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Synergy or Interference: The Effect of Product Placement on Commercial Break Audience Decline

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Recent years have seen a considerable rise in the use of product placement in television shows. Taking advantage of second-by-second product placement, advertising, and audience tuning data, this research explores the impact of such product placement on the extent to which viewers tune away from downstream advertisements. Motivated by the behavioral priming literature, we examine how this impact relates to the brand- and category-match between product placement and subsequent advertising, as well as the temporal distance between them. Our analysis suggests that the coveted first position of a commercial break holds a greater audience when preceded by product placement from the same brand. This indicates a positive synergy between the two activities that can reduce audience decline by more than 10%. Product placements by other brands, however, can actually exacerbate audience loss, thus interfering with the reach of advertisements by competitors. Significantly, these changes in audience size are not temporary, but are retained across the remaining commercials in the same break. We discuss the managerial implications of these findings and directions for future research in the rapidly changing media landscape.

Data, as supplemental material, are available at <http://dx.doi.org/10.1287/mksc.2014.0864>.

Keywords: product placement; advertising; brand strategy

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1. Introduction

Consumers are becoming more adept at avoiding television advertisements. They switch channels, divert attention to other tasks or media, and fast forward through ads on DVRs (Wilbur 2008a). Given such behavior, it is imperative for marketers to understand the factors that determine whether consumers watch advertisements, as the size of the audience that has the opportunity to see the commercial impacts the commercial's ultimate effectiveness. From the networks' perspective, given the industry's interest in transitioning away from the historical practice of pricing advertisements based on the program audience to pricing them based on the size of the actual advertisement audience itself (Atkinson 2007, 2008; Schweidel and Kent 2010; Wilbur 2013), there is an increasing desire to understand those factors that affect the size of commercial break audiences.

This rise in ad avoidant behaviors has also led marketers to increasingly focus on product placement (hereafter, placement) as an alternative means of exposing consumers to their brands. Placement is innately less avoidable given its integration into the program content, and has become an important new source of

revenue for the networks. Indeed, the rapid growth of placement in recent years¹ has expedited the need to fully investigate its efficacy and strategic implications (Balasubramanian et al. 2006). However, while extant research has begun to examine how placement affects brand recall and attitude (e.g., Russell 2002), little is known about its potential positive or negative impact on television advertising; specifically, does a brand's placement increase or decrease the likelihood of viewers tuning away from its downstream advertisements?² The presence of a positive relationship would

¹ According to the PQ Media's *Global Branded Entertainment Marketing Forecast* 2010–2014, following double-digit gains from 2005 to 2008, spending on placement in the United States exceeded \$3 billion in 2009. It is also expected to grow at an annual rate of more than 5% through 2014. Furthermore, while placement has been commonplace in the United States for some time, double-digit growth is also projected in the European market, including the important U.K. media market where paid placement was only recently permitted in 2011.

² Consistent with the extant literature on ad avoidance (e.g., Danaher 1995, Schweidel and Kent 2010), factors contributing to increased ad avoidance can be interpreted as having a negative impact on the size of the commercial audience.

indicate a synergy between placement activities and the audience of downstream advertisements, while a negative relationship may suggest that placement interferes with the reach of downstream commercials.

For marketers, a better understanding of the relationship between placements (both their own and competitors') and advertising would enable more strategic placement-advertising coordination within the same television program. Moreover, just as marketers are innately motivated to ensure that placements do not inadvertently interfere with the reach of their own advertisements, networks need to understand how placement activity might affect the aggregate audience of entire commercial breaks as advertising is still the primary driver of more than \$140 billion domestic (Kantar Media 2014) and almost \$500 billion worldwide (Magna Global 2014) advertising revenues. In particular, networks need to be cognizant of any potential for growth in placement revenues to inadvertently undermine their cash cow of advertising revenues.

Despite the clear strategic importance of understanding the effect of placement on advertising audiences, extant research on placement has primarily considered it as an independent persuasive device. That is, mirroring early research on TV advertising, this literature has focused on placement's influence on viewers' recall of and attitude toward brands (e.g., Russell 2002). Similarly, the literature on ad avoidance has primarily addressed how advertisement characteristics (e.g., brand or product category) or general program characteristics (e.g., genre) impact the commercial break audience (e.g., Danaher 1995, Schweidel and Kent 2010). Meanwhile, the potential for specific program content (be it placements or otherwise) to influence the size of the advertising audience has received little attention to date. The current research thus begins to address an important void in both literatures by exploring how brand placements embedded in program content impact the extent to which the audience tunes away from downstream advertisements in the same program.

To better motivate this central question, consider the advertisements for AT&T mobile services aired in a major metropolitan area over the weekday primetime (defined by the industry as 8–11 p.m.) in 2007 on the five major networks (ABC, CBS, Fox, NBC, and CW). During those advertisements that aired in the first position of each commercial break, the audience declined by approximately 7% on average. However, a closer inspection reveals that when these commercials were preceded by AT&T's placements, the audience size declined by only 4%. While this pattern could be idiosyncratic to AT&T or attributable to other factors, it is also indicative of a possible synergy between AT&T's placements and the audience size for its downstream advertisements.

In this research, we systematically investigate the impact of a brand's and its competitors' placements

on the extent of audience decline during downstream advertising, while controlling for advertiser-related effects (e.g., brand- or category-specific differences) and program-related effects (e.g., genre-, network-, and program-specific differences). Drawing on behavioral theories, we conceptualize placement incidents as primes capable of influencing the degree of attention paid to, and thus the likelihood of a viewer staying tuned to, related downstream advertisements. As such, we posit that any potential relationship between the two should be contingent on two key factors: (1) the brand and category match between the placement and the advertisement (hereafter, brand-category match), and (2) the temporal proximity between the two. For example, suppose a Samsung smartphone's placement appears in a program segment. Would this incidence of placement affect the extent of audience decline during a subsequent Samsung smartphone advertisement in the next commercial break? Would the placement affect the audience decline experienced by an advertisement of a category competitor such as a Motorola smartphone? What if the commercial in question was for a Samsung television (i.e., another Samsung-branded product in a different category)? Would these effects differ if the placement had occurred earlier in the program?

To investigate these questions, we relate placement activity to the percentage change in the audience size from the first to last second of each advertisement. We use a Bayesian regression that incorporates random effects to capture variations across product categories, brands within categories, and programs. While an analysis that fails to account for the aforementioned two factors would suggest that placements exacerbate decline in the commercial audience, our results paint a more nuanced picture. When an advertisement in the coveted first spot of a commercial break is preceded by placement for the same product, we find that the audience decline during the advertisement is reduced by more than 5%. When the advertisement is preceded by placement by the same brand but from a different category, the reduction in audience decline exceeds 10%. Significantly, the resulting increased audience persists across the remainder of the break, thus providing a spillover effect akin to a positive audience externality (Wilbur et al. 2013) that can benefit both the brands advertising later in the break and the network itself. In contrast to this intra-brand synergy, prior placements by a category competitor result in an interference effect that can increase the audience decline during a brand's advertisement by over 2%. Our analysis also reveals that these effects depend on the temporal proximity between the placement and advertisement. Taken together, these findings suggest that advertisers and networks can mutually benefit from strategic coordination of placement and advertising.

In addition to making an important contribution to the growing literature on placement and multimedia

synergies (e.g., Naik and Raman 2003), this research also contributes to the advertising literature on commercial audience (e.g., Danaher 1995, Siddarth and Chattopadhyay 1998, Woltman Elpers et al. 2003, Teixeira et al. 2010). While general program characteristics such as genre have been found to affect the extent of ad avoidance (e.g., Danaher 1995), our results demonstrate how program content can affect the change in audience size during subsequent commercials. Put differently, rather than simply considering programs as a medium in which advertisements are embedded, we reveal a specific way in which the program content affects the reach of the advertisements, suggesting the potential value of increased collaboration among content creators, networks, and marketers.

The remainder of this article is organized as follows. First, we briefly review the related literature. Next, we describe the data used in the empirical study, present our analysis and findings, and discuss the managerial implications. Finally, we consider the limitations of our approach and suggest directions for future research.

2. Related Literature

2.1. Advertising Avoidance

As mentioned previously, the literature on ad avoidance (i.e., the extent of audience decline during commercial breaks) has examined the impact of program and advertisement characteristics on commercial audience decline. For example, Danaher (1995) used data from peplemeters to demonstrate that ad avoidant behavior is moderated by program genre and commercial break characteristics, such as the length of the break. Schweidel and Kent (2010) built on this research by incorporating random effects for programs in their analysis. Using set-top box tuning data, they found systematic differences in audience retention across programs of the same genre and demonstrated that programs attracting a smaller total program audience may still be a preferred option for advertisers because they could retain a larger portion of their audience during commercial breaks. Relatedly, Kent and Schweidel (2011) observed variations in audience sizes across advertisements in the same commercial break. In particular, they found that the majority of audience loss occurs during the first advertisement of a break, a result that underscores both the strategic importance of the first commercial and the need for marketers to consider the commercial break audience separately from the program audience.

While the aforementioned research used aggregate data, other studies examined panel data to understand individuals' channel-switching behavior. Van Meurs (1998), for example, found that ad avoidant behaviors are significantly affected by specific program and commercial break characteristics, such as the target

audience and the position of the commercial break in the program. Siddarth and Chattopadhyay (1998) used a split hazard model to investigate viewers' decisions to tune away during a commercial. They found that tuneaway was exacerbated by prior exposure to the brand's advertising. Teixeira et al. (2010) investigated how the specific way brands are visually presented in an advertisement affects the likelihood of viewers choosing to remain tuned to the advertisement. They found that viewers are more likely to tune away when the brand is placed more centrally on the screen, but that this effect could be mitigated by pulsing the brand's on-screen presence in such a way as to keep total brand exposure constant. From our perspective, these latter results are of particular interest, as they suggest that both prior brand exposure and the salience of the brand during a given advertisement can influence tuneaway behavior. As such, it seems reasonable that the presence of brands in the program content itself might also affect audience sizes during subsequent advertisements.

In summary, extant research has demonstrated that the size of the advertising audience is influenced by characteristics of both the program and the advertisement itself. To our knowledge, what this literature has not yet investigated, however, is how program content in the form of placements may affect the size of the advertising audience. We next briefly review the specific literature on product placement.

2.2. Product Placement

Product placement is the incorporation of a brand into a specific entertainment vehicle, such as television, movies, radio, music, video games, or novels (Russell and Belch 2005, Karniouchina et al. 2011). Placement in television shows has considerable appeal to marketers looking for new ways to cultivate their brands and to connect with consumers. As placement embeds the brand within a program, consumers are innately less able to skip through this content than they are traditional advertisements. Moreover, placement may appear more natural to viewers as long as it is carefully situated in the shows (Russell 2002), enabling marketers to link their brands to particular characters or plots. This enables marketers to naturally imbue their brands with particular meaning in a fashion that traditional television advertising struggles to match (McCracken 1989, O'Guinn and Shrum 1997). As a result, persuasion knowledge (Friestad and Wright 1994) may be less likely to be invoked.

Since the successful placement of Reese's Pieces in the 1982 movie *E.T.* (Moses et al. 2004), placement has triggered significant attention from mainstream advertisers. A survey of the *Association of National Advertisers* suggests that the majority of advertisers are interested in improving their ability to measure the

effectiveness of their placements (Eggerton 2006). Much of the initial research has focused on the impact of placement on viewers' subsequent recall of (Gupta and Lord 1998, Law and Braun 2000) or attitude toward the placed products (Russell 2002, Cowley and Barron 2008). However, research also revealed that simple recall of a placed brand offers no guarantee of improved attitude toward the brand (Russell 2002). Moreover, negative effects of placements on brand attitudes are especially likely to occur for viewers who like the show more (Cowley and Barron 2008), thus suggesting that the level of attention to the show could moderate the way in which placements are processed.

As this brief review reveals, extant research has primarily examined placement as an independent persuasive device. Building on this stream of work, we directly examine how placement influences the audience retention of downstream commercials. In particular, we investigate the relationship between placements and the extent of audience decline over the downstream commercial break, with a primary focus on the first ad in the commercial break as this is where the largest audience decline typically occurs (Kent and Schweidel 2011). Our investigation is contingent on two potentially critical factors: the brand-category match between the placement and commercial, and their temporal proximity. We next describe our theoretical reasoning for this conceptual framework.

3. Empirical Questions and Behavioral Motivation

3.1. The Potential Role of Brand-Category Match Between Placement and Advertisement

Prior research has revealed that not only can the degree of prior exposure to a brand influence its own ad's audience (Siddarth and Chattopadhyay 1998) but also that the degree of brand salience within an advertisement itself influences the likelihood of a consumer skipping the advertisement (Teixeira et al. 2010). As such, it is plausible that prior exposure to a brand via placement earlier in the show could impact the audience of subsequent related advertisements. We investigate this possibility using a typology of four mutually exclusive brand-category matches between the placement and advertisement: First, a perfect match in which both the placement and advertisement feature the same brand and category (e.g., an LG phone placement preceding an LG phone advertisement). Second, a brand-only match in which a particular advertisement is preceded by a placement of the same brand in a different category (e.g., an LG phone placement prior to an LG television advertisement). Third, a competitive match in which a category placement precedes a category ad from a different brand (e.g., an LG phone placement followed by a Samsung phone advertisement). Finally, we

include a no match type (e.g., an LG phone placement followed by a Pepsi advertisement) to capture any shifts in advertising audience sizes that may be driven by the general volume of brand placement activity in earlier programming.

Although our data do not allow us to observe individual viewers' behavior or psychological processes, we draw on behavioral theories, not to derive specific hypotheses per se, but to frame a discussion as to how these different brand-category matches might affect the size of the advertising audience. We rely on the primary idea that when a placement and a subsequent advertisement are from the same brand (perfect match and brand-only match) and/or product category (competitive match), the placement may serve as a prime that activates the brand and/or category in memory, thus leading to temporary increases in their accessibility (Higgins et al. 1977). Several theoretical accounts predict that such increased accessibility would result in increased attention being paid to a related advertisement, thus reducing the likelihood of a viewer tuning away. First, increased accessibility of the brand and/or category may lead viewers to be temporarily more sensitive to brand- or category-related cues in the environment (Bruner 1957). This might result in increased attention being paid to subsequent ad content featuring the brand or category, and consequently to a reduction in audience decline during them (Woltman Elpers et al. 2003, Teixeira et al. 2010). Second, enhanced accessibility of the brand specifically (in the brand-only match or perfect match cases) could lead viewers to experience increased perceptual fluency in processing brand-related stimuli (Reber et al. 1998), which might also result in a reduction in audience decline during the matched advertisement. Relatedly, in these cases the placement may also result in a mere exposure effect (Zajonc 1968), engendering a more positive view of the brand, thus resulting in greater audience retention for advertisements from the brand (Keller and Lehmann 2006).

While the above accounts all predict less audience decline, other theories might predict the opposite. In the perfect match case, research on persuasion knowledge (Friestad and Wright 1994) would suggest that viewers who consciously notice the same product being featured in both the placement and advertisement may infer that persuasive intent underlies the combination. This activation of persuasion knowledge may lead viewers to be less inclined to view the advertisement, thus reducing the audience size.

Turning to the case of competitive match, research on nonconscious goal pursuit suggests that active goals can actually inhibit the pursuit of competing goals (Shah and Kruglanski 2002, Chartrand et al. 2008). In our context, to the extent that a placement induces a goal to acquire or consume the placed product, this

goal may reduce the motivation to consume competing products from the same category. This may result in attention to brand cues in competitive commercials being automatically inhibited thus rendering tuneaway more likely. This possibility is supported by research pertaining to the notion of advertising interference, which has found that memory for a focal brand’s advertising is reduced by competitive advertising (Burke and Srull 1988, Kent and Allen 1994) and that such interference may adversely affect sales (e.g., Danaher et al. 2008). If we view placement activities as another form of advertising, it is reasonable to suspect that a competitive brand’s placements may also adversely affect how viewers attend to and/or process a downstream advertisement.

In sum, from a general priming perspective, we expect that prior placements temporarily increase the accessibility of the brand and/or category. This increased accessibility should, all other things being equal, result in more attention being paid to brand or category cues, resulting in a reduction in the extent to which the audience declines during matching advertisements. On the other hand, in the perfect match and competitive match cases, we identify potentially opposing forces, persuasion knowledge for the perfect match, and competing goals for the competitive match, that may reduce or even overwhelm the positive effect of increased accessibility.

3.2. Temporal Proximity Between Placement and Advertisement

Having theorized the impact of recent placements on the audience of the first advertisement of a commercial break, we next consider how recent versus distant placements (i.e., the temporal distance between the placement and advertisement) may impact the effect of placements on the extent of audience decline during downstream advertisements. Specifically, in relation to a given advertisement (e.g., B1 in Figure 1), we define a recent placement as one occurring in the immediately preceding program segment (segment B in Figure 1), and a distant placement as having occurred at any prior time in the current program (e.g., segment A). The key theoretical issue is that the effects of priming and increased accessibility are generally temporary in nature. Specifically, as the temporal distance from the prime (i.e., placement) increases, the cognitive associational processes invoked by the prime (i.e., the increased accessibility of brand or category cues) tend

to decline (Chartrand et al. 2008). As such, we would expect the priming accounts described above to be weaker for distant placements compared with recent placements.

However, an important exception to the general principle that associational processes tend to decline in activation over time is that automatically activated goals actually tend to strengthen until fulfilled (Chartrand et al. 2008). This is highly pertinent in the competitive match case. Recall that a category accessibility account would predict that a competitive placement (e.g., by Pepsi) would positively affect the audience size of a subsequent advertisement by a category competitor (e.g., a Coca-Cola commercial). However, we also pointed out that a goal pursuit account predicts an opposing effect, as an automatically invoked goal to consume the placed product (i.e., Pepsi) may inhibit the attention paid to brand cues pertaining to competing products (i.e., Coca-Cola). Overall then, as the temporal distance between the placement and advertisement increases, extant theory would predict that the positive effect of category accessibility on the commercial audience size would decline, while the opposing force of goal pursuit would strengthen (Chartrand et al. 2008). Thus, in the competitive match case, our expectation is that the net effect of these two opposing forces on the commercial audience will become more negative as the temporal distance between the placement and the advertisement increases. That is, any interference effect is expected to be stronger when competitors’ placements appear earlier in the program.

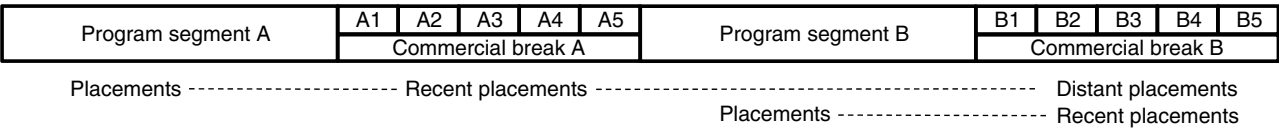
In summary, our conceptualization suggests that both the brand-category match between the placement and advertisement, and the temporal distance between the two, could affect whether the relationship between the placements and the downstream advertising audience is synergistic or indicative of interference. Hence, in our subsequent empirical analysis of each advertisement, each placement is characterized by one of the eight mutually exclusive types, depending on its brand-category match with the ad and whether it is a distant or recent placement.

4. Empirical Analysis

4.1. Data

To examine the impact of placement on advertising audience decline, we analyze second-by-second data of placements, advertisements, and aggregate sizes

Figure 1 Illustration of Placements and Advertisements in a Television Program



of advertising audience provided by Kantar Media. Audience size is measured by the total number of set-top boxes tuned live to a particular channel among nearly half a million households in a major metropolitan area.³ It thus captures the live audience's opportunity to see advertisements (Wilbur 2008b, Schweidel and Kent 2010).

We analyze all placements and advertisements that appeared in 2007 weekday primetime programs on the five major broadcasting networks mentioned earlier.⁴ While the data does not include the recorded content of the placements or advertisements, it tracks the starting and ending times, and the featured brands and categories in the placements and advertisements. It also records each advertisement's position within the commercial break, each break's position within the program, and each program's title, network, genre, and starting and ending times.

Overall, the sample consists of 20,600 commercial breaks with a total of 148,448 advertisements. This equates to an average of 7.2 advertisements in each break (min = 1, max = 25, standard deviation = 2.5, mode = 7). On average, each commercial break occupies 187.6 seconds (min = 10, max = 903, standard deviation = 64.4, mode = 210). The ratio of total program length to total commercial break length remains roughly constant at 3.6 on average, with 99% of the programs having a ratio between 2 and 5.

Table 1 provides the frequency of different program genres and commercials of differing lengths. The most advertised product categories include the television networks promoting their shows, restaurants, automobiles, telecommunication services, motion pictures, retailers, and medicines. These categories account for 59% of the advertisements in our sample. They are also among the most frequently placed categories, besides those such as footwear and beverages. Examples of the most advertised brands include AT&T, Verizon, Toyota, McDonald's, and Target; and the most frequently placed brands are Coca-Cola, Converse, and Dell.

4.2. Dependent Variable

The behavioral theory motivating our investigation informs our expectation of the degree to which

³ Viewers using DVRs were excluded in the data collection and thus we do not make statements about those viewers in this research. At the time of the data collection, the DVR penetration was approximately 20%–30% and households with DVRs watched a significant amount of television live (Bronnenberg et al. 2010). Also, the data does not track individual viewers' or households' tuning behavior.

⁴ Our data does not allow us to distinguish placements that arise from content producers' artistic choices from advertisers' commercial intent (i.e., paid versus unpaid placements). However, revenues generated from paid placements remained a fraction of the networks' advertising revenues. Coordinated placement-advertising campaigns were even sparser because longer-term planning is needed to integrate a brand into program content and then slot advertising after program production completes.

Table 1 Descriptive Statistics

Variable	Frequency (%)
<i>Program genre:</i>	
<i>Drama</i>	29.9
<i>Game</i>	5.6
<i>News magazine</i>	4.5
<i>Newscast</i>	12.9
<i>Police/Mystery/Suspense</i>	7.4
<i>Sitcom</i>	14.9
<i>Slice of life</i>	17.1
<i>Others</i>	7.8
<i>Advertisement length (seconds):</i>	
10	7.6
15	27.9
20	4.4
30	58.0
45	0.2
60	1.9
>60	0.0

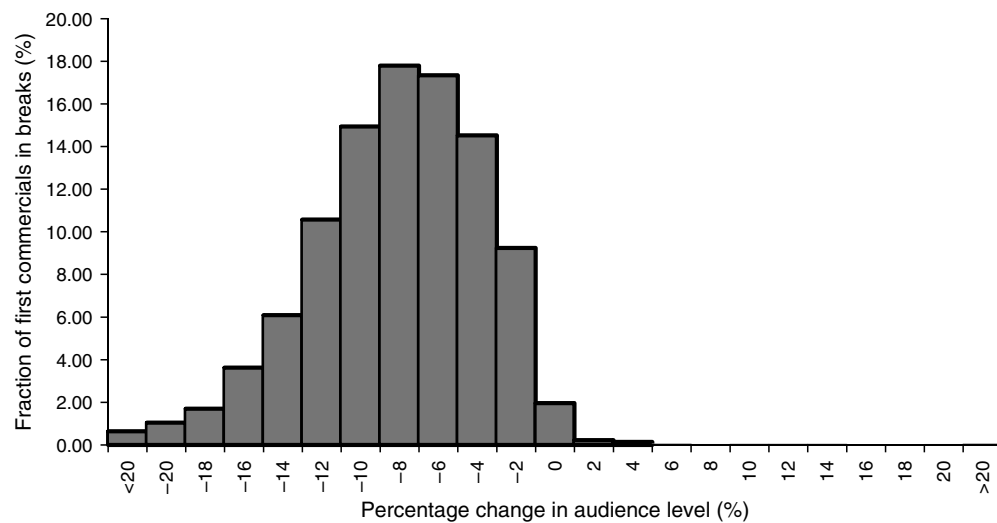
commercial audience declines are affected by prior placements. Also consistent with prior research that explores the factors contributing to ad avoidance (e.g., Siddarth and Chattopadhyay 1998),⁵ the dependent variable in our analysis is the percentage change in the audience size from the first second compared to the last second of the commercial. As discussed earlier, though our primary interest lies in the changes of audience sizes during the strategically important first advertisements of the commercial breaks, we do analyze all advertisements of each break. This enables us to explore how the placement-advertisement match of the first commercial of a break affects subsequent commercials in the same break, and how placements from multiple brands within a program affect the change in the commercial audience.

We plot the distribution of audience changes during the first advertisements of the breaks in Figure 2. On average, the audience size drops approximately 7.06% during these advertisements. There is a high degree of variation with some advertisements experiencing an increase in audience sizes (possibly a result of being in a commercial break near the start or end of a program); other advertisements experience declines of more than 15%.

In comparison to the first advertisements, later advertisements in the same break experience substantially smaller audience changes. Figure 2 shows the distribution of the percentage audience changes over the later advertisements in a break. On average, the audience

⁵ Schweidel and Kent (2010) used such an approach to model ratings of commercial breaks. In empirically assessing the need to model program ratings and the extent of ad audience decline jointly, they do not find support for correlating the two model components. This suggests that the average audience size of the program and the extent of audience decline during advertisements can be modeled independently.

Figure 2 Distribution of Percentage Changes in Audience Sizes Over First Advertisements



size increases by 0.87%. In comparison to Figure 2, we also observe much less variation in Figure 3, with approximately 90% of advertisements experiencing an audience change of less than 2%. In summary, most of the audience decline over a commercial break occurs during the first advertisements. This is consistent with the premium value placed on this position in commercial breaks (Kent and Schweidel 2011). Therefore, the strategic opportunities to increase the commercial break audience lie primarily in reducing audience decline during the first advertisements.

4.3. Independent Variables

The key independent variables of interest are eight counts of recent and distant placement incidents in each brand-category match type. That is, as described earlier, for every advertisement, each preceding placement occurrence is characterized as one of the eight mutually

exclusive categories based on its brand-category match with the advertisement and on whether it is a recent or distant placement. Table 2 shows the frequency and average volume of these eight measures of placements. Incidents of recent placements occur before 29.5% of first commercials (6,078/20,600) and 30.5% of all commercials (45,222/148,448). Overall, placements occur before 37.5% of the first commercials (7,731/20,600) and 38.7% of all commercials (57,427/148,448). As would be expected, the most prevalent form of placement is unrelated placements that match neither the advertised brand nor its product category. The next most prevalent, when accounting for both the recent and distant placements, are the cases of competitive match and perfect match, followed by brand-only match.

Random Effects. Consistent with recent research (e.g., Schweidel and Kent 2010, Danaher et al. 2011, Danaher and Dagger 2012), we incorporate random effects to

Figure 3 Distribution of Percentage Changes in Audience Sizes Over Later Advertisements

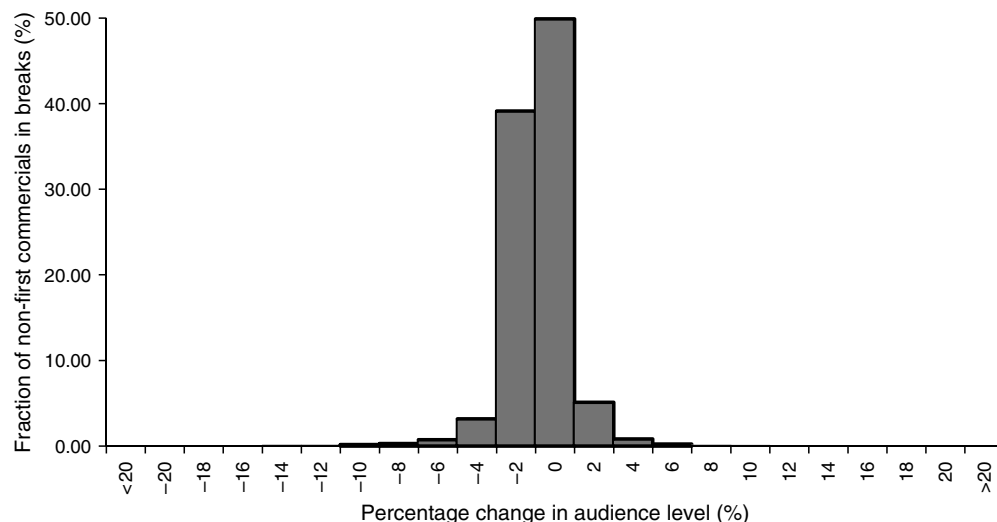


Table 2 Incidents of Placements

Match type	Number of ads (first ads only)	Average number of placement incidents (first ads only)	Number of ads (all ads)	Average number of placement incidents (all ads)
Recent placements:				
No match	5,903	3.68	44,478	3.76
Competitive match	312	1.93	1,841	1.96
Brand-only match	61	1.79	163	1.69
Perfect match	255	2.48	496	2.34
Total	6,078	3.80	45,222	3.81
Distant placements:				
No match	5,934	9.00	44,847	8.92
Competitive match	426	3.00	2,852	2.90
Brand-only match	30	2.57	200	2.32
Perfect match	166	6.34	459	4.58
Total	6,011	9.28	45,404	9.05
Overall	7,731	10.20	57,427	10.15

account for unobserved differences in the audience changes from the start until the end of a commercial across product categories, brands within product categories, and programs (e.g., unobserved brand appeal or ad quality, category interest, or program characteristics). Overall, these random effects capture variations across the 1,587 brands from the 193 product categories advertised in the 302 television programs in the sample.

Control Variables. In addition to capturing heterogeneity across advertisements due to brand, category, and program differences, we include a vector of control variables, Z_j , for each advertisement j . This includes the network where the program airs (default = NBC), the half-hour interval at which the program begins (default = 8:00 P.M.), and the program genre (default = others). Prior research suggests that these variables are related to the extent to which the size of the audience changes during commercials (Danaher 1995, Schweidel and Kent 2010). We also include an indicator variable for whether advertisement j is the first advertisement of a break. Our exploratory analysis and prior research shows larger changes in the audience size during first advertisements compared with later advertisements in the same break.

In addition, we include an indicator variable for whether an advertisement appears within two minutes of a half-hour interval. Prior research has shown that being positioned near the start or end of a program affects the commercial audience size (Siddarth and Chattopadhyay 1998). We further incorporate indicator variables for the month when commercial j was aired (default = December), whether a commercial break is the first or last break of a program, the length of the advertisement (i.e., fewer than 30 seconds, 30 seconds, 45 seconds, and 60 seconds or more; default = 30 seconds), and whether earlier commercials in the program featured the same brand or category.

Last, some brands may advertise in programs that elicit a similar mood as their advertisements or target similar audiences (see Cohen and Andrade 2004,

Andrade and Ariely 2009). Hence, the extent of audience change during brand b 's commercials in program p may be related to the fit between brand b and program p . To control for this, we use a proximity model (Bradlow and Schmittlein 2000) to derive a measure of the distance between brand b and program p in a latent space based on the set of programs in which brand b advertises (technical details in Appendix A). The brand-program fit is assumed to negatively relate to this distance. We also allow for this fit effect to differ between the first and later advertisements in a break.

4.4. Model

We first consider the first advertisement in each commercial break, as it is viewed as the most desirable. We then discuss the later advertisements in the same break and present our final model for all advertisements. For a first advertisement j , let y_j denote our dependent variable, i.e., the percentage change in the aggregate size of the audience from the first to the last second of the ad. To investigate how the placements preceding advertisement j in the same television program may impact y_j , recall that we categorize each incident of placement as one of the eight mutually exclusive measures. The vector *Placement* captures these eight counts of incidents. In addition to the placement variables of interest, we incorporate control variables Z_j and random effects to account for additional variation attributable to the brand and product category being advertised, and the program. That is, for the first advertisement ($FirstAd_j = 1$), we model y_j as:

$$y_j = \alpha + \sum_{k=1}^8 \beta_k \cdot Placement_{jk} + \gamma' Z_j + \kappa_{c(j)} + \theta_{b(j)|c(j)} + \psi_{p(j)} + \varepsilon_j, \quad (1)$$

where α is the intercept; β_1 through β_8 are the coefficients for the impact of the preceding placements categorized as one of the aforementioned eight measures; γ is a vector of coefficients for the control

variables; $\kappa_{c(j)}$ is a random effect reflecting variation across product categories; $\theta_{b(j)|c(j)}$ is a random effect that captures variation across brands after taking into account the product category; $\psi_{p(j)}$ is the random effect that captures variation across programs; and ε_j is a normally distributed error with variance σ_ε^2 . We assume that $\theta_{b(j)|c(j)} \sim N(0, \sigma_b)$, $\kappa_{c(j)} \sim N(0, \sigma_c)$, $\psi_{p(j)} \sim N(0, \sigma_p)$, and that σ_b , σ_c , and σ_p are drawn from diffuse inverse gamma prior distributions.

In our data, multiple brands advertise in different product categories, as classified by Kantar Media. For instance, Apple advertises in both electronic entertainment equipment and telephone equipment. Automotive brand advertisements are conducted by the dealer association and the manufacturer. Advertisements for the same movie occur in the categories of motion picture and pre-recorded audio and video. Cosmetic brands, such as Garnier and Covergirl, also advertise in a range of categories. As such, we can estimate separately the random effects associated with brands and product categories, where the random effect $\theta_{b(j)|c(j)}$ may vary across the product categories in which brand $b(j)$ advertises.

While the audience size primarily changes during the first advertisement, networks are interested in maximizing the audience size over the entire commercial break. Therefore we also consider how the placement-advertisement relationship may impact later advertisements in the same commercial break. For example, if placement reduces the audience decline during a first advertisement featuring the same brand, does this benefit marketers with advertisements later in the same break, or is the advantage only temporary (i.e., does it result in increased audience loss over later ads in the break)?

To this end, for each later advertisement j in the break ($FirstAd_j = 0$), in addition to including the vector $Placement_j$, we define a vector $LagMatch_j$ to capture prior brand-category matches that occurred for earlier advertisements during the same commercial break. These eight measures in $LagMatch_j$ sum the corresponding eight measures of $Placement_j$ across all advertisements aired earlier than advertisement j within the same break. For example, the values of $LagMatch_j$ for the second advertisement of a break are given by the values of $Placement_j$ from the first advertisement of the break. The values of $LagMatch_j$ for the third advertisement of the break would then be given by adding $Placement_j$ from the first advertisement and $Placement_j$ from the second advertisement. For each later advertisement j in a break ($FirstAd_j = 0$), we model the audience change y_j as:

$$y_j = \alpha + \sum_{k=1}^8 \beta_{8+k} \cdot Placement_{jk} + \sum_{k=1}^8 \beta_{16+k} \cdot LagMatch_{jk} + \gamma'Z_j + \kappa_{c(j)} + \theta_{b(j)|c(j)} + \psi_{p(j)} + \varepsilon_j. \quad (2)$$

Having discussed the first and later advertisements separately, we can now present our combined final model to examine all advertisements in our sample. We model the change in the audience size during advertisement j (y_j) as:

$$y_j = \alpha + FirstAd_j \sum_{k=1}^8 \beta_k \cdot Placement_{jk} + (1 - FirstAd_j) \cdot \left\{ \sum_{k=1}^8 \beta_{8+k} \cdot Placement_{jk} + \sum_{k=1}^8 \beta_{16+k} \cdot LagMatch_{jk} \right\} + \gamma'Z_j + \kappa_{c(j)} + \theta_{b(j)|c(j)} + \psi_{p(j)} + \varepsilon_j. \quad (3)$$

Hence, the model allows differential influence of the placements on the first advertisement (β_1 through β_8) versus later advertisements (β_9 through β_{16}).

We randomly select half of the advertisements in the sample for model calibration and use the remaining advertisements for validation. To complete the model specification, we further assume diffuse normal priors on the coefficients. The MCMC Gibbs sampler draws the parameters from the marginal posterior distributions. We run three independent chains for 10,000 iterations, discarding the first 5,000 draws from each chain as a burn-in period. Our inferences are based on the remaining 5,000 draws from each of the three chains.

5. Results

5.1. Model Comparison

To assess the impact of placements on the extent to which the size of advertising audience changes, we compare the proposed model in Equation (3) with a series of alternative models in Table 3. The in-sample (calibration sample) comparison is based on the deviance information criterion (DIC), a likelihood-based measure that penalizes more complex model specifications. A lower DIC indicates a better model fit. In addition to calculating the DIC on the calibration sample, we compare the mean absolute errors (MAEs) in both the calibration and validation samples, where a lower MAE suggests a more accurate prediction.

The baseline model accounts solely for the control variables, such as program genre and the length of the advertisement. The second model further includes the random effects to capture the unobserved heterogeneity across categories, brands within categories, and programs. Building on the second model, the third integrates the brand-program distance. We then incorporate an additional variable for the total number of placement incidents before an advertisement. In this model, we do not consider the differential impacts of placements of different brand-category matches or temporal proximities. Finally, we distinguish the impact of the placements based on their brand-category

Table 3 Model Comparison

Model	DIC of calibration sample	MAE of calibration sample (% improvement against baseline)	MAE of validation sample (% improvement against baseline)
Baseline	329,132	1.312	1.308
+Random effects	325,012	1.275 (2.82)	1.274 (2.60)
+Brand-program distance	324,247	1.273 (2.97)	1.273 (2.68)
+Placement	323,543	1.265 (3.58)	1.266 (3.21)
+Brand-category match and temporal proximity	323,344	1.261 (3.89)	1.263 (3.44)

matches with the advertisement and whether they are recent or distant placements.

The DICs and MAEs in Table 3 suggest that including different model components improves fit. Consistent with the literature, the random effects capture the variations across categories, brands within categories, and programs in the changes of audience sizes. Our results also indicate that the addition of the brand-program distance improves the model performance. While the brand random effect captures the systematic differences in the changes of audience sizes across all brands (regardless of the program) and the program random effect across all programs (regardless of the brand), the brand-program distance measure accounts for how the combination of a particular brand and program impacts the change in the audience size.

More important for our main thesis, Table 3 also reveals that incorporating the brand-category match and temporal proximity between placements and advertisements further improves model fit. We therefore detail the parameter estimates under the best-fitting proposed model.⁶

5.2. Parameter Estimates

5.2.1. Control Variables. Table 4 displays the posterior means and standard deviations of the coefficients for the control variables. A positive coefficient suggests an upward shift in the audience size and hence can be interpreted as a reduction in audience decline. We highlight a few key results below. First, consistent with recent research (e.g., Danaher 1995, Schweidel and Kent 2010), earlier and later periods of primetime (such as 8:30 P.M. and 10:30 P.M.) experience less audience decay. Second, advertisements in a program's first commercial break (posterior mean = 0.41) or last commercial

Table 4 Parameter Estimates of Control Variables

Parameter	Mean (S.D.)
Intercept	− 0.48 (0.14)
Network	
ABC	0.01 (0.07)
CBS	0.34 (0.08)
CW	− 0.50 (0.09)
FOX	− 0.31 (0.08)
Half-hour	
8:30	0.15 (0.03)
9:00	− 0.16 (0.03)
9:30	−0.05 (0.04)
10:00	− 0.22 (0.05)
10:30	0.03 (0.05)
Genre	
Slice of life	0.12 (0.08)
Sitcom	0.11 (0.09)
Drama	0.36 (0.07)
News magazine	0.04 (0.14)
Game show	0.83 (0.12)
Police/mystery/suspense	0.26 (0.14)
Newscast	0.31 (0.28)
Month	
January	− 0.33 (0.04)
February	− 0.22 (0.04)
March	− 0.10 (0.04)
April	− 0.09 (0.04)
May	− 0.18 (0.04)
June	− 0.22 (0.04)
July	− 0.25 (0.04)
August	− 0.25 (0.04)
September	− 0.09 (0.04)
October	−0.06 (0.04)
November	0.07 (0.04)
Length of ad	
< 30 seconds	− 0.18 (0.02)
45 seconds	1.18 (0.21)
60+ seconds	0.33 (0.09)
Break position	
First commercial break	0.41 (0.03)
Last commercial break	0.05 (0.02)
Position within break	
First advertisement	− 4.32 (0.09)
Proximity to half-hour	0.13 (0.02)
Brand-program distance	
Main effect	0.36 (0.09)
Interaction with first break position	− 2.86 (0.10)
Prior advertisements	
Same category, earlier breaks	− 0.06 (0.02)
Same category, same break	0.21 (0.04)
Same brand, earlier breaks	0.04 (0.03)
Same brand, same break	− 0.45 (0.05)

Note. Bold typeface indicates that the 95% highest probability density (hereafter, HPD) interval does not contain 0.

break (posterior mean = 0.05) see less audience decline compared with interior commercial breaks. Third, as illustrated in Figures 2 and 3, the first ad experiences a larger audience drop than later ads in a break (posterior mean = −4.32).

Fourth, as expected, a larger brand-program distance (i.e., a lower brand-program fit for the advertisement)

⁶ As an additional robustness check, we have examined (1) the duration (i.e., overall number of seconds of appearance) of the placements, and (2) number of placement incidents based on their characteristics, such as background versus foreground (Cowley and Barron 2008). These alternative models performed worse based on both the DIC and MAE of the validation sample. We therefore report the results of the parsimonious, proposed model.

is associated with a stronger negative impact on the first advertisements' audience sizes. Interestingly, this effect reverses for the later advertisements in the same break, albeit with a small magnitude. This reversal suggests possible differences in how viewers attend to and process the first versus later advertisements in the same break, something future research might usefully investigate. Last, with regard to the impact of prior advertisements from the same brand or category, we observe an interesting pair of results. If advertisements from the same product category have occurred in previous breaks, we observe slightly more audience decline (posterior mean = -0.06). In contrast, if these advertisements appeared earlier within the same break, they reduce audience decline (posterior mean = 0.21). This latter result, while not speaking to our core conjecture, is consistent with the notion that prior advertisements from the same category increase category accessibility thus resulting in a smaller decline in the commercial audience.

5.2.2. Brand-Category Match. Let us first examine the fourth model in Table 3 where only the total number of all preceding placements, regardless of their brand-category match with or temporal proximity to the advertisement, is considered. Interestingly, based on a placement coefficient of -0.04 (standard deviation = 0.002), one would infer that placements exacerbate audience decline. Such a result would not be unintuitive, as placements may contribute to general commercial message fatigue and/or invoke persuasion knowledge among viewers (Friestad and Wright 1994). Nonetheless, distinguishing placements according to their brand-category match with and temporal proximity to ads reveals a much more nuanced and strategically important relationship between placements and commercial audience sizes.

Table 5 shows the impact of each of the eight placement measures on the extent of audience change during the strategically important first advertisement of a break. The benchmark of comparison against which to interpret these coefficients is the scenario in which there is no placement activity of any type in either the immediately preceding (for the recent placement coefficients) or earlier program segments (for the distant placement coefficients).

The top half of the table indicates that unrelated recent placements (no match) contribute to lower audience sizes (posterior mean = -0.08). All other things being equal, unmatched placements exacerbate audience decline, likely as a result of general commercial message fatigue. However, we find that when the first advertisement is preceded by brand-matched placement, audience decline during the ad is actually reduced. This synergistic effect of placements on changes in the size of the commercial audience is largest for brand-only match (posterior mean = 0.76).

Given that the average audience decline during the first ads is 7.06% , this suggests that a single recent brand-matched placement can reduce this decline by 10.8% ($= 0.76/7.06$). For the perfect match, recent placements again curb audience decline (posterior mean = 0.35), equating to a reduction in audience decline of 5.0% ($= 0.35/7.06$). Note that these estimates are based on a single placement incident matched with the advertisement in question. As such, if a placed product is featured multiple times within a program segment, the reduction in audience decline will be larger. These positive placement-advertising synergies suggest potential value for advertisers in coordinating their placement and advertising efforts. Moreover, as we will discuss below, increased audience sizes during the first advertisement will also benefit marketers placing advertisements in later positions of the break, yielding potential benefits for the networks as well.

Turning to the competitive case, recent competitive placements only directionally alleviate audience decline during first advertisements, as the effect is the smallest and not statistically different from zero. While this result could simply reflect competitive matches being less noticeable to consumers than perfect matches, it is also consistent with our prediction that in the competitive match case the positive effects of increased category accessibility could be offset by brand-cue inhibition caused by the goal to acquire or consume the competing product. While specific theory testing is beyond the scope of our analysis, the temporal proximity results we discuss next are consistent with such a goal activation explanation.

5.2.3. Temporal Proximity. The bottom half of Table 5 shows the impact of distant placements on audience decline over first advertisements. Similar to recent placements, distant placements of perfect matches mitigate audience decline, albeit with the expected reduced magnitude, decreasing audience decline by only 1.3% ($= 0.09/7.06$) compared with the 5.0% reduction in audience loss following a recent

Table 5 Synergy and Interference Effects of Placements on First Advertisement in a Break

Parameter β_1 through β_8	Mean (S.D.)
Recent placements	
No match	-0.08 (0.01)
Competitive match	0.03 (0.09)
Brand-only match	0.76 (0.23)
Perfect match	0.35 (0.06)
Distant placements	
No match	-0.05 (0.00)
Competitive match	-0.16 (0.03)
Brand-only match	0.13 (0.14)
Perfect match	0.09 (0.03)

Note. Bold typeface indicates that the 95% HPD interval does not contain 0.

placement. This finding, combined with those above, raises a strategic issue: From the standpoint of maximizing the advertising audience, it is beneficial to the advertiser and network to tightly schedule the brand's advertising directly following its placements.

As for competitive matches, a different picture emerges. Recall that in this case, we theorized that distant competitive placements could aggravate audience decline given the tendency for automatically invoked goals to strengthen over time. Indeed, the posterior mean dips from a nonsignificant 0.03 for recent placements to a significant -0.16 for distant placements, suggesting that audience loss increases by 2.3% ($= 0.16/7.06$) as a result of an earlier competitive placement. While not conclusive, this temporal shift supports a goal driven explanation, and mirrors the use of delay paradigms in the experimental literature to isolate goal driven effects (e.g., Chartrand et al. 2008).

More practically, this finding of a competitive interference effect suggests hindrances to brands advertising in programs that feature large volumes of competitive placements. For example, if GM or Pepsi advertises on *American Idol*, a show in which Ford and Coca-Cola undertake considerable placements, the GM or Pepsi advertisements may be viewed by a smaller audience than otherwise anticipated. Of course, other reasons, such as attempting to neutralize competitors' placements, may lead brands to competitively position their advertisements in the same program. However, our data show a previously undocumented disadvantage of this action. From the perspective of the network and brands advertising in later spots of the break, such competitive placements may be undesirable as well. The resulting audience decline carries over to the audience for later advertisements in the same break, thus weakening the revenue potential and advertising reach for the break as a whole.

5.2.4. Impact of Placements on Later Advertisements. In light of the positive effects of the placements from the same brand on the size of the first advertisements' audience, another interesting question naturally follows: Do the increased audience sizes experienced by the first advertisement (when it is preceded by perfect and brand-only matches) persist throughout the entire break, or are they offset by increased audience loss during later commercials in the break? Table 6 offers some insights.

First, overall we see that placements increase audience decline in the later advertisements of a commercial break (top panel of Table 6). While this may similarly stem from message fatigue, it could also suggest that viewers behave differently toward later advertisements in commercial breaks, a topic worthy of future investigation. We next turn our attention to the coefficients of *LagMatch* (β_{17} through β_{24}), which account for the impact of brand-category matches and

Table 6 Effects of Placements on Later Advertisements in a Break

Parameter	Mean (S.D.)
Placements' match with focal advertisements β_9 through β_{16}	
Recent placements	
No match	-0.06 (0.01)
Competitive match	-0.07 (0.04)
Brand-only match	-0.45 (0.16)
Perfect match	-0.11 (0.08)
Distant placements	
No match	-0.01 (0.00)
Competitive match	-0.01 (0.02)
Brand-only match	0.10 (0.09)
Perfect match	-0.03 (0.02)
Placements' match with earlier advertisements in the break β_{17} through β_{24}	
Recent placements	
No match	0.02 (0.00)
Competitive match	0.05 (0.02)
Brand-only match	0.07 (0.06)
Perfect match	0.02 (0.02)
Distant placements	
No match	0.00 (0.00)
Competitive match	0.01 (0.01)
Brand-only match	0.01 (0.04)
Perfect match	0.00 (0.01)

Note. Bold typeface indicates that the 95% HPD interval does not contain 0.

temporal proximities between placements and earlier commercials of a break on the changes in the audience sizes during subsequent commercials in the same break. The bottom panel of Table 6 shows small, positive effects. That is, the different forms of brand-category matches with earlier advertisements in a break, for both recent and distant placements, do not adversely impact the audience size of later advertisements.

These results strengthen the strategic importance of our findings on the first advertisements, as they show that placements' positive effects on the first advertisement's audience in the brand-only and perfect match cases are not offset by larger audience declines later in the commercial break. Thus, recent placements by the same brand as the first advertisement can benefit advertisers with commercials later in the same break by increasing the audience that can be reached by these advertisements and, consequently, the total revenue potential of the break. As a result, the networks, brands with both placements and advertisements, and brands featured only by advertisements can all reap benefits from improved coordination of placement and advertising.

Our empirical analysis also enables us to address the issue of multiple brands engaging in both placement and advertising activities within the same program. From the perspective of producing television programs, having multiple placement participants is clearly desirable to offset the costs of production and generate additional revenues. As Table 5 shows, for instance, recent placements from a brand (perfect match or brand

match) contribute to reduced audience loss if the same brand advertises in the first spot of a commercial break (0.35 or 0.76, respectively). Moreover, while placements by brands in different product categories (no match) have a small negative impact on the extent to which the audience size changes (-0.08 or -0.05 , depending on whether these placements are recent or distant), such effects are offset by the positive impact of perfect match and brand-only match placements. Thus, if multiple brands undertaking placement also want to advertise in the first position of breaks, our analysis suggests that the first ad audience synergies arising from matching the brand of the advertisement and placement (i.e., 0.35 or 0.76) offset the small interference effects caused by having placements from multiple brands (i.e., -0.08 or -0.05).

Furthermore, when the brands conducting placements advertise in the same commercial break, those in positions beyond the first slot are not expected to accrue benefits from their placement efforts on the size of their commercial audience (e.g., -0.11 and -0.03 as shown in the top half of Table 6). Suppose that one brand (A) conducting a placement advertises in the first slot of the immediately following commercial break, while brand (B), also with a recent placement, advertises in the second slot. While A will benefit from the synergies arising from combining placements and advertising in temporal proximity (0.35 in Table 5), B receives no such benefit because there are no positive effects of either A's (-0.06 or -0.07 in the top panel of Table 6) or B's (-0.11) placements on later advertisements in the break. One way in which B will actually benefit from A's placement-advertising match is by having a larger initial audience for its advertisement. Moreover, while the bottom half of Table 6 suggests that the perfect match arising from A's placement and first advertisement in the break will not adversely affect the extent of tuneaway from B's advertisement (0.02), if B wants to benefit from its own placement activities, it would be better served by having its advertisement in the first slot of a later commercial break. While this placement-ad synergy (0.09 in Table 5) would not be as strong due to their temporal separation, it would result in less audience loss during B's advertisement. Similar arguments would follow when A or B or both engage in distant placements, or when additional brands are present. As we will discuss shortly, however, the extent to which placements affect the size of the commercial audience is just one factor that marketers may consider when engaging in placement and advertising activities.

6. Discussion

6.1. Summary

Guided by behavioral theories and using data of television product placements, advertising, and audience

tuning, our investigation reveals a strategically important, yet (to our knowledge) previously undocumented, relationship between placements and advertising. This relationship is determined by the strength of brand association between these two crucial channels of brand communications, as captured by the brand-category match and temporal proximity between the placements and advertisements. While an analysis that fails to account for these two factors suggests that placements exacerbate audience decline, our results suggest more nuanced effects of placements.

In particular, while unrelated placements (no match) worsen audience decline over the coveted first spot of a commercial break, placements from the same brand as the advertisement (brand-only match and perfect match) can actually attenuate audience decline to a substantial degree, reducing the extent of audience decline by 5.0% in the case of a perfect match and by 10.8% in the case of a brand-only match. Significantly, these synergistic benefits are not reversed by increased audience decline during later advertisements in the same break, hence yielding a spillover benefit for subsequent advertisers. Moreover, we identify an interference effect that adversely affects the audience for first advertisements preceded by competitive placements earlier in the show. Given that the industry routinely measures and competes for audience changes in terms of a tenth of a ratings point, these findings generate valuable strategic insights for both advertisers and networks.

6.2. Contributions

This research contributes to both the advertising avoidance and product placement literatures. In particular, while the early research on product placement has focused on its impact as an independent persuasive vehicle (e.g., Russell 2002), our work reveals (to our knowledge) hitherto unknown positive and negative synergies between placement and the degree of audience decline during downstream advertising. These findings are also highly relevant to research on ad avoidance, as they reveal a specific way in which the actual program (rather than advertising) content can materially influence the extent to which downstream advertisements are avoided. Also, interestingly, in contrast to a negative impact of a brand's prior advertising on its audience size found in the literature (Siddarth and Chattopadhyay 1998), we find that a brand's placements can contribute to an increased commercial audience size. Hence, our results suggest that there may be synergistic advantages in using the media budget to combine placements and advertising rather than relying on advertising alone.

Finally, we note that there is currently considerable controversy in the behavioral literature with regard to the robustness (and even existence) of behavioral phenomena broadly attributed to priming and

nonconscious process oriented theoretical explanations (e.g., Bartlett 2013). While the current research is clearly not designed to isolate the underlying behavioral mechanisms for our findings, we note that one way to resolve the current controversy over priming oriented work is to seek evidence for these effects outside of the laboratory. As such, we think a nontrivial contribution of our work is that it identifies evidence of actual behavior consistent with the underlying behavioral theories in a large scale empirical investigation.

6.3. Managerial Implications

Our results reveal a number of novel and important managerial implications, especially about multimedia, competitive, and pricing strategies. First, the synergistic effects that we observed in the brand match and perfect match cases show that strategic use of placements can contribute to increased audience sizes during a brand's subsequent commercials, thereby aiding in audience retention during the first advertisement of a commercial break. Essentially, by pairing their placement and advertising activities (through shorter-term ad slotting or longer-term placement planning), marketers can reach a larger audience with their advertisements, a necessary condition for advertising to be effective. It is particularly noteworthy that placement from the same brand but a different product category yields the strongest effect, a finding of interest to firms engaged in branding efforts that span multiple product categories. Also, these positive effects are strongest when the matching placement occurs in the program segment immediately before the focal advertisement, suggesting that tight coordination is required to take full advantage of the synergy between them. From the broader networks' perspective, such coordination may reduce the chance that they will need to provide costly "make goods" to advertisers for delivering a smaller than expected audience.

Implicit in our discussion of these synergistic benefits is that they represent a positive return on the cost of placement. While a detailed cost/benefit analysis is beyond the scope of our work, let us briefly consider both the costs and benefits. The cost of product placement is relatively low compared to traditional commercial break advertising (Barnard 2011). As one example, *Advertising Age* reported that Coca-Cola paid \$26 million for a season-long right to product placements and advertising in the show *American Idol*, which, based on a 41 episode season, implies an average cost per sponsorship episode of \$634,146. Given that a single 30 second spot in the show reportedly cost \$620,000 (http://www.frankwbaker.com/2006_2007_ad_rates.htm), then even factoring in a season discount, the costs of such high profile product placement are clearly considerably less than the costs of the advertisements. Perhaps more important, the price

that brands are currently willing to pay for placement is likely based on their belief about its efficacy as a persuasive device. Thus, the advertising audience synergies we identify can be considered an additional upside benefit beyond placements' independent influence on audiences, for which the only potentially incremental cost required is increased scheduling coordination between the marketer and network.

Second, the interference effect that we observed for competitive placement activities can pose a (deliberate or incidental) challenge for competitors. In particular, when a competitor has engaged in placement in an earlier program segment, our results show that the audience size during the first advertisement of a break will decline by a larger amount. While marketers, even after viewing the programs' prerecordings or acquiring placement information from the networks, may still choose to advertise in the programs with competitors' placements, they should at least be cognizant of this interference effect when slotting the advertisements or negotiating specific advertising rates. In short, a smaller audience size than expected results in a higher cost per viewer for the advertiser.

Third, moving beyond the implications for the brand advertising in the first slot of the commercial break, the change in audience size from the first slot also results in a benefit (or cost) to downstream advertisers. As such, placement activities may attenuate (or exacerbate) the extent of negative audience externalities across advertisements (Wilbur et al. 2013). Put differently, the placements' synergistic (or interference) effects on audience retention over the first advertisement provide a higher (or lower) starting audience size for the later advertisements. Moreover, the synergistic effects on first advertisements are not reversed by increased audience decline later in the break. In fact, a brand with a later position in the break and no placements (i.e., often a less prominent brand or one with a lower advertising budget) can expect to enjoy the spillover effect from the first advertisement. From the networks' point of view, because placement activities can impact audience sizes during the entire commercial break, they may wish to incentivize advertisers to better coordinate their placement and advertising activities.

Finally, this discussion also has interesting implications for media pricing. For example, a firm wishing to synergistically couple its placement and advertising in the same program may negotiate for a lower rate for the most desirable first spot in a commercial break, as the network will benefit from improved monetization potential for the subsequent advertisements in the break due to the increased beginning audience size. More generally, advertisers and networks should factor the enhanced or diminished audience decline into the costs of reaching customers, which is often measured by cost per thousand or CPM. This is akin to Wilbur's

(2008a, p. 146) argument for an “adjusted CPM” to account for potentially lost viewers due to DVR use.

6.4. Limitations and Future Research

While our study reveals an important and understudied relationship between placement and advertising audience, like most studies, it has limitations. First, while reduced audiences unambiguously affect the potential impact of an advertisement on viewers, the shift in the aggregate size of the audience remains a somewhat blunt metric with which to fully assess the impact of placements on advertising effectiveness. For example, our data does not allow us to identify situations where increased or decreased attention paid to the advertisement do not result in a change in tuneaway behavior but do influence how the ad is processed. Thus, our findings may actually provide a rather conservative account of the placements’ true impact on the broadly defined effectiveness of downstream advertisements.

Second, given that we focus on advertising reach and that we do not observe brand attitudes or sales, this research cannot gauge the ultimate persuasiveness of the placement-advertising combination. However, because exposure to an advertisement is a necessary precursor to an advertisement’s influence on behavior, our results do clearly pertain to one critical component of a broader model of persuasion, i.e., viewers’ opportunity to see an advertisement (Briggs and Stuart 2006). Certainly, one important avenue for future research is to incorporate sales data and/or brand health metrics to quantify the direct effects of placement-advertising combinations on subsequent purchasing behavior or brand attitudes.

Third, in this initial investigation of placement-advertising synergies we have focused on assessing the core effects of the four match types that we identified. An interesting question that remains to be addressed is how viewers may react to multiple match types (e.g., incidents of both perfect matches and brand-only matches in the immediately preceding program segment). While we find that the inclusion of interaction effects among the four different match types does not contribute to model fit in either the calibration or holdout samples, this may be due to the relatively low co-occurrence of the different match types in 2007 compared to today’s product placement activities.⁷ As such, an important avenue for future research is the effect of more complex interactions between the match types. Additionally, future research may consider how characteristics of advertising creatives (e.g., Schweidel et al. 2006, Liaukonyte et al. 2014) may affect the way in that viewers react to product placement activity.

Fourth, to help better understand the full impacts of placement on advertising effectiveness, future research

could usefully examine the specific psychological mechanisms underlying our results. Particularly, while our empirical findings of synergy and interference effects are consistent with viewers paying differing levels of attention to advertisements following placements, our data do not allow us to either explicitly test this or to investigate the consequences of differential attention paid to advertisements that does not result in viewers tuning away from the current channel. For example, in the synergistic cases (brand match and perfect match), we would expect that increased attention toward brand stimuli has the potential not only to reduce audience decline during the ad but also to increase advertising effectiveness for those who view it. Conversely, for those viewers who do not tune away, the interference effect in the competitive match case may also result in reduced attention being paid to the advertisement, thus reducing its effectiveness. One particularly promising direction for research is the use of eye tracking technology to isolate the effects of placements on how viewers subsequently attend to related downstream advertisements; this may further inform how attention might differ across advertisements in the same break. This research could also investigate how prior exposure to a brand’s advertising (as opposed to its placement) might similarly influence the audience for additional downstream commercials.

Last, future research may push the data and methodological fronts of the current work. One such direction is the use of perceptual distance metrics at the category or brand levels, such as a metric that allows complementary categories to be closer to each other than our current binary classification allows. Another direction involves examining the potentially different impacts of paid versus unpaid placements on ad audience once this distinction becomes available in future data.

7. Concluding Remarks

In conclusion, the current research makes important contributions to the growing literature on product placement and advertising audience. It also suggests the applicability of the broader priming/automaticity literature to an important domain where their relevance has not yet (to our knowledge) been examined. It investigates a critical, yet understudied, relationship between placements and the extent of ad audience decline, and provides strategic guidance to the advertisers and the \$2 trillion global entertainment and media planning industry (*Global Entertainment and Media Outlook 2007–2011* by PricewaterhouseCoopers). Moreover, our results may shed light on other interactions between emerging media vehicles such as digital placement and advertising. For example, our findings are likely to be relevant to ongoing efforts to integrate the television (placement, advertising) and second-screen (online,

⁷ Detailed findings from this analysis are available from the authors on request.

mobile, and tablet brand placement, advertising, search, and shopping) experiences. Coupling placement with advertising may be a potent combination in driving sales through such platforms. More broadly then, we hope this research contributes to a more comprehensive understanding of how integrated marketing communications may impact consumers in the rapidly evolving media landscape.

Supplemental Material

Supplemental material to this paper is available at <http://dx.doi.org/10.1287/mksc.2014.0864>.

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Appendix A. Estimation of Brand-Program Fit

Let $z_{bp} = 1$ if brand b advertises in program p during our observational period, and 0 otherwise. Following Bradlow and Schmittlein (2000), we assume that the probability with which b advertises in p is driven by the latent distance between the two, $LatentDist_{bp}$, such that:

$$\Pr(z_{bp} = 1) = \frac{1}{1 + (LatentDist_{bp})^{\beta_b}},$$

where $LatentDist_{bp}$ is the Euclidean distance between brand b 's and program p 's location in a latent space. If $\beta_b > 0$ (as we find in our empirical application), then as the latent distance between brand b and program p increases, the brand is less likely to advertise in the program. Thus, the brand-program fit measure can be thought of as inversely related to the latent distance inferred from the set of programs in that a brand is observed to advertise. We further allow for β_b to be brand-specific, as some brands may “cast a wider net” and place commercials in a broader array of programs.

In the two dimensional latent space, we let P_{pd} denote the location of program p on dimension d . Similarly, we let B_{bd} indicate the location of brand b on dimension d . The Euclidean distance $LatentDist_{bp}$ is then given by:

$$LatentDist_{bp} = \sqrt{\sum_{d=1}^2 (B_{bd} - P_{pd})^2}.$$

We impose restrictions on the location of a number of brands to prevent shifts and rotation of the axes in the latent space. We assume that one brand (brand 1) is located at the origin to prevent the axes from shifting ($B_{11} = B_{12} = 0$). To prevent rotation over the y -axis, we assume that a second brand (brand 2) is located on the positive x -axis ($B_{21} > 0$, $B_{22} = 0$). To prevent rotation over the x -axis, we assume that a third brand (brand 3) is located such that $B_{32} > 0$. We treat the remaining coordinates corresponding to the brand locations

and programs as parameters to be inferred from the data. We further assume that:

$$\begin{pmatrix} B_{b1} \\ B_{b2} \\ \beta_b \end{pmatrix} \sim MVN \left(\begin{pmatrix} \bar{B}_1 \\ \bar{B}_2 \\ \bar{\beta} \end{pmatrix}, \Lambda \right),$$

and:

$$\begin{pmatrix} P_{p1} \\ P_{p2} \end{pmatrix} \sim MVN \left(\begin{pmatrix} \bar{P}_1 \\ \bar{P}_2 \end{pmatrix}, \Gamma \right),$$

where the mean vectors of the multivariate normal distributions are assumed to have diffuse normal priors and the covariance matrices have inverse Wishart priors. The mean vectors for brands and programs reflect the average location of all brands and programs, respectively, in the latent space.

The likelihood for the observed choice of programs in that brands place advertisements is given by:

$$\prod_{b \in B} \prod_{p \in P} \Pr(z_{bp} = 1)^{z_{bp}} (1 - \Pr(z_{bp} = 1))^{1 - z_{bp}}.$$

We estimate the hierarchical Bayesian model using a Metropolis-Hastings algorithm.

In the table below, we provide the posterior means and standard deviations across the MCMC iterations of the aggregate level parameters (\bar{B}_1 , \bar{B}_2 , $\bar{\beta}$, \bar{P}_1 , and \bar{P}_2). We also report the square root of the corresponding diagonal elements of the covariance matrix (Λ and Γ). These elements point to considerable heterogeneity across the location of the brands and programs in the latent space. Moreover, as reflected by the slope parameter $\bar{\beta}$, some brands place advertisements in programs that are at more distant locations, suggesting that these brands may be selecting a wider array of programs.

We then calculate the latent distance between brand b and program p ($LatentDist_{bp}$) as the Euclidean distance between b 's and p 's locations at each iteration of the MCMC sampler. The posterior mean of $LatentDist_{bp}$ across the iterations serves as one of the control variables in our regression analysis (Equation (3)).

While we derive our latent distance measure based on the firm's decisions on which programs to advertise in, one could reasonably derive the latent distance measure based on both decisions of which programs to advertise in and in which programs to engage in placement activities. We estimate such a model in which the decisions for a brand to advertise in a program and for the brand to have product placement in a program follow a bivariate logit model (e.g., Russell and Peterson 2000). One utility corresponds to the decision to advertise in a program and a second utility to the decision to place in a program. Each is affected by the distance between the brand and the program. The bivariate logit model allows for the possibility of coincidence in the brand's decisions to advertise and place in the same program. As expected, we find that the coincidence parameter is positive, suggesting that the tendency to engage in both placement and advertising is greater than independence would suggest. Calculating the posterior mean of the latent distance between brand b and program p resulting from this model, we find that the model fit of our regression model detailed in Equations (1)–(3) is worse than when the latent distance measure is derived based only on advertising decisions in terms of DIC, the MAE of the calibration sample, and the MAE of the validation sample.

	Aggregate size parameter	Mean (S.D.)	Heterogeneity parameter	Mean (S.D.)
Brand location on dimension 1	\bar{B}_1	0.02 (0.03)	$\sqrt{\Lambda_{11}}$	0.30 (0.03)
Brand location on dimension 2	\bar{B}_2	0.31 (0.07)	$\sqrt{\Lambda_{22}}$	0.45 (0.02)
Slope	$\bar{\beta}$	1.26 (0.03)	$\sqrt{\Lambda_{33}}$	0.20 (0.01)
Program location on dimension 1	\bar{P}_1	0.72 (0.10)	$\sqrt{\Gamma_{11}}$	0.18 (0.01)
Program location on dimension 2	\bar{P}_2	2.53 (0.03)	$\sqrt{\Gamma_{22}}$	0.30 (0.02)

Model comparison			
Model	DIC of calibration sample	MAE of calibration sample	MAE of validation sample
Latent distance based on advertising	323,391	1.249	1.257
Latent distance based on advertising and placement	324,150	1.259	1.268

Given that the model that infers the latent distance measure from brands' advertising and placement decisions results in a poorer model fit than the model in which latent distance is inferred based only on brands' advertising decisions, we use the latter in our analysis.

Appendix B. Pseudo-Code for WinBUGS

```

model{
  for(i in 1:N){
    change[i] ~ dnorm(mean[i], prec)
    mean[i] <- -intercept + controls[i] + brand[i] + program[i] +
      category[i] + placement[i]
    controls[i] <- -gamma[1] * Z[1] + ... + gamma[K] * Z[K]
    placement[i] <- -beta[1] * X[1] + ... + beta[S] * X[S]
  }
  prec ~ dgamma(0.01, 0.01)
  prec.b ~ dgamma(0.01, 0.01)
  prec.p ~ dgamma(0.01, 0.01)
  prec.c ~ dgamma(0.01, 0.01)
  for(b in 1:B){
    brand[b] ~ dnorm(0, prec.b)
  }
  for(c in 1:C){
    category[c] ~ dnorm(0, prec.c)
  }
  for(p in 1:P){
    program[p] ~ dnorm(0, prec.p)
  }
  intercept ~ dnorm(0, 0.01)
  for(k in 1:K){
    gamma[k] ~ dnorm(0, 0.01)
  }
  for(s in 1:S){
    beta[s] ~ dnorm(0, 0.01)
  }
}
end

```

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