Allocating Spending On Digital-Video Advertising

A Longitudinal Analysis Across Digital and Television

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Companies have been increasing their investments in digital-video advertising at the expense of television advertising. This study examines the efficacy of such investments with a media efficiency and saturation analysis on longitudinal datasets from a national restaurant chain and a national food and beverage brand. The authors found that digital-video advertising was more efficient than television advertising, so a shift is justifiable. These differences in efficiency, however, decreased rapidly as investment levels behind digital-video advertising increased. The impact of digital-video advertising saturates early, and companies need to account for such diminishing returns in their media strategy.

INTRODUCTION

In 2016, U.S. digital-advertisement spending reached $72 billion, whereas spending on television advertisement was $67 billion (Poggi, 2017). This was the first time that the investment in digital advertisements exceeded the investment in television advertisements, and this trend is expected to continue in the near future (eMarketer.com, 2016). Although some of the increase in investment in digital advertisements can be attributed to an overall increase in marketing budgets, in 2016, 38 percent of U.S. marketers diverted funds from their broadcast budgets to their companies' digital-advertising initiatives—primarily digital-video advertising (Advertiser Perceptions, 2016).

In increasing their spending on digital-video advertising, companies are, in general, following their viewers. In 2016, more than half of Americans watched television shows online at least once a month. This trend is increasing rapidly among younger Americans. Nielsen, Inc., reported a fall of 9.5 hours per week in traditional television viewing by 18- to 24-year-olds during the 2011 to 2015 period, and most of this time was spent on online video streaming (Marketing Charts, 2016). Following this move by their viewers, companies have

Management Slant

- Television has higher scale parameters and higher retention compared with digital media.
- At low levels of support, the sales volume attributable to digital videos can be higher than that attributable to television.
- Digital-video advertising effectiveness is high, but reach is highly limited.
- To use digital video effectively, companies need to spend on digital-video advertising, but not too much.

been investing in online video websites, such as YouTube and Hulu. Even traditional content-generation companies, such as Disney/ABC, NBC/Comcast, and CBS, are focusing on online digital-video advertisements to monetize their content.

Although companies are increasing their investments in digital-video advertising, the efficacy of such moves has not been investigated in media-saturation studies. Media agencies and brands do conduct various surveys and tests for both premarket and in-market performance of advertisement copies and campaigns, but these tests seldom capture the diminishing returns from increase in marketing investments. This article thus poses two research questions:

RQ1:   How do digital-video advertising and traditional television advertising compare with regard to their effectiveness and efficiency in driving retail footfalls and sales?

RQ2:   How do the effectiveness and efficiency of digital-video advertising scale with increase in investments?

The authors used a rich dataset comprising two years of weekly sales, footfalls, pricing, and all self- and competitive marketing information of a restaurant chain operating 781 quick-serve restaurants in the United States. The dataset also provided store-specific information, such as location, competitors, operating hours, and store quality-of-service ratings. The authors used a reduced-form dynamic model and a Kalman-filter–based estimation process (suggested in previous work; Naik, Raman, and Winer, 2005) to assess the effectiveness and efficiency of digital and television advertising while controlling for all other marketing and environmental variables.

The authors found that at the current spend levels of the restaurant chain (1.5 percent of the television spend), digital-video advertising was more efficient—seven times more—in driving additional footfalls to the restaurant than television. The efficiency started to decline rapidly, however, as the investment level increased. Overspending on digital-video advertisement very quickly could make television advertisement more efficient. Television thus still might hold the key in today's world, because it still reaches a much larger audience and has a significantly higher maximum potential, compared with digital-video advertisement.

The authors tested the validity of the current study's results in the packaged food and beverages industry, with a rich dataset encapsulating three different theme campaigns—standard, news, and reminder (Bruce, 2008). The results indicated that media saturation—in particular, early digital-media saturation—was observed in the selected food and beverage brand as well. Even though different advertisement copies and campaign themes saturated at different levels, digital-video advertisements saturated early.

Detailed financial information related to the restaurant chain's production, media-buy, and execution costs enabled the authors to develop and solve mathematical-optimization models of allocation of marketing budget across various marketing tactics. The authors found that the restaurant chain could increase its investment in digital videos by 100 percent, but if it did so, it would reach the point where shifting the funds from television to digital-video advertising becomes suboptimal. Such a point is reached when digital-video advertising is only at 4 to 5 percent of the spend level behind television. This is a worrisome finding given that most companies are increasing the investment level behind digital-video

advertising to about 10 to 30 percent of their television budget.

The current study and method had several advantages. Because the study compared digital-video advertising with television advertising, the authors could control for the impact of the creative content of a video (Pfeiffer and Zinnbauer, 2010), because both formats used the same creative content during the analysis period. The company, of course, deployed different advertisement copies over the two-year period, but at one point of time, the same creative content was used in digital-video and television advertising.

With the food and beverage dataset, the authors also were able to compare three different themed campaigns and show that the results held across different types of creative content. In addition, the authors used a Kalman-filter–based approach to measure the advertising efficiency, rather than ordinary least squares. The latter has been shown to give biased estimates for measuring advertising efficiency when researchers use reduced-form market-response models (Naik, Mantrala, and Sawyer, 1998).

The authors used longitudinal data and looked at the dynamic aspects of spending on media—namely retention and saturation, in addition to the standard effectiveness and efficiency metrics—while controlling for all other marketing and environmental factors. Research has shown that dynamic, environmental, and competitive factors significantly influence advertising effectiveness and, subsequently, the estimated results of the advertising response function (Vakratsas, Feinberg, Bass, and Kalyanaram, 2004). This study's methodology and longitudinal dataset thus allowed the authors to conduct a saturation analysis of investments in online and offline media.

The article is organized as follows. First is a review of the literature on effectiveness

Although consumers are less tolerant of online video advertising, they also are involved more when consuming online media.

of television and digital advertising and the metrics and market-response models used in estimating advertising effectiveness. Second, the data for the restaurant chain are presented, followed by the estimation method and results. The authors report results for an optimal marketing mix for the restaurant chain. Next are the results of the validation study—the media-saturation analysis in the national food and beverages brand. The article concludes with a discussion of findings and implications for practitioners.

BACKGROUND
Literature Review on Effectiveness of Advertising

Television advertising always has been considered a necessary evil from the consumer's perspective because of its obtrusiveness (Li, Edwards, and Lee, 2002), and a long stream of empirical research has focused on its effectiveness. Research on the short-term effectiveness of television advertisements has focused largely on "micro" advertising factors, such as which advertisement works, when it works, and where it works (*e.g.*, Tellis, Chandy, and Thaivanich, 2000). Research on the long-term effectiveness of advertising has focused on how advertising decreases consumers' price sensitivity and affects brand equity (*e.g.*, Dekimpe and Hanssens, 1999).

The advent of digital media has prompted increased research on the effectiveness of online advertising in its various forms, such as banners, search, and digital videos (Chang and Thorson, 2004; Dijkstra, Buijtels, and Van Raaij, 2005; Manchanda, Dubé, Goh, and Chintagunta, 2006; Naik and Raman, 2003; Ryan, 2016; Sherman

and Deighton, 2001). This research stream suggests that although consumers are less tolerant of online video advertising, they also are involved more when consuming online media (Logan, 2011). Although the obtrusiveness of online advertisements increases consumers' purchase intentions (Goldfarb and Tucker, 2011), consumers also are more aware of how online advertisements are trying to manipulate them (Boush, Friestad, and Wright, 2009), which can reduce online advertisements' effectiveness. Online media, however, can be targeted more narrowly toward its audience, which can increase online advertisements' effectiveness.

This lack of clarity on the effectiveness of online media likely stems from the fact that the relative effectiveness of online advertising over offline advertising has had little investigation in the marketing literature. An exception is a study that found that search-engine marketing was more effective in acquiring new consumers than was television advertising (Pfeiffer and Zinnbauer, 2010). In that study, television had a stronger impact on brand equity because of the medium's ability to convey messages in an emotional manner with video advertisements. Because the current article compares digital-video advertising with television advertising, the authors were able to control for the aspect of messages and to assess the effectiveness of digital-video advertising relative to television advertising.

Metrics and Models Used to Measure Advertising Effectiveness

The effectiveness of television campaigns often is measured as the incremental sales

volume attributed to the campaign per unit of execution used by the advertiser. Execution of television advertisement is measured in terms of gross rating points, whereas execution of digital advertisement is measured in terms of impressions (or million impressions). Estimating the incremental sales volume attributable to the campaign in turn requires understanding three key constructs: the retention rate, advertisement stock, and saturation levels.

Retention Rate. The retention rate is a measure of the "stickiness" of the advertisement. A retention rate of $\alpha_k (0 \leq \alpha_k \leq 1)$ for a campaign k implies that although there is some forgetting (forgetting being a function of $1 - \alpha_k$), an advertisement seen in Week t continues to remain about αk times as effective in driving incremental sales in Week t+1 as it was in Week t. The retention rate thus is a metric that captures the dynamic impact of an advertisement and is used to infer how long an advertisement seen today will influence a person's purchasing decision in the future.

Ad-Stock. The ad-stock, or "goodwill," is a latent construct that is defined as "the impact advertising has over time on sales and awareness" (Ephron and Macdonald, 2002). It links media execution measured in terms of gross rating points and retention rate and typically is modeled with a geometric lag model (presented in Equation 1):

$$Q_{kt} = \theta_{0k} + \sum_{l=0}^{\infty} (1 - \alpha_k) \alpha_k^l G_{kt},\qquad(1)$$

where Q_{kt} is the advertising-stock variable, α_k is media retention rate, and G_{kt} is media execution (Palda, 1965).

Saturation. The saturation effect is based on the principle of diminishing returns beyond a specific level of exposure to an advertisement. It usually is modeled

with a Weibull transformation of Q_{kt}, the advertising-stock variable (See Equation 2). The saturation model allows researchers to capture various nonlinear relationships (including saturation and S-shaped) that are hypothesized between the dependent variable and the ad-stock. The parameter η_k (in Equation 2) is known as the Weibull shape parameter, and λ_k is known as the scale parameter.

$$Y_{kt} = 1 - e^{-(Q_{kt}/\lambda_k)^{\eta_k}} \qquad (2)$$

The three quantities, α_k, λ_k, and η_k, are unknown and need to be estimated from the data. The "transformed" media variable, Y_{kt}, is linked to the dependent variable (e.g., sales, footfalls, revenue) with a sales-response model (of the form presented in Equation 3). The Cobb–Douglas function presented in Equation (3) describes the reduced-form relationship between Z_t (a measure of quantities such as sales, the number of footfalls, revenue) and the transformed marketing variable Y_{kt} during period t.

$$Z_t = e^{\beta_0} e^{\varepsilon_t} \prod_{k=1}^{K} Y_{kt}^{\beta_k} \prod_{j=1}^{J} X_{(K+j)t}^{\beta_{K+j}} \qquad (3)$$

e^{β_0} captures the fixed effects, and $X_{(K+1)t}$ to $X_{(K+J)t}$ are control variables, such as pricing, competitive actions, seasonality, trend, macroeconomic conditions, and calendar-time effects. The model (presented in Equation 3) has $k = 1…K$ media variables, such as television advertisement and digital advertisement, that likely will affect Z_t. The estimates of incremental sales attributable to a marketing tactic k allow one to estimate both the effectiveness and the efficiency of the tactic k.

Efficiency is defined as the incremental sales, footfalls, or revenue attributable to dollars spent on the media. One of the common metrics used to measure efficiency is the return on investment (ROI), which is the incremental profit attributable to a medium per dollar spent on that

medium. It is important to evaluate both effectiveness and efficiency simultaneously when evaluating and comparing the performance of advertising across media types. A specific media type could be very effective in driving footfalls and sales, but a costly media buy can lead to a suppressed ROI.

METHODOLOGY

The authors used data of a U.S.-based quick-serve restaurant chain, CeCareus, Inc. (a fictitious name used in compliance with a nondisclosure agreement), with more than 781 restaurants located across the country. CeCareus competes for customers against two major national restaurant chains and several regional restaurants. CeCareus operates in a highly competitive industry, so the firm tries to be on the customers' "top of the mind" by investing across multiple mass-media channels, including television, digital, radio, and print media.

CeCareus tracks both the footfalls and the sales (revenue) on a weekly level at each restaurant. Weekly data also are available for all marketing activities CeCareus is engaged in (See Table 1); competitive actions; and environmental conditions, such as local and regional macroeconomic conditions (updated monthly), weather, and seasonality. Information about restaurant-level covariates, such as the local sociodemographic conditions and the number and characteristics of competitors within various radii, also is available.

Marketing Data

CeCareus's marketing investments include television, various digital formats, radio, print, and coupons. Within digital media, CeCareus invests in digital search, display videos (preroll advertisements), display banners of varying levels of richness (e.g., flash banners; rich media-based banners; and custom display, a strategy wherein the

company pays websites such as Yahoo to change the background of the homepage of its website with banners provided by the company). Some of the marketing is customized for each store, and some is customized for a region. Television and digital-video advertising, however, are coordinated at the national level, with more investments (buys) in designated market areas with more stores.

CeCareus's marketing investments were pegged at about 9.1 percent of their revenue in Year 1, and the investment dollars decreased by 1.2 percent in Year 2 of the study's analysis horizon. The investments in traditional media (e.g., television, radio, and print), which formed 87.3 percent of the total marketing budget, decreased by 1.4 percent, whereas the investments in digital media increased by 16.7 percent (See Table 1). At the time of this analysis, CeCareus's investments in social media were minimal, and the company was focused primarily on content building rather than targeting customers.

Over the duration of the two years constituting the analysis horizon, CeCareus, Inc., used several campaigns to communicate with its customers and potential customers. Although special banner advertisements were created in Flash and rich media for these campaigns, the advertising copies used in the television advertisements and the digital-video advertisements were the same (See Table 2). The use of the same advertising copies across television as well as digital media provided the opportunity to compare the effectiveness as well as the efficiency of the two instruments. Not all campaigns used both television and digital videos, which helped the authors in identifying the impact of each of these instruments.

Within digital display, there was a 93.3 percent increase in the investment behind digital videos, and the data contained

TABLE 1
Scaled Marketing Investments by CeCareus in Year 1 and Year 2

Marketing Medium	Year 1	Year 2	% Change Year 2 vs. Year 1	Aggregation
Television	0.78	0.79	+0.49%	National
Digital display	0.10	0.12	+16.7%	National
Digital search		0.01		National
Coupons	0.06	0.06	+0.05%	Store
Print	0.00	0.00	−33.3%	Regional
Radio	0.02	0.01	−60.4%	Regional
Rest	0.03	0.01	−58.4%	Regional
Total	1.00	1.00	−1.20%	Regional

TABLE 2
Scaled Investments by CeCareus on Digital Display in Year 1 and Year 2

Digital Display	Year 1	Year 2	% Change Year 2 vs. Year 1
Flash	0.64	0.53	−0.40%
Rich media	0.13	0.19	+66.3%
Custom	0.11	0.09	−2.10%
Videos	0.12	0.19	+93.3%
Total	1.00	1.00	+16.7%

TABLE 3
Model Outputs: Coefficients of the Marketing Variables, Retention Rates and Weibull Scale Parameters

Marketing Media	β (t)	Retention	Scale
Television	0.0279 (5.34)	0.50	2.8
Digital videos	0.0062 (4.22)	0.60	1.2
Flash	0.0021 (2.89)	0.20	1.3
Rich media	0.0016 (2.09)	0.30	1.3
Custom	0.0003 (3.12)	0.25	1.5
Search	0.0011 (4.76)	0.40	1.9
Print	0.0001 (1.03)	0.20	1.0
Radio	0.0000 (0.98)	0.20	1.0
Coupons	0.0047 (3.82)	0.10	2.3

significant range as well as variation in the investment level behind the vehicle. This range enabled testing for the saturation effects of digital videos. The range in the data generated by the week-by-week variation in the gross-rating-point investment behind television also enabled the testing of saturation of television advertisement.

Estimation
Estimation involves simultaneous estimation of the retention rates, α_k; the scale parameters, λ_k; and all the coefficients in the Cobb–Douglas function (*i.e.*, βs). The authors assumed that ε_{st} had a normal distribution, with a mean 0 and a variance σ^2_ε. Similar to the case of a Raleigh distribution, the authors fixed the η_k parameter at 2 and used the Kalman filters to estimate simultaneously all other parameters in Equations (1) to (3).

RESULTS
All television and digital-marketing variables were statistically significant (See Table 3). Television and digital-video advertisement had higher retention rates as compared with other tactics, and television had a significantly higher scale parameter as compared with the digital media. The impact of some of the traditional media, such as print and radio, was not measurable and is not statistically significant.

Effectiveness and ROI
The effectiveness estimates (See Figure 1) indicate that digital-display tactics, such as video advertisements and custom displays, were significantly more effective than television. The efficiency estimates (See Figure 2) paint a picture similar to the effectiveness estimates (See Figure 1). Digital videos and custom display had a significantly higher ROI as compared with television. Digital search had a high ROI despite a low effectiveness, because its execution is inexpensive.
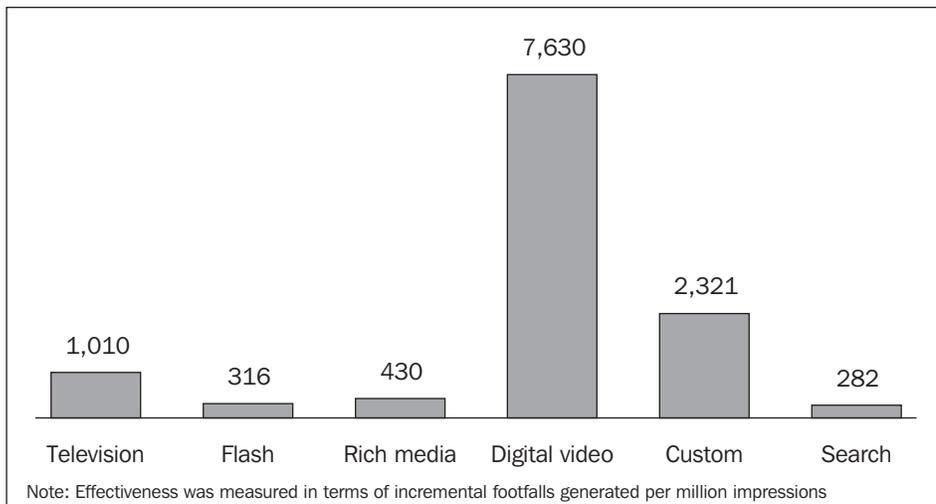
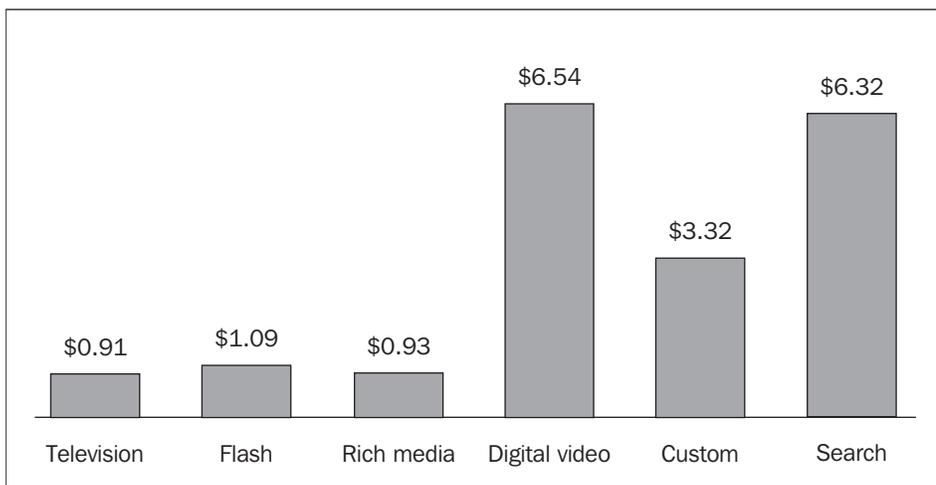**Figure 1** Effectiveness of Television and Digital Media

Figure 2 Efficiency of Television and Digital Media

The results indicate higher effectiveness and efficiency of digital videos as compared with their effect when they were shown on television (See Figures 1 and 2). The relatively low spend on digital videos seems questionable from the optimal-strategy perspective, given that one might want to allocate funds from other media toward digital videos. For example, the investments behind television theoretically could be decreased (*i.e.*, from the levels presented in Table 1) and moved to support digital videos. Because the effectiveness and efficiency of digital

videos were significantly higher than those for television (See Figures 1 and 2), such a reallocation likely would increase both the footfalls and the revenue for CeCareus.

Maximum Potential and Saturation
Effectiveness and efficiency results present one perspective on the impact of television and digital marketing on footfalls for CeCareus (See Figures 1 and 2). The model coefficients (See Table 3) can be used to create an alternative perspective—one that looks at how the efficiency of the media changes as the investment in the media

type increases. The authors present this perspective (See Figure 3) on the basis of

- the beta coefficients of the media type, which were indicative of the maximum potential of that medium;
- the retention rates associated with the medium;
- the shape and scale parameters estimated for the medium.

For the transformed variables used in this study's models, the authors compared the maximum potential and saturation of television and digital videos (See Figure 3). The results indicate the following:

- The maximum potential from television is approximately four times higher than that from digital videos. In the best case scenario, therefore, if funds were not a constraint, television could generate four times the number of footfalls as compared with digital videos.
- The incremental footfalls driven by the digital videos showed a very early saturation. As the funds behind digital videos increase, therefore, the effectiveness is expected to decrease rapidly.

This finding implies that companies should spend on digital-video advertising, but not too much. It is likely that the high ROI and effectiveness of digital videos were due to a higher retention rate, which arises from consumers' engagement in the transaction and content on the Internet (looking for and watching a specific video) and better demographic targeting. The faster saturation, and thus the limit of the usefulness of advertising using digital videos, arises from the limited reach that advertising using digital videos has because of the chosen medium as well as because of good targeting. As companies widen the target base, reach increases, and although saturation also would come later,
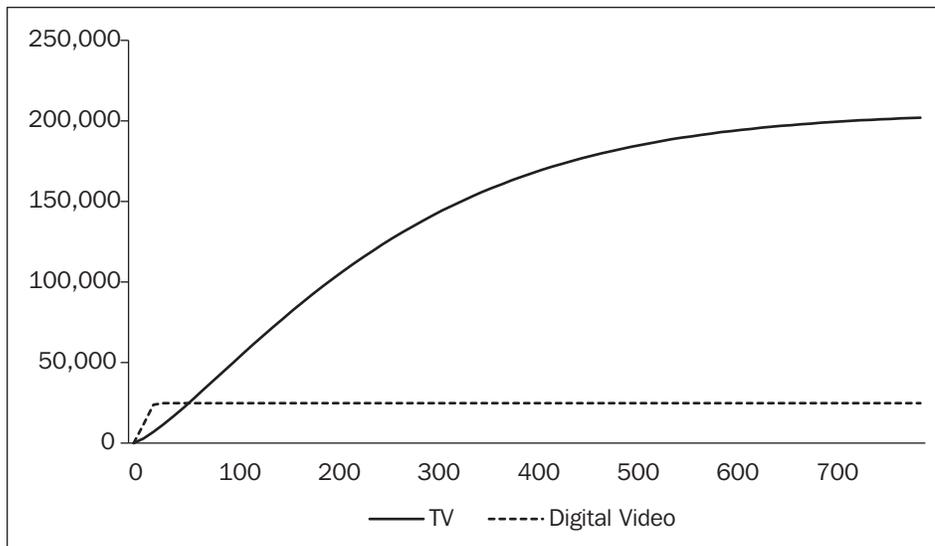
Figure 3 Maximum Potential and Saturation Patterns Of Television and Digital Videos
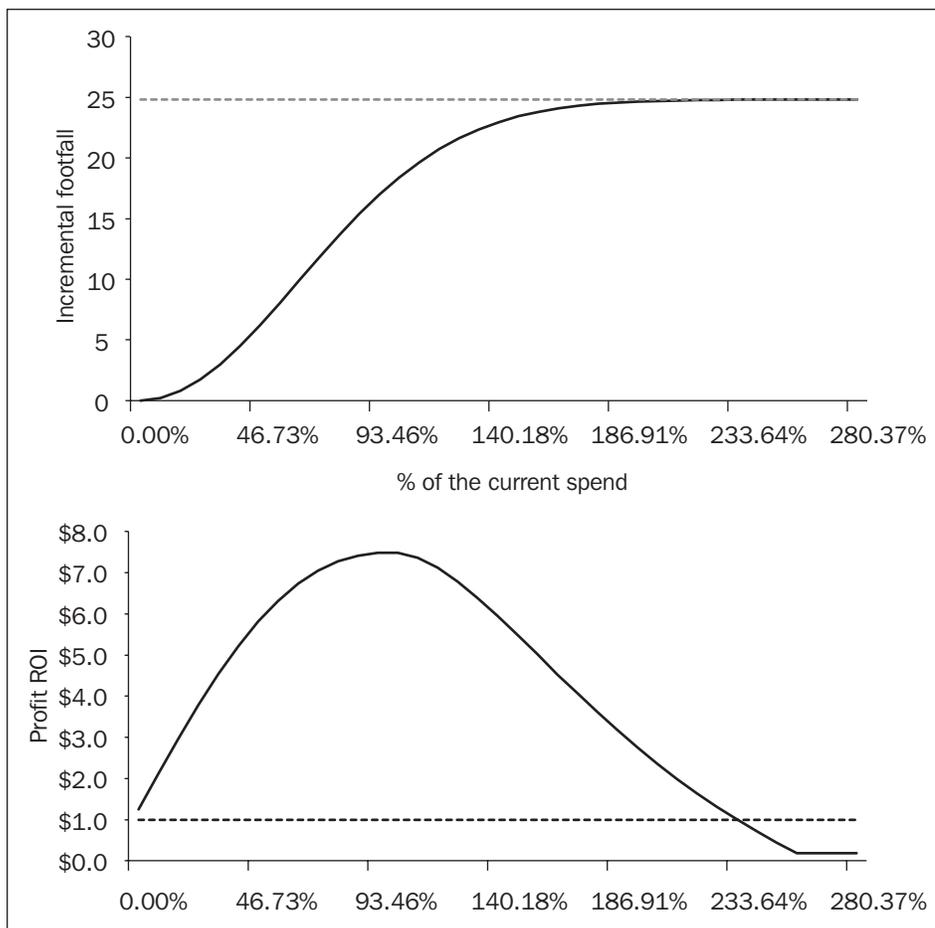

Figure 4 Change in Effectiveness and Return on Investment (ROI) with Increase in Investment for Digital Videos

the effectiveness of digital videos would drop. To use digital video effectively, companies need to spend on digital video advertising, but not too much.

Optimal Marketing Mix

Accounting for the maximum potential and the shape of the saturation curve in media planning implies that the problem of media planning be formulated as a non-linear optimization problem (Naik *et al.*, 2005; Zufryden, 1973). In CeCareus's case, the ROI from digital-video advertising changes with increase in investments (See Figure 4). CeCareus currently is operating at (approximately) the maximum ROI point, and an increase in investment likely will lower the ROI.

Because the ROI will continue to be over $1.00 until approximately a 233 percent increase in the investment, however, the optimal media plans could consider increasing the spend behind digital videos up to that level. The joint optimization of all the marketing-mix variables shows exactly this (See Table 4). The optimization model suggests a 200 percent increase in the investment behind digital videos and an overall 150 percent increase in the digital-display budget but a 6.3 percent cut in the television budget. The reallocation likely would yield a $0.13 (14.6 percent) increase in ROI, if one assumes that total spend remains the same.

VALIDATION

The authors validated their key results regarding the relative effectiveness and efficiency of investments in digital-video media compared with the prominent offline medium, television, with a rich longitudinal dataset from a U.S. national food and beverage brand. The dataset contained the company's weekly investments in media advertising for its brand across three different themed campaigns—standard, news, and reminder—across 63

TABLE 4
Results: Optimization of the Marketing Mix

Marketing Instrument	Year 2	Proposed	% Change Year 2 vs. Year 1
Television	0.79	0.74	−6.33%
Digital videos	0.03	0.06	+100.00%
Flash	0.06	0.04	−33.33%
Rich media	0.03	0.03	−5.52%
Custom	0.01	0.02	+112.5%
CeCareus digital search	0.01	0.02	+100.00%
CeCareus coupons	0.06	0.08	+33.33%
CeCareus print	0.00	0.00	+00.00%
CeCareus radio	0.01	0.00	−100.00%
Rest	0.01	0.01	
Total	1.00	1.00	
Net impact on ROI ($)	0.89	1.02	

Note: ROI = return on investment.

TABLE 5
### Scaled Investments by Beverage on Television and Digital Display in Years 1 and 2

Campaign/Creative Theme	Medium	Year 1	Year 2	% Change Yr 2 vs. Yr 1
Standard	Television	0.21	0.23	9.52%
	Digital videos	0.02	0.05	150.00%
	Digital display	0.02	0.01	−50.00%
	Search	0.01	0.01	0.00%
	Social media	0.12	0.01	0.00%
	Coupons	0.02	0.03	50.00%
News	Television	0.16	0.19	50.00%
	Digital videos	0.05	0.06	18.75%
	Digital display	0.02	0.03	20.00%
	Search	0.02	0.02	50.00%
	Social media	0.02	0.02	0.00%
	Coupons	0.03	0.04	33.33%
Reminder	TV	0.29	0.19	−34.48%
	Digital videos	0.04	0.05	25.00%
	Digital display	0.03	0.02	−33.33%
	Search	0.01	0.01	0.00%
	Social media	0.03	0.02	−33.33%
	Coupons	0.01	0.01	0.00%

U.S. markets over two years (See Table 5). It also contained the corresponding weekly scanner data for the grocery channel. Control variables for macroeconomic factors, weather, seasonality, holidays, demographics, and trend were also available. The analysis was limited to the grocery channel, because that channel alone accounted for 73 percent of the sales volume of the brand. Data in other channels (*e.g.*, convenience and gas stores, mass-merchandising, and the club-store channel) were sparse and incomplete.

Results

The analysis for the food and beverage brand presents a pattern of results similar to CeCareus's (See Table 6): Television had higher scale parameters and higher retention compared with digital media, across all three creative themes. The authors plotted the effectiveness and efficiency of the television and digital-media investments (See Figures 5 and 6) across all three creative themes. Similar to CeCareus, digital display and digital videos were more effective than television in increasing sales per million impressions, and they were also more efficient, generating higher ROI.

Results for the saturation analysis (See Table 6 and Figure 7) support the implications that were expressed with CeCareus's data. These results also indicate that the maximum potential from television is significantly higher than that from digital videos. At low levels of support, however, the sales volume attributable to digital videos can be higher than that attributable to television. This makes the digital videos significantly more effective and efficient as compared with television advertisements when the investments in digital videos are moderate to low. In conclusion, the authors found that the results and implications indicated by a restaurant chain held true in a very different product sector—food and
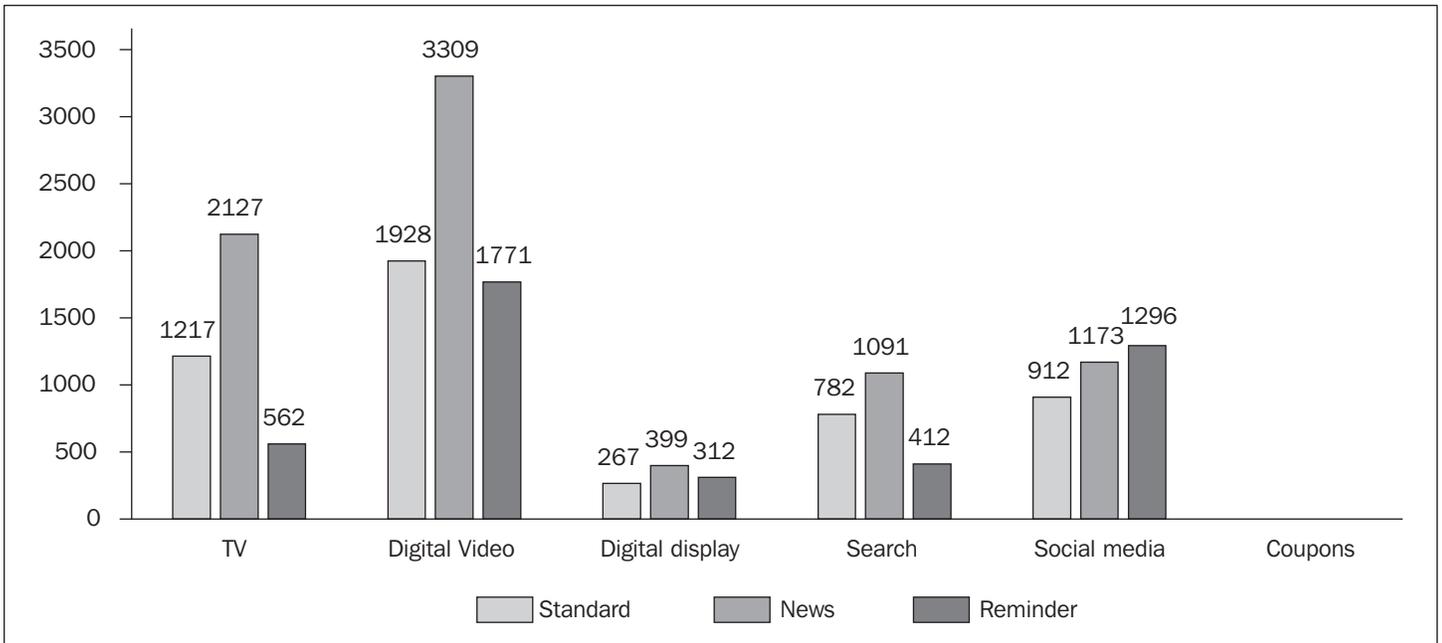
Note: Effectiveness was measured in terms of incremental sales per million impressions

Figure 5 Effectiveness of Television and Digital Media for the Food and Beverage Brand Across Campaign Themes
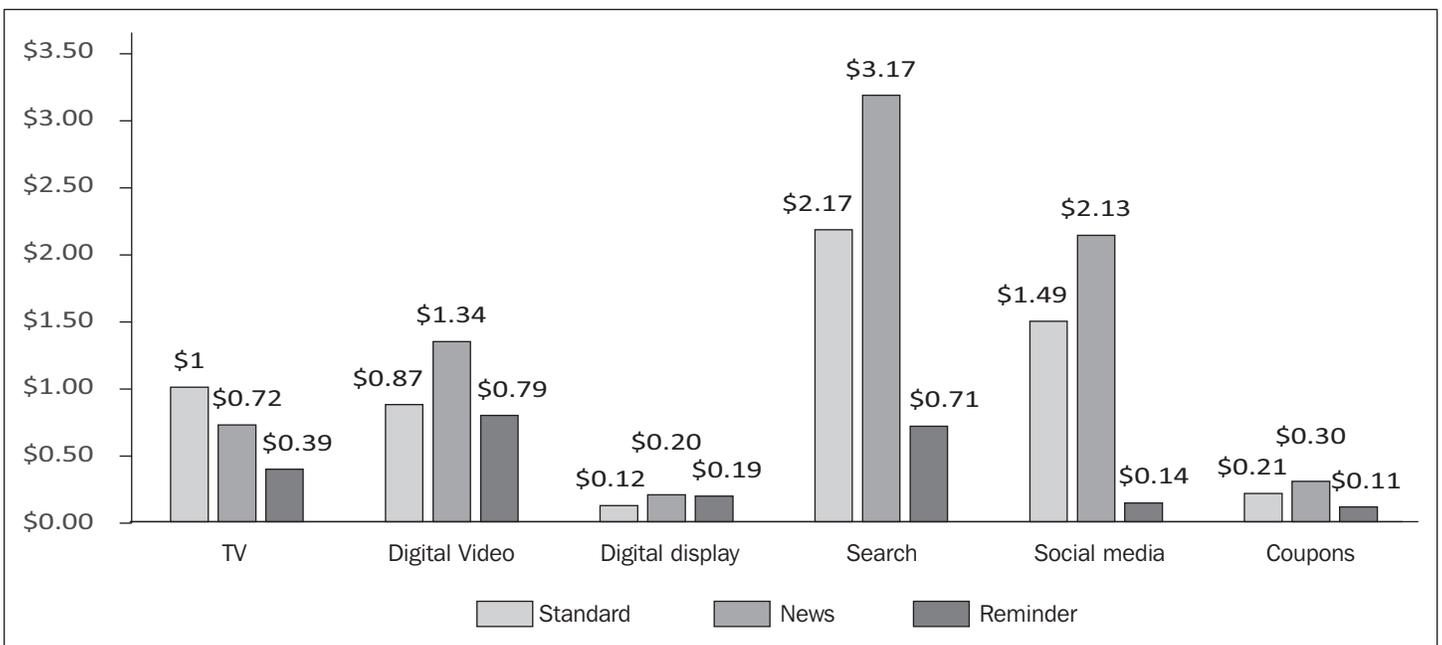

Figure 6 Efficiency of Television and Digital Media for National Food and Beverage Company Across Campaign Types

TABLE 6

Results: Model Coefficients for Food and Beverages Brand

| Campaign/Creative Theme	Marketing Medium	β (t)	Retention	Scale
Standard	Television	0.0386 (2.82)	0.80	2.8
	Digital videos	0.0065 (2.31)	0.50	1.1
	Digital display	0.0024 (1.99)	0.30	1.4
	Search	0.0017 (2.72)	0.60	1.5
	Social media	0.0015 (2.71)	0.40	1.7
	Coupons	0.0011 (0.98)	0.20	1.1
News	Television	0.0329 (4.01)	0.60	2.5
	Digital videos	0.0049 (1.97)	0.40	1.8
	Digital display	0.0008 (1.01)	0.30	1.2
	Search	0.0015 (3.47)	0.50	1.5
	Social media	0.0010 (2.21)	0.20	1.3
	Coupons	0.0027 (1.98)	0.10	1.1
Reminder	Television	0.0354 (3.78)	0.70	2.3
	Digital videos	0.0041 (2.19)	0.50	1.6
	Digital display	0.0014 (2.07)	0.40	1.5
	Search	0.0012 (3.12)	0.50	1.5
	Social media	0.0001 (1.12)	0.20	1.3
	Coupons	0.0011 (0.98)	0.30	1.1
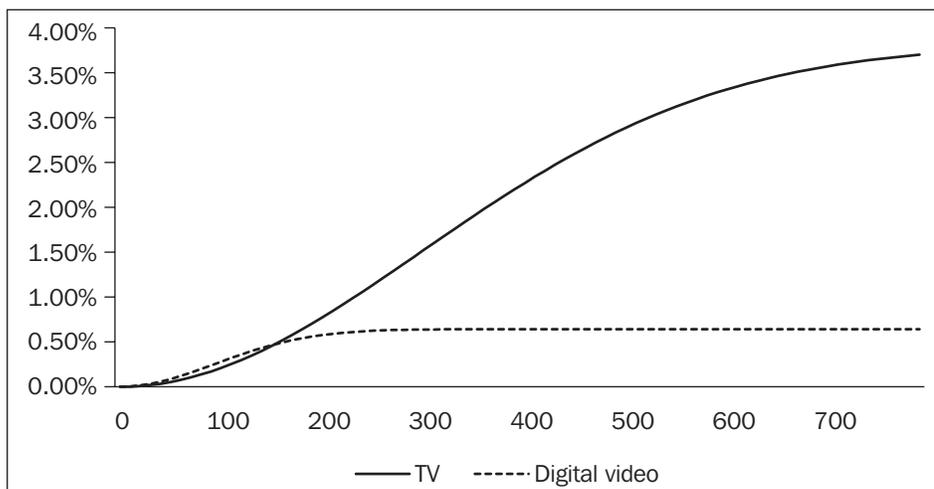
Figure 7 Maximum Potential (Percentage of Total Volume) and Saturation Patterns of Television and Digital Videos for a Standard Campaign

beverages—which provides confidence in the study's findings.

The authors acknowledge that marketing effectiveness and retention rates of a campaign could differ significantly by channel, because consumers visiting channels such as convenience and gas stores could have a different sociodemographic profile than consumers visiting a club store, such as BJ's Wholesale Club, for the same brand. The relationship between television and digital advertising could differ across channels.

DISCUSSION

In this article, the authors analyzed a U.S. restaurant chain's and a U.S. food and beverage brand's investments in advertising in offline and online media. With a dynamic model, the authors focused on the effectiveness, efficiency, and saturation of digital-video advertising compared with television advertising, with the same creative content deployed across both. The findings can be summarized as follows:

- Digital-video advertising was highly effective and efficient but showed quicker saturation.
- At the spend level that yielded the highest ROIs, digital-video advertising provided a higher ROI than television advertising, because of its higher retention rates and lower execution costs.
- Digital-video advertising had a much narrower and more targeted reach compared with television advertising.

An earlier study showed similar saturation curves using 14 weeks of data (Fulgoni and Lipsman, 2014). Whereas the authors of that study emphasized that companies should invest in television as well as web and digital-video advertising to reach the full potential, the similarity of the curves (in particular the lower reach and early saturation of digital advertising as compared

with television-based advertising) provides additional support for the current study's findings.

Although the focus in this study was on comparing digital-video advertising with television advertising, in the current study's model, the authors also estimated the effectiveness and efficiency of several other digital-display media. The authors found that search was low in effectiveness as compared with other digital media. One reason for this could be that the companies are established players in the United States, and consumers do not need to search for them. Most consumers who live in its vicinity likely are aware of the presence of the restaurant and therefore less likely will search for it online. Similarly, most people living in the United States likely are aware of the food and beverage brand and less likely will search for it. Investments in online search have a high ROI because the amount of investment required is low given the pay-per-click approach in digital search.

The authors also controlled for factors that are beyond a company's control, such as holidays and competition. The strong impact of holidays, seasonality, and the macroeconomic conditions point to the role played by uncontrollable factors in a restaurant's demand. The results related to competition support beliefs such as the following:

- The location of competitors matters.
- Competitive pricing and discounts can have a large impact on the restaurant's footfalls.
- Competitive media that act as a reminder of the brand can have a large negative impact on the restaurant's footfalls.

One reason for the high effectiveness and efficiency of the digital-video advertisements might be that consumers who view the media and watch the digital-video

advertisements online are involved more with the product than consumers who view the same advertisements on television. Companies thus can target their consumers better online as compared with offline. Although the authors do not have consumer-level data to assess this possibility, they note that the companies chose the online websites using the same targeting criteria as they used to choose television programs to advertise on. Future research can investigate the reasons why the gap in effectiveness and efficiency is present.

The lack of consumer-level data also limits the authors in the attributions they can make in their model: Did the people who saw the advertisement go to the restaurant or purchase the good? This limitation provides opportunities for future research to study how specific consumer segments, such as frequent shoppers, respond to television versus digital-video advertising.

The study's optimized marketing-mix model for the restaurant chain shows that, within digital media, the restaurant should increase investments in digital search, custom display, and video by 100 percent while reducing investments in Flash and rich media. The optimized investment allocation also recommends reducing spending on television advertising by 6 percent and spending in radio by 100 percent. No change is recommended for print advertising.

With these reallocations in marketing spend, CeCareus's ROI would increase from $0.89 to $1.02 for every $1 spent. This is a significant improvement in marketing efficiency based on simple resource reallocation. For marketing practitioners, there thus is an opportunity to readjust marketing spend by allocating higher spend on digital-video advertising to drive optimal traffic and ROI, but with the caveat that the company soon will reach its maximum possible potential in digital-video advertising.

In conclusion, the current study's saturation analysis demonstrates that it is very important to balance the choice between investing in television advertisements and digital-video advertisements. Because of the fragmented nature of the consumption of digital-streaming videos and shows, digital-video advertising effectiveness is high, but reach is highly limited. Media agencies and companies need to be cautious about a headlong plunge into moving dollars from traditional television to digital video. **JAR**

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Appendix A

Complete Model and Parameter Estimates for CeCareus Used in the Analysis

The lag variables capture the impact (traffic, sales, revenue) in the week following the holiday

Variable	Coefficient	0	Variable	Coefficient	0
Constant	−0.0078	−5.44	Holiday dummy Thanksgiving	0.0608	24.46
Media investments (transformed)			Holiday dummy Christmas	−0.0455	−19.67
Television	0.0279	5.34	Holiday dummy Christmas (lag)	0.0021	0.89
Email	0.0000	4.00	Holiday dummy Martin Luther King Jr. Day	−0.0542	−25.50
Digital video	0.0062	6.93	Holiday dummy Super Bowl	−0.0562	−26.97
Flash	0.0021	2.89	Holiday dummy Super Bowl (lag)	−0.0284	−13.46
Custom	0.0032	3.12	Holiday dummy Valentine's Day	0.0468	22.92
Rich media	0.0016	2.09	Holiday dummy Easter	−0.0060	−2.38
Paid search	0.0002	4.76	Holiday dummy Memorial Day	0.0170	6.56
Print	0.1066	1.03	Holiday dummy Memorial Day (lag)	−0.0182	−9.23
Organic search	8.1836	2.27	Holiday dummy July 4th	0.0867	40.61
Restaurant factors			Holiday dummy July 4th (lag)	−0.0401	−17.70
Operating hours	0.4554	126.38	**Seasonal factors**		
CeCareus sales-per-footfall index	−0.5419	−42.68	Seasonality index	0.7640	111.41
Price discount	0.0455	41.88	Average temperature	0.0429	25.44
Depth of discount	0.0117	9.89	**Macroeconomic factors**		
Weekly metric: store cleanliness	0.0103	12.89	Unemployment rate	−0.0439	−12.58
Weekly metric: employee training	−0.0008	−11.96	Consumer price index	−0.2221	−5.27
Weekly metric: team helpfulness	0.0128	17.63	**Competitor factors**		
CeCareus_coupon_T1 transformed	0.0031	11.20	Competitors' location and restaurant size index	−0.0001	−1.89
CeCareus_coupon_T2 transformed	0.0009	7.18			
CeCareus_coupon_T3 transformed	0.0012	11.10	Competitor 1 marketing investments	0.0000	−4.71
CeCareus_Coupon_T4 transformed	−0.0001	−1.07	Competitor 2 marketing investments	−0.0001	−12.91
Holiday dummies (representative sample)			**Pseudo R^2**	0.89	
Holiday dummy Labor Day	−0.0317	−14.84	Observations	81,224	
Holiday dummy Columbus Day	0.0224	10.26	Log likelihood	−9,459	
Holiday dummy Veterans Day	0.0030	1.49			