Cognitive Need and Creative Interstitial Advertising

Effectiveness—Empirical Study Based on Propensity Score Matching

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Abstract. Along with the development of online movie and TV series, the current online advertising has developed into the 3.0 era with creative interstitial advertising as the core. In order to investigate the influence of consumers' cognitive need on the effect of creative interstitial advertising, this paper combines cognitive need theory, based on survey data from 2021, and adopts propensity score matching method to control sample selectivity for empirical research. The research results show that: after matching the effects of covariates, for high-value goods, viewers' cognitive need positively affects the creative interstitial advertising effect; for low-value goods, cognitive need does not affect the creative interstitial advertising effect. The article concludes with a discussion and analysis of the research results, and suggestions for advertisers to produce ads for different value goods and place ads for different types of watchers based on the analysis results. These findings enrich the research on creative interstitial advertising and provide practical reference for marketers.

Keywords: creative interstitial; cognitive need theory; advertising effectiveness; propensity score matching

1 Introduction

Relying on the rapid development of the Internet, the form of online video advertising is also changing day by day. At present, there is a new and special form of advertisement, which invites actors in the drama to appear in the advertisement, uses the scenes in the drama, and designs a complete plot according to the characteristics of the product, so as to integrate the advertisement with the plot skillfully, which is the creative interstitial advertising. “creative interstitial advertising”, also known as “small theater advertising”, is a new form of advertising that emerged along with the development of online TV series[1]. As creative interstitials are more interesting and creative than tra-
ditional hard ads, they are loved by viewers once they are aired, and the price is naturally high. According to the "2017-2018 White Paper on Creative Interstitial Advertising", the highest price for a single creative interstitial ad in the first half of 2018 reached 12 million\textsuperscript{[2]}.

The popularity of creative interstitial advertising also raises the question of whether creative interstitial advertising, with a slightly more complex expression than traditional advertising, has the same effect on audiences with different cognitive levels. Based on this background, this paper combines the theory of cognitive need with the three dimensions of advertising cognition, advertising attitude and purchase intention to measure the effectiveness of advertising, and uses the propensity score matching method to control the sample selectivity based on the data collected from the questionnaire survey to investigate the influence of cognitive need on the effectiveness of creative interstitial advertising.

2 Relevant Theory and Hypothesis Formulation

2.1 Cognitive need and Measurement

Cognitive need reflects individual differences in cognitive motivation. People with high cognitive need are more proactive in thinking about problems and are willing to think about complex problems and get a sense of accomplishment from them. People with low cognitive need try to avoid things that require a lot of thinking, and thinking is not a happy thing for them, so they are not willing to think actively. Cacioppo and Petty first developed a 45-question scale in 1982 \textsuperscript{[3]}. This scale was later revised by Cacioppo, Petty, and Kao et al. The revised questionnaire has only 18 items, which allows the scale to more accurately assess the cognitive needs of the subjects\textsuperscript{[4]}.

2.2 Advertising Effectiveness and Measurement

The main purpose of advertising is to influence consumers' attitudes and ultimately promote their purchases, and it plays a key role in influencing consumers' purchase decisions and promoting the conversion of consumer behavior\textsuperscript{[5]}. The process of advertising's psychological effect on people is divided into three stages: cognition and understanding, emotion and attitude, and intention and action, and there are different indicators to measure the effectiveness of advertising for these three stages. In his study, Liang method introduced three indicators to measure the sales effect of advertising: advertising awareness to measure the first stage, advertising attitude to measure the second stage, and purchase intention to measure the third stage\textsuperscript{[6]}.

2.3 Research Hypothesis

Based on the above analysis and research findings, this paper proposes the hypothesis that: consumers' cognitive need has a significant impact on the effectiveness of creative interstitial advertising, and the higher the consumers' cognitive need, the better the effectiveness of creative interstitial advertising.
3 Research Content

3.1 Study Design

In this paper, creative interstitial advertisements are selected as the research object, and based on the cognitive need theory; three dimensions of advertising cognition, advertising attitude, and purchase intention are used to measure the advertising effect, and their synthesized factor is used as an evaluation index; a questionnaire scale was used to obtain watchers' cognitive need, advertising effect after viewing the advertisement, and personal information such as gender, age, income, and education level, and the propensity score matching method \(^7\) was applied to avoid the influence of confounding variables and selective bias, in order to test the research hypotheses.

The overall steps of the empirical analysis are as follows: firstly, a prediction model of the propensity score of advertising watchers is established; secondly, the propensity score is predicted based on the model and the balance of the matched samples is diagnosed, which is a prerequisite to be satisfied for propensity score matching; next, three matching strategies of 1:1 matching, kernel matching, and radius matching are adopted, and the average intervention effect (ATT) of the intervention group is calculated respectively based on the analytical framework of this paper; Finally, the hypothesis is tested based on the empirical results, and make conclusions and recommendations.

3.2 Data Sources and Variable Settings

The data used in this study came from 1457 questionnaires collected in the 2021 survey, and after deleting invalid questionnaires and observations with missing values, the sample size that entered the final analysis was 790. Because the actual effect of the final advertisement is considered to be influenced by the value of the goods, to ensure the credibility of the study results, hypothesis testing models were established separately according to different price goods. Two creative interstitial advertisements for products as cell phones and Coke were selected and inserted in the questionnaire respectively, and after the watchers performed the advertisement viewing, user-related feedback was collected to obtain the watchers' cognitive need, the effect of the advertisement after viewing, and the subjects' personal information such as gender, age, income, and education level.

The quantitative analysis session of this study involved three types of variables, with advertising effectiveness as the dependent variable, cognitive need as the independent variable, age and gender are set as control variables with reference to similar empirical studies.
### TABLE I. VARIABLES OF HIGH-VALUE GOODS MODEL

<table>
<thead>
<tr>
<th></th>
<th>Mean Value</th>
<th>Standard Deviation</th>
<th>Value Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advertising Effect(adef)</td>
<td>0.59</td>
<td>0.03</td>
<td>0=weak; 1=strong</td>
</tr>
<tr>
<td><strong>Independent Variable</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive Need(cogne)</td>
<td>0.53</td>
<td>0.03</td>
<td>0=low; 1=high</td>
</tr>
<tr>
<td><strong>Control Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gender</td>
<td>0.53</td>
<td>0.50</td>
<td>0=female; 1=male</td>
</tr>
<tr>
<td>age</td>
<td>2.78</td>
<td>0.94</td>
<td>1=18 years old and younger;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2=19-25 years old; 3=26-30 years</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>old; 4=31-40 years old; 5=41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>years old and older</td>
</tr>
<tr>
<td>Years of Watching Short</td>
<td>3.44</td>
<td>0.75</td>
<td>1=less than 1 year; 2=1-2 years;</td>
</tr>
<tr>
<td>Online videos(year)</td>
<td></td>
<td></td>
<td>3=3-5 years; 4=more than 5 years</td>
</tr>
<tr>
<td>Education Level(edu)</td>
<td>3.12</td>
<td>0.83</td>
<td>1=general high school/junior</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>college; 2=college; 3=Bachelor's</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>degree; 4=Master's degree and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>above</td>
</tr>
<tr>
<td>job</td>
<td>3.81</td>
<td>2.37</td>
<td>1=students; 2=white collar</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>workers; 3=Civil servant; 4=Freelancer;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5=Medical worker; 6=self-employed;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7=Other</td>
</tr>
<tr>
<td>income</td>
<td>2.13</td>
<td>1.04</td>
<td>1=2000 and below; 2=2001-6000;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3=6001-10000; 4=10001 and above</td>
</tr>
</tbody>
</table>

### TABLE II. VARIABLES OF LOW-VALUE GOODS MODEL
3.3 Data Analysis Methods

To avoid the effects of confounding variables and selectivity bias, the Propensity Score Matching method is chosen to analyze the data in this study. As an emerging and reliable causal inference method, the propensity score matching technique can, to a certain extent, overcome endogenous problems such as sample selection bias, omitted variables, and the risks of "cumulative effect prespecification, average effect, and covariance"[7]. On the one hand, the propensity score matching method can skillfully accomplish the control of multiple confounding variables, thus supporting causal inference. On the other hand, the presence of selective bias may expose us to a biased sample and adversely affect the findings. To address such problems, the propensity score matching method can estimate the probability of an individual receiving an intervention by calculating the individual's propensity score, on which the effect of the independent variable on the dependent variable is then examined, yielding a net effect of the independent variable influencing the dependent variable[7]. Currently, the PSM method has been widely used in scientific research as a common means of approximating randomized trials in observational studies.

4 Empirical Analysis

4.1 High-Value Context

This study examines the results of the equilibrium test of the covariates by calculating the degree of deviation abatement of the variables and the range of common values.
Figure 1. Standardized bias across covariates of high-value goods.

Figure 2. Common range of values for propensity scores after matching (high-value goods model).
Figure 1 presents the extent to which the biases of the variables abate before and after the adoption of the kernel matching technique, from which it is quite intuitive that the standardized biases of almost all variables are significantly reduced after matching, providing a subsequent comparison of the treatment effects after matching (ATT). Figure 2 depicts the common range of values for the propensity scores, and the results indicate that most observations fall within the common range, indicating that only a few samples are lost during matching, satisfying the realistic requirement of propensity score matching for the common support assumption.

Table 3 reports the mean intervention effect (ATT) for the experimental groups based on the propensity score matching method and the standard errors calculated using the Bootstrap method. The ATT values for the experimental groups using 1:1 matching, kernel matching, and radius matching were generally similar, ranging from 0.29 to 0.30, and passed the 99% confidence level test of significance. The results show that for high cognitive need watchers, the effectiveness of the ad after viewing the creative interstitial ad is generally improved by about 0.3 points compared to low cognitive need watchers. This result supports our hypothesis that cognitive need does have a significant effect on individuals' perceptions of advertising after viewing ads, and the higher the cognitive need, the better the advertising effect.

However, the results of the current empirical analysis only prove that the hypothesis holds in the high-value goods context, and further confirmation of the consistency of the findings in the low-value goods context is needed next.
4.2 Low Value Context

![Figure 3. Standardized bias across covariates of low-value goods.](image)

It is clear from observing Figures 3 and 4: the standardized deviations of the variables in the low-value goods scenario are significantly reduced after matching, and most of the observations are within the common range of values, with fair matching results.

![Figure 4. Common range of values for propensity scores after matching (low-value goods model).](image)

TABLE IV. EXPERIMENTAL RESULTS OF LOW-VALUE GOODS MODEL
Table 4 reports the effect of cognitive need on the effectiveness of creative interstitials based on propensity score matching techniques in the low-value goods context. All three matching methods confirm that cognitive need does not significantly affect the effectiveness of creative interstitials in the low-value goods context.

5 Conclusions and Recommendations

5.1 Conclusion

In this paper, we combine cognitive need theory with propensity score matching method to construct a model to investigate the influence of cognitive need on the effect of creative interstitial advertising. The results of the empirical analysis show that after matching the effects of covariates, cognitive need positively affects the creative interstitial advertising effect for high-value goods; for low-value goods, cognitive need does not affect the creative interstitial advertising effect.

5.2 Discussion

Why does the hypothesis that the empirical results are highly significant in the context of high-value goods fail to be confirmed in the context of low-value products? The Elaboration Likelihood Model can explain this result. The basic principle of the theory is that different persuasion methods depend on the likelihood of fine-grained processing of the information. When the likelihood of fine-grained processing is high, the central path plays a major role, and conversely, when this likelihood is low, the limbic path plays a dominant role[8]. The theory suggests that the likelihood of fine processing of information is influenced by individual motivation and ability. Among them, motivation refers to the strength of an individual's willingness to process information. When individuals are highly motivated to process information, they will be more inclined to make decisions by making efforts to collect and finely process information before making decisions. In other words, people tend to be more inclined to devote their thinking and energy to what they think is more worthwhile.

In this study, when viewing creative interstitial advertisements for high-value goods (such as cell phones), consumers believe that they will suffer a greater loss if they do not make a good decision research to purchase such products, so consumers will pay more attention to a range of information related to the products and think and evaluate the products carefully. Therefore, at this time the central path comes into play, consumers will invest more cognitive energy and refer to a large amount of information. In contrast, when watching creative interstitials for low-value products (such as Coke), consumers generally do not consider the decision of whether to buy a can of Coke priced at 3 RMB is important, and they do not invest a lot of energy in thinking and have less motivation to process information. In this path, consumers pay less attention to the quality of the information itself, and their evaluation of the product does not depend on careful consideration of the performance of the product itself, but rather...
incorporates more emotion, which explains why individual cognitive needs do not influence the effectiveness of creative interstitials in the context of low-value products.

5.3 Recommendation

From the results of the above analysis, this study makes the following recommendations for advertisers in terms of production and placement of advertisements:

For high-value products, ads can be produced and precisely placed based on different cognitive needs of watchers. For watchers with low cognitive needs, complex designs should be avoided in ad production, and the use of ad words should be simple and easy to understand; while when displaying ads for watchers with high cognitive needs, attention should be paid to the logic of ads, setting scenes with reflective meaning and more in-depth lines.

As for low-value goods ads, since viewers' cognitive needs have no influence on the effect of creative interstitials, and the same ad has almost the same effect on viewers with different cognitive needs, there is no need to differentiate the level of advertising at this time, and this suggestion can save certain costs for enterprises and advertisers.

References
