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Reply to Commentary

A Reply to “A Comment on ‘Is Having More Channels Really Better? A Model of Competition Among Commercial Television Broadcasters’ ”

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Liu et al. [Liu, Y., D. S. Putler, C. B. Weinberg. 2004. Is having more channels really better? A model of competition among commercial television broadcasters. *Marketing Sci.* 23(1) 120–133] examine the television broadcast industry using a model in which profit-maximizing broadcasters seek to gain viewers by choosing the type of program to offer and by spending money to set program quality, allowing broadcasters to sell access to those viewers (through inserted advertisements) at a fixed rate per viewer. Wu and Chou [Wu, C., S. Chou. 2006. Commentary on “Is having more channels really better? A model of competition among commercial television broadcasters”. *Marketing Sci.* 25(5) 541–545] argue that the duopoly result for a certain range of the cost parameter in Liu et al. is not a pure strategy Nash equilibrium. They further propose some modifications to the original model to restore Liu et al.’s results.

In this reply, we demonstrate how a single strategy, not included in the strategy space of the Liu et al. duopoly model leads to the difference between our analysis and that of Wu and Chou. While we had intended to rule out this strategy, the text was not entirely clear on this issue; Wu and Chou’s comment provides an opportunity to clarify the situation. We provide both empirical and theoretical support for excluding this strategy, which allows us to focus on the more plausible competitive situations in television broadcasting. We also reply to Wu and Chou’s other comments on several issues, such as the relative importance of program type versus quality.

Key words: competition; competitive strategy; entertainment marketing; game theory; market structure; media; product policy

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In Liu et al. (2004), we investigate the consequences of competition in the television broadcast industry. Using a model in which profit-maximizing broadcasters seek to gain viewers by both choosing the type of program to offer and by spending money to set the quality of the program, which in turn allows them to sell access to those viewers (through inserted advertisements in that program) to companies at a fixed rate per viewer, Liu et al. (2004) find some distinctive characteristics of this important industry. To cite two, even without price competition, Liu et al. (2004) find that broadcasters have an incentive to differentiate themselves from each other on the type dimension. In other words, they develop a counter programming strategy, which differentiates the broadcasters but not to the fullest extent possible. Furthermore, under some cost conditions, viewer welfare will be

greater in a monopoly market than in a duopoly market.

Wu and Chou’s comment (2006) draws attention to the need for clarifying one particular assumption. In brief, when setting the cost of production to $c = 2.7$, Liu et al. (2004) find a pure strategy equilibrium at $v^A = v^B = 0.25$ and $d^A = 0.25$, $d^B = 0.75$, with each firm earning a profit of 0.331 (notations as defined in Liu et al. 2004 and Wu and Chou 2006). Wu and Chou (2006) confirm that “if there exists one equilibrium, then Theorem 2 in Liu et al. (2004) will be valid.” However, Wu and Chou (2006) argue that, from the viewpoint of firm A, $v^A = 1/2.7 + \varepsilon$ and $d^A = 1 - 1/2.7$ yield a higher profit. Hence they argue that no equilibrium actually exists and the Liu et al. (2004) result is not a pure strategy Nash equilibrium. Most of the remainder of the Chou and Wu (2006) commentary

discusses alternative approaches to restoring the basic findings of Liu et al (2004).

As every researcher who uses game theory models to understand market behavior recognizes, and as Shugan (2005) so aptly summarizes, the results of game theory models depend crucially on the "rules of the game." We had attempted to rule out the case described by Wu and Chou (2006) in a statement that "in this model, both broadcasters first attempt to capture the greatest number of viewers from their 'uncontested hinterlands' before competing for the 'contested' demand in the market center" (p. 125). In this reply we discuss our justification for this assumption, and why we believe it is reasonable. We also recognize that this assumption was in the midst of the text and might not have been clear when we presented the model and outlined our "rules of the game." If this assumption is removed, then no pure strategy Nash equilibrium exists for the specific case of the cost parameter examined. The Wu and Chou (2006) analysis and that of Liu et al. (2004) diverge when Wu and Chou (2006) introduce the possibility of a firm choosing a position in which part of its home market is uncovered and it locates on the same side of the "type" space as the competitor. We believe that excluding this case enables the model to better capture the features of the broadcast television market and to have more realistic managerial implications, and now discuss the main reasons.

Competitive Outcome When $8/3 \leq c < 4$

Wu and Chou (2006) use four lemmas and one theorem to show that no pure strategy Nash equilibrium exists when $8/3 \leq c < 4$. They indicate that the quality and location results leading to the Liu et al. (2004) Theorem 2 satisfy all of the four lemmas. As noted above, the critical difference between the Wu and Chou (2006) Theorem 1 and the Liu et al. (2004) Theorem 2 is in the allowable solution space as defined by the "rules of the game." When Wu and Chou (2006) prove their Theorem 1, they rely on a strategy that one broadcaster chooses a particular position on the opponent's side of the market, resulting in a quality war under which profits are driven away, and no pure strategy Nash equilibrium exists. Such a position requires the broadcaster to give up the uncontested demand in its *hinterland*, leaving the viewers there unserved. While accommodating all other possible competitive strategies considered by Wu and Chou (2006), the Liu et al. (2004) analysis did not consider this case as a relevant element in the strategy space, because it represents self-destructive behavior unlikely to exist if the broadcasters have any competitive foresight (and the literature suggests that they do, as discussed below). Instead, Liu et al. (2004) assume

that both broadcasters prefer to capture the greatest number of viewers from their uncontested *hinterlands* before competing for the contested demand in the market center, thus $d^A = v^A$ and $d^B = 1 - v^B$ hold at equilibrium (i.e., Lemma 3 in Wu and Chou 2004). There are several factors that justify this approach.

First, to provide useful insights into the television broadcasting market, Liu et al. (2004) try to incorporate many of its unique features such as the two-market structure, the critical role of program production values in viewer choice, and the technology and regulation-driven market structure. Previous studies of television broadcasting have often found this market to be semi-competitive, and that counter programming (i.e., offering differentiated programs) is heavily used by the networks (Lin 1995, Tiedge and Ksobiech 1987, Litman 1979, Owen et al. 1974). This is primarily the result of technology and government regulation that limited (and in many cases exogenously set) the number of broadcasters. As Litman (1979) concluded, "the television networks closely correspond to the market structure in economic theory known as oligopoly," where "full-fledged competition seldom takes place" (pp. 393–394). This is consistent with the studies of oligopolistic behavior in general where mutual monitoring is feasible and firms are cautious about their actions to avoid retaliation (Stigler 1964).

Second, the reputation (or image) that a particular broadcaster has earned among viewers works to restrain its range of competitive behavior. While broadcasters may sometimes want to abandon a market in which there is limited demand or too much competition, the more common view is that of John Matoian, president of Fox Entertainment Group, who in commenting on network programming said, "we want to grow, but we don't want to abandon what got us here in the first place" (*US News & World Report* 1996). Constraining a broadcaster's type choice to be within certain ranges is consistent with this strategy.¹

Third, situations similar to jumping (e.g., price under cutting in price-location spatial competition models) have been discussed broadly in the literature. In the theoretical work on spatial competition and differentiated product models, this technically feasible, but substantively unlikely case, has motivated researchers to construct alternative ways to rule it out (e.g., Eaton 1976, Novshek 1980, Vassilakis 1993).² Furthermore, previous studies have either adopted

¹ For an interesting article on broadcaster identity and branding and how the major television networks carefully approach it, see "TV's Identity Crisis" (*US News & World Report* 1996).

² One particular approach is the modified zero conjectural variation or "MZCV" (Eaton 1976; Vassilakis 1993; Novshek 1980; Eaton and Lipsey 1975, 1978). The MZCV slightly modifies the zero conjectural variation assumption ("ZCV," which assumes no response

other approaches to constrain the range of firm behavior under investigation or proposed alternative equilibrium concepts so that the analysis and insight would not be hindered by substantively uninteresting situations (e.g., Shubik and Levitan 1980, McGuire and Staelin 1983, Hauser 1988, Morgan and Shy 2000). We also note that the most interesting results of Liu et al. (2004) occur when the marginal revenue curve is at the discontinuous point of a kinked demand curve, which has produced unexpected results in other model settings (e.g., Salop 1979). It is debatable whether one-shot games should include expectations of competitive behavior, but theoretical models are most meaningful when they incorporate reasonable market realities and the firms' knowledge of the marketplace.³

Other Issues

We find it useful that Chou and Wu (2006) suggest possible ways to restore the Liu et al. (2004) results by changing certain model assumptions, such as advertising rate and dynamics (e.g., Ailawadi et al. 2005). However, we want to clarify two issues regarding the advertising rate that Chou and Wu (2006) commented on. First, the number of advertising slots is not modeled in Liu et al. (2004). While Chou and Wu (2006) argue that a high-quality television program may face "a more stringent upper bound on the capacity of advertising time slots than a low-quality program" (p. 545), it is unclear whether this assertion is consistent with reality. Zhou (2004) finds that networks run commercials more frequently during more popular shows. Second, parameter r in Liu et al. (2004) is the advertising rate *per ratings point*, which is further normalized to be one. It would be interesting to examine the issue of endogeneity of r , but it is difficult to start with the hypothesis that a program with higher quality will have a reduced r .

from the rival when one firm evaluates its own action) so that the ZCV holds unless one firm attempts to drive the other out of the market. Essentially, the MZCV gives more foresight to firms and restricts the set of actions to those yielding nonzero market shares (Vassilakis 1993, Morgan and Shy 2000). Interested readers are referred to Brown (1989), Eaton and Lipsey (1975), Morgan and Shy (2000), Novshek (1980), Perry (1982), and other related articles for more detailed discussion of nonzero conjectural variations and other equilibrium issues.

³ In an interesting study, Lehmann (2001) suggests that the payoff of competitors should be considered in a firm's own utility function. The firm is altruistic if it positively values the competitors' payoffs, or envious if it negatively values them. In a broader context, the behavioral game theory literature has found the existence of (so-called) social preferences (which account for preferences over altruism and envy in addition to monetary gain, as well as notions of reciprocity) in both repeated and one-shot games. An excellent overview of findings in the behavioral game theory literature can be found in Chapter 2 of Camerer (2003).

Chou and Wu (2006) also argue that the Liu et al. (2004) model has placed "too much weight on viewers' concerns about program type" (p. 542) and this "rules out the possibility that program quality may be higher in the duopoly case than in the monopoly case" (p. 542). Previous empirical work indicates that program type is a critical factor in determining viewers' program choices (Goettler and Shachar 2001, Rust et al. 1992). Moreover, the trend of "narrowcasting" in the television markets suggests that, at least for some viewers, type is more important than quality. Together with the literature that indicates the importance of program quality (e.g., Barwise and Ehrenberg 1988), we believe that the equal weight assumption adopted in Liu et al. (2004) is a reasonable one. A more complete understanding of viewer preferences and a richer model to capture these preferences are definitely worthwhile research issues.

The Liu et al. (2004) study indicates that it is theoretically possible that greater competition may reduce programming spending, and thereby reduce viewer welfare, both of which have been primary concerns in this industry. It is our hope that, at a time when alternative media options become increasingly available, further research will explore richer model settings and derive useful insights for television and other media markets, such as movies, DVDs, and the Internet (e.g., Ainslie et al. 2005). We also hope that this discussion illustrates how the rich features of the broadcast television industry can be incorporated into theoretical models via different assumptions and approaches.

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