *then*:

(i) *One of the exclusionary regimes is always an equilibrium. ES is an equilibrium if* $C^*_{ES} > C^*_{ED}$ *and ED is an equilibrium if* $C^*_{ED} > C^*_{ES}$.

(ii) *For very large values of* α *and small values of* t_s, *the NE regime is also an equilibrium.*

Proposition 3 asserts that exclusionary practices by media stations are very likely in our model. Even though we have demonstrated the existence of exclusionary equilibria for a restricted set of advertising response functions satisfying the condition of Proposition 3, such equilibria may exist even in the absence of this condition. We have imposed the condition to simplify the characterization of the asymmetric regime. It is a sufficient rather than a necessary condition to guarantee that exclusionary practices arise at the equilibrium. Recalling our earlier discussion, exclusionary practices yield reduced levels of advertising and alleviated price competition among products. Because the payoff of each station is determined as a fraction of the producer surplus generated in the product market, stations may benefit from the increased producer surplus that is implied by alleviated price competition. The proposition asserts also that exclusionary and nonexclusionary equilibria can coexist when the ratio α/t_s is relatively large.

5. Concluding Remarks and Possible Extensions

We presented a model of a differentiated product oligopoly in which producers compete in prices and informative advertising. We assumed that the producers negotiate independently with two competing media stations' prices of advertising slots. We found that the volume of advertising of each producer increases when media stations offer programs that are more highly differentiated. Higher levels of informative advertising lead, in turn, to intensified price competition between the producers. Media stations might be worse off as a result, because the overall gain from trade that is available in the negotiations with producers declines when producers compete more aggressively in the product market. We found that when stations can offer exclusivity rights to advertisers, aggregate levels of advertising per station decline, thus yielding more poorly informed consumers and alleviated price competition in the product market. Exclusivity agreements therefore offer a vehicle for media stations and advertisers to extract additional rents from consumers.

In the model presented here, exclusivity agreements arise in equilibrium when advertising is an important means of communicating product information. Such is the case when the media market is significantly differentiated and the product market relies heavily on advertising. Drawing on our opening example, the Super Bowl, because of its spectacle nature, is very differentiated from other programming airing at that time. In addition, the United States beer manufacturers' big television advertising budgets suggest that the industry relies heavily on television advertising to communicate with potential customers. In light of equilibrium conditions of our model, it is not surprising that FOX offered Anheuser-Busch an exclusive advertising contract for the 2002 Super Bowl.

Finally, we offer some comments concerning possible extensions of our model. Our analysis assumes that when choosing the prices of their products, advertisers cannot observe the advertising choices of their competitors. In future work, we plan to relax this assumption by considering the possibility that a given advertiser can observe the level of advertising of its competitor when selecting the price of its product. Such observability is expected to yield lower levels of advertising at the equilibrium because advertisers are likely to incorporate, in this case, the adverse effect high levels of advertising have on the extent of price competition in the product market. Lower levels of advertising, in turn, may reduce the need for exclusivity arrangements among stations and advertisers.

Because of space consideration, we limited our derivation mostly to the case that $\alpha_1 = \alpha_2$, namely that the base awareness levels of both products are the same. Only for the nonexclusive regime did we explicitly also consider the asymmetric environment with $\alpha_1 \neq \alpha_2$. We do not anticipate that introducing asymmetry of awareness levels in the *ES* or *ED* regimes will change our basic result that exclusivity agreements arise at the equilibrium. It is interesting to investigate, however, whether or not stations will be more inclined to award exclusivity to the producer whose product is better known to consumers (i.e., whose α_i is larger). We plan to pursue this question in the future.

Acknowledgments
The second author acknowledges the support of the National Science Foundation under Grant SBR-981-9373. The first author acknowledges the support of the Faculty of Arts and Sciences at the University of Pittsburgh through the Andrew Mellon Predoctoral Fellowship. Helpful comments of the editor and associate editor of this journal, as well as of two referees, are greatly appreciated. The authors also acknowledge the valuable suggestions of Rabikar Chatterjee and Jeffrey Inman. John Harpur at MARC-USA provided valuable assistance.

Appendix A

Proofs of Lemmas and Propositions

Proof of Lemma 1. Lemma 1 follows directly from the advertiser's first-order conditions, (8) and (9), and the bargaining outcome specified in (7).

(i) Substituting symmetry between stations into (9), the advertiser's first-order condition with respect to price, yields the system

$$(p_i - c) = \frac{t_p[2-(\alpha_k+G_k)]}{2(\alpha_k+G_k)} + \frac{(p_k-c)}{2} \qquad i,k=1,2;\, i\neq k. \tag{A.1}$$

Solving for product prices yields

$$(p_i - c) = t_p\left(\frac{2}{3}H_k + \frac{1}{3}H_i\right), \qquad i,k=1,2;\ i\neq k, \quad \text{where}$$
$$H_k \equiv \frac{[2-(\alpha_k+G_k)]}{(\alpha_k+G_k)}, \qquad k=1,2.$$

Substituting stations' symmetry as well as the product prices from (A.1) into Condition (7) yields

$$a_i^j = \frac{1}{8}(p_i-c)G_i(\alpha_k+G_k)\left(\frac{2}{3}H_k+\frac{1}{3}H_i\right)\left[\frac{1}{\varphi_i}+\frac{1}{t_s}\right]. \tag{A.2}$$

Substituting the expression for a_i^j from (A.2) into (8) yields the following condition for the levels of advertising:

$$\frac{\partial F_i}{\partial \varphi_i^j} = \frac{1}{4}(p_i-c)G_i(\alpha_k+G_k)\left(\frac{2}{3}H_k+\frac{1}{3}H_i\right) \times\left[\frac{G_i'}{G_i}-\frac{1}{2\varphi_i}-\frac{1}{2t_s}\right]=0. \tag{A.3}$$

It follows from (A.3) that even when $\alpha_1 \neq \alpha_2$, the level of advertising per station that is selected by each producer is identical. This level satisfies the equation

$$T(\varphi) = \frac{1}{2t_s}, \tag{A.4}$$

as long as $G(\varphi) \leq (1-\alpha_i)$. Expression (10) follows from (A.4).

(ii) The expressions for the prices are implied by (A.1).

(iii) The payoffs of stations and producers follow by substituting the equilibrium prices into (7) and subsequently into the agreement payoffs in (4). □

Proof of Proposition 1. Follows by conducting comparative statics analysis of the expressions in Lemma 1. □

Proof of Corollary 1. Substituting into (12) the value of φ^*_{NE} from (10) and $\alpha = \alpha_1 = \alpha_2$ yields

$$C^*_{NE} = \frac{t_p[2-\alpha-G(\varphi^*_{NE})]^2 G(\varphi^*_{NE})}{4[\alpha+G(\varphi^*_{NE})]}[1+2\varphi^*_{NE}T(\varphi^*_{NE})] - f.$$

When $\alpha \to 0$, the above payoff $C^*_{NE} \to (t_p/4)[2-G(\varphi^*_{NE})]^2 [1+2\varphi^*_{NE}T(\varphi^*_{NE})]$, which is strictly decreasing in φ^*_{NE} if the function

$$\varphi T(\varphi) = \frac{\varphi G'(\varphi)}{G(\varphi)} - \frac{1}{2}$$

is nonincreasing in φ. Hence, if the elasticity of $G(\cdot)$ is nonincreasing and α is sufficiently small, the payoff of each station declines when producers advertise more intensely. □

Proof of Lemma 2.

(i) The expressions for φ^*_{ED} and p^*_{ED} follow from (18) and (19). Using these expressions, the profit of each station is found by evaluating the symmetric agreement payoff $C^*_{ED} = a^i_i\varphi^i_i|_{\varphi^*_{ED}, p^*_{ED}}$, where $a^i_i\varphi^i_i$ is the negotiation outcome given by (17).

(ii) The expressions for φ^*_{ES}, p^*_{1ES}, and p^*_{2ES} follow from (21)–(23) upon the substitution $X^1 = X^2 = 1/2$ and $\varphi^1_2 = \varphi^2_2 = \varphi^*_{ES}$. Using these three expressions, the profit of each station is found by evaluating the symmetric agreement payoff $C^*_{ES} = a^j_2\varphi^j_2|_{\varphi^*_{ES}, p^*_{1ES}, p^*_{2ES}}$, where $a^j_2\varphi^j_2$ is the negotiation outcome given by (20). □

Proof of Proposition 2.

(i) The inequality follows because $T(\cdot)$ is strictly decreasing, by (A2).

(ii) Averaging the prices of the two producers under regime *ES* yields

$$\begin{aligned}(\bar{p}^*_{ES} - c) &= \frac{t_p(2\alpha-\alpha^2-\alpha G^*_{ES}+G^*_{ES})}{\alpha(\alpha+G^*_{ES})} < \frac{t_p(2\alpha-\alpha^2-\alpha G^*_{ED}+G^*_{ED})}{\alpha(\alpha+G^*_{ED})} \\ &= (p^*_{ED}-c),\end{aligned}$$

provided $\alpha > 0$. The inequality is implied by the fact that $G^*_{ED} < G^*_{ES}$ from part (i). A comparison with the product price of the *NE* regime that is expressed by (11) yields the remaining conclusion because $G^*_{ES} = G^*_{NE}$ from part (i).

(iii) Evaluating the profits of each station in the limit when $\alpha \to 0$ yields

$$\lim_{\alpha\to 0} C^*_{NE} = \frac{t_p(2-G^*_{NE})^2}{4}\left[1+\frac{\varphi^*_{NE}}{t_s}\right] - f,$$

$$\lim_{\alpha\to 0} C^*_{ED} = \lim_{\alpha\to 0}\frac{t_p G^*_{ED}}{4\alpha} - f,$$

and

$$\lim_{\alpha\to 0} C^*_{ES} = \lim_{\alpha\to 0}\frac{2t_p G^*_{ES}}{9\alpha}\left(1+\frac{\varphi^*_{ES}}{t_s}\right) - f.$$

(Note that for existence of an interior equilibrium in the *ES* regime, it is required that $\alpha \neq 0$. However, we can evaluate the limit expression above since an equilibrium exists for all $\alpha > 0$ in the neighborhood around 0.)

Because the limit of C^*_{NE} approaches a finite number whereas C^*_{ED} and C^*_{ES} approach infinity, it is clear that $C^*_{NE} < C^*_{ED}$ and $C^*_{NE} < C^*_{ES}$ when α is very small.

As well, it follows from the above that

$$\lim_{\alpha\to 0}\frac{C^*_{ED}+f}{C^*_{ES}+f} = \frac{9G^*_{ED}}{8G^*_{ES}}\left(1+\frac{\varphi^*_{ES}}{t_s}\right)^{-1}.$$

When t_s approaches infinity,

$$\begin{aligned}\lim_{t_s\to\infty} G^*_{ES} &= \lim_{t_s\to\infty} G\left(T^{-1}\left(\frac{1}{2t_s}\right)\right) \\ &= \lim_{t_s\to\infty} G\left(T^{-1}\left(\left(\frac{4-\alpha}{2-\alpha}\right)\frac{1}{2t_s}\right)\right) = \lim_{t_s\to\infty} G^*_{ED},\end{aligned}$$

and

$$\lim_{t_s\to\infty}\left[1+\frac{\varphi^*_{ES}}{t_s}\right] = 1,$$

because φ^*_{ES} is finite. As a result,

$$\lim_{\substack{\alpha\to 0\\ t_s\to\infty}}\frac{C^*_{ED}+f}{C^*_{ES}+f} = \frac{9}{8}.$$

By continuity, therefore, $C^*_{ED} > C^*_{ES}$ for very small values of α and very large values of t_s. From the expressions derived for C^*_{NE}, C^*_{ES}, and C^*_{ED} it follows that

$$\frac{C^*_{NE}+f}{C^*_{ES}+f} = \frac{9[2-(\alpha+G^*_{NE})]^2}{2\alpha(\alpha+G^*_{NE})}\left[\frac{2-\alpha}{\alpha} + \frac{[2-(\alpha+G^*_{NE})]}{2(\alpha+G^*_{NE})}\right]^{-2}$$

and

$$\begin{aligned}\frac{C^*_{NE}+f}{C^*_{ED}+f} &= \frac{2[2-(\alpha+G^*_{NE})]^2 G^*_{NE}(\alpha+G^*_{ED})}{G^*_{ED}(\alpha+G^*_{NE})(2\alpha-\alpha^2+G^*_{ED}-\alpha G^*_{ED})} \\ &\quad \times \left[1+\frac{\varphi^*_{NE}}{t_s}\right]\left[\frac{2-\alpha}{\alpha} - \frac{\varphi^*_{ED}}{t_s}\right]^{-1}.\end{aligned}$$

Evaluating the above ratios for very large values of $\alpha \to 1$ and very small values of $t_s \to 0$ (implying that $G^*_{NE} = G^*_{ED} = 0$) yields

$$\lim_{\substack{\alpha\to 1\\ t_s\to 0}}\frac{C^*_{NE}+f}{C^*_{ES}+f} = 2,$$

$$\lim_{\substack{\alpha\to 1\\ t_s\to 0}}\frac{C^*_{NE}+f}{C^*_{ED}+f} = 2.$$

By continuity, therefore, when α is sufficiently big and t_s is sufficiently small, $C^*_{NE} > C^*_{ES}$ and $C^*_{NE} > C^*_{ED}$. □

Proof of Lemma 3. Without any loss of generality, let the asymmetric regime be characterized by Advertiser 2 advertising on both stations and Advertiser 1 advertising only on Station 1, as illustrated in Figure A.1. The symmetric relationship of all agents in this regime implies that three distinct bargaining outcomes must be derived. We first specify agreement and disagreement shares for all three negotiations.

In the negotiations between Advertiser 2 and the two stations, the following market share expressions apply in case of agreement:

$$D_2^1 = \left[[1-\alpha-G(\varphi_1^1)]+(\alpha+G(\varphi_1^1))\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\right][\alpha+G(\varphi_2^1)],$$
$$D_2^2 = \left[(1-\alpha)+\alpha\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\right][\alpha+G(\varphi_2^2)],$$
$$X^1 = \frac{1}{2}+(\varphi_2^2-\varphi_2^1-\varphi_1^1)\Big/(2t_s), \qquad X^2 = 1-X^1.$$

In case of disagreement between Advertiser 2 and Station 1,

$$\widetilde{D}_2^1 = \left[[1-\alpha-G(\varphi_1^1)]+(\alpha+G(\varphi_1^1))\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\right]\alpha,$$
$$\widetilde{D}_2^2 = D_2^2,$$
$$\widetilde{X}^1 = \frac{1}{2}+(\varphi_2^2-\varphi_1^1)\Big/(2t_s), \qquad \widetilde{X}^2 = 1-\widetilde{X}^1.$$

In case of disagreement between Advertiser 2 and Station 2,

$$\widetilde{D}_2^1 = D_2^1,$$
$$\widetilde{D}_2^2 = \left[(1-\alpha)+\alpha\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\right]\alpha,$$
$$\widetilde{X}^1 = \frac{1}{2}-(\varphi_1^1+\varphi_2^1)\Big/(2t_s), \qquad \widetilde{X}^2 = 1-\widetilde{X}^1.$$

In the negotiations between Producer 1 and Station 1, the following market shares apply:

$$D_1^1 = \left[[1-\alpha-G(\varphi_2^1)]+(\alpha+G(\varphi_2^1))\left(\frac{1}{2}+\frac{p_2-p_1}{2t_p}\right)\right][\alpha+G(\varphi_1^1)],$$
$$D_1^2 = \left[[1-\alpha-G(\varphi_2^2)]+[\alpha+G(\varphi_2^2)]\left(\frac{1}{2}+\frac{p_2-p_1}{2t_p}\right)\right]\alpha,$$
$$X^1 = \frac{1}{2}+(\varphi_2^2-\varphi_2^1-\varphi_1^1)\Big/(2t_s), \quad X^2 = 1-X^1.$$

In case of disagreement between Advertiser 1 and Station 1,

$$\widetilde{D}_1^1 = \left[[1-\alpha-G(\varphi_2^1)]+(\alpha+G(\varphi_2^1))\left(\frac{1}{2}+\frac{p_2-p_1}{2t_p}\right)\right]\alpha,$$
$$\widetilde{D}_1^2 = D_1^2,$$
$$\widetilde{X}^1 = \frac{1}{2}+(\varphi_2^2-\varphi_2^1)\Big/(2t_s), \qquad \widetilde{X}^2 = 1-\widetilde{X}^1.$$

Using the above expressions in (4) and (5), the Nash bargaining solution yields the negotiated rates a_i^j, as follows:

$$\begin{aligned}
a_1^1\varphi_1^1 = \frac{(p_1-c)}{2}\Bigg\{&\left(\frac{1}{2}+\frac{\varphi_2^2-\varphi_2^1-\varphi_1^1}{2t_s}\right)\\
&\times\left[(1-\alpha-G(\varphi_2^1))+(\alpha+G(\varphi_2^1))\left(\frac{1}{2}+\frac{p_2-p_1}{2t_p}\right)\right]G(\varphi_1^1)\\
&+\frac{\alpha\varphi_1^1}{2t_s}[G(\varphi_2^1)-G(\varphi_2^2)]\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\Bigg\}.
\end{aligned}$$

$$\begin{aligned}
a_2^1\varphi_2^1 = \frac{(p_2-c)}{2}\Bigg\{&\left(\frac{1}{2}+\frac{\varphi_2^2-\varphi_2^1-\varphi_1^1}{2t_s}\right)\\
&\times\left[(1-\alpha-G(\varphi_1^1))+(\alpha+G(\varphi_1^1))\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\right]G(\varphi_2^1)\\
&+\frac{\varphi_2^1}{2t_s}\Bigg(\alpha G(\varphi_1^1)\left(\frac{1}{2}+\frac{p_2-p_1}{2t_p}\right)\\
&+G(\varphi_2^2)\left[(1-\alpha)+\alpha\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\right]\Bigg)\Bigg\}.
\end{aligned}$$

$$\begin{aligned}
a_2^2\varphi_2^2 = \frac{(p_2-c)}{2}\Bigg\{&\left(\frac{1}{2}+\frac{\varphi_2^1+\varphi_1^1-\varphi_2^2}{2t_s}\right)\left[(1-\alpha)+\alpha\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\right]G(\varphi_2^2)\\
&+\frac{\varphi_2^2}{2t_s}\Bigg(-G(\varphi_1^1)[\alpha+G(\varphi_2^1)]\left(\frac{1}{2}+\frac{p_2-p_1}{2t_p}\right)\\
&+G(\varphi_2^1)\left[(1-\alpha)+\alpha\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\right]\Bigg)\Bigg\}.
\end{aligned}$$

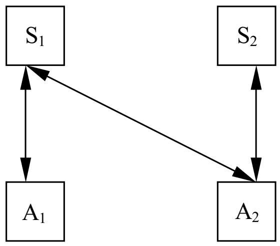
Substituting the above rates into the first-order conditions with respect to φ_i^j and p_i (Conditions (8) and (9)) yields the following five expressions to determine φ_2^1, φ_2^2, φ_1^1, p_1, and p_2.

$$\begin{aligned}
\frac{\partial F_1}{\partial\varphi_1^1} &= \left[[1-\alpha-G(\varphi_2^1)]+[\alpha+G(\varphi_2^1)]\left(\frac{1}{2}+\frac{p_2-p_1}{2t_p}\right)\right]\\
&\quad\times\left[G(\varphi_1^1)T(\varphi_1^1)\left(\frac{1}{2}+\frac{\varphi_2^2-\varphi_1^1-\varphi_2^1}{2t_s}\right)-\frac{G(\varphi_1^1)}{2t_s}\right]\\
&\quad+\frac{\alpha}{4t_s}[G(\varphi_2^1)-G(\varphi_2^2)]\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)=0.
\end{aligned}\tag{A.5}$$

$$\begin{aligned}
\frac{\partial F_2}{\partial\varphi_2^1} &= \left[[1-\alpha-G(\varphi_1^1)]+[\alpha+G(\varphi_1^1)]\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\right]\\
&\quad\times\left[G(\varphi_2^1)T(\varphi_2^1)\left(\frac{1}{2}+\frac{\varphi_2^2-\varphi_1^1-\varphi_2^1}{2t_s}\right)-\frac{G(\varphi_2^1)}{2t_s}\right]\\
&\quad+\frac{\alpha}{4t_s}G(\varphi_1^1)\left(\frac{1}{2}+\frac{p_2-p_1}{2t_p}\right)\\
&\quad+\frac{G(\varphi_2^2)}{4t_s}\left[(1-\alpha)+\alpha\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\right]=0.
\end{aligned}\tag{A.6}$$

$$\begin{aligned}
\frac{\partial F_2}{\partial\varphi_2^2} &= \left[(1-\alpha)+\alpha\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\right]\\
&\quad\times\left[G(\varphi_2^2)T(\varphi_2^2)\left(\frac{1}{2}+\frac{\varphi_1^1+\varphi_2^1-\varphi_2^2}{2t_s}\right)-\frac{G(\varphi_2^2)}{2t_s}\right]
\end{aligned}$$

Figure A.1 Negotiations of the Asymmetric Regime



$$-\frac{[\alpha+G(\varphi_2^1)]G(\varphi_1^1)}{4t_s}\left(\frac{1}{2}+\frac{p_2-p_1}{2t_p}\right)$$
$$+\frac{G(\varphi_2^1)}{4t_s}\left[(1-\alpha)+\alpha\left(\frac{1}{2}+\frac{p_1-p_2}{2t_p}\right)\right]=0. \qquad \text{(A.7)}$$

$$\frac{\partial F_1}{\partial p_1} = X^1D_1^1+X^2D_1^2-\frac{(p_1-c)}{2t_p}$$
$$\times\left\{X^1[\alpha+G(\varphi_2^1)][\alpha+G(\varphi_1^1)]+X^2[\alpha+G(\varphi_2^2)]\alpha\right\}=0. \qquad \text{(A.8)}$$

$$\frac{\partial F_2}{\partial p_2} = X^1D_2^1+X^2D_2^2-\frac{(p_2-c)}{2t_p}$$
$$\times\left\{X^1[\alpha+G(\varphi_2^1)][\alpha+G(\varphi_1^1)]+X^2[\alpha+G(\varphi_2^2)]\alpha\right\}=0. \qquad \text{(A.9)}$$

When the condition of this lemma holds (i.e., $\lim_{\varphi\to 0} T(\varphi)\cdot G(\varphi)=0$) it is easy to show that $\varphi_1^1=0$ and $\varphi_2^1=\varphi_2^2=T^{-1}(1/2t_s)$ solves the first-order conditions (A.5)–(A.9). The condition $T'(\varphi)<0$ guarantees that this solution is unique. Hence the *AS* regime reduces to the *ES* regime as claimed. □

Proof of Proposition 3. (i) Two possible unilateral deviations are to be considered when investigating whether *ES* is an equilibrium. A station can deviate by offering advertising space to the excluded advertiser, thus translating the game to the *AS* regime. The second deviation has a station offering exclusivity to the excluded advertiser. The first type of deviation maintains the *ES* regime, in view of the result reported in Lemma 3, implying that the deviation yields the same payoff to the deviating station. The second type of deviation changes the regime from *ES* to *ED*. Hence, *ES* is an equilibrium whenever $C^*_{ES}\ge C^*_{ED}$. Two possible unilateral deviations should also be considered when investigating whether *ED* is an equilibrium. Deviating to nonexclusivity changes the regime from *ED* to *AS*, which in view of Lemma 3 is equivalent to the *ES* regime. Deviating by offering exclusivity to the other producer changes the regime from *ED* to *ES*. In both cases, if $C^*_{ED}\ge C^*_{ES}$ such deviations are unprofitable.

(ii) To support *NE* as an equilibrium, no station should benefit by unilaterally awarding exclusivity to one of the producers. Such a deviation translates the second-stage game to the *AS* regime, which, given the condition of the proposition, is equivalent to the *ES* regime. Hence, *NE* is an equilibrium whenever $C^*_{NE}>C^*_{ES}$. The remaining conclusion follows from part (iii) of Proposition 2. □

Table B.1 Station Profits as Functions of α and t_s ($t_p=0.5$, $\eta=0.6$, $G(\varphi)=\varphi^\eta$)

t_s	α	C^*_{NE}	C^*_{ES}	C^*_{ED}	C^*_{1AS}	C^*_{2AS}	Remark
1.00	0.35	0.126	0.138	0.015	0.147	0.119	S_2 deviates (*NE*)
1.00	0.40	0.109	0.116	0.070	0.126	0.101	S_2 deviates (*NE*)
1.20	0.35	0.123	0.150	0.093	0.154	0.127	*AS* is an equilibrium
1.20	0.40	0.109	0.126	0.077	0.132	0.108	*AS* is an equilibrium
1.40	0.35	0.120	0.161	0.100	0.159	0.134	S_1 deviates (*ES*)
1.40	0.40	0.104	0.135	0.083	0.137	0.115	*AS* is an equilibrium
1.60	0.35	0.116	0.171	0.107	0.163	0.140	S_1 deviates (*ES*)
1.60	0.40	0.100	0.143	0.088	0.140	0.120	S_1 deviates (*ES*)

Appendix B

Asymmetric Exclusion as an Equilibrium

In this appendix, we discuss the case when exactly one station offers exclusivity, and we show that this arrangement can arise as an equilibrium outcome for certain parameter values and for the functional specification $G(\varphi)=\varphi^\eta$, $\eta<1$. (Note that when $\eta<1$, the condition of Lemma 3 is violated.) Figure A.1 in Appendix A illustrates such an arrangement.

Possible deviations (in Stage 1) by either station lead to regimes previously discussed. Station 1 has two possible deviations and both involve excluding one of the producers. These two deviations lead to either *ES* (excluding Producer 1) or *ED* (excluding Producer 2). Station 2 also has two possible deviations. It can offer advertising space to Producer 1, in addition to Producer 2, which leads to the *NE* regime. Alternatively, it may switch the exclusive arrangement from Producer 2 to Producer 1. This deviation leads again to the asymmetric arrangement (*AS*) with the roles of the producers switched (relative to that depicted by Figure A.1).

Proposition 3 suggests that intermediate values of t_s and α can possibly support *AS* as an equilibrium (provided that the condition of Lemma 3 is violated). A sample of numerical results, presented in Table B.1, show parameter values for which *AS* is an equilibrium. The table also illustrates how changes in certain parameters provide stations with the profitable deviations discussed above. As t_s becomes smaller, advertising becomes a less effective means for product information, reducing the benefit of exclusion. Thus, Station 2 has the incentive to offer advertising to Producer 1 and deviate from *AS*, which yields *NE*. On the other hand, as t_s becomes large or α small, exclusion has large benefits to stations. In this case, Station 1 has the incentive to offer Producer 2 exclusive rights and deviate from *AS*, which yields *ES*.

Appendix C

Both Advertising Prices a_i^j and Advertising Levels φ_i^j Are Part of the Negotiations

When both a_i^j and φ_i^j are negotiated, the negotiated price is still selected so that each negotiating party obtains half of the gains from trade (i.e., $C_j-C_j^{-i}=F_i-F_i^{-j}$) and the negotiated advertising level maximizes the surplus of the negotiating pair. Note that the payment for advertising that is transferred between producer i and station j plays no role in determining levels of advertising.

In the *NE* regime, let S_{ij} designate the joint payoff of the $\{i, j\}$ pair, expressed by

$$S_{ij} \equiv (p_i - c)(X^1 D_i^1 + X^2 D_i^2) - k - f, \tag{C.1}$$

where X^j and D_i^j are expressed, as before, by (2) and (3). Maximizing S_{ij} with respect to φ_i^j requires taking the derivative

$$\frac{\partial S_{ij}}{\partial \varphi_i^j} = \left\{1 - [\alpha_k + G(\varphi_k^j)] + [\alpha_k + G(\varphi_k^j)]\left[\frac{1}{2} + \frac{p_k - p_i}{2t_p}\right]\right\} G'(\varphi_i^j) - \frac{D_i^j - D_i^r}{2t_s},$$

which is strictly positive for all values of φ_i^j. ($D_i^j = D_i^r$, assuming symmetry between stations.)

We obtain a corner solution in which each pair chooses the maximum level of advertising that is feasible. This upper bound might be dictated by the limited advertising space that is available to stations or by the probability requirement that $\alpha + G(\varphi) \le 1$. Denote the more binding of the two constraints by $\bar{\varphi}$ and the advertising response at this level by $\overline{G}$. The payoff of each station remains identical to that derived in Lemma 1, with the only difference being that $\overline{G}$ replaces G_{NE}^*. At the symmetric equilibrium, when $\alpha_1 = \alpha_2$,

$$C_{NE}^* = \frac{t_p \overline{G}[2 - (\alpha + \overline{G})]^2}{4(\alpha + \overline{G})}\left[1 + \frac{\bar{\varphi}}{t_s}\right] - f. \tag{C.2}$$

In the *ES* regime, the total surplus of station j, and producer i, who is awarded exclusivity by both stations, is still expressed by (C.1). As a result, the solution for advertising levels is still the corner solution $\bar{\varphi}$. The payoff of each station at the symmetric equilibrium remains as derived in part (ii) of Lemma 2, with the only difference being that $\overline{G}$ replaces G_{ES}^* and $\bar{\varphi}$ replaces φ_{ES}^*. Specifically,

$$C_{ES}^* = \frac{\alpha t_p \overline{G}}{18}\left[1 + \frac{\bar{\varphi}}{t_s}\right]\left[\frac{2-\alpha}{\alpha} + \frac{[2 - (\alpha + \overline{G})]^2}{2(\alpha + \overline{G})}\right]^2 - f. \tag{C.3}$$

In the *ED* regime, the combined surplus of station i and producer i is given as

$$S_{ii}^{ED} = (p_i - c)(X^i D_i^i + X^j D_i^j) - k - f. \tag{C.4}$$

Maximizing, the above surplus with respect to φ_i^i yields

$$\frac{\partial S_{ii}^{ED}}{\partial \varphi_i^i} = \frac{X^i D_i^i G'(\varphi_i^i)}{\alpha + G(\varphi_i^i)} - \frac{D_i^i - D_i^j}{2t_s}.$$

Note that in the *ED* regime $D_i^i \neq D_i^j$, because station j awards exclusivity to producer i's competitor. Evaluating the above at the symmetric equilibrium where $\alpha_1 = \alpha_2$ yields an interior solution for φ_i^i as follows:

$$\frac{G'(\varphi_i^i)}{G(\varphi_i^i)} = \frac{2}{t_s(2-\alpha)}.$$

Designating $R \equiv G'/G$ and assuming that R is a strictly decreasing function implies that

$$\varphi_{ED} \equiv R^{-1}\left(\frac{2}{t_s(2-\alpha)}\right). \tag{C.5}$$

The payoff of each station remains as expressed in part (i) of Lemma 2, with φ_{ED} from above replacing φ_{ED}^* of the lemma, namely

$$C_{ED}^* = \frac{t_p G_{ED}}{8}\left(\frac{2-\alpha}{\alpha} - \frac{\varphi_{ED}}{t_s}\right)\left(\frac{2\alpha - \alpha^2 + G_{ED} - \alpha G_{ED}}{\alpha + G_{ED}}\right) - f. \tag{C.6}$$

In view of the above derivations, all the results reported in Proposition 2 remain unchanged. In particular, levels of advertising in the *NE* and *ES* regimes are identical and equal to the upper bound $\bar{\varphi}$. Since the advertising level under the *ED* regime is an interior solution, it falls short of the upper bound $\bar{\varphi}$. The ranking of prices remains as reported in part (ii) of Proposition 2 because the expressions derived for prices remain identical to those derived in Lemma 2. The proof of the first part of (iii) remains identical because when $t_s \to \infty$, $\varphi_{ED} \to \bar{\varphi}$. The proof of the second part has to be slightly modified as follows:

$$\frac{C_{NE}^* + f}{C_{ES}^* + f} = \frac{9[2 - (\alpha + \overline{G})]^2}{2\alpha(\alpha + \overline{G})}\left[\frac{2-\alpha}{\alpha} + \frac{[2 - (\alpha + \overline{G})]}{2(\alpha + \overline{G})}\right]^{-2}$$

and

$$\frac{C_{NE}^* + f}{C_{ED}^* + f} = \frac{2[2 - (\alpha + \overline{G})]^2 \overline{G}(\alpha + G_{ED})}{G_{ED}(\alpha + \overline{G})(2\alpha - \alpha^2 + G_{ED} - \alpha G_{ED})}\left[1 + \frac{\bar{\varphi}}{t_s}\right]\left[\frac{2-\alpha}{\alpha} - \frac{\varphi_{ED}}{t_s}\right]^{-1}$$

Evaluating the above ratios for large values of $\alpha \to (1 - \overline{G})$ yields

$$\lim_{\alpha \to 1 - \overline{G}} \frac{C_{NE}^* + f}{C_{ES}^* + f} = \frac{9}{2\alpha}\left(\frac{2-\alpha}{\alpha} + \frac{1}{2}\right)^{-2}.$$

The above ratio is larger than 1 provided that $\alpha > 0.63$ or, alternatively, if $\overline{G} < 0.37$. Hence, for α sufficiently large and $\overline{G}$ sufficiently small, $C_{NE}^* > C_{ES}^*$. When $t_s \to 0$, $G_{ED}^* \to 0$, which implies that the following ratio approaches infinity:

$$\lim_{\alpha \to 1 - \overline{G}} \frac{C_{NE}^* + f}{C_{ED}^* + f} = \frac{2\overline{G}(\alpha + G_{ED}^*)}{G_{ED}^*(2\alpha - \alpha^2 + G_{ED}^* - \alpha G_{ED}^*)}\left[1 + \frac{\overline{\varphi}}{t_s}\right]\left[\frac{2-\alpha}{\alpha} - \frac{\varphi_{ED}^*}{t_s}\right]^{-1}.$$

Hence, when α is sufficiently large and t_s sufficiently small, $C_{NE}^* > C_{ED}^*$ as well.

The above derivations indicate that levels of advertising when negotiated exceed levels of advertising when chosen to maximize the producer's payoff. This is obviously the case in the *NE* and *ES* regimes, because negotiated advertising levels are selected at the highest possible level. In the *ED* regime, negotiated levels satisfy the equation

$$\frac{G'}{G} = \frac{2}{t_s(2-\alpha)},$$

and the levels that maximizes the producer's payoff satisfy the equation

$$\frac{G'}{G} = \frac{1}{2\varphi_{ED}^*} + \frac{4-\alpha}{2t_s(2-\alpha)},$$

where φ_{ED}^* corresponds to the level that maximizes the producer's payoff. Negotiated levels are higher if

$$\frac{1}{2\varphi_{ED}^*} + \frac{(4-\alpha)}{2t_s(2-\alpha)} > \frac{2}{t_s(2-\alpha)}$$

or, alternatively

$$\varphi^*_{ED} < \frac{(2-\alpha)t_s}{\alpha}.$$

For the examples we consider in this paper,

$$\varphi^*_{ED} = \frac{(2\eta-1)t_s(2-\alpha)}{(4-\alpha)} \qquad \text{if } G(\varphi)=\varphi^{\eta};$$
$$\varphi^*_{ED} < \frac{(2-\alpha)t_s}{\alpha} \qquad \text{if } \eta<2;$$

and

$$\varphi^*_{ED} = \frac{3t_s(2-\alpha)}{2t_s(2-\alpha)+(4-\alpha)} \qquad \text{if } G(\varphi)=\varphi^2 e^{-\varphi};$$
$$\varphi^*_{ED} < \frac{(2-\alpha)t_s}{\alpha} \qquad \text{always.}$$

Note also that comparative statics with respect to t_s remain qualitatively the same when levels of advertising are negotiated as when they are selected unilaterally by producers. Specifically, whenever interior levels of advertising are selected at the equilibrium (*ED*), such levels increase with t_s.

References

Anderson, S., S. Coate. 2002. Market provision of public goods: The case of broadcasting. Working paper, University of Virginia.

Baye, M., J. Morgan. 2000. A simple model of advertising and subscription fees. *Econom. Lett.* **69** 345–351.

——, ——. 2001. Information gatekeepers on the internet and the competitiveness of homogeneous product markets. *Amer. Econom. Rev.* **91**(3) 454–474.

Dukes, A. J. 2002. The advertising market in a product oligopoly. Working paper, GSIA, Carnegie Mellon University, Pittsburgh, PA.

Dutta, S., M. Bergen, G. John. 1994. The governance of exclusive territories when dealers can bootleg. *Marketing Sci.* **13**(1) 83–99.

Fruchter, G. 1999. The many player advertising game. *Management Sci.* **45**(11) 1609–1611.

——, S. Kalish. 1997. Closed-loop advertising strategies in a duopoly. *Management Sci.* **43**(1) 54–63.

Gabszewicz, J., D. Laussel, N. Sonnac. 2001. TV-broadcasting competition and advertising. Working paper, CORE.

Gal-Or, E. 1999. Mergers and exclusionary practices in health care markets. *J. Econom. Management Strategy* **8**(3) 315–350.

——, A. Dukes. 2003. Minimum differentiation in commercial media markets. *J. of Econom. Management Strategy.* Forthcoming.

Grossman, G., C. Shapiro, C. 1984. Informative advertising with differentiated products. *Rev. Econom. Stud.* **51**(1) 63–81.

Häckner, J., S. Nyberg. 2000. Price competition, advertising and media market concentration. Working paper, Department of Economics, Stockholm University, Stockholm, Sweden.

Iyer, G., M. Villas-Boas. 2003. A bargaining theory of distribution channels. *J. Marketing Res.* Forthcoming.

Lal, R., J. M. Villas-Boas. 1996. Exclusive dealing and price promotions. *J. Bus.* **69** 159–172.

Naik, P., M. Mantrala, A. Sawyer. 1998. Planning media schedules in the presence of dynamic advertising quality. *Marketing Sci.* **17**(3) 214–235.

Nilssen, T., L. Sørgard. 2001. The TV advertising: Advertising and programming. Working paper, University of Oslo, Oslo, Norway.

O'Brien, P., G. Shaffer. 1997. Nonlinear supply contracts, exclusive dealing, and equilibrium foreclosure. *J. Econom. and Management Strategy* **6**(4) 755–785.

Purohit, D. 1997. Dual distribution channels: The competition between rental agencies and dealers. *Marketing Sci.* **16** 228–245.

Shaffer, G. 2001. Bargaining in distribution channels with multiproduct retailers. Working paper, W. E. Simon School of Business, University of Rochester, Rochester, NY.

——, F. Zettelmeyer. 2002. When good news about your rival is good for you: The effect of third-party information on the division of channel profits. *Marketing Sci.* **21**(3) 273–293.

Siddarth, S., A. Chattopadhyay. 1998. To zap or not to zap: A study of the determinants of channel switching during commercials. *Marketing Sci.* **17**(2) 124–138.

Siklos, Richard D. 1999. They have it all now. *Business Week* (September 20).

Silk, A., E. Berndt. 1993. Scale and scope effects on advertising agency costs. *Marketing Sci.* **12**(1) 53–72.

Srivastava, J., D. Chakravarti, A. Rapoport. 2000. Price and margin negotiations in marketing channels: An experimental study of sequential bargaining under one-sided uncertainty and opportunity cost of delay. *Marketing Sci.* **19**(2) 163–184.

Villas-Boas, J. M. 1994. Sleeping with the enemy: Should competitors share the same advertising agency? *Marketing Sci.* **13** 190–202.

von der Fehr, N-H., K. Stevik. 1998. Persuasive advertising and product differentiation. *Southern J. Econom.* **65**(1) 113–126.

Vranica, Suzanne. 2001. "After heated court battle, Pepsi Co. allows FCB to work on ads for Coca-Cola brands." *Wall Street Journal* (November 23).

This paper was received November 13, 2001, and was with the authors 4 months for 3 revisions; processed by Sridhar Moorthy.