4-29-2021

Do Students Buy Attention-Grabbing Stocks? A Field Experiment

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April 29, 2021

Submitted to the Faculty of Ursinus College in fulfillment of the requirements for Distinguished Honors in the Business and Economics Department.

Abstract[1]

In this paper, we look to find out whether or not student investors are drawn to "attention-grabbing" stocks. We define "attention-grabbing" stocks as those that are issued by companies with either large numbers of Twitter followers, large general marketing budgets, or both. Our theory is that the more followers that a publicly traded company has on Twitter and/or the more money the company spends on marketing and advertising, the more likely a student would be to invest in its stock.

A field experiment was conducted in which undergraduate students constructed their own virtual stock portfolios. A treatment group was given a training seminar in stock market fundamentals in order to enhance their skillset for stock market analysis and stock selection. This was compared to a control group, who received no such training, with the intent to study the difference in stock selection. Students placed 7.45-percentage points more weight on "attention-grabbing" stocks than the weight of those stocks in the market capitalization-weighted S&P 500 benchmark index. Regression analysis reveals that students in our study were more likely to invest in stocks that fits our proxy measures for "attention-grabbing" after controlling for the market capitalization of the stocks. Additionally, stocks meeting our criteria for "attention-grabbing" carried greater weight by value in students' portfolios than stocks that did not.

1. Introduction

The evolution of social media has changed the way that the public interacts with companies. Many companies have increased their brand awareness not only through spending on traditional forms of marketing but also through developing followings on social media. Consumers interact with and follow these companies, which could ultimately lead to product purchase. But what about investors, who are looking for companies to invest in? Barber and Odean, (2008) concluded that, in the era before social media's prominence, individual investors tended to be net buyers of "attention-grabbing" stocks when compared to institutional investors. In works that followed, academics examined related topics including the impact of news media on investment behavior (Kaniel & Parham, 2017) and the use of Google search frequency as a proxy for investor attention (Da, Engleberg, & Gao, 2011). In this paper, we expand upon these findings to explore the role a company's marketing presence plays in attracting student investors.

Today's students are conditioned in an electronic world, which now hosts individual, zero-fee, stock brokerage platforms such as Robinhood. Students can now invest in any U.S. publicly traded company with their own money without a financial adviser or stockbroker. Based in part on media coverage of the growth of day-trading during the COVID-19 pandemic, we believe students would be likely to over-invest in stocks issued by "attention grabbing" companies, such as Tesla, Amazon, and Apple. We suggest that a company's ability to attract attention on social media would also attract individual investors, including students, independent of the expected combination of reward and risk that other companies' stock may offer. This led to our first proxy measure for "attention-grabbing": whether a company has a large following on

Twitter. Twitter was chosen as it was social media platform for which counts of followers could be objectively measured.

A critical component of driving market presence is marketing. The greater the marketing effort, most often and most easily measured by money spent on marketing, the greater familiarity a market or consumer is with a brand or company. Previous research shows there is a positive relationship between a firm's marketing spending and its stock market value (Joshi & Hanssens, 2007). This led to the second proxy measure for "attention-grabbing": whether a company is among the leading spenders on all types of marketing according to the industry standard source, *AdAge*.

It is theorized that stocks that qualify as "attention-grabbing" will be overrepresented in the stock portfolio choices of students. To test the theory, we simulated the construction of an investment portfolio using *MarketWatch.com*'s virtual portfolio simulator. It was hypothesized that students in both groups would disproportionately purchase "attention-grabbing" stocks and there would be no difference between the control and treatment groups with respect to "attention-grabbing" stocks. Data was collected on the investment choices of 67 undergraduate students, randomly split into treatment and control groups. The former was given training in stock market fundamentals, the latter received no such training. A stock was qualified as "attention-grabbing" if it met *either* of our proxy measures for being so.

We found no significant difference in the weight placed on "attention-grabbing" stock between the average treatment group portfolio (50.55%) and the average control group portfolio (51.48%). Further, we found that the participants invested 51.01% of the total value of their portfolios on "attention-grabbing" stocks of U.S. companies, compared to a weight of 43.56% in the S&P 500 index benchmark. The top three companies in which students invested were

Amazon (9.31%), Tesla (7.63%), and Apple (4.94%). The percentages next to each of the companies' names is the total amount invested in each company as a percentage of the total amount across all student portfolios.

Using regression analysis, the impact of a stock being "attention-grabbing" is then quantified as the likelihood of students adding them to their portfolio and the impact on the total value of such stocks across all students' portfolios. We find (with 99% confidence) that students are more likely to include "attention-grabbing" stocks in their portfolios. Additionally (with 99% confidence), a value of 1 for either proxy measures of "attention-grabbing" increased the percentage of the company's value across all student portfolios.

Based on the regression analysis, we are 99% confident that a publicly traded U.S or foreign company that falls on our list of top Twitter followers, most marketing spend via an AdAge report, or both lists, led students to be more likely to include that company's stock in their portfolios. Additionally, a company's presence on either or both of the above-mentioned lists also increased the percentage of the company's total value across all student portfolios. These results remain significant at the 99% level even when accounting for a 1% increase in the company's market capitalization.

The participants further filled out a post-experiment survey asking about how they decided upon their portfolio holdings. Interestingly, the results from the post-experiment survey show that the top three stocks in which students invested the most, Amazon (9.31%), Tesla (7.63%), and Apple (4.94%), are also the three companies in which students became most aware during their typical week and also exposed to the most on social media. (The percentage next to each of the companies' names is the total amount invested in each company as a percentage of the total amount across all student portfolios.) Additionally, responses to questionnaires sent

after the experiment show that participants' stock selection decisions were most influenced by their familiarity with the companies.

In the following sections of this paper, we discuss the grounds on which the foundation of our theory stands by exploring and detailing works that precede ours. Next, we describe how we classified stocks as "attention-grabbing" and our experimental design. In our "Pre-Experiment Survey" section, we detail the demographics and characteristics of our student participants. We later detail the regression results and the post-experiment survey, and then conclude.

2. Literature Review

2.1 Attention-Grabbing Stocks

Barber and Odean (2008) showed individual investors tend to be net buyers of "attention-grabbing" stocks when compared to institutional investors. In their study, "individual investors" are defined as discount and retail broker investors. They defined "attention-grabbing" stocks as those that are reflected, or shown, in the news, or other media, either positively or negatively. Essentially, the idea is that any news about a company is going to attract an investor's attention. Additional research suggests that social media coverage of a stock could be a predictor of high volatility and trading volume, compared to news media, which would predict low volatility and trading volume (Jiao, Veiga, & Walther, 2016). With that, it is theorized that the more prominent a company is on social media and more marketing effort exerted, the more likely investors would be to buy that company's stock.

2.2 Availability Heuristic

The application of heuristics as they relate to investments are studied in the field of behavioral finance. An investor's decision is influenced by many behavioral heuristics (Boda & Sunitha, 2018) which may contribute to irrational investment decisions. The Availability

Heuristic, or the "process of judging frequency by the 'ease with which instances come to mind'"
(Kahneman, 2011) comes into play most directly in this research. The Availability Heuristic
would influence student investors if they choose to buy a company's stock because of the
information and opinions to which they are exposed through a company's marketing efforts
including social media, news apps, public relations, advertisements, etc. Depending on the
information available, investors may make irrational decisions and the information may even
change their preferences (Ullah Khan, 2017).

2.3 Brand Awareness

Studies of brand awareness (a customer's recognition of a brand or company) show a
positive impact of company awareness on the likelihood that consumers will choose to purchase
from a company, because it saves time and risk (Bilgin, 2018). Through marketing spend and the
resulting market facing efforts, including social media, a company tries to grow its brand
awareness with consumers, increase sales and positively impact overall brand equity. Our
assumption is that an investor would invest in a stock that they have increased exposure to,
increased awareness of and more information about.

2.4 Social Media Relationship with Stock Performance

Research surrounding social media suggests that there is a predictive relationship
between social media presence and firm equity value. Luo, Zhang, and Duan (2013) suggest that
social media is a leading indicator of firm equity value. They argue that social media has
changed the way companies interact with consumers, and that user-generated content could
provide information for investors regarding firm performance (Luo, Zhang, & Duan, 2013).
Twitter has been a key component in this relationship between social media and companies. Data

shows that there is a correlation between the daily number of tweets that mention S&P 500 companies and their closing prices (Mao, Wang, Wei, & Liu, 2012).

2.5 Marketing Influences on Stock Performance

Firms grab a market's attention in a variety of ways that are not confined to social media. There is a positive relationship between how much a firm spends on advertising and its stock market value (Joshi & Hanssens, 2007). As alluded to earlier, marketers even leverage social media in order to create a stronger brand awareness for their firm (Alhaddad, 2015), which creates a positive relationship with present and potential consumers and how they see the brand. The positive relationship between marketing spending and a firm's value allows us to assume that investors may have more interest in a company that has a higher marketing budget and spends more on advertising in general. This assumption led to the second binary proxy measure of "attention-grabbing" stocks: the amount of money a firm spends in marketing as reported by the industry journal *AdAge*. The more money a firm spends on marketing and the resulting advertising, the more aware the potential market is of the company, which would result in the higher likelihood of the company being "attention-grabbing" to student investors.

2.6 Gender Differences in Risk Preferences

Given the relationship suggested by previous research, stocks from companies that are "attention-grabbing" and that have a great deal of coverage on social media would seem to be higher risk than those that don't fit that criteria (Yuan, 2015) due to these stocks' proven higher volatility. There is also research that shows that males have a higher tendency to choose riskier investments than females (Bayyurt & Coskun, 2015). Since the COVID-19 pandemic didn't significantly affect investors' risk appetites, an assumption could be made that the conclusions by Bayyurt and Coskun in 2015 hold during times of market uncertainty. On the basis of

"attention-grabbing" stocks having higher volatility (Jiao, Veiga, & Walther, 2016), an argument can be made that males might be more likely to invest in "attention-grabbing" stocks than females.

2.7 COVID-19

There was an awareness of the potential influence of COVID-19 to lead investors to be more conservative in their investment decisions for their portfolios. For example, movements away from speculative stocks to Treasury Bills and Notes as a more conservative approach in the short- and medium-terms. Research suggests that the pandemic has not significantly affected investors' risk preferences for investment (Angrisani, Cipriani, Guarino, Kendall, & Ortiz de Zarate Pina, 2020). Despite the economic conditions faced during COVID-19, investors, both student and professional, on average were not affected when it came to their risk tolerance, according to the study. The research built on this idea, in part because this study recruited undergrads of various disciplines, but also because it provided a reasonable foundation for the risk tolerance levels that could be expected amidst the pandemic.

3. **Experimental Design**

This section presents our definition of "attention-grabbing" stocks, how study participants were trained to use the virtual portfolio simulation, a description of a pre-experiment survey, the design of the portfolio simulation, and a description of a post-simulation survey that asked participants for insights into their construction of their portfolios.

3.1 Defining "Attention-Grabbing" Stocks

A list of "attention-grabbing" stocks was designed by using articles from *Morning Consult, Yahoo!, Unmetric, BunsinessInsider, Social Breakers* (Consult, 2019; May, 2019; Ramakrishnan, 2019; Lutz & Taylor, 2018; SocialBreakers, 2020) and data from Twitter to develop a list of the

100 companies with the most Twitter followers in November 2020. (A full description of our process for identifying "attention-grabbing" companies, as well as a full list of the companies and stocks are available in the Appendix). Further, the 100 firms with the greatest marketing spending in 2019 were identified using *AdAge*'s annual listing of such firms (AdAge, 2020). Each of the Twitter and *AdAge* lists were comprised of a mix of publicly traded U.S. companies, private companies, subsidiaries of some larger company that may be publicly traded, and foreign firms that are publicly traded in the OTC markets. We removed from these lists subsidiaries of larger companies and private companies. In order to remain consistent with our determination of "attention-grabbing", publicly traded companies whose subsidiaries were on the list but were not on the list themselves were not included. What was left was a list of 58 publicly traded companies, both U.S. and foreign firms, in the top 100 Twitter followers, and 93 publicly traded companies, both U.S. and foreign firms, in the top 100 of *AdAge*'s marketing spending list. A total of 29 publicly traded companies were on both lists. The presence of a company on either of these lists qualified it as "attention-grabbing".

3.2 Training Subjects

A campus-wide email campaign at Ursinus College garnered responses from 141 undergraduate students who were interested in taking part in our study. Ultimately, 67 students completed the experiment in its entirety. All participants completed a preliminary survey that collected demographic data including gender, major and minor, previous coursework in economics and finance, and previous interest and experience in the stock market, as shown in the tables in the Appendix. As the tables show, the students had backgrounds across educational disciplines, class years, and genders. Students were then randomly assigned to a treatment or control group, with stratification techniques used to create a rough balance between the groups in

terms of gender, previous coursework in economics, and previous interest and experience in the stock market.

Prior to selecting stocks for a virtual portfolio, the participants in the treatment group received an hour of training in stock market fundamentals via a virtual meeting as well as training in the use of the virtual portfolio simulator (MarketWatch Virtual Stock Exchange) that we used for the experiment, which was also virtual. The control group only received training in the use of the virtual portfolio simulator.[2] Our expectation was that the control group would rely less on fundamentals and instead be attracted to "attention-grabbing" stocks. Topics that were covered during the training seminar included basic fundamental analysis techniques such as price-to-earnings ratio, current ratio, and debt-to-asset ratio. Participants also received information about awareness of behavioral biases and heuristics, such as the availability heuristic, that they may experience during the stock selection process. Since the seminar was done virtually, the experimenters used Zoom's polling feature, to make sure the participants were actively paying attention and that the technology was working properly.

3.3 Simulation Design

Following the training, all participants were tasked with constructing a virtual portfolio of investment holdings from market open on Thursday, Nov. 12, 2020 to market close on the following Friday, Nov. 20, 2020 (seven trading days). Students were instructed to only buy and hold stocks and avoid selling, in order to limit trading activity. (No students sold the stocks they had purchased in the simulation.) Each student began with an initial simulated portfolio value of $20,000.[3] The participants were offered compensation based on the generated return of their

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[2] To provide access to the same benefit, the control group was offered – and some accepted – the same stock market fundamentals training after they had selected stocks for their portfolio.
[3] The value of $20,000 is significant because it parallels the compensation the students were offered.

portfolio around a base of $20 where they would earn $20*(1+*r*), where *r* is the portfolio's rate

of return, including both capital gains and dividends. This made the visualization of the student's

return easier as they progressed through the experiment.

3.4 Post-Simulation

   Following the experiment, students were instructed to complete a post-experiment survey in

order to receive their compensation. The final survey asked questions about the participants'

stock-selection methodology and their familiarity with the firms that issued the stocks they

selected. We will use the pre- and post-survey responses as well as econometric analysis of

quantitative data to assess whether participants are more likely to select "attention-grabbing"

stocks than other stocks.

   4.   Cross-Sectional Comparisons

   Our expectation was that giving a training seminar that briefed stock valuation techniques

and brought awareness to behavioral biases and heuristics would be enough to affect the weight

by value placed on "attention-grabbing" stocks by participants. After reviewing the data on the

stocks selected by the participants, we found no significant difference in the weighting by value

on "attention-grabbing" stocks between the treatment (50.55%) and control (51.48%) groups.

One possible reason that the training had no effect was that the relatively short time window of

the experimental payoff may have given limited incentive for the subjects to internalize the

lessons.

   Figure 1 shows the results of the comparisons across groups.

		n1	n2	Weight 1	Weight 2	z/t-score	p-values
COMPARISON TO POPULATION MEAN (z-score calculated)							
	Tot. students v. S&P 500	67		51.01%	43.56%	1.894	0.033
DIFFERENCE IN MEANS							
	Treatment v. Control	34	33	50.55%	51.48%	-0.118	0.908
TREATMENT v. CONTROL GROUP							
Gender Comparisons[1]							
	Tot. Males v. Tot. Females	31	35	53.48%	48.71%	0.588	0.559
	Trt. Females v. Trt. Males	20	14	53.04%	48.34%	0.417	0.68
	Ctrl. Females v. Ctrl. Males	15	17	45.20%	56.82%	-1.073	0.292
	Trt. Males v. Ctrl. Males	14	17	48.34%	56.82%	-0.79	0.436
	Trt. Females v. Ctrl. Females	20	15	53.04%	45.20%	0.691	0.495
Economics Courses Taken							
	At least one course v. no courses	32	35	47.91%	54.40%	-0.827	0.411
	Trt.: At least one v. none	16	18	47.94%	53.48%	-0.464	0.646
	Ctrl.: At least one v. none	16	17	47.88%	55.31%	-0.708	0.484
Self-Reported Interest level							
	Low interest v. High interest	31	38	50.08%	51.81%	-0.219	0.827
	Trt: Low v. High Interest	16	18	53.04%	48.34%	0.437	0.665
	Ctrl.: Low v. High Interest	15	18	46.93%	55.28%	-0.798	0.431

Figure 1: Comparison of "Attention-Grabbing" Weighting Between Groups

[1]*One student identified as non-binary.*

Figure 1 shows the raw data from the field experiment. "Weight 1" and "Weight 2" show the weight by value placed on "attention-grabbing" stocks by the first and second group in each comparison, respectfully. The p-, t-, and z-scores measure the statistical significance between the two groups being compared.

When comparing the differences in investment behavior across gender, our findings show that gender did not have much of a difference, at the 5% level. As suggested by Bayyurt and Coskun (2015), males do have a higher risk appetite than females, but this is not supported by

our results. Yuan (2015) found stocks that fit a criteria for "attention-grabbing" on social media are deemed to be riskier than those that do not fit that criteria. Neither did a student's previous history in Economics courses, where they would presumably learn about investing basics, have any effect, nor did self-reported interested level.

Prior to conducting the field experiment, a pre-experiment survey was used to collect demographic information from our participants. Responses collected included information about participants' gender (which included an "other" option in addition to "male" and "female"), age, graduation year, the number of economics courses taken, whether or not the participants have taken a course in finance, self-reported level of interest in the stock market, the students' major(s) and minor(s), and level of familiarity with the stock market. Our numerical results found that none of these variables led to any differences in the investment decisions of the students when it comes to "attention-grabbing" stocks. The exact numerical results can be found in the Appendix.

The results described come from the final 67 students who ultimately took part in the study. Interestingly, the participants ranged across varying disciplines, ages, familiarity, and levels of interest. Of the 67 students, 44.78% said they have only heard of the markets on the news when asked about their familiarity with markets. Additionally, 47.76% of the sample said they have never taken at economics course at Ursinus College or elsewhere. Interestingly, 28.36% of the participants said they had no previous knowledge about the stock market, which shows that students in the control group would likely have no knowledge of fundamental economic factors that could be used in choosing a stock, making them likely to buy the stock of a company (or companies) they are familiar with. Some 13.43% of the participants indicated they understood markets *and* managed their own brokerage account. When self-reporting interest

levels in the stock market (using a 1-to-5 scale, 5 being the highest level of interest), only

52.24% reported moderately high-to-high interest (scores 4-to-5). Alternatively, only 16.42%

self-reported moderately low-to-low interested (scores 1-to-2). Of the participants, 68.7% have

not taken a finance course.

5. Regression Analysis

Regression analyses were conducted to measure the effect of a stock's presence on our

Twitter and *AdAge* lists, on two dependent variables -- *PCTG_STUDENTS*, the percentage of

students holding a given company's stock and *PCTG_TOTAL*, a given stock's percentage of the

total value of all student portfolios.

TWITTER$_i$ is a dummy variable that takes the value of 1 if a publicly traded company

finds itself on our list of companies with the most Twitter followers, *ADAGE$_i$* is a dummy

variable that takes the value of 1 if a publicly traded company finds itself on our list of top

spenders on marketing in general (based on *AdAge's* list), and *TWITTER*ADAGE$_i$* is an

interaction variable that takes the value of 1 if a publicly traded company finds itself on *both*

lists. *LN_MKTCAP$_i$* was added to the regression for a few reasons. First, we believed that the

students may also be attracted to larger companies. Second, there is likely to be a strong

correlation between the market capitalization of a company and its presence on the Twitter and,

especially, AdAge lists. We estimated the model using observations on 4,975 stocks that trade on

the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and in the over-

the-counter market (OTC). These stocks were available to our students through the *Marketwatch*

portfolio simulator.

We estimated Equation (1).

$PCTG\_STUDENTS_i = \beta_0 + \beta_1 TWITTER_i + \beta_2 ADAGE_i + \beta_3 TWITTER*ADAGE_i +$

$\beta_4 LN\_MKTCAP_i + \varepsilon_i$ (1)

When accounting for stocks' market capitalization (Results can be found in Figure 2 in the Appendix), we found a $TWITTER_i$ value of 1 was associated with a 2.72-percentage-point increase in the percentage of students who hold its stock, an $ADAGE_i$ value of 1 was associated with a 0.923-percentage-point increase in the percentage of students who hold its stock, and a $TWITTER*ADAGE_i$ value of 1 was associated with a 2.17-percentage-point increase in the percentage of students who hold its stock. We also found that a 1% increase in market cap is associated with a 0.0124-percentage-point increase in the likelihood of students choosing a company's stock. At the 1% significance level, we can assume that a company is more likely to have students invest in its stock if it has a strong media presence and advertising spend than not, even when accounting for a percentage change in its market cap.

In interpreting the coefficients, this means that if a stock is on *both* the Twitter and AdAge lists, there is a total of a 5.81-percentage point increase (2.72 + 2.17 + 0.923) in the percentage of students holding that stock. When comparing to the effect of market capitalization, we see that, for example, the effect of being *only* on the Twitter list is 218-times larger than a 1% increase in market capitalization. In other words, being on the Twitter list has as much of an effect on the percentage of students purchasing the stock as 218 1% increases (or about 1.01^218 = 875% overall increase) of the market capitalization of the stock. This is a notable contrast of the impact of Twitter versus the impact of the valuation of the company. Similar comparisons hold for a stock on the AdAge list, or a company on both lists.

We next estimated Equation (2).

$$PCTG\_TOTAL_i = \beta_0 + \beta_1 TWITTER_i + \beta_2 ADAGE_i + \beta_3 TWITTER*ADAGE_i + \beta_4 LN\_MKTCAP_i + \varepsilon_i \quad (2)$$

When accounting for stocks' market capitalization (Results can be found in Figure 2 in the Appendix), we found a $TWITTER_i$ value of 1 was associated with a 0.513-percentage-point increase in the total value across all portfolios, an $ADAGE_i$ value of 1 was associated with a 0.0979-percentage-point increase in the percentage of total value across all portfolios, and a $TWITTER*ADAGE_i$ value of 1 was associated with a 0.427-percentage-point increase in the percentage of total value across all portfolios. We also found that a 1% increase in market cap is associated with a 0.0231-percentage-point increase in the percentage of total value across all portfolios. At the 1% significance level, we can assume that a company is more likely to have a higher percentage of the total value across all of the portfolios if it has a strong media presence and advertising spend than not, even when accounting for a percentage change in its market cap.

In interpreting the coefficients, this means that if a stock is on *both* the Twitter and AdAge lists, there is a total of a 1.0379-percentage point increase (0.513 + 0.0979 + 0.427) in the percentage of total portfolio value dedicated to that stock. When comparing to the effect of market cap, we see that, for example, the effect of being *only* on the Twitter list is 22-times larger than a 1% increase in market capitalization. In other words, being on the Twitter list has as much of an effect on the percentage of total portfolio value dedicated to that as 22 1% increases (or about $1.01^{22} = 124\%$ increase in value) of the market capitalization of the stock. This is a notable contrast of the impact of Twitter versus the impact of the valuation of the company. Similar comparisons hold for a stock on the AdAge list, or a company on both lists.

We recognize that the benchmark of the S&P 500 is not the ideal comparison for the preliminary comparison at this time because it fails to include OTC stocks that are not listed on

major U.S. stock exchanges. This would help to build a more wholistic benchmark comparison for the students' portfolios. Additionally, future research could base one proxy measure of "attention-grabbing" stocks by using the Van Eck BUZZ ETF, which tracks 75 of the most popular companies on social media. We failed to use this proxy measure because we were not aware of the existence of the ETF at the time of the experiment. Results from the regression models can be found in the appendix.

6. Post-Experiment Survey Results

In order to be compensated upon conclusion of the experiment, the participants were asked to complete a final survey, in which they were asked about the influence of their decisions for their purchase of certain stocks. The influence for each of these were based on the financial performance or the participants' familiarity with the companies (or neither factor) they ultimately decided to invest in. Participants were also asked about which of the companies in which they invested they became aware of during their typical week, the types of media exposure they had with the companies they invested in, the information used to choose the stocks, ways in which the students are exposed to the companies in their daily life, and the social media platforms on which the participants could recall seeing a company, if applicable. The tables for each of these could be found in the Appendix.

The post-experiment data show that 58.0% of participants recall seeing at least one of the companies in which they invested on Instagram. Despite this realization of the popularity among the college-age students, the data for Instagram followers that would have been necessary was bleak at the time of finding the social media proxy measure. When asked about the information used to choose the stocks, 61.54% of participants chose their stock, either solely or in part, due to being familiar with the products/services the companies offer. If this is any insight to how the

larger population of student investors choose stocks, the behavior could, at least in part, be due to the attachment of the company through its products.

Additionally, through the post-experiment survey, we found that the top three "attention-grabbing" companies in which students invested were also the same three companies that had the greatest awareness during a typical week and the most social media interaction by the students. During a typical week, 9.76% of the participants became aware of Tesla, and 8.54% of the students became aware of each Apple and Amazon. Further, on either Instagram, Twitter, LinkedIn, TikTok, or any other social media platform, 12.20% of students were exposed to Tesla, 10.98% of students were exposed to Amazon, and 9.76% of students were exposed to Apple. These are the same companies that were the stocks students invested the most in, during the experimental period. This could provide insight to how much influence a company's presence, either through societal or social media awareness could have on a student's decision to invest in its stock.

We recognize that asking participants for recollection of a company playing a role in their decision may lead to bias in the response. However, given the level of attention some companies create in the population, it was decided that this could be a proxy (even weak) that could give insight to how the students interacted with the companies.

7. Conclusion

This research takes a new approach to determine and measure "attention-grabbing" stocks. Measures of Twitter followers and advertising spend were used as proxy measures for "attention-grabbing". The regression analyses show that a stock being "attention-grabbing" significantly increases its likelihood of being included in students' portfolios. Additionally, we

found that a stock being "attention-grabbing" significantly increases the percentage of its total value across all student portfolios.

Future studies of this kind should take into consideration the holdings of Van Eck's ETF measuring "attention-grabbing" stocks (BUZZ) as a proxy measure, which tracks 75 of the most popular companies on social media. At the time of the experiment, we were not aware of the existence of the ETF.

This study provides evidence that social media presence and advertising spend influences students' stock selections. Because of this, as college students begin to enter the investment world, whether for retirement or leisure investing, they may fail to make optimal decisions in constructing their portfolios. Whether or not students are more influenced in this way than the average adult retail investor is an important avenue for future research.

Appendix

Description for Regression Model Variables:

Dependent Variables:

$PCTG\_STUDENTS_i$ The percentage of students to include the stock of company i in their portfolios.

$PCTG\_TOTAL_i$ The percentage of total value among all portfolios for stock of company i.

Independent Variables:

$TWITTER_i$ 1 if company i falls within the Top 100 highest Twitter followers
0 otherwise

$ADAGE_i$ 1 if company i falls within the Top 100 highest Advertising Spending, according to AdAge
0 otherwise

$TWITTER*ADAGE_i$ An interaction variable between Twitter and AdAge, if a company fits the criteria for both the $TWITTER_i$ and $ADAGE_i$ variables

LN_MKTCAP_i Represents a one-percent change in a stock's market cap

Criteria for Dummy Variables:

$TWITTER_i$ Companies that Twitter followers that fall within the Top 100 of our lists will be considered "high-attention"

$ADAGE_i$ Companies that fall in the Top 100 of AdAge's 2020 report will be considered "high-attention"

Figure 2: Regression Table

Dependent Variable	PCTG_TOTAL	PCTG_STUDENTS
INTERCEPT	0.00202	-0.01203***
	(<0.0001)	(<0.0001)
TWITTER	0.00513	0.02718***
	(<0.0001)	(<0.0001)
ADAGE	0.0009794	0.00923***
	(<0.0001)	(<0.0001)
*TWITTER*ADAGE*	0.00427	0.02165***
	(<0.0001)	(<0.0001)
LN_MKTCAP	0.0002309	0.0001243***
	(<0.0001)	(<0.0001)
n = 4975		
Adj. R-squared		0.2414
F-statistic		396.71

This table presents the results of estimation of linear regression models of the percentage of students who included "attention-grabbing" stocks in their portfolio during an experimental period. The companies observed are all of those made available to the students for purchase on a *MarketWatch* virtual stock exchange during November 2020, including, but not limited to those on the Nasdaq, NYSE, and OTC markets. Model and variable definitions are given in the Appendix. Column numbers correspond to equation numbers in the text. In parentheses are *p*-values for *t*-tests that coefficients are different from zero. Statistical significance at the 10%, 5%, and 1% levels is indicated using *, **, and ***, respectively. Standard errors are calculated using White's (1980) correction for heteroscedasticity.

Figure 3: Companies with the top 100 Twitter followers (column 1) and top 100 advertising spending (column 2). Stock tickers (columns 3-5).

[1] Top 100 Twitter	[2] Top 100 Ad Spend	[3] Twitter	[4] AdAge	[5] Both
3M	AbbVie	AAPL	AAPL	AAPL
Adidas	Adidas	ADDYY*	ABBV	ADDYY*
Aeropostale	Allstate	AEO	ADDYY*	AMZN
Airbnb	Alphabet	AMZN	ALL	BBY
Amazon	Amazon	AUDVF*	AMGN	DELL
American Eagle	American Express	BBY	AMZN	DIS
Anthropologie	Amgen	BURBY*	AXP	EBAY
Apple	Anheuser-Busch	CHDRY*	BAC	F
Asus	Apple	CMG	BBY	FB
AT&T	AT&T	DELL	BKNG	GM
Audi	Bank of America	DIS	BRK	GPS
Best Buy	Berkshire Hathaway	DNKN	BUD	HMC
Burberry	Best Buy	DPZ	C	KO
Burger King	Booking Holdings	EBAY	CHTR	KSS
Calvin Klein	Capital One Financial	F	CLX	LVMUY*
Chanel	Charter Communications	FB	CMCSA	M
Chevrolet	Citigroup	GM	COF	MCD
Chick-fil-A	Clorox	GME	COTY	MSFT
Chipotle	Coca-Cola	GOOG	DELL	NFLX
Coach	Comcast Corp	GPS	DEO	NKE
Coca-Cola	Constellation Brands	HMC	DFS	NSANY*
Converse	Coty	HNNMY*	DIS	PEP
Dell	Cox Enterprises	HPE	DISH	SNE
Dior	Daimler	HTCKF*	DMLRY*	T
Disney	Dell Technologies	IDEXY*	EBAY	TGT
Dodge	Diageo	JWN	EL	TM
Dolce & Gabbana	Discover Financial	KO	ESLOY*	UBER
Domino's Pizza	DISH	KSS	EXPE	VZ
Doritos	Disney	LEVI	F	WMT
Dunkin' Donuts	eBay	LUV	FB	
eBay	Eli Lilly & Co.	LVMUY*	FCAU*	

Figure 3 continued:

Facebook	EssilorLuxottica	M	FUJH*Y
Ford	Estée Lauder	MCD	GILD
Forever 21	Expedia	MMM	GM
Gamestop	Facebook	MNST	GOOGL
Gap	Fiat Chrysler	MSFT	GPS
Google	Ford	NFLX	GSK
Gucci	Gap Inc.	NKE	HD
H&M	General Motors	NSANY*	HMC
Hewlett-Packard	Gilead Sciences	NTDOY*	HYMTF*
Hollister	GlaxoSmithKline	PEP	IAC
Honda	Home Depot	PINS	IBM
Hot Topic	Honda	PUMSY*	INTU
HTC	Hyundai	RL	JCPNQ
Instagram	IAC (InterActiveCorp)	SBUX	JNJ
Jeep	IBM Corp.	SNAP	JPM
Jordan	Inspire Brands	SNE	KDP
Kohl's	Intuit	SPOT	KHC
Levi's	J.C. Penney	T	KIMTF*
Louis Vuitton	Johnson & Johnson	TGT	KO
Macy's	JPMorgan Chase	TM	KR
Marc Jacobs	Keurig Dr. Pepper	TSLA	KSS
Marvel Studios	Kia	TWTR	LGF
McDonald's	Kohl's	UA	LLY
Michael Kors	Kraft Heinz	UBER	LOW
Microsoft	Kroger	VZ	LRLCY*
Monster Energy	L'Oréal	WEN	LVMUY*
Mountain Dew	LendingTree	WMT	M
Nat Geo Travel	Liberty Mutual		MAR
Netflix	Lions Gate Entertainment		MCD
Nike	Lowe's		MRK
Nintendo	LVMH Moët Hennessy Louis Vuitton		MSFT
Nissan	Macy's		NFLX
Nordstrom	Marriott International		NKE
Oreo	Mars, Inc.		NSANY*
Pepsi	McDonald's		NSRGY*
Pinterest	Merck & Co.		NVS
Pizza Hut	Microsoft		PEP

Figure 3 continued:

PlayStation	Molson Coors Beverage	PFE
Puma	Nestlé	PG
Ralph Lauren	Netflix	PGR
Red Bull	Nike	QSR
Saint Laurent	Nissan	RBGLY*
Samsung	Novartis	SNE
Sephora	PepsiCo	SNY
Snapchat	Pfizer	STZ
Sony	Procter & Gamble	T
Southwest Airlines	Progressive Corp	TAK
SpaceX	RB (Reckitt Benckiser Group)	TAP
Spotify	Restaurant Brands	TGT
Starbucks	Samsung Electronics	TM
Subway	Sanofi	TMUS
Taco Bell	Sony	TREE
Target	State Farm Mutual	UBER
Tesla	Subaru Corp	UN
Toms	T-Mobile	VIAC
Toyota	Takeda Pharmaceutical	VWAGY*
Twitter	Target	VZ
Uber	Toyota	W
Under Armour	U.S. Government	WBA
Vans	Uber	WFC
Verizon	Unilever	WMT
Versace	Verizon	YUM
Victoria's Secret	ViacomCBS	
Walmart	Volkswagen	
Wendy's	Walgreens Boots Alliance	
Whole Foods	Walmart	
Xbox	Wayfair	
YouTube	Wells Fargo	
Zara	Yum Brands	

Columns 1-2 of the table above show what we identified as the top 100 companies, as of November 2020, in terms of Twitter followers and general marketing budgets. Columns 3-5 present the ticker symbols of the firms included in our analysis. Columns 3-5 do not include

companies in columns 1-2 that were either subsidiaries or private companies. Tickers with asterisks (*) next to them in columns 3-5 were excluded from our comparison of our students' aggregate portfolio holdings with the holdings of the S&P 500 index. We excluded companies with OTC-traded stocks from the S&P 500 comparison.

In order to create the proxy measure for social media attention, we obtained and looked for reports focusing on companies that posed to be the most popular and among young adults from sources: *Morning Consult, Yahoo!, Unmetric, BunsinessInsider,* and *Social Breakers*. With these reports, we created a master list of companies, making sure to avoid repeats of companies on more than one report. Once we had our list from these reports, we found up to date Twitter follower numbers, by looking at each company's number of Twitter followers, as of November 6, 2020, for each company and arranged the list from most-to-least Twitter followers. We then looked at the top 100 companies in terms of Twitter followers, and then filtered out companies that were not U.S. publicly traded companies, namely subsidiaries, private companies, and foreign firms. For instance, you can see that our Twitter list includes Jordan and Converse, both of which are subsidiaries of Nike. Since these subsidiaries and private companies were not available to the participants to purchase during the experiment, they were excluded from the lists in columns 3-5. Since subsidiaries, private companies, and foreign stocks are not part of the S&P 500, they were excluded from the S&P 500 comparison. For the regression analysis, we included foreign stocks, since they were available for purchase during the time of the experimental period. The list used for the regression analysis was comprised of 58 companies, both U.S. publicly traded and foreign firms.

We obtained our list of the top 100 companies in terms of general marketing budgets, on the 2020 *AdAge* report for the most marketing expenditures in 2019. Once the top 100 companies were identified, we identified marketing expenditures that were not U.S. publicly traded companies, namely subsidiaries, private companies, and foreign firms. Subsidiaries and private companies were excluded from our analysis entirely. Foreign firms were excluded from the comparison of our student portfolios with the S&P 500 but included in our regression analysis. The list used for the regression analysis was comprised of 93 companies, both U.S. publicly traded and foreign firms.

Finally, we created the list for companies that appear in *both* our Twitter and *AdAge* lists. We looked at companies that fell on both lists and created this group of companies the purposes of measuring the extent to which a company's presence on both lists could influence a students' investing behavior. We created this list based on the two other lists mentioned above, since they were already filtered out from subsidiaries, private companies, and OTC stocks for comparison against the S&P 500. If a publicly traded U.S. company appeared on both lists, we included it on this list to compare against the benchmark. For the regression analysis, we included foreign firms that also appeared on both lists. The list used for the regression analysis was comprised of 29 companies, both U.S. publicly traded and foreign firms.

Pre and Post Survey Data:

Pre-Survey Data:

Gender	
Female	52.24%
Male	46.27%
Other	1.49%

Familiarity with the stock market	
I don't have any knowledge about the stock market	28.36%
I only hear about markets on the news	44.78%
I understand markets	13.43%
I understand markets and manage my own brokerage account	13.43%

Age	
18	31.34%
19	28.36%
20	14.93%
21	19.40%
22	5.97%

Economics Courses Taken	
0	47.76%
1-to-2	38.81%
3-to-5	10.45%
6+	2.99%

Graduation year	
2021	25.37%
2022	8.96%
2023	32.84%
2024	32.84%

Have you taken a finance course?	
No	68.66%
Yes	31.34%

Level of interest in the stock market (1-5; lowest-to-highest)	
1	5.97%
2	10.45%
3	31.34%
4	31.34%
5	20.90%

Post-Survey Data

Which of the following influenced your decision to determine which stocks to invest in?	
Familiar with these companies	58.70%
Desirable financial performance	32.61%
None of the above	8.70%

In what ways are you exposed to these companies in your daily life?	
Use their products/services	78.57%
See their products/services	73.21%
Conversations with friends	66.07%
Media/Social Media	66.07%

Of the companies you invested in, how many do you become aware of during your typical week?	
Some	41.54%
None	40.00%
All	18.46%

Of the companies you invested in, do you remember seeing any on social media prior to/during the experimental period?	
Yes	52.31%
No	47.69%

What types of media exposure did you have to the companies you invested in?	
Social Media	76.36%
Print/Websites	56.36%
Podcast	14.55%
Radio	10.91%

| On which of the following social media platforms do you remember seeing one of the companies in which you invested?	
Instagram	58.00%
Twitter	24.00%
Facebook	22.00%
Other	20.00%
TikTok	10.00%
LinkedIn	6.00%

What information did you use to choose your stocks?	
Familiar with products/services	61.54%
From credible news sources	46.15%
From professional investor	35.38%
No information	27.69%
Financial Statements	23.08%
Advertisements	13.85%

Companies participants become aware of
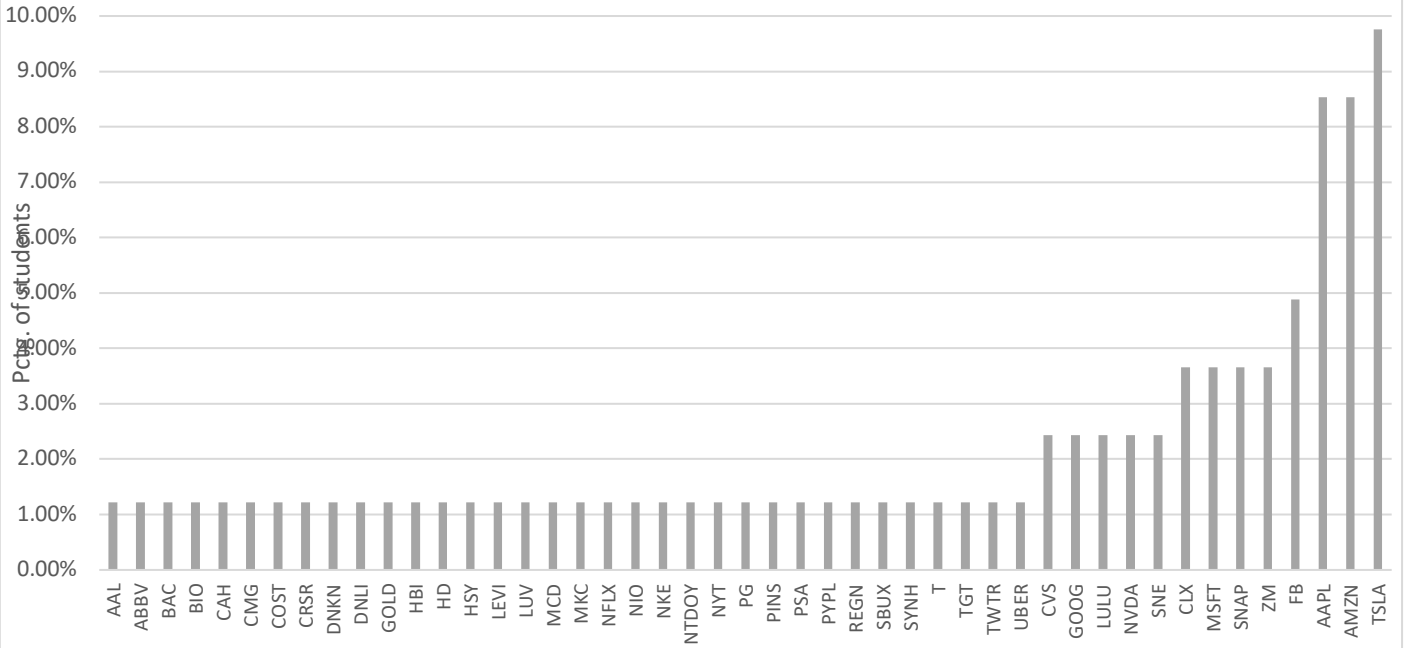
Companies students were exposed to via social media prior to/during experimental period
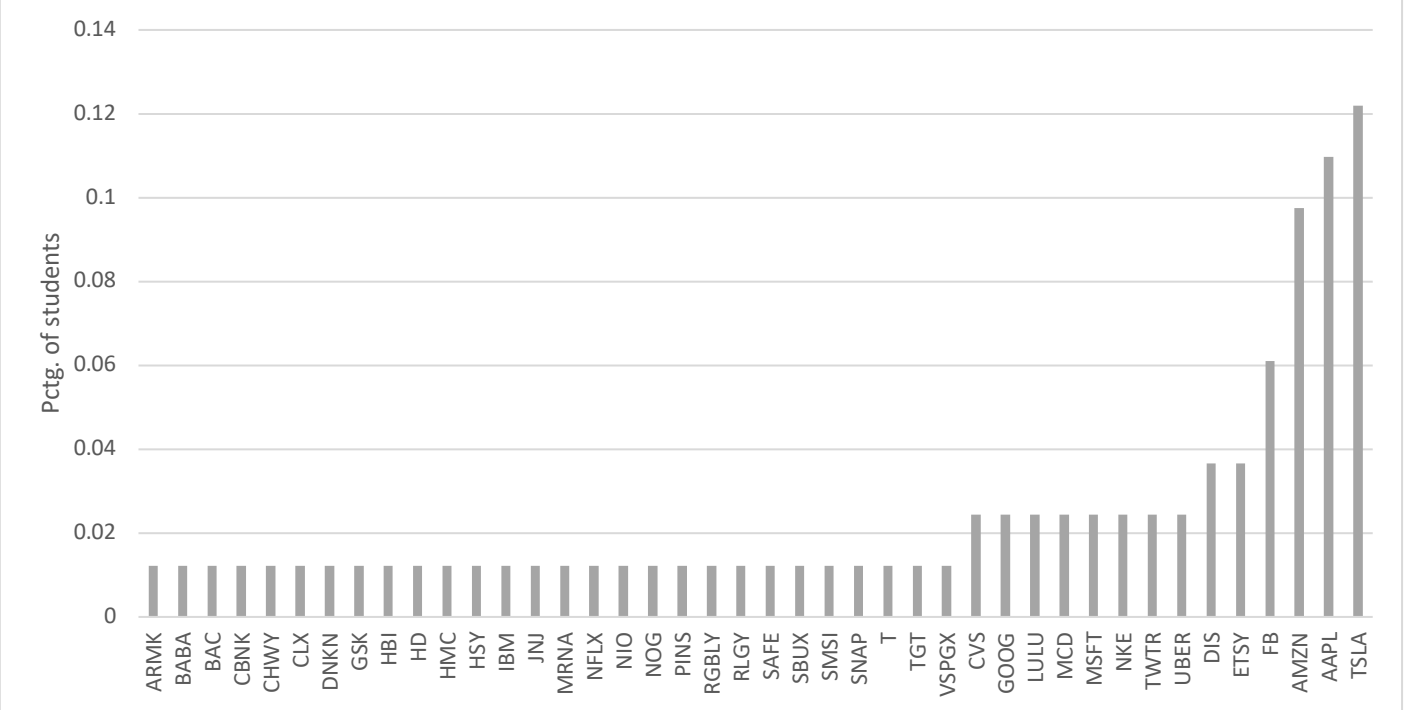
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