

Background Noise?

TV Advertising Affects Real Time Investor Behavior

Jūra Liaukonytė

Cornell University

Alminas Žaldokas

HKUST

UBS Quant Insight Series

Disclaimer

This presentation was produced solely by Alminas Žaldokas. The opinions and statements expressed herein are those of Alminas Žaldokas and are not necessarily the opinions of any other entity, including UBS AG and its affiliates. UBS AG and its affiliates accept no responsibility whatsoever for the accuracy, reliability or completeness of the information, statements or opinions contained in this presentation and will not be liable either directly or indirectly for any consequences, including any loss or damage, arising out of the use of or reliance on this presentation or any part thereof. Reproduced with permission.

Rise of Retail Investors?

Retail investors have seen huge gains as S&P 500 nears pre-pandemic high

Retail investors have been flocking to equity markets as an unrelenting five-month surge in valuations suggests stocks are immune to the damage being inflicted on the economy by the Covid-19 pandemic.

Betty Liu, Executive Vice Chairman for NYSE Group, provides her perspective:

What's been the role of the retail investor over the past few months?

So, US equity market volumes have been pretty high, remarkably high since the end of February 2020, and much of that is being attributed to the rise in retail investment activity. In fact, on peak market days, retail investors can account for up to a quarter of all market activity.

Vanguard

- ▶ Using Vanguard's platforms, between February 19, 2020 and April 17, 2020:
 - ▶ 7 in 10 households trading moved into equities
 - ▶ Just 0.6% of investors moved into an all-cash position
 - ▶ 6.6% of Gen Z traded; 15.3% of early boomers traded
- ▶ The numbers are possibly even larger since then
- ▶ Media speculates about retail investors: substitution from sports gambling, boredom, fear of missing out..

Recent Stock Market Turbulence

- ▶ Do retail investors estimate discounted cash flows / perform technical analysis of all thousands of publicly-traded stocks available globally?
- ▶ Just buy TSLA and and NKLA?
- ▶ Resort to their recent personal experiences?
 - ▶ Surge in video conferencing
 - ▶ Home deliveries
 - ▶ Sold out home gym equipment
 - ▶ News about emptying hotels
 - ▶ Progress in medical kits

Retail Investors

- ▶ Retail investors sometimes react to attention-grabbing events without paying much attention to information

COMPANIES

Zoom Technologies Stock Soared a Whopping 56,000% Because People Are Confusing It With the Zoom Video IPO

By Mark DeCambre, MarketWatch April 18, 2019 1:54 pm ET

MARKETS

▲ ZM \$262.10 +1.10 0.42%

Zoom Stock or ZM Stock? Confusion Continues for Potential Zoom Video Investors

CONTRIBUTOR

Nick Clarkson — [InvestorPlace](#)

PUBLISHED

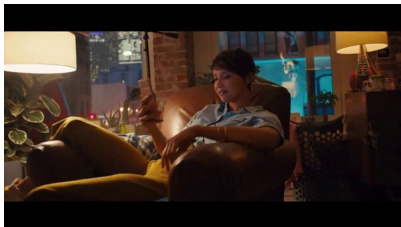
MAR 27, 2020 1:13PM EDT

Vanguard's Clients

- ▶ What drives retail investors' information acquisition and trading on the daily basis?
- ▶ Giglio, Maggiori, Stroebe, and Utkus (2019):
 - ▶ Survey 20,000 Vanguard's clients on their beliefs
 - ▶ Match responses to their portfolio composition and trading
 - ▶ Conclude that “it is hard to predict when retail investors trade”
- ▶ Can advertising be one source of trigger for a recurring trading pattern of retail investors?

Robinhood

- ▶ Robinhood, a retail trading platform, has been one of top finance sector TV advertisers recently
 - ▶ Spending \$24m in the past 6 months



Can Some Recurring Event Consistently Predict Retail Investor Actions?

TV Advertising Puts Firms on Investor Radar

- ▶ Advertising is usually thought to be intended to increase the sales of a firm's products rather than its securities
- ▶ At the same time, investors are likely to be exposed to TV ads of specific firm quasi-randomly
- ▶ Advertiser becomes more salient to the investors with limited attention

Why Do We Care?

- ▶ **Household portfolio choice**

- ▶ Understanding how households build their portfolios might guide certain public policies (e.g., retirement and financial education)

- ▶ **Informed trading**

- ▶ Understanding how retail investors trade might help decide when to take trades on the other side

- ▶ **Firm strategies**

- ▶ Understanding how investors trade might influence firm advertising choices

This Research Project

- ▶ Uses high-frequency ('big') advertising data and links it to real-time investor actions
- ▶ Shows a more direct, immediate, and far-reaching effect than previously documented
- ▶ Identifies one channel that generates a constant flow of retail trading activity

Agenda

- ▶ Does TV advertising affect financial information acquisition?
- ▶ Does this information collection translate into actual investment decisions?
- ▶ Are there any spillovers to other firms? How to capture such spillovers?

Empirical Challenges and Solutions

Empirical Challenges

- ▶ Advertising timing and extent are strategic choices by the firms (e.g., before the equity issuance or M&A)
- ▶ Contemporaneous confounding events (e.g., media coverage) are correlated with both advertising and investor interest
- ▶ Relationship between advertising and investor actions might reflect its relationship with profitability
- ▶ Advertising might affect investors indirectly by raising the consumer-investor familiarity with the product

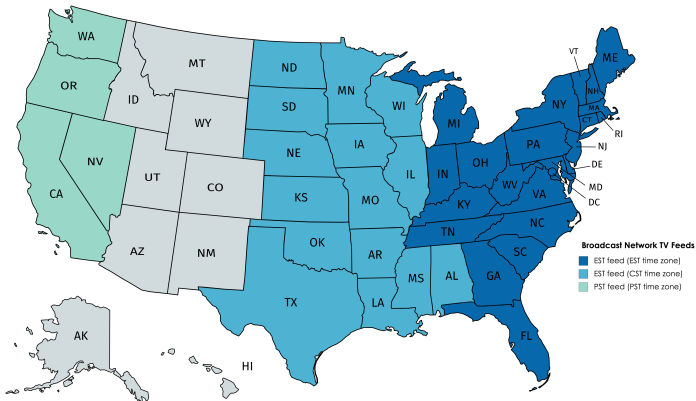
Empirical Challenges

- ▶ Can we just correlate advertising expenditure data with stock market valuations or investor trading?
 - ▶ We might be capturing some confounding influences
- ▶ In building our [identification strategy](#), we will rely on certain institutional features of TV advertising

Broadcast TV Network Feeds

- ▶ Institutional feature:
 - ▶ Broadcast networks (CBS, ABC, NBC, Fox, and CW) use only one feed for all of their affiliate partners
 - ▶ When the broadcast feed goes out, each station picks up the feed to broadcast immediately (EST or CST) or they hold the feed for broadcast at a later time (MST or PST)
- ▶ Identification strategy relies on different geographic locations being exposed to the same TV ads at different times

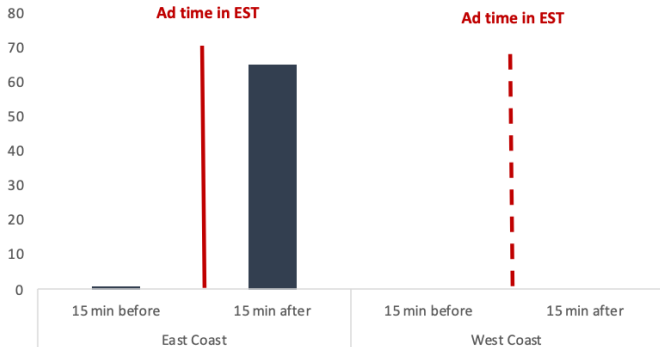
Identification Strategy: EST and PST



- ▶ $EST + CST = EST$
- ▶ Exclude MST, HI, AK

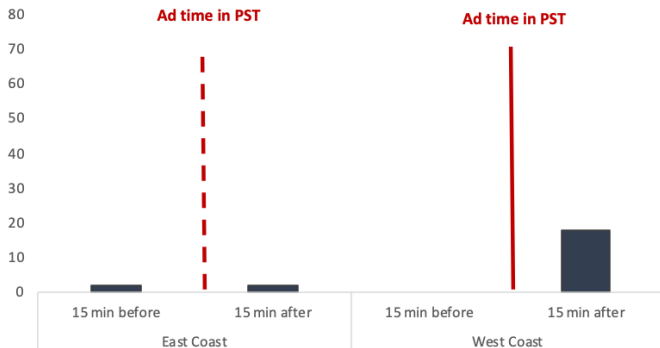
What Variation Would Identify the Effect?

- ▶ Example: *Apple Inc* ad on Mar 19, 2017 during SNL on NBC
- ▶ Financial information search bump on *Apple Inc* after ad is shown in EST (but not yet in PST):



What Variation Would Identify the Effect?

- ▶ The reverse pattern when same ad is shown 3h later in PST



- ▶ We study if such patterns exist across all ads in our sample

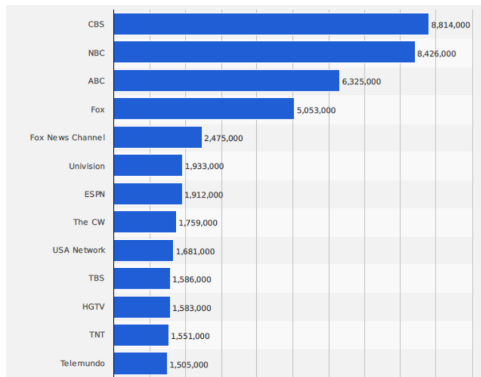
Data and Specification

Advertising Data

- ▶ Advertising data comes from Kantar Media
- ▶ We observe every ad at the ad insertion level for the years 2015-2017Q1:
 - ▶ Timestamp, TV channel, product, parent company, estimated cost, creative title
- ▶ 301 publicly listed firms
 - ▶ 326k ad insertions with an estimated total cost of \$20bn
 - ▶ Around half of the ads are primetime ads, which are generally more expensive
 - ▶ The ads of these firms constitute 64% of all TV ads

Relevance of Broadcast TV Networks?

- ▶ We only explore ads on the five broadcast networks
- ▶ By far the most watched TV channels with the most expensive advertising slots:



Descriptive Statistics

	# of ads	Ad expenditures			
		Mean	1%	99%	Total (\$bn)
Total	326,745	\$61,058	\$3,400	\$354,900	\$20.00
ABC	87,973	\$65,832	\$5,600	\$332,800	\$5.79
CBS	91,461	\$55,598	\$3,100	\$337,400	\$5.09
CW	24,796	\$20,972	\$6,000	\$73,800	\$0.52
FOX	27,466	\$86,447	\$7,500	\$549,300	\$2.37
NBC	95,049	\$65,015	\$4,600	\$551,700	\$6.18
Primetime	181,266	\$86,520	\$7,300	\$536,000	\$15.68
2015	143,993	\$58,813	\$4,100	\$322,000	\$8.47
2016	146,168	\$62,966	\$3,200	\$431,400	\$9.25
2017 (Q1)	36,584	\$62,270	\$3,000	\$339,500	\$2.28

GICS Sectors

GICS	# of firms	# of ads	Avg. ad exp.	Total ad exp. (in \$MM)
Energy	5	457	\$157,588	\$72
Materials	5	2,044	\$44,300	\$91
Industrials	23	2,146	\$77,805	\$167
Consumer Discretionary	115	125,211	\$62,799	\$7,863
Consumer Staples	43	81,926	\$44,963	\$3,684
Healthcare	31	63,237	\$68,793	\$4,350
Financials	30	16,617	\$63,754	\$1,059
Information Technology	38	17,513	\$81,101	\$1,420
Telecommunication Services	3	14,121	\$71,899	\$1,015
Utilities	1	1	\$187,600	\$0.188
Real Estate	3	558	\$39,585	\$22

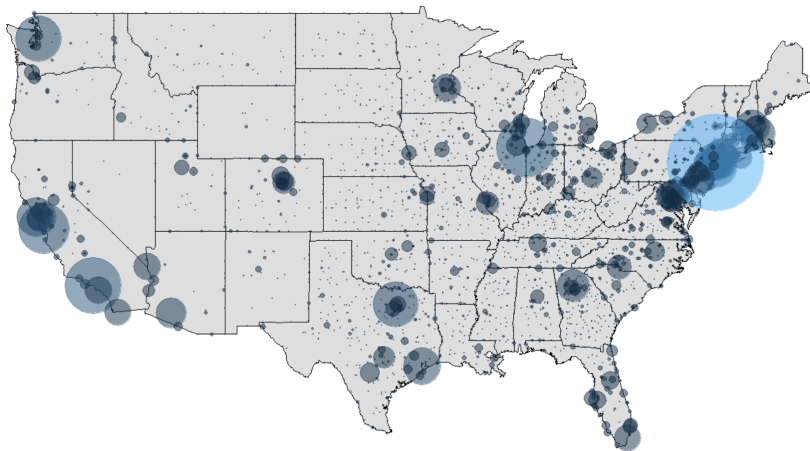
SEC EDGAR

- ▶ EDGAR online system hosts all mandatory filings by public companies
 - ▶ 8-Ks, 10-Ks, 10-Qs, insider trading filings
- ▶ EDGAR is broadly accessed by investors
 - ▶ 108m requests in our sample in 2015-2017Q1
 - ▶ At least 134k unique daily users
 - ▶ Higher income, more educated demographics
- ▶ A lower bound estimate of information acquisition/interest level by investors

SEC EDGAR Log Files

- ▶ SEC maintains a log file of all user activity on EDGAR
- ▶ For each query we observe:
 - ▶ Who made the query (a partially redacted IP address)
 - ▶ When the query is made (a time stamp)
 - ▶ Which financial document was accessed (which firm)
- ▶ IP addresses in the dataset are partially anonymized using a static cypher (e.g., 24.145.236.jcf)
 - ▶ Even without knowing the last three digits, we can reliably match IP addresses at the timezone level
- ▶ Exclude IP addresses that are likely to be automated bots
 - ▶ IP addresses with > 500 daily queries, robustness with > 50

SEC EDGAR User Heatmap



- ▶ As expected, most searches are coming from the financial hubs, but they are spread all over the U.S.

Top 10 Counties by Total Queries

	County	Representative City	Time Zone	# of queries (in MM)	Top 15 Institutional Fund Holdings
1	New York	Manhattan, NY	EST	26.59	Y
2	Cook	Chicago, IL	CST	10.09	Y
3	Los Angeles	Los Angeles, CA	PST	8.86	Y
4	Santa Clara	Palo Alto, CA	PST	7.07	N
5	King	Seattle, WA	PST	5.95	N
6	Dallas	Dallas, TX	CST	5.78	N
7	Kings	Brooklyn, NY	EST	4.83	N
8	San Francisco	San Francisco, CA	PST	4.31	Y
9	Harris	Houston, TX	CST	3.94	N
10	Essex	Newark, NJ	EST	3.81	N

Google Searches

- ▶ We also look at minute-by-minute Google searches
 - ▶ One month (Aug 2016, Summer Olympics)
 - ▶ Most populous U.S. states
 - ▶ 156 firms
- ▶ We collect Google Trends search volume indices for:
 - ▶ Firm's ticker (e.g., *AAPL*), and
 - ▶ Other related keywords that lead a user to the same financial information websites as the searches for the firm's ticker (e.g., *Apple Stock*; *AAPL Stock*)

Econometric Specification

$$\begin{aligned} \ln(\text{Searches})_{itk} = & \alpha + \beta \times \text{Ad}_{itk} \\ & + \gamma_{it} + \kappa_{ik} + \theta_{tk} + \epsilon_{ikt}, \end{aligned}$$

where

- ▶ i indexes the firms
- ▶ t indexes time at a 15 min interval
- ▶ k indexes the timezones (EST or PST)
- ▶ $\text{Ad}_{itk} = 1$ denotes a treated 15 min interval t for firm i in timezone k

Econometric Specification

- ▶ γ_{it} : 15 min interval \times firm f.e.
 - ▶ control for what is happening nationally with the firm i at a 15 min time interval t
 - ▶ e.g., contemporaneous signal such as confounding news
- ▶ κ_{ik} : firm \times time zone f.e.
 - ▶ control for non-time varying investor information set/baseline interest difference across timezones k for firm i
 - ▶ e.g., local bias
- ▶ θ_{tk} : 15 min interval \times timezone f.e.
 - ▶ control for something particular happening in the timezone k at a particular time t that is unrelated to the firm
 - ▶ e.g., time of the day habits, internet search patterns, or TV watching behavior differences across timezones at time t

Findings

Baseline Specifications

- ▶ TV ads lead to $\sim 3\%$ increase in the SEC EDGAR queries:

	All ads	Primetime	Ln(ad\$)
TV Ad	0.025*** 3.105	0.032*** 2.931	0.002*** 3.07
Firm \times Time f.e.	yes	yes	yes
Firm \times Timezone f.e.	yes	yes	yes
Time \times Timezone f.e.	yes	yes	yes
R-squared	0.374	0.374	0.374
N	47.2MM	47.2MM	47.2MM

Placebo Tests

- ▶ **Timing falsification test:** Insert a placebo ad one 15 min interval before the actual ad
 - ▶ No effect on placebo ads: future events do not affect contemporaneous outcomes
- ▶ **Bot falsification test:** Include only automated bot traffic
 - ▶ No effect on bot traffic

Robustness Tests

- ✓ Robust to the **exclusion of days with major financial events** (earnings announcements, merger activity)
- ✓ Significant effect for **the first-time queries** on any firm
- ✓ Larger effects for **more narrowly defined geographic areas** with higher expected financial activity (CT&NY vs CA)
- ✓ Abnormal search **persists for one more 15 minute period** after the ad airing but then dissipates completely
- ✓ 10 min interval effect > **15 min** > 20 min interval effect

Effect Heterogeneity

The effect is larger:

- ▶ For financial firms, pharmaceuticals, and consumer staples
 - ▶ Financial firms during primetime - 11%
- ▶ On the days of M&A announcements (for acquirer only)
- ▶ On the days of earnings announcements

Effect Heterogeneity

At the ad creative level the effect is larger:

- ▶ When advertised brand sounds similar to the publicly traded parent company name
 - ▶ e.g., *Wendy's* (brand) and *The Wendy's Co* (parent company) vs. *Taco Bell* (brand) and *Yum! Brands Inc* (parent company)
- ▶ For more recent ads
- ▶ For the first ad in an ad break
- ▶ For longer ads

Top 20 Firms

No	Parent Company	Ticker	% lift	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

Google Searches

- In terms of economic significance, the effect on Google searches is 3x that on SEC EDGAR queries:

	All ads	Primetime	Ln(ad\$)
TV Ad	0.078**	0.091**	0.006**
	2.518	2.304	2.473
Firm \times Time f.e.	yes	yes	yes
Firm \times Timezone f.e.	yes	yes	yes
Time \times Timezone f.e.	yes	yes	yes
state f.e.	yes	yes	yes
R-squared	0.645	0.645	0.645
N	5.75MM	5.75MM	5.75MM

- The effect of an ad on product searches (*iPhone*) is around 2.5-3x higher than searches on financial keywords (*AAPL*)

Investors and Markets

Investor Sophistication

- ▶ We do not observe who search but many do
 - ▶ Upper bound: 164k distinct IP addresses searched for advertiser within 15 mins after ad airing
- ▶ They are particularly active in the evening
 - ▶ Suggests browsing from a different location than during work hours

Trading Volume

- ▶ We look at whether searches due to TV ads lead to higher trading volumes in the next trading day:
 - ▶ For each ad aired during primetime, calculate the **ad-induced abnormal search**, after removing γ_{it} , κ_{ik} , θ_{tk}
 - ▶ Take the daily total abnormal search for each firm i (primetime hours only)
 - ▶ Check whether this abnormal search correlates with the trading volume on firm's stock in the next day d

Trading Volume

- ▶ Strong positive association between the high abnormal search during the primetime and the trading volume next day
- ▶ For one st. dev. increase in SEC EDGAR searches:
 - ▶ Overall trading increases by 0.82%
 - ▶ Trading initiated by retail investors increases by 1.12%

	Overall Daily Trading Volume	Retail Trading Volume	Market Open 9:30-9:35am
Prior Day's Abnormal Search	0.000391*** (4.109)	0.000535*** (5.645)	0.000506** (2.440)
Controls	yes	yes	yes
Firm \times Month f.e.	yes	yes	yes
Day f.e.	yes	yes	yes
R-squared	0.939	0.920	0.832
N	0.161MM	0.159MM	0.153MM

Back-of-the-Envelope

- ▶ What fraction of overall trading volume is attributable to product-market advertising?
 - ▶ Average primetime ad cost \$87k and average trading daily trading volume was \$252m
 - ▶ The dollar elasticity of TV ad spending is 0.40
 - ▶ Extrapolate it to the annual advertising expenditures:
Advertising contributes 0.33% of trading volume, up to 0.6% for the largest advertisers
- ▶ Benchmark: $\sim 7\%$ (?) of trading volume can be attributed to firms' earnings announcements

Robinhood

- ▶ How certain are we that these are **retail investors**?
 - ▶ We do not have precise retail holding data for our study period
- ▶ Since 2018, Robintrack provides the (hourly) number of Robinhood users for each stock
 - ▶ No location of users \Rightarrow cannot apply the same methodology
 - ▶ But we can check if there is a change in the number of users if there was an ad broadcast in that hour in 2019-2020

Robinhood

- ▶ Hourly turnover of retail investors holding a stock is 24% higher when a TV ad for that company is aired in that hour
- ▶ This number rises to 28.7% for ads during live programming
- ▶ The users who acquire the stock outnumber the users who sell out their current stockholdings

	Absolute change		Signed change	
	All ads	Live TV	All ads	Live TV
TV Ad	0.238***	0.287***	0.052***	0.081***
	15.13	12.17	7.99	5.73
Firm \times day f.e.	yes	yes	yes	yes
Day \times hour f.e.	yes	yes	yes	yes
R-squared	0.453	0.453	0.140	0.140
N	77.8MM	77.8MM	77.8MM	77.8MM

Spillovers

Spillovers in Product Space

- ▶ If ad is informative about the firm's future sales, it is also informative about:
 - ▶ Rivals' relative performance
 - ▶ Sales of suppliers who have this firm as the major customer
- ▶ We find significant, albeit smaller, advertising effects on:
 - ▶ Key rivals' searches and subsequent trading volume
 - ▶ Key suppliers' searches

Rivals

- ▶ For each firm, we pick a firm that is closest in terms of the business descriptions in 10-K annual filings in 2014
- ▶ "Rival" TV ads lead to 1/3 increase in the SEC EDGAR queries, compared to own TV ads:

	All ads	Primetime	Ln(ad\$)
Rival TV Ad	0.022** 2.149	0.031* 1.951	0.002** 2.106
Own TV Ad	0.060*** 4.530	0.084*** 5.001	0.005*** 4.771
firm \times time f.e.	yes	yes	yes
firm \times timezone f.e.	yes	yes	yes
time \times timezone f.e.	yes	yes	yes
R-squared	0.310	0.310	0.310
N	34.1MM	34.1MM	34.1MM

Supply-Chain Links

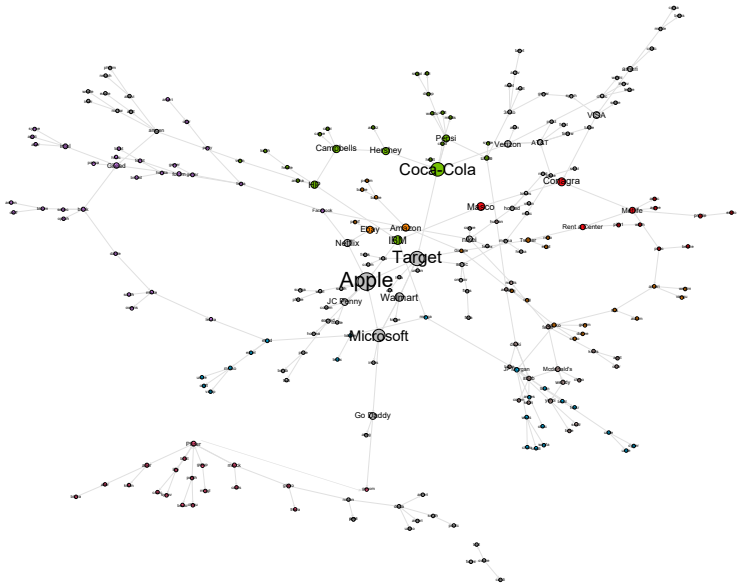
- ▶ For each firm, we check if it appears as the major customer for any publicly-listed supplier in the latter's filings
- ▶ Primetime customer ads affect suppliers:

	All ads	Primetime	Ln(ad\$)
Customer TV Ad	0.004 1.275	0.008* 1.812	0.000 1.388
Own TV Ad	0.111*** 9.229	0.156*** 10.531	0.009*** 9.412
firm \times time f.e.	yes	yes	yes
firm \times timezone f.e.	yes	yes	yes
time \times timezone f.e.	yes	yes	yes
R-squared	0.310	0.310	0.310
N	112.2MM	112.2MM	112.2MM

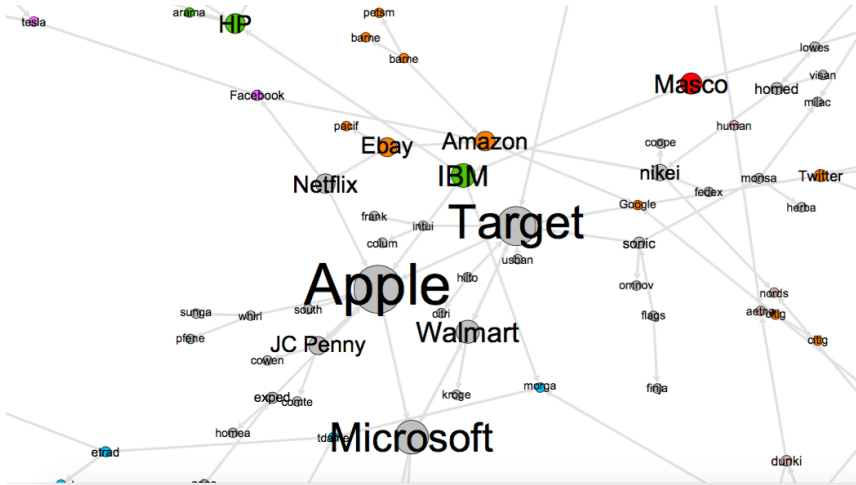
But Maybe Investors' Minds Work Differently?

- ▶ Where do investors click next after they have been primed with an ad and went to see the advertiser's filings?
 - ▶ For each IP address that queries advertising firms filings within 15 minutes following the ad, we check the next firm that this IP address queries if the next click is immediate
 - ▶ We do not condition on known economic links, i.e., the procedure is **unsupervised**
 - ▶ We aggregate this list of **'spillover' firms** over our sample period and for each advertising firm

Network of Searches



Network of Searches



What Are These Firms?

- ▶ Can we systematically identify the links between these firms?
 - ▶ In 24.34% cases, they are rivals (10-K predicts best)
 - ▶ In 5.80% cases, they are in supply-chain relationships or partners
 - ▶ In 13.90% cases, they are mentioned in the same media articles
- ▶ Overall, we can identify the link for 29% cases

More Research!

- ▶ Ad-induced information search spillovers might go [beyond product market links](#)
- ▶ Salience of the shock allows us to identify the [direction](#) of the relation when two consecutive searches take place
- ▶ Trading effect for these [‘unsupervised’](#) spillover firms even larger than for rivals and suppliers
- ▶ Curious to learn more on [how investor minds work...](#)

Takeaways

- ▶ After being primed with a TV ad, investors search for the firm financial information on SEC EDGAR and Google
- ▶ Ad-induced information collection leads to trading and a non-trivial fraction of trading volume can be attributed to advertising
- ▶ Advertising effects on financial information search travel via product market links but also further than that
- ▶ These findings suggest one channel that generates a constant flow of retail trading activity and provides one potential way to capture noise trading

Next-Day Stock Returns

- ▶ The prediction on the stock returns is a priori ambiguous
- ▶ Higher abnormal search \Rightarrow higher positive overnight stock returns, but these partially reverse during the trading hours:

	(1)	(2)	(3)
	Total Returns	Overnight Returns	Intraday Returns
Prior Day's Abnormal Search	0.000005	0.000009*	-0.000003*
	0.977	1.737	-1.962
Controls	yes	yes	yes
Day f.e.	yes	yes	yes
R-squared	0.318	0.320	0.188
N	0.161MM	0.161MM	0.161MM

- ▶ Suggestive that trading volume is not driven by information effect only