

Standardization, Standards and Online Advertising

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Abstract

The technological transformation and automation of digital content delivery has revolutionized the media industry. Increased reliance on automation has also led to requirements for standardization of content-delivery formats. This paper examines how the memorability of banner advertising changed with the introduction of new standards regularizing their format. Using data from randomized field tests, we find evidence that for most ads, ad effectiveness falls as a result of standardization. The decline is also weaker when a standardized ad is the only ad on the page, and when the ads appear to be more original (such as ads created by an ad agency). Therefore, a likely explanation is that standardization makes it harder for basic ads to distinguish themselves from their competition. Because ad agencies participated in the setting of standards, the result suggests that insiders were less affected than outsiders.

Keywords: Online advertising, Standards, Marketing regulation

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1 Introduction

The advent of electronic methods of delivering ads and content has led to substantial efficiency gains in the media industry. One side effect of increasing reliance on electronically automated ad display is that ad formats need to be standardized. Standardization resolves problems of coordination between publishers and advertisers. Reducing these coordination costs is particularly important in media because of the prevalence of two-sided markets with competing platforms and potential multi-homing (Armstrong, 2006). For example, television channels ask TV commercials to be filmed to fit 15-, 30- or 60-second spots. This standardization benefits both the producer of content, who can more easily fit content around advertising, and also the advertiser, who can use the same creative ad design more easily across multiple advertising channels.

Generally, standards help firms through reduced coordination costs but they can hurt firms by making it harder to differentiate (Shapiro and Varian, 1999; Augereau et al., 2006). In the advertising context, the inability to differentiate might manifest itself through reduced attention. As consumers adapt to a particular format, they pay less attention (Solomon, 1999; Pashler, 1998).

In this paper, we examine how standards influence the effectiveness of online advertising. The standardization process was led by the online advertising industry association, the Interactive Advertising Bureau. We use data from a large-scale databank of ‘a/b’ real-time field tests of online display advertising by advertisers that allows us to measure how much an ad was able to grab consumers’ attention. In each test, people were randomly exposed either to a focal ad (the treatment group) or a placebo ad (the control group). On leaving the website, both groups were asked whether they could pick the focal ad out of a random selection of ads (which did not include the placebo ad) as the one they had just seen. Because of the experimental design, the difference between the treatment and control groups

in recall of the focal ad can be seen as the causal impact of the ad on aided ad recall. This data set is one of the primary data sets used by the industry to benchmark online display advertising.

From this data set, we use all US-based advertising campaigns from August 2002 to August 2004, totaling 381,641 survey responses to 1,064 different advertising campaigns. We study how the difference in aided ad recall between the treatment and control groups changed with the April 2003 introduction of standard formats. While all results are robust to a measure of purchase intention, we focus on aided recall because the psychology literature on advertising and attention explicitly links attention to memory (Pieters et al., 2002; Dreze and Hussherr, 2003).

In order to measure the treatment effect of interest, which is how the effectiveness of ads changed with the process of standardization, we use difference-in-differences around the date that standards were launched. The identifying assumption is that there are no reasons why standard format ads should change in effectiveness relative to non-standard format ads over time for reasons not associated with the standards-setting process.

We find evidence that on average, standardization damaged aided ad recall and stated purchase intention. Standardization decreased recall by 21 percent for standard-format ads after formal standardization. Before standardization, ads that self-selected into the standard format showed no decline in effectiveness. This 21 percent decline appears to be driven by the increased difficulty of differentiating standard-format ads from other ads - we find no such effect when we look at ads where a sponsorship deal meant only one company's ad appeared on that webpage.

To further support the idea that standards reduce effectiveness because of a lack of differentiation, we also show that more original ads are not affected by standardization. This is consistent with well-known laboratory-based research on habituation and novelty (Pieters et al., 2002; Pashler, 1998). Therefore, our results suggest that the rewards to creativity

increase in other dimensions if ad formats are standardized. Specifically, ads that were designed by ad agencies and ads with content other than a simple logo have no significant change in effectiveness after standards are implemented. This suggests that some players that were actively involved in the regulatory decision process (the advertising agencies) were least affected by the adoption of standards. This result does not imply that the standards were bad; their widespread adoption hints otherwise. It simply suggests that in addition to any benefits related to reduced coordination costs, the standards (asymmetrically) reduced the effectiveness of advertising.

To our knowledge, this is the first paper to investigate the effects of the process of standardization on differentiation. As such it builds on the economics literature on standards. This literature has focused on the costs and benefits of standards and standards setting organizations. Pioneered by Katz and Shapiro (1985), Farrell and Saloner (1988), and summarized in Greenstein and Stango (2007), much of this literature examines how the incentives to create standards (and the standards created) vary with market and firm characteristics. For example, Simcoe (2011) shows that increased private incentives slow the standard setting process; Chiao et al. (2007) test the model of Lerner and Tirole (2006) and show that standards-setting organizations that have friendlier links with sponsors tend to have higher-quality standards.

In contrast to this literature, our paper does not examine how standards evolve or how standards are set. Instead it builds on a recent literature that attempts to measure the outcomes of standardization. For example, Rysman and Simcoe (2008) show that patent citations increase after standardization, suggesting that standards can promote coordinated innovation. With respect to the benefits of coordination relative to the costs of differentiation, Augereau et al. (2006) show that retail firms differentiate from each other in the presence of competing standards. Our paper examines a different outcome of standardization: it empirically documents the cost of coordination (in terms of reduced differentiation)

and the benefit of differentiating in the dimensions that are not standardized. Because ad agencies appear to design online advertising to stand out, this is consistent with Simcoe (2011) that the standards process tends to be resolved in the favor of insiders.

Our paper also relates to two streams of research in marketing. First, there is an emerging literature on understanding the effectiveness of online advertising. For example, Manchanda et al. (2006) and Ghose and Yang (2009); Goldfarb and Tucker (2011d) measure the effectiveness of advertising tactics in banner ads and search engine ads respectively. More recently, Sun and Zhu (2011) examine the relationship between website content and ad revenue. Second, there is a stream of research that examines how external and regulatory environments affect marketing outcomes. For example, Luchs et al. (2010) examine the impact and enforcement of legal regulations on price discrimination and Dhar and Baylis (2011) examine bans on advertising targeting children. Along with our other recent work (Goldfarb and Tucker, 2011a,c), this paper sits at the intersection of online advertising and the impact of external regulatory bodies.

Overall, our results suggest that advertising standards have a cost in terms of reduced recall and stated purchase intent (likely due to reduced attention as ad formats become less distinct from each other), particularly for ads that are not created by advertising agencies. Therefore, standards lead to reduced differentiation and effectiveness but this effect is muted for a set of industry insiders.

2 Advertising Standards

The standards-setting organization for online advertising in the United States is the Interactive Advertising Bureau (IAB). Founded in 1996, the IAB consists of 460 leading media and technology companies who are responsible for selling 86% of online advertising in the United States. Working with its member companies, the IAB evaluates and recommends standards and practices and conducts research on interactive advertising.

In 1996, the IAB issued its first set of guidelines for ad formats. In January 2001, among increasing concerns about the costs of effective online advertising and the perceived need for a more professional organization, the IAB hired its first CEO. A perceived problem in the industry at that time was that the extant 1996 guidelines were too broad and that “online publishers...had a tendency to go their own way [that is, introduce new ad formats] in trying to attract advertisers” (Taylor, 2001). To address this issue, in August 2002, the IAB formed the ‘Ad Sizes Task Force.’ This was created to reduce the number of ad sizes, so as to reduce costs and inefficiencies associated with planning, buying and creating online media. In December 2002, the task force announced that they would create a universal ad package. This would consist of a set of four ad sizes that all compliant member publishers had agreed to support. The intention was to establish a real standard for the industry rather than the less effective guidelines that had previously governed ad sizes. Jeff Bernstein, Director of MSN Ad Planning and Chairman of the IAB Ad Sizes Committee, described the aim thus: “This initiative....is intended to answer advertisers’ requests for a limited, core set of compelling ad units to create and plan online campaigns that will be able to run across the majority of Web sites and users. It will also enable publishers, regardless of size or niche, a common palette with which to attract advertisers and agencies, providing the framework for integrated campaigns across the Internet.” The American Association of Advertising Agencies (AAAA) agreed to support this set of ad formats, and the initiative seems to have succeeded in that publishers and advertisers largely adhere to the standards. The new standards were officially launched on April 28, 2003. The timeline of this decision process is summarized in Table 1.

Table 2 summarizes the ad sizes. Appendix Figure A-1 presents a mock-up of how these ad formats appear on a webpage. These formats were a subset of the standards previously described in IAB guidelines. After the introduction of the Universal Ad Package (UAP), compliance meant that publishers accepted these four sizes and consequently enabled the

Table 1: Standardization Timeline

Date	Event
1996	IAB Founded
August 2002	Initial Standards Task force convened
December 2002	Initial press release about standards
April 28 2003	Official Launch of Standards

Table 2: New Standardized Ad Units (in pixels)

Ad Label	Ad Size	Max. Initial Download Fileweight	Animation Length (Seconds)
Medium Rectangle	300 x 250	40k	15
Rectangle	180 x 150	40k	15
Wide Skyscraper	160 x 600	40k	15
Leaderboard	728 x 90	40k	15

advertisers to reach their audience using standardized ads.

As new advertising technologies arise, the IAB regularly sets new standards. For example, standards for rich media were changed substantially in 2009. We focus on the April 2003 standards for two reasons. First, they are the first set of standards to be widely adopted and therefore they provide the starkest contrast for studying before and after the introduction of standards. Second, our data contain mostly plain banner ads. The April 2003 standards are therefore the set of standards best applied to our data.

The April 2003 IAB standards were warmly received by advertisers. Jonathan Adams, a Senior Partner at mOne Worldwide, a subsidiary of Ogilvy, said ‘The UAP offers a win-win for agencies and their clients. Now, as with a 30-second spot for TV, agencies can plan against a standard set of ad units. The UAP affords a simpler approach to interactive media planning without impacting flexibility for advertisers to execute compelling, unique online advertising campaigns.’ The analogy with the standardization of the 30-second spot suggests that the IAB was successful in their aim of creating a perceived standard for online banner ads that was common to publishers and advertisers.

The new standards were announced by the IAB in December 2002, but they were not widely adopted until after the official April 2003 launch. Figure 1 shows the change in the proportion of display ads in the US that used these standardized units for campaigns before and after the official launch of the standards on April 28, 2003. It indicates that there was a clear kink in the rate of standardization in April 2003. The delay in take-off between announcement and launch may be because it took time for websites and advertising networks to adjust their formats to allow these standard-sized ads. We are therefore assuming that consumers are not well enough informed about the future change of advertising standards to adjust their behavior to anticipate the change in ad format before widespread adoption of the standards.

Figure 1 provides evidence that the standardization process was successful, and that gradually more and more publishers and advertisers used these units. There are two other messages in Figure 1. As discussed by Farrell and Simcoe (2009), adjustment is not immediate after standards are established. After the announcement, both creative agencies and internet platforms needed time to adjust the design of ads and websites to accommodate the new standards. Last, even prior to the December announcement of the specific standards, the standard formats were relatively popular and growing in their use in campaigns, perhaps because these standards were chosen due to their perceived advantages by the industry.

In our empirical analysis, the difference-in-difference estimation focuses on the change in effectiveness before and after the kink. Similar to Chen et al. (2011); Sun and Zhu (2011) we take the precise timing of the change in standards as exogenous and our source of exogenous variation.

3 Data on Display Advertising

We use data from a large database of field tests conducted in the United States by a media metrics agency. The aim of this database is to provide comparative guidance to advertisers



Figure 1: Standardization Over Time

about which types of ad design are effective and to benchmark current campaigns against past campaigns. Each of the 1064 campaigns in the database follows the same methodology to evaluate effectiveness. Therefore, a key strength of this data source is that it allows comparison across many campaigns for different types of ads and different types of advertisers.¹ This database is among the main sources used by the online media industry to benchmark online display ad effectiveness.

Specifically, for each campaign the advertiser hired the media metrics agency to assess and benchmark the effectiveness of an ongoing campaign (beyond clickthroughs as these are banner ads). The agency integrates its services into an ongoing campaign, randomly shows the ad for the focal product to some individuals and an ad for another (typically non-profit) product to other individuals. It then immediately surveys these individuals (359 on average) upon leaving the website using a pop-up window and gathers measures of aided ad recall and purchase intent for the focal product. Because these individuals are randomly assigned

¹The ability to compare is driven by the use of "purchase intent" and "ad recall" as measures of ad effectiveness. These measures are weaker than data on actual purchasing, as used by Lewis and Reiley (2009) because state purchase intentions and ad recall do not necessarily lead to purchasing. Our measures therefore trade precision on measuring effectiveness for the ability to compare across many campaigns.

to the treatment and control groups, any differences in their ability to recall ads for the focal product can be ascribed to ad exposure.

The field test collected data by means of an online questionnaire that appears as a pop-up window as the website visitor tries to navigate away from the webpage where the focal or dummy ad is served. This means that the questions measure the immediate effect of seeing the ad. In the main specification in this paper, our dependent variable is whether or not the respondent was able to pick the focal product ad out of a random selection of ads (which did not include the placebo ad), as the one they had just seen. As mentioned earlier, we focus on ad recall because the existing literature on advertising and attention explicitly links attention to memory. Our results are robust to using stated purchase intent (using both a five-point scale and a discrete variable for whether the respondent answered "likely to purchase" or "very likely to purchase" – four or five on the five-point scale). Of the 381,641 total survey responses, all provided purchase intent information but 27,266 did not provide ad recall information. Broadly, our results are robust to an ad effectiveness measure as well as an ad recall measure.

Although our raw data spans 2001 to 2008, we focus on the time span immediately surrounding the change in standards, specifically from August 2002 to August 2004. Prior to August 2002, our data become too sparse to estimate reliable effects. We end the 'after' period in August 2004 because the relatively short window reduces the potential of other changes in the industry to wash out our main results, such as a gradual decline in advertising effectiveness over time and the arrival of new formats. Our results are also robust to using a six-month window on either side of the April 2003 announcement.

The mean ad campaign lasted 32 days and consisted of a uniform set of ads. There were 167 separate products advertised in total on 30 different categories of websites. Products include diapers, television programs, shampoo, airlines, toys, and wireless carrier services. Website categories include personal finance websites, news websites, entertainment websites,

and portals. This means that our estimates reflect the placement of ads in their natural settings. Consistent with industry norms and our prior work (Goldfarb and Tucker, 2011c), we define a "campaign" as an ad shown for a specific product on a specific website.

If a respondent was in the exposed condition and returned to that particular webpage, or refreshed that webpage before exiting the website, the respondent is counted as having seen the ad again. The median exposure was to have seen the ad one time (56 percent of respondents who were in the exposed condition).

The survey also asked respondents about their gender, income, and age. We converted the responses to zero-mean-standardized measures and used these variables as controls in our regressions. We assigned a value of zero to the missing data. We do not view the missing data on the demographic controls to be a concern because the results are robust to a non-parametric specification of the controls that adds missing data fixed effects and to the omission of these controls entirely. There is also data on whether the respondent said they were likely to purchase the product and we use this as a robustness check. Table 3 shows summary statistics for this survey data.

There were many different creative formats used for these banner ads. The database was partly designed to help guide advertisers in their creative decisions, so the format information is very detailed. For each ad, we know the precise size and various formatting decisions. We use these to determine whether or not the ad was part of the standardized ad package developed by the IAB as laid out in Table 2.

Table 4 displays the percentage of different creative formats used before and after the standards announcement. All four of the standard-format ads exhibited a sharp increase in usage. Previously popular ads (such as Banner (468x60) and Skyscraper(120x600)) that were not part of the standard format ad package exhibited a decline.

As with any empirical paper, it is important to consider whether sample selection drives the results, especially one where subjects are recruited through an unusual process. In

principle, any selection bias should apply to both treatment and control groups. Therefore, given that our interest is in measuring how standardization affects the difference in ad recall across these groups, our results should hold.

There is the further issue of the representativeness of the measured ‘treatment’ effect, given that the subjects may be unusual because they were willing to answer an online survey. The data provider does not make information available about response rates, and response rates are likely to be quite low. However, the demographic variables reported in Table 3 appear representative of the general internet population at the time of the study as documented in the Computer and Internet Use Supplement to the 2003 Current Population Survey. Still, various forms of selection bias are possible. For example, it may be that those who are willing to answer the survey are perhaps more observant than other web users: They did notice and respond to the pop-up window. Therefore, given that the allocation to treatment and control groups is random, an accurate but cautious interpretation of our results is in terms of how standardization affects a widely-used industry measure of how well advertising performs, rather than necessarily reflecting the responses of all consumers. A less cautious interpretation assumes that the measured qualitative difference between the treatment and the control groups is not affected by the consumers who selected into the survey.

Table 3: Summary Statistics for Full Sample

	Mean	Std Dev	Min	Max	Observations
Ad Recall	0.29	0.45	0	1	354375
Purchase Intent (dummy)	0.32	0.47	0	1	381641
Purchase Intent (scale)	2.93	1.35	1	5	381641
Exposed	0.52	0.50	0	1	381641
Respondent Female	0.46	0.50	0	1	381641
Respondent Income	59520.5	49354.6	15000	250000	280943
Respondent Age	38.3	13.8	13	100	381476
Ad is Standard Format	0.47	0.50	0	1	381641
Ad created by agency	0.15	0.36	0	1	381641
Ad contains text ("copy")	0.19	0.40	0	1	381641
Observations	381641				

Table 4: Distribution of Different Creative Formats

	Before Announcement Percentage	After Announcement Percentage	Total Percentage
Super Banner (728x90) (Standard Format)	4.66	21.63	16.76
Rectangle (180x150) (Standard Format)	0.05	3.31	2.38
Medium Rectangle (300x250) (Standard Format)	11.37	20.77	18.08
Wide Skyscraper (160x600) (Standard Format)	5.00	16.57	13.26
Banner (468x60)	28.03	11.78	16.44
Button (120x90)	6.91	2.35	3.65
Large Rectangle/Square (336x280)	12.02	5.34	7.25
Skyscraper (120x600)	18.65	9.55	12.15
Vertical Rectangle (240x400)	1.20	1.15	1.16
Half-Banner (234x60)	2.42	0.87	1.31
Full page	0.08	0.39	0.30
Interstitial	1.61	0.76	1.00
Bridge/Minisite	0.00	1.52	1.08
Scoreboard	0.84	0.04	0.27
Floating	1.30	1.49	1.44
Pop Up (250x250)	0.22	0.19	0.20
Half Page Ad (300x600)	0.00	1.36	0.97
Vertical Banner (120x240)	5.65	0.94	2.29
Total	100.00	100.00	100.00

Table 5: Differences in Differences: Standardized Ads

	Difference	Mean Control	Mean Exposed	T-Test
Ad Recall Before Standardization	-0.106	0.230	0.336	-16.272
Ad Recall After Standardization	-0.084	0.239	0.323	-36.447

Tables 5 and 6 provide some initial raw data evidence on how standardization affected ad recall. In particular, Table 5 suggests that for standardized ads there was around a 20 percent decline in relative recall between the exposed and control group after the policy change. Table 6 suggests that non-standardized ads appear to have performed somewhat better after the standardization process; however, this latter result goes away in the regression analysis due to the addition of campaign-level controls.

Table 6: Differences in Differences: Non-Standardized Ads

	Difference	Mean Control	Mean Exposed	T-Test
Ad Recall Before Standardization	-0.106	0.211	0.317	-32.492
Ad Recall After Standardization	-0.122	0.238	0.360	-44.708

4 Empirical Analysis

Next, we document the decrease in the effectiveness of standard-format ads after standardization. First, we use a difference-in-difference specification to show that the standard-format ads became less effective after April 28, 2003, relative to before that date and relative to other ads. Then, we validate these results by showing that the negative effect of standardization is mitigated by changes to the advertising setup that should make it easier for the standard-format ads to get attention: when an ad is the only one on the page and when ads are likely to be original in other dimensions (such as ads designed by an ad agency). These validations also suggest ways that advertisers can partially overcome the challenges associated with standardization.

4.1 Regression Results

In our empirical analysis, we use a straightforward specification to capture how recall is affected by the type of ad format. For person i who was exposed to advertising campaign j at time t , their ad recall reflects

$$\begin{aligned} \text{Recall}_{ijt} = & \alpha \text{Exposed}_{ij} + \beta_1 \text{Exposed}_{ij} \times \text{StandardFormat}_j \times \text{AfterStandardization}_t + (1) \\ & \beta_2 \text{Exposed}_{ij} \times \text{StandardFormat}_j + \beta_3 \text{Exposed}_{ij} \times \text{AfterStandardization}_t + \\ & \theta X_{ij} + \gamma_j + \epsilon_{ijt} \end{aligned}$$

Therefore, α captures the main effect of being exposed to an ad on recall; β_1 captures the core coefficient of interest for the paper - whether exposure is more or less influential for ads that used one of the Standard Formats listed in Table 2 after they were recognized as the standards; β_2 and β_3 respectively control for whether the standardized ad format is less effective even prior to the change and whether ads were generally less effective after the

change than before; X_{ij} is a vector of controls for gender, age, income, and time online; γ_j is a series of campaign fixed effects that control for heterogeneity in baseline recall and includes the main effect of whether or not the focal ad was standardized ($StandardFormat_j$), which is why this lower order interaction is not included in our specification. For convenience below, we will refer to ad "effectiveness" as the impact of ad exposure on ad recall.

This is estimated with a linear probability model. We focus on the linear probability model because it allows us to estimate a model with many campaign fixed effects as these fixed effects get differenced out. In contrast, computational challenges and the incidental parameters problem limit the fixed effects we can use in a nonlinear model (though we do show robustness to logit specification). We are less concerned about the potential bias on the linear probability model discussed in Horrace and Oaxaca (2006) because the predicted probabilities all lie between 0 and 1. This is likely because the mass point of the Ad Recall variable is far from 0 or 1 and the covariates are mainly binary.

Table 7 shows the results. Columns (1) to (4) build to the main specification for equation (1) in column (5). Specifically, Column (1) shows the raw difference between the exposed and control groups in ad recall: about 10 percentage points. This value does not control for campaign effects, category effects, or respondent demographics. The R-squared value in this column is just 0.0127. This is unsurprising given that the regression examines the effect of seeing just one online display ad once on overall recall of advertising across individuals and campaigns. In prior work (Goldfarb and Tucker, 2011b), we showed that the measured ad effectiveness in this data is appropriate in light of the relatively low price of online display advertising.

Column (2) shows that standard-format ads are, on average, less effective than other ads. Column (3) adds category fixed effects.² Column (4) controls for demographics and category

²The raw effect of the standard format changes in response to the addition of category fixed effects. This is driven by the effect of adding controls for the pharmaceutical category where there was low ad recall and where few ads were standardized.

fixed effects and shows that this reduced effectiveness of standard-format ads is only true after the April 28, 2003 standardization.

Column (5) shows the main specification, with campaign-level fixed effects. It shows that standard-format ads, when conducted after standardization occurred, are less effective than other ads. Interestingly, this is not true of standard-format ads prior to standardization and it is a much stronger effect than the small general reduction in the effectiveness of non-standard-format ads. As expected from a randomized field test, we see little qualitative difference between columns (4) and (5).

One potential concern is that the results are simply driven by changing consumer responsiveness to how large ads were over time, and that this was independent of standardization. To address this, in column (6) we show that the qualitative results are also robust if we include additional controls for advertisement size. This suggests that it was not changes in the importance of ad size but rather the changes in the importance of the ads being standardized that drives the results.

Table 8 checks further the robustness of these results to different data selection criteria, dependent variables, and functional forms. Columns (1) and (2) show robustness of the main specification to a logit model. We checked that the marginal effects and logit coefficients have the same sign and significance level, using the method suggested by Ai and Norton (2003). Column (3) and (4) shows robustness of the main specification to using a different time window of the six months before and after the standardization announcement. Column (5) shows that the results hold using a discrete measure of high purchase intent and column (6) shows that the results hold using a full five-point scale on purchase intent. Appendix Table A-1 shows further robustness for these alternative dependent measures.

Overall, in combination Tables 7 and 8 suggest that standard-format ads became significantly less effective after April 28, 2003, relative to the change in effectiveness of other types of advertising. Our main specification in column (5) of Table 7 suggests that the standard-

Table 7: Difference-in-difference specification

	(1)	(2)	(3)	(4)	(5)	(6)
	Ad Recall	Ad Recall	Ad Recall	Ad Recall	Ad Recall	Ad Recall
Exposed × Standard Format × After Standardization				-0.0370*** (0.00796)	-0.0225*** (0.00695)	-0.0228*** (0.00702)
Exposed × Standard Format		-0.0296*** (0.00302)	-0.0253*** (0.00292)	0.00531 (0.00717)	-0.00303 (0.00622)	-0.00223 (0.00630)
Exposed	0.102*** (0.00151)	0.116*** (0.00210)	0.104*** (0.00205)	0.102*** (0.00319)	0.107*** (0.00304)	0.105*** (0.00361)
Standard Format		0.0106*** (0.00219)	-0.0138*** (0.00235)	-0.0147*** (0.00536)		
Exposed × After Standardization				0.00490 (0.00416)	-0.00644* (0.00391)	-0.00860* (0.00462)
Standard Format × After Standardization				-0.00276 (0.00594)		
After Standardization				0.00614* (0.00317)		
Female				-0.0247*** (0.00171)	-0.0329*** (0.00180)	-0.0329*** (0.00180)
Std. Income				-0.00196** (0.000921)	0.00128 (0.000915)	0.00128 (0.000915)
Std. Age				-0.0188*** (0.000794)	-0.0144*** (0.000802)	-0.0144*** (0.000802)
Exposed × Ad Area						6.20e-09 (6.84e-09)
Exposed × Ad Area × After Standardization						1.52e-08 (1.10e-08)
Constant	0.232*** (0.00109)	0.227*** (0.00150)	0.245*** (0.00151)	0.252*** (0.00258)	0.252*** (0.00128)	0.252*** (0.00128)
Category Fixed Effects	No	No	Yes	Yes	No	No
Campaign Fixed Effects	No	No	No	No	Yes	Yes
Observations	354375	354375	354375	354375	354375	354375
R-Squared	0.0127	0.0130	0.0946	0.0966	0.134	0.134

Ordinary Least Squared (OLS) regression coefficients shown. Data are for August 2002 to August 2004. The dependent variable is an indicator variable for whether or not the person was able to recall the ad. Robust standard errors clustered at the campaign level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

format ads become 21% less effective. This can be seen as a conservative estimate as other specifications suggest even higher effects.

Table 8: Robustness Checks for Difference-in-difference specification

	Logit (1) Ad Recall	(2) Ad Recall	6 Month (3) Ad Recall	(4) Ad Recall	Alt. Dep Var (5) Purchase Intent	(6) Likely Scale
main						
Exposed × Standard Format × After Standardization	-0.145*** (0.0430)	-0.0856** (0.0371)	-0.0259*** (0.00912)	-0.0284*** (0.00788)	-0.0144** (0.00644)	-0.0555*** (0.0187)
Exposed × Standard Format	-0.000563 (0.0386)	-0.0340 (0.0332)	-0.00545 (0.00722)	-0.00312 (0.00625)	0.00238 (0.00581)	0.0136 (0.0169)
Exposed	0.567*** (0.0179)	0.622*** (0.0176)	0.107*** (0.00328)	0.108*** (0.00315)	0.0233*** (0.00297)	0.0588*** (0.00867)
Exposed × After Standardization	-0.00540 (0.0229)	-0.0734*** (0.0218)	0.0121** (0.00486)	0.00554 (0.00453)	-0.00351 (0.00369)	0.00421 (0.0109)
Standard Format × After Standardization	-0.0300 (0.0342)		-0.0147** (0.00711)			
Standard Format	-0.0639** (0.0307)		0.00838 (0.00562)			
After Standardization	0.0448** (0.0188)		0.00149 (0.00399)			
Female	-0.133*** (0.00915)	-0.181*** (0.00995)	-0.0176*** (0.00234)	-0.0279*** (0.00241)	0.00263 (0.00171)	-0.00942* (0.00510)
Std. Income	-0.0110** (0.00507)	0.00748 (0.00521)	0.00270** (0.00122)	0.00453*** (0.00121)	-0.00160* (0.000887)	-0.0231*** (0.00269)
Std. Age	-0.103*** (0.00442)	-0.0825*** (0.00465)	-0.0221*** (0.00112)	-0.0166*** (0.00112)	-0.0167*** (0.000760)	-0.0708*** (0.00227)
Constant	-1.572*** (0.104)	0.459*** (0.0773)	0.235*** (0.00284)	0.242*** (0.00177)	0.310*** (0.00125)	2.911*** (0.00370)
Category Fixed Effects	Yes	No	Yes	No	No	No
Campaign Fixed Effects	No	Yes	No	Yes	Yes	Yes
Observations	354375	354375	189822	189822	381641	381641
R-Squared			0.0941	0.124	0.215	0.188

Unless otherwise stated OLS regression coefficients shown, data are for August 2002 to August 2004, and the dependent variable is an indicator variable for whether or not the person was able to recall the ad. Robust standard errors clustered at the campaign level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

5 Validation: Understanding the Underlying Mechanism

In order to better understand why standards lead to reduced ad effectiveness, we draw on the psychology of attention literature to argue that clutter hurts attention and originality increases attention. In light of this, we expect that standardization will have a smaller impact on ads when those ads are the only ones on the page and we expect that original ad content will help overcome the reduced effectiveness of standard-format ads after standardization. Below, we show results consistent with these hypotheses and argue that because these results demonstrate the role of attention in overcoming the change in standardized ad effectiveness after April 2003, they help to validate a causal interpretation that the introduction of standards drove the observed reduction in effectiveness of standardized ads.

Decreased advertising effectiveness in the presence of more advertising has become a standard assumption in economic models of advertising (see Bagwell (2007) for a review). Furthermore, a rich psychology literature (e.g. Pashler (1998)) documents that attention to any particular stimulus is reduced in the presence of other stimuli. In Table 9, we explore what happens when a standard-format ad is placed in a context where it has little or no competition from other ads and therefore it is easier to notice.³

In particular, the number of ads shown on a typical website varies. Most commonly, there are multiple ads for different products appearing at the same time. On some websites, there is just one ad for one product (specifically email websites at the time of our data collection). In addition, an advertiser may pay to ‘sponsor’ a website and will then be able to place multiple ads for the same product on the website, excluding all competing ads.

Columns (1) and (2) explore campaigns on email websites, which, during the time period we study, typically displayed just one ad at a time. We find little effect of standardization for such campaigns. Columns (3) and (4) explore sponsorship campaigns, in which an advertiser

³In another context, Kornish and Watts (2011) examine the number of ads on a page in order to examine the relationship between number of ads and the degree of cross-platform competition.

Table 9: Reduced clutter

	E-mail		Sponsorship	
	(1)	(2)	(3)	(4)
	Ad Recall	Ad Recall	Ad Recall	Ad Recall
Exposed \times Standard Format \times After Standardization	0.0133 (0.0798)	-0.0204 (0.0537)	0.0689 (0.0655)	-0.0233 (0.0392)
Exposed \times Standard Format	0.0805** (0.0353)	0.0806** (0.0353)	-0.0642 (0.0650)	0.0204 (0.0385)
Exposed	0.0375 (0.0259)	0.0371 (0.0259)	0.0463*** (0.00783)	0.0727*** (0.00749)
Exposed \times After Standardization	0.0251 (0.0441)	0.0259 (0.0416)	0.0669*** (0.00984)	0.0470*** (0.00903)
Standard Format \times After Standardization	-0.240** (0.118)		-0.00109 (0.0575)	
Standard Format	0.0989 (0.0636)		0.105* (0.0570)	
After Standardization	0.186** (0.0727)		-0.163*** (0.00918)	
Female	0.0146 (0.0134)	0.0151 (0.0133)	-0.0158*** (0.00417)	-0.0207*** (0.00425)
Std. Income	-0.00981 (0.00732)	-0.00926 (0.00731)	-0.00148 (0.00202)	0.00140 (0.00200)
Std. Age	-0.0113 (0.00742)	-0.00946 (0.00745)	-0.0148*** (0.00209)	-0.0184*** (0.00207)
Constant	0.104*** (0.0394)	0.197*** (0.0151)	0.405*** (0.00714)	0.321*** (0.00297)
Category Fixed Effects	Yes	No	Yes	No
Campaign Fixed Effects	No	Yes	No	Yes
Observations	4466	4466	63785	63785
R-Squared	0.111	0.112	0.148	0.170

OLS regression coefficients shown, data are for August 2002 to August 2004, and the dependent variable is an indicator variable for whether or not the person was able to recall the ad. Robust standard errors clustered at the campaign level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

usually takes over all advertising at a website. As discussed by this Dukes and GalOr (2003) this form of exclusivity contract is attractive since it reduces competition from other ads. The results suggest that for these particular ad campaigns there was no measurable negative effect from standardization.⁴

Drawing on work in psychology that suggests that originality increases attention (Pieters et al., 2002), in Table 10 we examine whether more original ads are not hurt by standardization. Columns (1) and (2) compare the effectiveness of ads that were designed by a named ad agency compared to those that were not. It is clear that the ads that were not designed by an ad agency were more negatively affected by standardization, suggesting that the original

⁴The main coefficient of interest is positive in two specifications and negative in two specifications. It is never significantly different from zero. Some caution is warranted in interpretation because the coefficient is also never significantly different from the effect estimated using the full sample.

input of the ad agency helped them stand out. Columns (3) and (4) compare ads that had explicit ad copy compared to those that did not. This suggests that focusing the advertising appeal on a different dimension (wording) as opposed to format helped such ads stand out after standardization.

The asymmetric effect for ads designed by ad agencies and other ads suggests the possibility of regulatory capture. Specifically, that the standardization process benefited some firms (the ad agencies) that had the power to shape that process. As discussed above, this is consistent with the arguments in Simcoe (2011) and elsewhere that standards are influenced by the interests of the participants in the standards setting process. In the appendix, we show robustness of the results of this section to purchase intent rather than ad recall.

These results also serve as a falsification test against a potential weakness of our approach. In particular, it is possible that, after standardization, firms move their best ads out of the standard format. If our results are driven by increasingly poor ads showing up in the standard format, we shouldn't see a difference in the effectiveness of poor quality ads after standardization but no difference in the effectiveness of high quality ads.

Broadly, these results are consistent with an interpretation of the reduced effect of standard-format ads after standardization being causally due to the standardization, most likely because of a change in attention given to the ads. Originality, however, nullifies the effect of a lack of differentiation due to this standardized format.

6 Implications and conclusion

This paper uses rich field experiment data from real online advertising campaigns to investigate how the standardization process for advertising affects the memorability of advertising and how it affects purchase intent. We examine the effects of the first attempts to set formal format standards for online display advertising in the US by the Interactive Advertising Bureau. We find evidence that standards-setting reduced the effectiveness of standard size

Table 10: Originality: Ad content

	Ad Agency (1)	No Ad Agency (2)	Ad Copy (3)	No Ad Copy (4)
	Ad Recall	Ad Recall	Ad Recall	Ad Recall
Exposed × Standard Format × After Standardization	0.0232 (0.0247)	-0.0258*** (0.00739)	-0.0107 (0.0509)	-0.0215*** (0.00726)
Exposed × Standard Format	-0.0351 (0.0239)	-0.00153 (0.00646)	-0.0508 (0.0502)	0.00793 (0.00641)
Exposed	0.189*** (0.0127)	0.101*** (0.00313)	0.156*** (0.00709)	0.0940*** (0.00337)
Exposed × After Standardization	-0.0976*** (0.0134)	0.00127 (0.00426)	-0.0132 (0.00944)	-0.00488 (0.00432)
Constant	0.252*** (0.00294)	0.252*** (0.00143)	0.248*** (0.00336)	0.254*** (0.00139)
Demographic controls	Yes	Yes	Yes	Yes
Campaign Fixed Effects	Yes	Yes	Yes	Yes
Observations	70931	283444	55815	298560
R-Squared	0.126	0.136	0.124	0.137

OLS regression coefficients shown, data are for August 2002 to August 2004, and the dependent variable is an indicator variable for whether the person was able to recall the ad.

Robust standard errors clustered at the campaign level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
‘StandardFormat’ is collinear with campaign fixed effects and omitted (see page 16 for details).

ads by over 20%. This reduction in effectiveness was mitigated by showing the ads without other ads present and by adding original content to the ads as would likely be accomplished through an advertising agency.

Our results also have important implications for media platforms, for advertisers, and for evaluating the benefits of a standards-setting process. Generally, the reason that media platforms try to set cross-platform standards is that it facilitates the placement and use of a single format across multiple platforms. We present evidence that while such standards-setting may be beneficial in terms of efficiency for both advertiser and platform, it reduces the ability of ads to attract attention. As ad delivery is being increasingly digitized and automated, standards-setting is likely to become an increasingly important topic for advertisers and media platforms.

A key novel finding of our study is that standardization did not affect all ads negatively. Instead, it appeared to have had little effect on ads that which were made by specialists in ad design. Ads which were reasonably generic in design were the ones most negatively affected. This leads to an unexpected conclusion. The process of standardization might, by virtue of standardizing some design elements, promote greater creativity in other design elements.

Such creativity is more likely to be found in industry insiders, such as ad agencies. Speculatively, this suggests another benefit of standardization for the industry: it reduces the role of plain ads that require less insider expertise. This relative benefit to insiders over outsiders suggests that the socially optimal set of standards may differ from those chosen by an industry standards body in important ways, perhaps favoring creativity over simplicity (Simcoe, 2011).

There are of course limitations to our study that suggest potential avenues for future research. First, and perhaps most importantly, we focus exclusively on the standardization process for online display advertising. We do not know exactly the extent to which our results will generalize to standards-setting processes in general and to other media in particular. Second, the standards-setting process we study, while typical of many standards-setting processes, did not immediately force advertisers and publishers to adopt a standard. This means that our results should be thought of as representative of a non-governmental standards-setting process rather than something with more coercive force. Third, we measure the effect of standardization on the type of measures that advertisers themselves use to measure ad effectiveness, but do not have data about how the pricing of ads changed as a result of this standardization process. Therefore, we do not know how this process affected media platform revenues. Fourth, the standards were known well in advance. This means that our treatment of the rise of standard format as a natural experiment is driven by the seemingly sudden acceptance of the format coincident with the April 2003 official launch rather than any new information about the formats available on the market. Fifth, we measure aided ad recall and purchase intent rather than actual purchases as a result of advertising. Given that our data come from a key source for benchmarking ad effectiveness, a weak interpretation of our results is that standardization reduced a key measure of ad effectiveness used by the industry. Finally, we focus on measuring the (asymmetric) costs of standardization, leaving the analysis of the benefits to other work (including Rysman and

Simcoe (2008), David and Greenstein (1990) and others). Given that the standards were widely adopted, the benefits likely outweighed the costs in total.

Notwithstanding these limitations, we believe our study does represent an important step in understanding the costs of standardization in general and how the standardization of advertising affects advertisers, media platforms, and consumers in particular.

References

- Ai, C. and E. C. Norton (2003). Interaction terms in logit and probit models. *Economics Letters* 80(1), 123–129.
- Armstrong, M. (2006). Competition in two-sided markets. *RAND Journal of Economics* 37(3), 668–691.
- Augereau, A., S. Greenstein, and M. Rysman (2006). Coordination vs. differentiation in a standards war: 56k modems. *RAND Journal of Economics* 37(4), 887–909.
- Bagwell, K. (2007). *The Economic Analysis of Advertising*, Volume 3 of *Handbook of Industrial Organization*, Chapter 28, pp. 1701–1844. Elsevier.
- Chen, Y., Q. Wang, and J. Xie (2011). Online social interactions: A natural experiment on word of mouth versus observational learning. *Journal of Marketing Research* 48(2), 238–254.
- Chiao, B., J. Lerner, and J. Tirole (2007). The rules of standard-setting organizations: An empirical analysis. *RAND Journal of Economics* 38(4), pp. 905–930.
- David, P. and S. Greenstein (1990). The economics of compatibility standards: An introduction to recent research. *Economics of Innovation and New Technology* 1, 3–42.
- Dhar, T. and K. Baylis (2011). Fast-food consumption and the ban on advertising targeting children: The Quebec experience. *Journal of Marketing Research* 48(5), 799–813.

- Dreze, X. and F.-X. Husherr (2003). Internet advertising: Is anybody watching? *Journal of Interactive Marketing* 17(4), 8–23.
- Dukes, A. and E. GalOr (Spring 2003). Negotiations and exclusivity contracts for advertising. *Marketing Science* 22(2), 222–245.
- Farrell, J. and G. Saloner (1988). Coordination through committees and markets. *RAND Journal of Economics* 19(2), 235–252.
- Farrell, J. and T. S. Simcoe (2009). Choosing the Rules for Consensus Standardization. *Mimeo, Berkeley*.
- Ghose, A. and S. Yang (2009). An empirical analysis of search engine advertising: Sponsored search in electronic markets. *Management Science* 55(10), 1605–1622.
- Goldfarb, A. and C. Tucker (2011a). Advertising Bans and the Substitutability of Online and Offline Advertising. *Journal of Marketing Research* 48(2), 207–227.
- Goldfarb, A. and C. Tucker (2011b). Online display advertising: Targeting and obtrusiveness. *Marketing Science* 30(3), 389–404.
- Goldfarb, A. and C. Tucker (2011c). Privacy regulation and online advertising. *Management Science* 57(1), 57–71.
- Goldfarb, A. and C. Tucker (2011d). Search engine advertising: Channel substitution when pricing ads to context. *Management Science* 57(3), 458–470.
- Greenstein, S. and V. Stango (2007). *Standards and Public Policy*. Cambridge University Press, Cambridge UK.
- Horrace, W. C. and R. L. Oaxaca (2006). Results on the bias and inconsistency of ordinary least squares for the linear probability model. *Economic Letters* 90, 321–327.

- Katz, M. L. and C. Shapiro (1985). Network externalities, competition, and compatibility. *American Economic Review* 75(3), 424–440.
- Kornish, L. J. and J. Watts (2011). Website ad quantities: An empirical analysis of traffic, competition, and business model. *Mimeo, University of Colorado at Boulder*.
- Lerner, J. and J. Tirole (2006). A model of forum shopping. *American Economic Review* 96(4), 1091–1113.
- Lewis, R. and D. Reiley (2009). Retail advertising works! measuring the effects of advertising on sales via a controlled experiment on yahoo!™. Working Paper, Yahoo! Research.
- Luchs, R., T. Geylani, A. Dukes, and K. Srinivasan (2010). The end of the Robinson-Patman act? Evidence from legal case data. *Management Science* 56(12), 2123–2133.
- Manchanda, P., J.-P. Dube, K. Y. Goh, and P. K. Chintagunta (2006). The effect of banner advertising on internet purchasing. *Journal of Marketing Research* 43(1), 98 – 108.
- Pashler, H. E. (1998). *The Psychology of Attention*. MIT Press, Cambridge MA.
- Pieters, R., L. Warlop, and M. Wedel (2002). Breaking through the clutter: Benefits of advertisement originality and familiarity for brand attention and memory. *Management Science* 48(6), 765–781.
- Rysman, M. and T. Simcoe (2008). Patents and the Performance of Voluntary Standard-Setting Organizations. *Management Science* 54(11), 1920–1934.
- Shapiro, C. and H. R. Varian (1999). *Information Rules: A Strategic Guide to the Network Economy*. Boston: Harvard Business School Press.
- Simcoe, T. (2011). Standard setting committees: Consensus governance for shared technology platforms. *Forthcoming, American Economic Review*.

Solomon, M. R. (1999). *Consumer Behavior, Fourth Edition*. Prentice Hall, Upper Saddle River, New Jersey.

Sun, M. and F. Zhu (2011). Ad revenue and content commercialization: Evidence from blogs. *Mimeo, Stanford*.

Taylor, C. (2001). IAB guidelines on units may revive the Net. *Advertising Age Feb 26*.

A Press Release

April 28, 2003 IAB ANNOUNCES FINAL INTERACTIVE UNIVERSAL Industry Survey
Feedback Supports Four Large Ad Sizes

Today, the Interactive Advertising Bureau (IAB) announced the new Universal Ad Package (UAP), a creative suite of four ad sizes that will enable advertisers to reach the majority of each online publisher's audience. Designed in response to advertiser demand for more standard online advertising guidelines, this creative suite will ensure a greater consistency with online ads regardless of where they are published on the Web. The UAP is intended to improve the efficiency and ease to planning, buying and creating online media. The UAP has the support of the American Association of Advertising Agencies(AAAA).

The Universal Ad Package interactive units (IU) include: IU 728 x 90 IU 300 x 250 IU 160 x 600 IU 180 x 150

If a publisher is UAP compliant, an advertiser can buy, plan and create around four units knowing they can reach the majority (51%) of that publisher's audience. Buyers can identify IAB member UAP compliant sites by the UAP Compliance Seal (attached).

The UAP offers a win-win for agencies and their clients. Now, as with a 30-second spot for TV, agencies can plan against a standard set of ad units The UAP affords a simpler approach to interactive media planning without impacting flexibility for advertisers to execute compelling, unique online advertising campaigns, said Jonathan Adams, Senior Partner, Group Media Director, mOne Worldwide (Chairman, AAAA, Eastern Interactive Marketing and New Media Committee).

In December 2002, the IAB Ad Sizes Task Force recommended the four interactive UAP ad sizes and solicited feedback on the proposed units from industry stakeholders including agencies, advertisers and online publishers. The results of this survey confirmed that the chosen sizes recognized and conformed to the needs of the media buying community. The

initial four sizes were chosen based on customer feedback, extensive usability studies and brand and traditional click performance tests.


The current IAB member companies that are currently, or plan to be compliant in the next 12-18 months, include: 24/7 Real Media Inc., About, Inc., America Online, Inc., CBS SportsLine.com, Classmates Online, Inc., CNET Networks, CondeNet, Edmunds.com, Inc., The Excite Network, Forbes.com, Inc., iVillage Inc., MarketWatch.com, Inc., Meredith Corporation, MSN, New York Times Digital, Terra Lycos, Univision Online, USAToday.com, Wall Street Journal Online, The Walt Disney Internet Group, Washingtonpost/Newsweek Interactive, The Weather Channel Interactive, Inc. and Yahoo!.

The buying community implored publishers to simplify the planning process for interactive media, and we did just that. We listened and are reshaping our sites to accommodate these needs. This industry is determined to prove our commitment to our advertising clients. We are set to take the industry to a new level that offers advertisers best practices and leads to equal or greater results than other media vehicles such as TV and print, said Joanne Bradford, MSN vice president and chief media revenue officer. MSN is firmly committed to making online a better environment for advertisers to reach consumers and interact in a meaningful way.

From an agency perspective, the UAP exploits the best aspects of interactive advertising but doesn't impact flexibility and creative option. With the UAP, an advertiser retains the ability to develop an ad in any size, shape or form they wish, whether it be a half-page or otherwise, and at the same time, they have the reassurance that they can create against the UAP and reach their desired audience, said Matt Freeman, CEO, Worldwide, Tribal DDB.

In less than 9 months, the IAB Ad Sizes Task Force has delivered a program that will ultimately result in one of the most meaningful changes in this industry to date. The UAP presents a uniform platform against which advertisers and agencies can develop campaigns with maximum efficiency thus reducing the barriers to entry for the media buying community,


728x90




Interactive Advertising Bureau

Universal Ad Package Specs


	Recommended Maximum Initial Download Fileweight	Recommended Animation Length (Seconds)
300 x 250 IMU - (Medium Rectangle)	40k	:15
180 x 150 IMU - (Rectangle)	40k	:15
160 x 600 IMU - (Wide Skyscraper)	40k	:15
728 x 90 IMU - (Leaderboard)	40k	:15




Interactive Advertising Bureau



300x250



180x150



160x600

Figure A-1: Mock-Up of Compliant Ads

said Adam Gelles, Director, Industry Initiatives, IAB. At long last, this medium is using ad units that are the size people have come to expect in offline media. For that reason, I think they will generate attention and response, said Mike Donahue, Executive Vice President, AAAA.

Table A-1: Difference-in-difference specification. Intent as Dependent Measure.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Likely Scale	Likely Scale	Likely Scale	Likely Scale	Likely Scale	Likely Scale	Purchase Intent	Purchase Intent	Likely Scale	Likely Scale
	× After Standardization	× After Standardization	× After Standardization	× After Standardization	× After Standardization	× After Standardization	× After Standardization	× After Standardization	× After Standardization	× After Standardization
Exposed × Standard Format				0.0690*** (0.0229)	-0.0555*** (0.0187)	-0.0532*** (0.0190)	-0.0144** (0.00644)	-0.0146** (0.00652)	-0.0555*** (0.0187)	-0.0532*** (0.0190)
Exposed × Standard Format		0.0230*** (0.00874)	-0.00944 (0.00828)	-0.0677*** (0.0207)	0.0136 (0.0169)	0.0130 (0.0171)	0.00238 (0.00581)	0.00309 (0.00590)	0.0136 (0.0169)	0.0130 (0.0171)
Exposed	0.0585*** (0.00436)	0.0468*** (0.00598)	0.0464*** (0.00585)	0.0650*** (0.00928)	0.0588*** (0.00867)	0.0591*** (0.0102)	0.0233*** (0.00297)	0.0218*** (0.00355)	0.0588*** (0.00867)	0.0591*** (0.0102)
Standard Format		0.0287*** (0.00633)	-0.00543 (0.00681)	-0.107*** (0.0160)						
Exposed × After Standardization				-0.0212* (0.0120)	0.00421 (0.0109)	-0.0126 (0.0127)	-0.00351 (0.00369)	-0.00637 (0.00440)	0.00421 (0.0109)	-0.0126 (0.0127)
Standard Format × After Standardization				0.103*** (0.0178)						
After Standardization				0.0538*** (0.00953)						
Female				-0.0225*** (0.00491)	-0.00942* (0.00510)	-0.00944* (0.00510)	0.00263 (0.00171)	0.00263 (0.00171)	-0.00942* (0.00510)	-0.00944* (0.00510)
Std. Income				-0.0290*** (0.00275)	-0.0231*** (0.00269)	-0.0231*** (0.00269)	-0.00160* (0.000887)	-0.00160* (0.000887)	-0.0231*** (0.00269)	-0.0231*** (0.00269)
Std. Age				-0.0725*** (0.00228)	-0.0708*** (0.00227)	-0.0708*** (0.00227)	-0.0167*** (0.000760)	-0.0167*** (0.000760)	-0.0708*** (0.00227)	-0.0708*** (0.00227)
Exposed × Ad Area						-1.12e-09 (1.89e-08)		5.71e-09 (7.23e-09)		-1.12e-09 (1.89e-08)
Exposed × Ad Area × After Standardization						9.34e-08*** (3.02e-08)		1.88e-08* (1.09e-08)		9.34e-08*** (3.02e-08)
Constant	2.902*** (0.00315)	2.889*** (0.00428)	2.913*** (0.00441)	2.885*** (0.00758)	2.911*** (0.00370)	2.910*** (0.00370)	0.310*** (0.00125)	0.309*** (0.00125)	2.911*** (0.00370)	2.910*** (0.00370)
Campaign Fixed Effects		No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	381641	381641	381641	381641	381641	381641	381641	381641	381641	381641
R-Squared	0.000471	0.000717	0.116	0.119	0.188	0.188	0.215	0.215	0.188	0.188

OLS regression coefficients shown. Data are for August 2002 until August 2004. In columns (1) and (2), the dependent variable is an indicator variable for whether or not the person is likely or very likely to purchase. In columns (3) and (4), the dependent variable is a five-point scale for purchase intent. Robust standard errors clustered at the campaign level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A-2: Originality: Ad content–Likely Intent as Dependent Measure

	Ad Agency (1)		No Ad Agency (2)		Ad Copy (3)		No Ad Copy (4)	
	Purchase Intent	Standardization	Purchase Intent	Standardization	Purchase Intent	Standardization	Purchase Intent	Standardization
Exposed × Standard Format × After Standardization	0.00135 (0.0236)		-0.0166** (0.00681)		0.000395 (0.0610)		-0.00275 (0.00668)	
Exposed × Standard Format	-0.0112 (0.0228)		0.00339 (0.00604)		-0.0385 (0.0605)		-0.00215 (0.00596)	
Exposed	0.0367*** (0.0106)		0.0221*** (0.00310)		0.0246*** (0.00755)		0.0238*** (0.00324)	
Exposed × After Standardization	-0.0169 (0.0115)		-0.00205 (0.00400)		0.0158* (0.00960)		-0.00964** (0.00402)	
Constant	0.295*** (0.00291)		0.313*** (0.00139)		0.334*** (0.00341)		0.305*** (0.00135)	
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Campaign Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	74260		307381		57607		324034	
R-Squared	0.177		0.224		0.181		0.221	

OLS regression coefficients shown, data are for August 2002 and August 2004, and the dependent variable is an indicator variable for whether the person stated they were likely or very likely to purchase the product.

Robust standard errors clustered at the campaign level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

'StandardFormat' is collinear with campaign fixed effects and omitted (see page 16 for details).

Table A-3: Originality: Ad content–Intent Scale as Dependent Measure

	Ad Agency (1)		No Ad Agency (2)		Ad Copy (3)		No Ad Copy (4)	
	Likely Scale	Likely Scale	Likely Scale	Likely Scale	Likely Scale	Likely Scale	Likely Scale	Likely Scale
Exposed × Standard Format × After Standardization	0.0163 (0.0703)	-0.0665*** (0.0198)	0.0224 (0.160)	-0.0268 (0.0195)				
Exposed × Standard Format	-0.0245 (0.0679)	0.0145 (0.0175)	-0.127 (0.158)	0.00458 (0.0173)				
Exposed	0.0801** (0.0315)	0.0570*** (0.00904)	0.0745*** (0.0220)	0.0572*** (0.00946)				
Exposed × After Standardization	-0.0220 (0.0342)	0.00784 (0.0117)	0.0391 (0.0281)	-0.00938 (0.0118)				
Constant	2.819*** (0.00869)	2.933*** (0.00409)	2.983*** (0.00990)	2.898*** (0.00399)				
Demographic controls	Yes	Yes	Yes	Yes				
Campaign Fixed Effects	Yes	Yes	Yes	Yes				
Observations	74260	307381	57607	324034				
R-Squared	0.176	0.190	0.139	0.197				

OLS regression coefficients shown, data are for August 2002 and August 2004, and the dependent variable is 5-point scale reflecting purchasing intent. Robust standard errors clustered at the campaign level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. ‘StandardFormat’ is collinear with campaign fixed effects and omitted (see page 16 for details).