

## Internet Appendix 1: Choice of 15-Minute Intervals

We need to make a methodological choice for how to define the start of the 15-minute intervals. Ideally, we want ads to be distributed uniformly throughout the 15-minute interval. Alternatively, if ads are not distributed uniformly, we would prefer to have more ads at the start of the interval (front-loaded), so that we would capture the effect on search patterns in the same 15-minute interval. That is, if most ads were shown at the beginning of the interval (e.g., during the first minutes in the 15-minute interval), it is likely that the search behavior attributable to an ad would manifest itself in the same 15-minute interval. If, on the other hand, most ads were shown towards the end of an interval (back-loaded), most of the ad-induced search would happen in the subsequent 15-minute interval, which is what we want to avoid.

For example, one choice would be to start the intervals at the beginning of each hour, i.e., define them as (X:00-X:14; X:15-X:29; X:30-X:44; X:45-X:59, where X is a particular hour). However, ad insertions are indeed lowest during the beginning of each hour due to TV programming patterns.

We thus look at all of the possible variations of starting times of 15-minute intervals. All of the possible interval variations and the resulting distributions of ad insertions are reported in the Internet Appendix [Figure IA1](#). Based on this inspection, we can see that ads are not uniformly distributed and that starting the intervals at 3 to 7 minutes past the hour would provide us with most front-loading of ads within the interval. Thus, we choose to define our intervals starting at 5 minutes past each hour. That is, our intervals are defined as X:05-X:19; X:20-X:34; X:35-X:49; X:50-X+1:04, where X is a particular hour. We perform robustness checks to this methodological choice in Section [5.2](#).

## Internet Appendix 2: Heterogeneity by Firm

In this internet appendix we study the heterogeneity of advertising effect across firms.

Given that our estimation is now performed at a 15-minute *time interval*  $\times$  *time zone* level for each firm separately and thus we cannot include a 15-minute *time interval*  $\times$  *time zone* fixed effect, which in the specification (1) was defined as  $\theta_{tk}$ , we alter our specification to be:

$$\text{Ln}(\text{EdgarIPSearches})_{tk} = \beta \times \text{Ad}_{tk} + \gamma_t + \kappa_k + \epsilon_{tk} \quad (\text{IA1})$$

We report the distribution of the coefficients in Internet Appendix [Figure IA3](#).<sup>1</sup> We find that 124 firms have a statistically significant positive response to the TV advertising at a 5% significance level. The largest effects are 205.54% increase for Energy Transfer Partners and 148.31% increase for Harley-Davidson Motor Co. We report the firms with top 30 largest coefficients in Internet Appendix [Table IA2](#) together with the number of ads and expenditure on those ads from these firms over our sample period. As one can see, top seven firms with the largest abnormal searches had very few TV ads over the sample period and this is consistent with the ad novelty effect having a strong influence on the viewer attention.

In addition, we perform a similar exercise for Google searches. Given that we have fewer firms in August 2016 sample, for comparison reasons we limit our estimation of SEC EDGAR queries to the same set of firms. As expected, we find that Google searches have a larger economic effect and are statistically significant for more firms (relative to SEC EDGAR queries) as Google searches allow for a wider information environment. Specifically, as illustrated in Internet Appendix [Figure IA4](#), we find that around half of the firms in the sample (71 out of 156) have a statistically significant Google search response to TV advertising at a 5% significance level versus 29 firms with a significant positive response for SEC EDGAR queries. The mean effect, however, calculated over the significant coefficients is similar: 0.46 for Google SVI and 0.40 for SEC EDGAR queries.<sup>2</sup> Internet Appendix [Table IA5](#) lists all of the 29 firms for which the SEC EDGAR search effect was significant along with the corresponding estimated Google SVI abnormal search results. These results highlight the fact that there is a significant overlap between the sets of firms for which the effect is statistically significant for SEC EDGAR queries and the set of firms for which the effect is statistically significant for Google searches.

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<sup>1</sup>The average coefficient in this distribution does not correspond to our baseline estimate due to the fact that we estimate these firm-level regressions independently and thus we do not capture the correlation between firm responses in a particular time zone at a particular time, which was previously captured by  $\theta_{tk}$ .

<sup>2</sup>As expected, the SEC EDGAR effect is larger in August 2016 sample relative to the effect in the full sample due to 2016 Summer Olympics ads having a significantly wider audience reach.

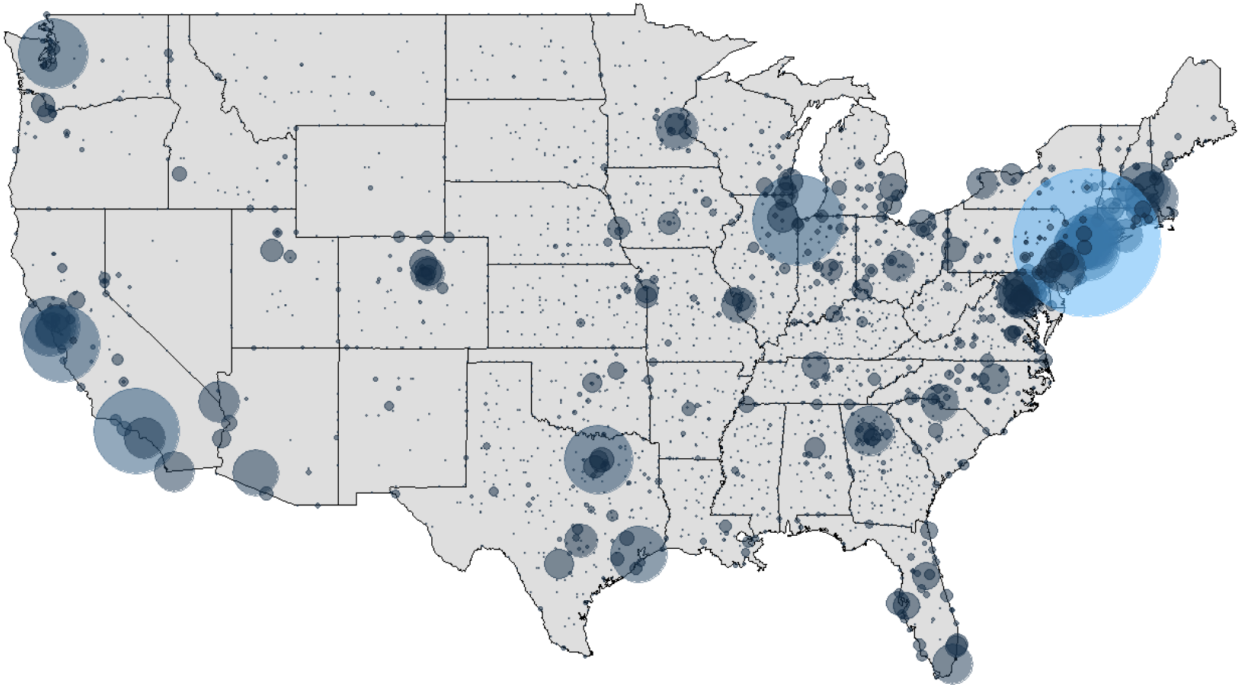
**Figure IA1: Ad Insertions by Minute**

This figure shows different distributions of ad insertions by minute if the 15-minute intervals are started at a particular minute. For instance, the top left figure shows the aggregated distribution of ads if intervals are started at an hour. The next figure on the left shows the aggregated distribution of ads if intervals are started at 1 minute past the hour, and so on.



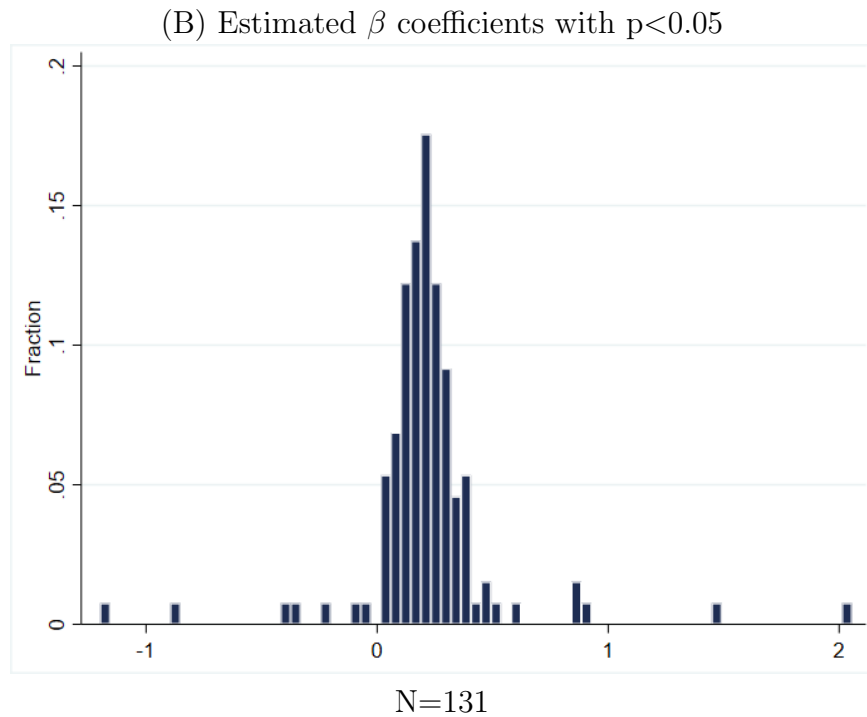
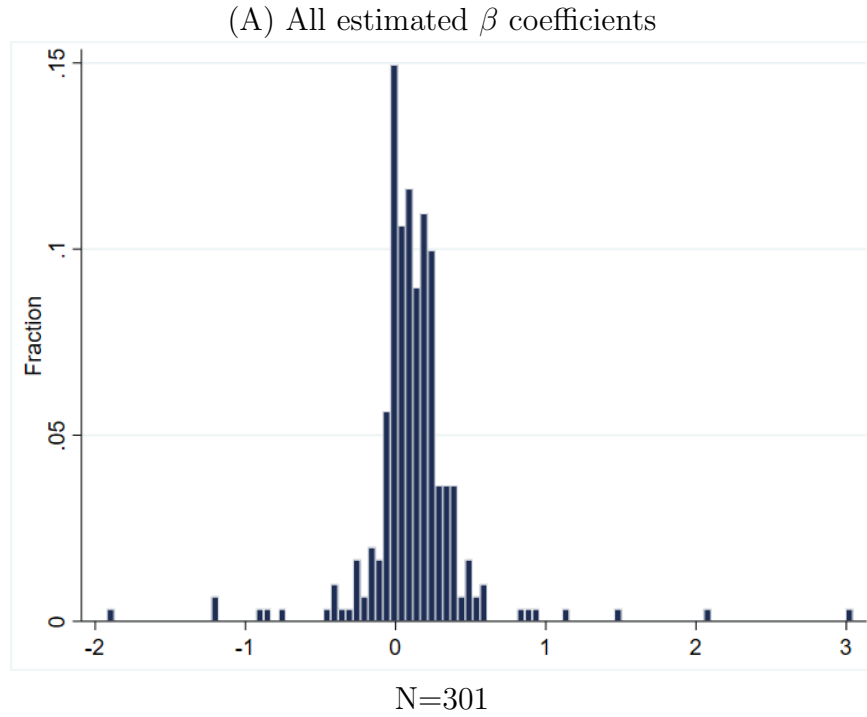
**Figure IA2: Map of SEC EDGAR Queries**

This figure reports the bubble map for the total SEC EDGAR queries during our sample period by matching the IP addresses in the SEC EDGAR database to the MaxMind IP address data that contains information on the geographic coordinates. The IP addresses in SEC EDGAR data only contain the first three octets and the last part is anonymized using a static cypher (e.g., 66.208.17.efc). Since MaxMind reports locations for a range of IP addresses that are from the same location (e.g., 66.208.16.0 through 66.208.19.255 in Washington, DC), we can match the searches from the partially anonymized IP addresses in SEC EDGAR database to a specific county in the U.S. In creating the map, we match the IP addresses at the county level and we do not require all IP addresses to match to the same time zone, which is a stricter criterion that we use in the analysis in the rest of the paper. In this map, when the possible ranges of IP addresses from MaxMind map into multiple counties, we use the county that represents the majority of the IP addresses within the range. We remove the observations that are of unknown origin (MaxMind assigns U.S. IP addresses that are of unknown locations to the geographic center of the U.S., which is in the Reno County in Kansas. Approximately 4.7% of all searches in our SEC EDGAR sample database are assigned to this county).



### Figure IA3: Firm-Level Coefficient Estimates: SEC EDGAR

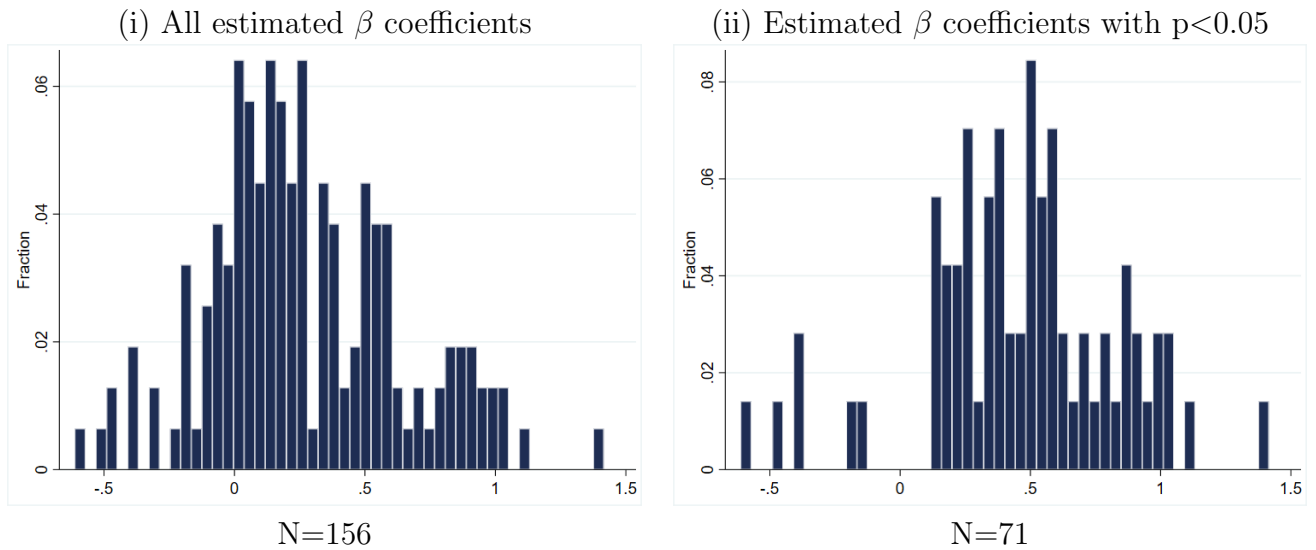
This figure plots the firm-level  $\beta$  coefficients estimated from the specification (IA1) for 301 firms in our full sample. Panel A plots all of the estimated coefficients, while Panel B only plots coefficients that were estimated to be statistically significant at  $p < 0.05$  level.



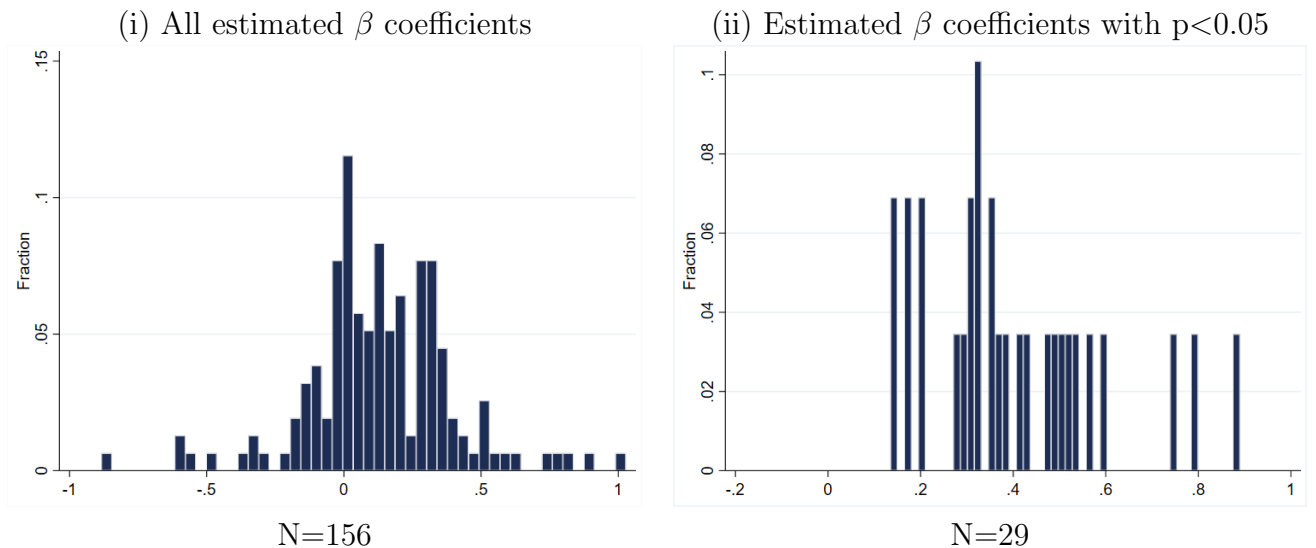
### Figure IA4: Firm-Level Coefficient Estimates: SEC EDGAR and Google

This figure plots the firm-level  $\beta$  coefficients estimated from the specification (IA1) for 156 firms in our August 2016 sample. Panel A plots the estimated coefficients for Google search volume index, while Panel B plots coefficients for SEC EDGAR searches restricted only to August 2016 sample. In both of the panels, the left graph (i) depicts all of the estimated coefficients, whereas the right graph (ii) plots only those coefficients that were estimated to be statistically significant at  $p < 0.05$  level.

#### (A) Google Search Volume Index

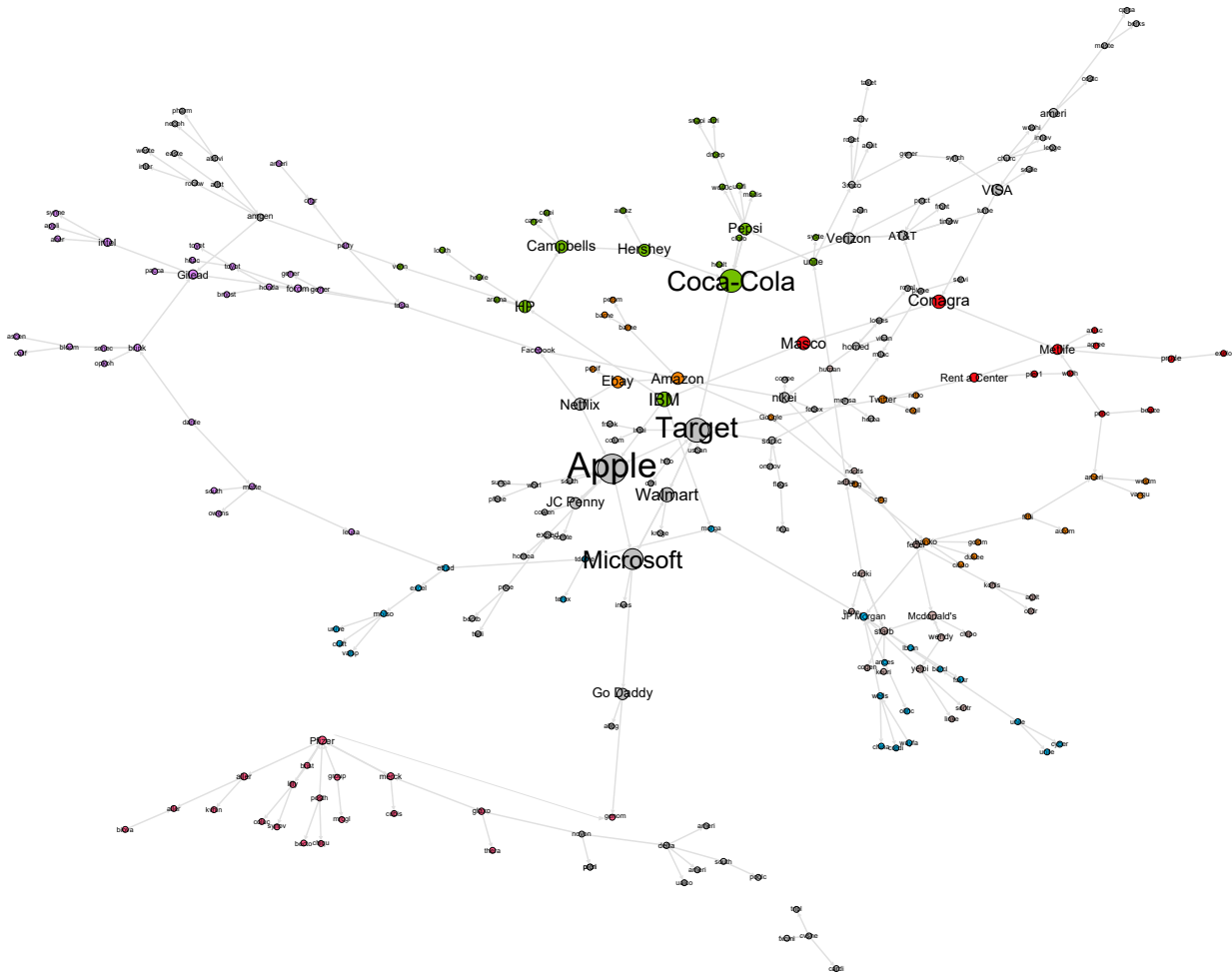


#### (B) SEC EDGAR searches (August 2016 sample)



## Figure IA5: Financial Information Search Spillovers

This figure reports the network graph for the linked SEC EDGAR searches that are triggered by ad-induced search for a focal advertiser. The direction of arrows indicates the sequence of visits. For each focal treated advertiser we include three most co-searched firms. The size of the node represents the importance of the node based on betweenness centrality: the more connected the company is to other segments of the graph, the more central it is.



**Table IA1: Heterogeneity Tests by Industry Sector**

This table reports results of the effect of advertising on SEC EDGAR searches by GICS sectors. Given limited number of observations in Telecommunications sector, we group it together with Information Technology sector. Similarly, we group Real Estate and Financial sectors together. Since the vast majority of the companies in our sample falling under the larger Healthcare GICS sector belong to Pharmaceuticals, Biotechnology & Life Sciences sub-sector (the other sub-sector being Health Care Equipment & Services), we refer to this sector as Pharmaceuticals. Finally, we define materials, utilities, and energy as “Other”. Column (1) presents the baseline overall effect for all ads within a given sector, column (2) presents the effect only for primetime ads, and column (3) reports the results of log of estimated ad expenditure. T-stats based on the standard errors clustered at the firm level are displayed below. \*, \*\* and \*\*\* indicate significance levels of 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)
	All ads	Primetime	Ln(ad\$)
Industrials	-0.001	-0.021	-0.000
	-0.062	-0.553	-0.124
Consumer Discretionary	0.017	0.027	0.001
	1.286	1.613	1.330
Consumer Staples	0.029**	0.033*	0.002*
	2.003	1.662	1.957
Pharmaceuticals	0.036**	0.042	0.003**
	2.215	1.476	2.257
Financials and Real Estate	0.057***	0.109***	0.005***
	2.870	2.955	2.969
Information Tech and Telecom Services	0.003	0.007	0.000
	0.073	0.137	0.083
Other (Utilities, Energy, Materials)	-0.024	-0.068	-0.002
	0.381	-0.918	0.381
firm $\times$ time interval f.e.	yes	yes	yes
firm $\times$ time zone f.e.	yes	yes	yes
time interval $\times$ time zone f.e.	yes	yes	yes
R-squared	0.381	0.381	0.381
N	47.1MM	47.1MM	47.1MM



**Table IA2: Top 30 Ad-Induced SEC EDGAR Query Abnormal Searches by Firm**

This table reports top 30 firms by estimated coefficient in firm-level regressions of ad effect on the SEC EDGAR queries. We report the firm name, ticker, the economic effect, T-stats based on clustered standard errors, the number of ads during our sample period, and the ad expenditure during our sample period.

No	Parent Company	Ticker	% Increase	T-stat	# of ads	Ad exp. (in \$MM)
1	Energy transfer partners LP	ETP	205.54%	1.96	1	\$0.02
2	Harley-Davidson motor co	HOG	148.31%	2.30	4	\$0.15
3	Paypal holdings Inc	PYPL	92.26%	1.96	13	\$1.27
4	Mylan Inc	MYL	87.25%	3.51	35	\$1.25
5	National amusements/TW	TWX	85.89%	3.49	92	\$1.28
6	Hasbro Inc	HAS	58.92%	2.02	19	\$1.67
7	Dicks sporting goods Inc	DKS	52.90%	3.67	79	\$36.49
8	Conagra brands Inc	CAG	48.51%	9.57	788	\$44.80
9	Wyndham worldwide corp	WYN	47.82%	3.14	69	\$4.22
10	Dell technologies Inc	DELL	42.54%	5.83	336	\$25.82
11	Marriott intl Inc	MAR	40.34%	5.34	380	\$28.64
12	AT&T Inc	T	38.99%	18.09	9,951	\$632.09
13	Whirlpool corp	WHR	37.90%	3.30	129	\$20.63
14	Wendys co	WEN	37.44%	7.73	934	\$46.66
15	Wells fargo & co	WFC	37.24%	5.22	553	\$49.61
16	Darden restaurants Inc	DRI	36.73%	12.58	2,908	\$108.93
17	Yum brands Inc	YUM	36.57%	12.88	3,116	\$192.56
18	Ameriprise financial Inc	AMP	36.09%	3.68	177	\$17.31
19	3M co	MMM	34.82%	1.98	75	\$5.02
20	Unitedhealth group Inc	UNH	33.83%	7.40	1,138	\$81.99
21	Time warner Inc	TWX	33.09%	17.33	8,490	\$599.05
22	Verizon communications Inc	VZ	33.02%	11.60	4,168	\$382.57
23	Dunkin brands Inc	DNKN	32.45%	4.69	438	\$32.73
24	L brands Inc	LB	31.71%	7.73	1,465	\$84.86
25	Best buy co Inc	BBY	31.65%	5.14	816	\$54.80
26	Citigroup Inc	C	31.55%	7.99	1,684	\$142.56
27	Bloomin brands Inc	BLMN	30.68%	8.70	1,023	\$50.81
28	Valeant pharmaceuticals intl	VRX	30.17%	6.23	1,198	\$122.56
29	JP morgan chase & co	JPM	29.95%	4.93	506	\$48.02
30	General motors corp	GM	29.62%	11.57	4,721	\$494.37

**Table IA3: Heterogeneity by Position of SEC EDGAR in Google Search Engine Results Pages**

This table reports how the baseline advertising effect from [Table 2](#) varies by the position of SEC EDGAR website in Google search engine results pages after searching for the keyword “respective firm name + 10K”, e.g., “Apple 10K”. Column (1) presents the results where we interact our baseline advertising treatment variable with the search result position. We control for *firm × time interval*, *firm × time zone*, and *time interval × time zone* fixed effects. T-stats based on the standard errors clustered at the firm level are displayed below. \*\*\* indicates significance level of 1%.

	(1)
	All ads
TV Ad	0.033***
	3.939
TV Ad × Google Position	-0.001***
	-3.669
firm × time interval f.e.	yes
firm × time zone f.e.	yes
time interval × time zone f.e.	yes
R-squared	0.374
N	47.2MM

**Table IA4: Robustness of Financial Information Search on Google**

This table reports results of the effect of advertising on contemporaneous Google Search Volume Index (SVI) for all advertisers in August 2016 and provides robustness for [Table 5](#). Compared to [Table 5](#), we report results where we consider different structure of fixed effects. Here we control for *firm*  $\times$  *time interval*, *firm*  $\times$  *state*, and *time interval*  $\times$  *state* fixed effects. Column (1) presents the baseline overall effect for all ads, column (2) presents the effect only for primetime ads, and column (3) reports the results of log of estimated ad expenditure. T-stats based on the standard errors clustered at the firm level are displayed below. \*\* indicates significance level of 5%.

	(1)	(2)	(3)
	All ads	Primetime	Ln(ad\$)
TV Ad	0.078**	0.091**	0.006**
	2.511	2.298	2.467
firm $\times$ time interval f.e.	yes	yes	yes
firm $\times$ state f.e.	yes	yes	yes
time interval $\times$ state f.e.	yes	yes	yes
R-squared	0.678	0.678	0.678
N	5.75MM	5.75MM	5.75MM

**Table IA5: Top Ad-Induced SEC EDGAR Queries and Corresponding Google Abnormal Searches by Firm**

This table reports firms ordered by estimated significant coefficient in firm-level regressions of ad effect on the SEC EDGAR queries in August, 2016. We report the firm name, ticker, the economic effect on SEC EDGAR queries, and the economic effect on Google searches for the same firm. n.s. indicates estimate with  $p > 0.1$  that we consider not to be statistically significant.

No	Parent Company	Ticker	SEC EDGAR % increase	Google SVI % increase
1	Best Buy co Inc	BBY	88.99%	83.57%
2	Unitedhealth group Inc	UNH	79.82%	100.28%
3	Priceline.com Inc	PCLN	74.13%	25.74%
4	Dell technologies Inc	DELL	60.03%	33.81%
5	Yum brands Inc	YUM	56.81%	33.59%
6	Amgen Inc	AMGN	52.99%	n.s.
7	Brinker intl Inc	EAT	52.72%	n.s.
8	AT&T Inc	T	50.86%	13.43%
9	Allergan plc	AGN	49.56%	n.s.
10	Pepsico Inc	PEP	47.26%	48.31%
11	Clorox co	CLX	42.58%	n.s.
12	Skechers usa Inc	SKX	41.53%	n.s.
13	Campbell soup co	CPB	38.15%	n.s.
14	Progressive corp	PGR	37.32%	n.s.
15	General mills Inc	GIS	35.17%	110.17%
16	Fiat Chrysler automobiles nv	FCAU	34.83%	n.s.
17	Time warner Inc	TWX	33.04%	20.15%
18	Darden restaurants Inc	DRI	31.99%	78.17%
19	L brands Inc	LB	31.93%	10.49%
20	Abbvie Inc	ABBV	30.83%	n.s.
21	General motors corp	GM	30.71%	37.20%
22	Honda motor co ltd	HMC	29.20%	n.s.
23	Target corp	TGT	27.37%	62.64%
24	Costar group Inc	CSGP	21.01%	n.s.
25	Pfizer Inc	PFE	20.28%	21.84%
26	Procter & Gamble co	PG	17.53%	75.62%
27	Toyota motor corp	TM	17.15%	54.24%
28	Unilever	UL	14.00%	60.00%
29	Glaxosmithkline plc	GSK	13.48%	24.84%

**Table IA6: Robustness Tests for the Next-day Effect on Stock Trading Volume**

This table shows the robustness results that complement the results presented in Table 6. The main explanatory variable is the total abnormal search in SEC EDGAR searches during the primetime hours in the prior day. In estimating this variable, we follow equation (1) and difference out  $\gamma_{it}$ ,  $\kappa_{ik}$ , and  $\theta_{tk}$  from total searches during the 15-minute time interval with an ad. We then aggregate these values across both time zones during primetime hours. In Panel A, the dependent variable is the log trading volume on a given day. In Panel B, the dependent variable is the log trading volume by retail investors as per Boehmer et al. (2020) on a given day. In both panels, column (1) considers ad effect over 10-minute interval only. Column (2) reports the results when earnings announcement days are excluded from the sample, while column (3) excludes merger announcement days. Column (4) estimates the specification with one-day lagged volume, instead of  $firm \times month$  fixed effects. T-stats based on the standard errors clustered at the firm level are displayed below. \*\*\* indicates significance level of 1%.

(A) Total Trading Volume				
	(1)	(2)	(3)	(4)
	10 min	Exclude EA	Exclude M&A	Lagged volume
Lagged Abnormal Ad Search	0.000430***	0.000444***	0.000394***	0.000187**
	2.979	4.373	3.994	2.544
Lagged Total Search	0.006378***	0.006708***	0.006442***	0.003045***
	3.551	3.562	3.541	5.021
Lagged Volume				0.958267***
				351.079
firm $\times$ month f.e.	yes	yes	yes	no
day f.e.	yes	yes	yes	yes
R-squared	0.939	0.942	0.939	0.926
N	0.161MM	0.158MM	0.159MM	0.161MM
(B) Retail Trading Volume				
	(1)	(2)	(3)	(4)
	10 min	Exclude EA	Exclude M&A	Lagged volume
Lagged Abnormal Ad Search	0.000589***	0.000593***	0.000551***	0.000509***
	4.012	6.782	6.111	4.71
Lagged Total Search	0.008002***	0.008346***	0.008112***	0.007665***
	3.586	3.582	3.58	5.477
Lagged Volume				0.936990***
				227.334
firm $\times$ month f.e.	yes	yes	yes	no
day f.e.	yes	yes	yes	yes
R-squared	0.920	0.924	0.920	0.893
N	0.159MM	0.156MM	0.157MM	0.158MM

**Table IA7: Next-Day Effect on Stock Trading Volume: Controlling for News**

This table shows the robustness results that complement the results presented in [Table 6](#). The main explanatory variable is the total abnormal search in SEC EDGAR searches during the primetime hours in the prior day. In estimating this variable, we follow equation (1) and difference out  $\gamma_{it}$ ,  $\kappa_{ik}$ , and  $\theta_{tk}$  from total searches during the 15-minute time interval with an ad. We then aggregate these values across both time zones during primetime hours. In columns (1)-(2), the dependent variable is the log trading volume on a given day. In columns (3)-(4), the dependent variable is the log trading volume by retail investors as per [Boehmer et al. \(2020\)](#) on a given day. In columns (1) and (3), we control for any news about the firm in the preceding day, as reported in RavenPack with the news relevance score of at least 75. In columns (2) and (4), we control for news about the firm in the preceding day, as reported in RavenPack with the news relevance score of 100. T-stats based on the standard errors clustered at the firm level are displayed below. \*\*\* indicates significance level of 1%.

	Total Trading Volume		Retail Trading Volume	
	(1)	(2)	(3)	(4)
	News	Most relevant news	News	Most relevant news
Lagged Abnormal Ad Search	0.000404***	0.000393***	0.000554***	0.000537***
	4.171	4.101	5.714	5.666
Lagged Total Search	0.006533***	0.006173***	0.008222***	0.007742***
	3.573	3.577	3.611	3.620
News	0.054472***	0.061497***	0.076417***	0.079224***
	13.759	17.244	12.412	15.725
firm $\times$ month f.e.	yes	yes	yes	yes
day f.e.	yes	yes	yes	yes
R-squared	0.939	0.939	0.920	0.920
N	0.161MM	0.161MM	0.159MM	0.159MM

**Table IA8: The Next-day Effect on Stock Trading Volume in Opening Hours**

This table shows the results on the trading volume over the opening hours on the day after the firm's ads were broadcast. The main explanatory variable is the total abnormal search in SEC EDGAR during the primetime hours in the prior day. In estimating this variable, we follow equation (1) and difference out  $\gamma_{it}$ ,  $\kappa_{ik}$ , and  $\theta_{tk}$  from total searches during the 15-minute time interval with an ad. We then aggregate these values across both time zones during primetime hours. In Panel A, the trading volume is estimated over 9:30am-10:00am period while in Panel B, the trading volume is estimated over 9:30am-9:35am period. In both panels, column (1) reports baseline results where only ads during the primetime are considered, while column (2) shows the total number of ad-induced abnormal searches over the whole day (rather than just primetime hours). Column (3) studies the intensive margin, i.e., the number of ad induced abnormal searches. Column (4) studies the extensive margin, i.e., whether or not an ad was aired (an ad dummy instead of an abnormal search magnitude). T-stats based on the standard errors clustered at the firm level are displayed below. \*\*\* indicates significance level of 1%.

(A) Opening Trading Volume (9:30am-10:00am)				
	(1)	(2)	(3)	(4)
	Primetime	All day	Int. margin	Ext. margin
Lagged Abnormal Ad Search	0.000536***	0.000432***	0.000481***	
	2.737	2.610	2.703	
Lagged Ad Dummy				0.008042
				1.142
Lagged Total Search	0.009485***	0.009488***	0.006354***	0.009450***
	3.428	3.419	3.252	3.368
firm $\times$ month f.e.	yes	yes	yes	yes
day f.e.	yes	yes	yes	yes
R-squared	0.873	0.873	0.874	0.873
N	0.153MM	0.153MM	0.045MM	0.153MM
(B) Opening Trading Volume (9:30am-9:35am)				
	(1)	(2)	(3)	(4)
	Primetime	All day	Int. margin	Ext. margin
Lagged Abnormal Ad Search	0.000506**	0.000412**	0.000386**	
	2.440	2.216	2.118	
Lagged Ad Dummy				-0.010146
				-1.200
Lagged Total Search	0.009599***	0.009602***	0.006688***	0.009574***
	3.572	3.562	3.273	3.502
firm $\times$ month f.e.	yes	yes	yes	yes
day f.e.	yes	yes	yes	yes
R-squared	0.832	0.832	0.844	0.832
N	0.153MM	0.153MM	0.045MM	0.153MM

**Table IA9: The Next-day Effect on Stock Returns**

This table shows the results of ad-induced search effects on the stock returns the day after the firm’s ads are broadcast. The explanatory variable is the total abnormal search in SEC EDGAR searches during the primetime hours in the prior day. In estimating this variable, we follow equation (1) and difference out  $\gamma_{it}$ ,  $\kappa_{ik}$ , and  $\theta_{tk}$  from total searches during the 15-minute time interval with an ad. We then aggregate and add these ad-induced searches across both time zones during primetime hours. Column (1) reports the results where the dependent variable is the total daily returns (close-to-close). Column (2) reports the results where the dependent variable is the overnight returns (close-to-open), estimated as in [Lou et al. \(2019\)](#). Column (3) reports the results where the dependent variable is the intraday returns (open-to-close). T-stats based on the standard errors clustered at the firm level are displayed below. \* and \*\*\* indicate significance levels of 10% and 1%, respectively.

	(1)	(2)	(3)
	Total returns	Overnight returns	Intraday returns
Lagged Abnormal Ad Search	0.000005 0.977	0.000009* 1.737	-0.000003* -1.962
Lagged Total Search	0.000135* 1.682	0.000138* 1.695	-0.000003 -0.375
Lagged Total Return	0.545561*** 6.371	0.545610*** 6.381	-0.000098 -0.595
day f.e.	yes	yes	yes
R-squared	0.318	0.320	0.188
N	0.16MM	0.16MM	0.16MM