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Mobile Devices and Investment News Apps: The Effects of Information Release, Push Notification, and the Fear of Missing Out

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Mobile Devices and Investment News Apps: The Effects of Information Release, Push Notification, and the Fear of Missing Out

ABSTRACT

We examine how information dissemination via mobile device applications (apps) affects nonprofessional investors' judgments. In response to the prevalence of mobile device use, the media ungroups content into smaller pieces to accommodate users, and apps use push notifications to highlight this content. These changes increase users' ability to access investment information in real time, leaving some investors feeling as if they are missing out if they are not continuously connected. We validate a scale to capture investors' fear of missing out on investment information (I-FoMO) and document that I-FoMO is distinct from traditional FoMO that occurs in social settings. Then, using an experiment, we find that receiving ungrouped content via a mobile device has a greater effect on investment allocations in the presence, rather than absence, of push notifications. Further, we find that these results hold for higher, but not for lower, I-FoMO investors.

JEL Codes: G23; M41; M48; M49

Keywords: investment apps; mobile communication; push notifications; fear of missing out; information release

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I. INTRODUCTION

Advances in technology have resulted in important changes to the way that investors receive, and the media disseminates, investment information. For example, recent survey data indicates that 65 percent of investors between the ages of 35 and 54 with online brokerage accounts now believe that it is critical to be able to monitor their investments via mobile applications (apps), and 43 percent of these investors report that they frequently read financial news on a mobile device (E*TRADE 2019). The numbers are even higher among investors between the ages of 25 and 34, where 72 percent monitor investments and 60 percent read financial news via apps. In response, news agencies increasingly ungroup news content by breaking it into smaller pieces to optimize content for mobile delivery (Farhi 2014). Further, to capture users' attention, news apps often use push notification technology, which alerts users to news as soon as it becomes available instead of requiring users to check the app for updates (Brown 2017). These practices decrease the length, but increase the number, of individual news releases that users receive.

As a result of the expanding role of mobile devices in investment news consumption and the media's response to this change, investors now have increased access to real-time investment information. While this is beneficial in that it has improved information flow for individual investors (Brown, Stice, and White 2015; SEC 1997), it is not without consequences. In this paper, we contend that the dissemination of information via mobile apps causes some users to feel as if they could be "missing out" on investment information if they are not continuously connected. Indeed, financial commentators have suggested that the fear of missing out on investment information is an important force in investment settings (e.g., Saft 2015; Wadhwa 2017). Despite speculation about the importance of this phenomenon, to date there has been no systematic way to study its existence or related effects.

The purpose of our research is therefore to examine how ungrouped content, push notifications, and the fear of missing out on investment information interact to affect individual investors' investment decisions. Investigating this issue is important because the media's role in information dissemination is critical to the capital markets (Miller and Skinner 2015). For example, media dissemination can reduce information asymmetry (Bushee, Core, Guay, and Hamm 2010), affect trading behavior (Engelberg and Parsons 2011), reduce cash flow mispricing (Drake, Guest, and Twedt 2014), and improve market pricing efficiency (Twedt 2016).¹ Combined, this literature supports the idea that investors attend to the information disseminated by the media, even when the media is simply repeating the information provided by a firm. If the manner in which media outlets package information affects how investors interpret that information, then these choices have potential economic consequences for investors. Further, if there is a systematic difference in the extent to which some investors respond to these dissemination changes, then it is useful to have a method for capturing that difference and understanding its effects in investment settings.

To address these issues, we examine how the fear of missing out on investment information, which we refer to as I-FoMO, is distinct from the cultural phenomenon in which individuals fear missing out on rewarding social experiences (traditional FoMO) (Przybylski, Murayama, DeHaan, and Gladwell 2013). We use a controlled experiment to examine how I-FoMO interacts with push notifications and ungrouped content to affect nonprofessional investors' judgments. We draw on prior marketing literature to develop predictions about how investors will evaluate the shorter, more frequent information releases that occur as a result of mobile technology. This literature finds that, even if total information content is held constant, breaking information into

¹ Blankespoor, Miller, and White (2014) show that dissemination of news via Twitter can raise a firm's visibility and increase liquidity, although theirs is a setting where the *firm* disseminates information rather than the media.

more pieces affects how it is evaluated because the breaks between the pieces capture users' attention, thereby stimulating their curiosity (Kupor and Tormala 2015) and intensifying their experience (Nelson and Meyvis 2008). For example, users who receive positive information think that this information is more favorable if they receive it in smaller pieces, with breaks in between, than if they receive it all at once.

In a mobile device setting, the presence of push notifications determines whether users view news releases as relatively more or less grouped because these notifications alert users to information delivery as it occurs. When push notifications highlight positive news, investors are more likely to process each release as it arrives, meaning that investors will respond more favorably to the shorter, ungrouped releases than to the longer, grouped releases. Without push notifications, investors are more likely to process multiple releases at the same time, meaning that grouping versus ungrouping will have less of an effect on investors' judgments. Accordingly, we predict an interaction whereby ungrouped information has a greater effect on investment allocations in the presence of push notifications than in the absence of these notifications. Further, we expect that higher I-FoMO individuals, who are more concerned with receiving investment information, will be more sensitive to the combined effects of information ungrouping and push notification.

To test our predictions, our experiment provides nonprofessional investors with a software-based "virtual iPhone." The phone includes an investment news app that provides firm-related news releases.² We hold constant the total amount of information provided to participants, but manipulate the number of news releases. An ungrouped (grouped) release breaks the information out over six (two) disclosures. We also manipulate whether participants

² We focus exclusively on positive news releases because the media primarily receives positive news from firms in most real-world settings (Graham, Harvey, and Rajgopal 2005; Jung, Naughton, Tahoun, and Wang 2018; Kothari, Shu, and Wysocki 2009).

receive push notifications that alert them to these releases. In the notification-present conditions, participants receive a banner alert each time a news release appears. In the notification-absent conditions, participants must look at the news app to learn that a news release is available. After accessing all news items, participants provide an investment allocation. We then measure individual I-FoMO levels with a scale that we develop and validate.

Consistent with our predictions, we find an interaction between information ungrouping and the presence of push notifications. Examining the interaction with respect to relative levels of I-FoMO, we find that this interaction holds for those who exhibit higher I-FoMO but not for those who exhibit lower I-FoMO. Our results are consistent with the idea that ungrouped content and push notifications have stronger effects on investors who are particularly concerned with missing out on investment information that can result in higher economic returns. Process data from the experiment provides additional insights. Relative to lower I-FoMO individuals, those with higher I-FoMO open the news app and check the home screen more frequently, looking for an indication of new investment news. Finally, we rule out alternative explanations for our results by documenting that those who are higher in I-FoMO do not differ from those who are lower in I-FoMO with respect to distractibility or level of education. Thus, I-FoMO seems to affect information search behavior rather than information processing behavior. Our results highlight both the effects of mobile technology features on investment judgments and the importance of I-FoMO to investment behavior.

Our research contributes to the voluntary disclosure literature that investigates the media's role as an information intermediary in financial markets. The media can serve at least three distinct purposes – (1) *disseminating* information through additional channels, (2) *synthesizing* information from multiple sources (without any additional interpretation), and (3) *creating*

information through investigation and interpretation (Bushee et al. 2010). In contrast to research that has investigated the media's role in synthesizing information (e.g., Blankespoor, deHaan, and Zhu 2018) or creating information (e.g., Guest 2018), we focus on the media's role in disseminating information (e.g., Bushee et al. 2010; Twedt 2016). Unlike prior research, which has examined the effects of increased access to information via media dissemination, we hold constant the total amount of information and examine how technological advances that accompany media dissemination can affect investor judgment.

In particular, we focus on the media's optimization of content for mobile delivery and the prevalence of push notifications. Inasmuch as media outlets continue to repackage content into smaller stand-alone pieces and develop new notification technologies to increase user engagement, our results illustrate the effects of these trends on investment judgments. These findings have implications for related settings in which information releases may vary in their length and delivery mechanism (e.g., Blankespoor et al. 2018). In general, our results suggest that the increasing use of RSS feeds, email alerts, and text alerts for information delivery may have significant effects on investors' reactions to that information. More broadly, our research contributes to the literature that examines how individuals find it difficult to ignore interruptions (e.g., Basoglu, Fuller, and Sweeney 2009).

Our research also makes an important methodological contribution to the literature. Although there is a validated scale for measuring traditional FoMO in social settings (Przybylski et al. 2013), there has not been a method for capturing the fear of missing out on investment information, despite speculation as to the importance of this construct in investment settings. Accordingly, we develop a psychometric scale that is tailored to the measurement of I-FoMO. Although our research examines the effects of I-FoMO on the behavior of nonprofessional

investors, hedge fund managers worry that I-FoMO may also affect professional analysts' behavior (Schüür 2017). Future research could examine this possibility.

Finally, our research has important practical implications for investors. If news outlets continue to optimize news for mobile delivery by providing shorter, more frequent releases, our results indicate that this choice can affect investors due to the prevalence of push notification technology on mobile devices. This is particularly the case for those who have a greater fear of missing out on investment information. Investors who use mobile devices for investment-related activities may wish to consider whether these devices are beneficial to their investment goals. Ironically, it may be difficult for higher I-FoMO individuals to make this determination, despite the fact that push notifications have the greatest effect on these individuals.

We organize the remainder of the paper as follows. The next section provides background information. Section III describes our I-FoMO scale development procedures. Section IV develops our predictions, Section V describes the experiment used to test these predictions, and Section VI reports the results. Section VII concludes and discusses the implications of our work.

II. BACKGROUND

Mobile Technology and Investment Information

The use of mobile devices in the United States is pervasive. The Federal Reserve Board found that 87 percent of the U.S. adult population has a mobile phone, and 71 percent of mobile phones are internet-enabled smartphones (Brown, Dodini, Gonzalez, Merry, and Thomas 2015). On average, users pick up their smartphone 100 times per day and spend 26 percent of their time looking at the home screen (Cooper 2014). Similarly, the Pew Research Center reports that 67 percent of mobile users find themselves checking their phones for messages, alerts, or calls, even when the phone has not been ringing or vibrating (Smith 2012).

Mobile devices serve as an information conduit between news sources and users, as individuals use mobile apps to keep up with breaking news. The Pew Research Center reports that 68 percent of smartphone owners use their phone to follow news events (Smith 2015). With respect to financial news, both traditional news outlets, such as the Wall Street Journal and CNBC, and large brokerages, including Charles Schwab, TD Ameritrade, Vanguard, Fidelity, and E*Trade, offer mobile apps that provide access to company news (Wells and Andriotis 2014). Indeed, one of the appeals of mobile technology is that it can serve as an always-on conduit for investment information and this information is essential for generating economic returns. However, the potential downside of this attachment to technology is that certain individuals may experience greater apprehension at the thought of missing information.

Fear of Missing Out on Investment Information (I-FoMO)

The fear of missing out (FoMO) is a pervasive apprehension that others might be having rewarding social experiences from which one is absent (Przybylski et al. 2013). FoMO has become a ubiquitous part of our culture as a result of the sharp increase in mobile technology and social media. That is, mobile technology makes it easier for individuals to be aware of social events and may cause individuals to feel anxious when they “miss out” on these events. FoMO is also an established personality trait that is grounded in psychology theory (Baumeister and Leary 1995; Deci and Ryan 1985; Reagle 2015). Accordingly, there is variation in the extent to which individuals exhibit FoMO (Przybylski et al. 2013).

While the term ‘FoMO’ applies to social contexts, concerns about the fear of missing out have started appearing more frequently in investment contexts. For example, investment blogs often argue that the fear of missing out is an important determinant of individuals’ investment behavior (Russell 2011; Saft 2015; Wadhwa 2017). In these contexts, the focus is on the fear of

missing information that could move prices (and result in trading gains for the individual) rather than on the fear of missing a rewarding social experience. Not only can I-FoMO affect retail investors, but experienced hedge fund managers also recognize the potential for investment-related FoMO to play a role in the financial markets by affecting analysts' information evaluation strategies (Schüür 2017). Even with this attention from both nonprofessional investors and Wall Street, the fear of missing out on investment information has yet to be studied systematically in the financial reporting literature. Thus, to date, there is no evidence as to whether investment-related FoMO (I-FoMO) exists, is different than traditional FoMO, or whether it can affect investors' judgments.³ Providing evidence with respect to these issues requires the development of a scale that can capture the I-FoMO construct.

I-FoMO is conceptually related to the more traditional notion of FoMO in that both are driven by an individual's concern for losing an opportunity to realize a positive outcome. However, with I-FoMO the potential reward is monetary, whereas with traditional FoMO the potential reward is psychological well-being. This difference is consequential, as individuals who miss out on a rewarding social experience cannot simply substitute a rewarding monetary experience (Kahneman and Deaton 2010). Furthermore, individuals who experience traditional FoMO may not necessarily experience I-FoMO because those who place a high value on social experiences do not necessarily place a high value on monetary experiences (Kasser and Ryan 1993). Accordingly, we investigate whether there is an important distinction between I-FoMO in investment settings and FoMO in popular culture by developing and validating an I-FoMO scale, and then testing its effects on investment decisions.

³ A theory paper in economics considers how the fear of missing out can affect one's willingness to fund a pre-IPO project (Buchak 2017). This setting differs from ours in that it does not consider the fear of missing out as a characteristic of retail investors and does not address the role that mobile devices play in exacerbating these fears.

III. SCALE DEVELOPMENT

To develop an I-FoMO scale, we follow the multi-step approach outlined by Hinkin (1995, 1998). We begin with the ten-item scale that Przybylski et al. (2013) established to capture the fear of missing out (FoMO) on rewarding social activities. We adapt this scale to our setting by creating 34 candidate I-FoMO scale items that reflect concern about missing out on investment-related information.⁴

Content Validity

To assess the content validity of the candidate scale items, we sequentially present both the original FoMO scale items and our candidate I-FoMO items, randomized together, to four Ph.D. student raters who are not familiar with this research project. Raters indicate whether each item relates to the “Fear of missing out on investment information,” “Fear of missing out on social engagements,” or “Other/neither.” As the amount of agreement among raters increases for a given item, it indicates that the item has better content validity. Of the 34 candidate items, there are 23 items that at least 75 percent of the raters categorize as related to the fear of missing out on investment information (I-FoMO). Accordingly, we conclude that these 23 items have adequate content validity and retain these items for further consideration. We list these items, as well as the original FoMO scale items, in Table 1.

Insert Table 1 about here

Discriminant Validity

Next, we use multiple approaches to assess the discriminant validity of our proposed I-FoMO scale items vis-à-vis the established FoMO scale items. First, we note that our raters do not

⁴ For example, whereas the original FoMO scale included socially-focused statements such as, “I get anxious when I don’t know what my friends are up to,” the candidate I-FoMO scale included economically-focused statements such as, “I get anxious when I don’t know what the companies I’m investing in are planning.”

classify any of the FoMO scale items as I-FoMO scale items, or vice-versa. Second, we administer the 23 I-FoMO scale items and the ten traditional FoMO scale items to a sample of 301 individuals recruited via Amazon Mechanical Turk.⁵ Participants rate the extent to which each item describes their experiences on five-point scales that range from “not at all true of me” to “extremely true of me.” We then use parallel analysis (Horn 1965) to assess our prediction that I-FoMO scale items and FoMO scale items will cleanly load on distinct factors and that no other significant factors are present.⁶ We find that there are a maximum of three potential factors.

Factor Retention

Following the suggestion of Zwick and Velicer (1986), we combine the parallel analysis results, examination of the scree plot, and consideration of our underlying theory in determining the number of factors to retain. While our parallel analysis suggests a maximum of three factors, both examination of the scree plot and our theory imply the retention of two factors. Looking at these results together, we determine a two-factor solution is most appropriate. Next, we conduct a factor analysis with oblimin rotation to examine factor loadings and cross-loadings.⁷ The two factors have eigenvalues of 13.09 and 3.86, respectively. We report rotated factor loadings for all 23 candidate items in our I-FoMO scale in Table 1, Section A. All 23 candidate items load on Factor 1 and all ten items from the established FoMO scale load on Factor 2. No items, from

⁵ All data collected in this paper has the approval of the Institutional Review Boards at the authors' respective universities. Of the 301 participants recruited via Amazon Mechanical Turk, we retained 294 responses, excluding seven participants for failing attention checks.

⁶ Parallel analysis uses Monte Carlo-based simulation to compare extracted factor loadings from observed data with those obtained from random draws from a parallel dataset parameterized with the same number of variables and observations as the observed data. This technique is relatively underutilized in business research, but is regarded to be the most accurate factor retention method (Hayton, Allen, and Scarpello 2004; Zwick and Velicer 1986).

⁷ We choose an oblique rotation to allow for factor correlation. Forcing orthogonality between factors would bias towards demonstrating discriminant validity. Further, it is reasonable to think that the established FoMO latent construct and our candidate I-FoMO latent construct may be correlated. Thus, our method of analysis must allow for scale correlation to occur if it exists. Results are inferentially identical if we use an orthogonal varimax rotation.

either scale, exhibit cross-loading above the 0.40 cutoff noted by Hatcher (1994). Thus, our evidence suggests that the FoMO and I-FoMO scale are indeed capturing distinct constructs.

Scale Reduction and Reduced Scale Validation

To combat scale fatigue (Hinkin 1995), and to remain consistent with the length of the original FoMO scale, we further reduce these 23 items to a ten-item scale. We use a two-parameter Item Response Theory (IRT) model (de Ayala 2009) to determine the scale items that effectively capture the I-FoMO construct, and yet still discriminate between higher and lower levels of I-FoMO. This technique captures these competing characteristics of our candidate items by examining two metrics: the information parameter and the discrimination parameter. We use both parameters to determine which items should be retained in our scale so that it reliably captures the underlying trait (DeMars 2010). We retain the ten items that have the highest scores for each of these parameters.⁸ We report factor loadings, item discrimination, and item information in Table 1, Section B for each of our candidate items. Finally, we conduct a confirmatory factor analysis with the reduced scale. As reported in Section C of Table 1, the ten items that we retain continue to have high factor loadings. Further, coefficient alpha for our final ten-item scale is 0.95, indicating excellent scale reliability (Cronbach 1951).⁹ We use this ten-item scale to assess the degree of I-FoMO by computing a factor score for each individual.

⁸ The information parameter, also known as the area under the item information curve (AUC), captures the degree to which the item provides information about the level of I-FoMO of a participant. Information parameters between 0.70-0.79 are acceptable, between 0.80-0.89 are good, and those greater than 0.90 are excellent (Hosmer and Lemeshow 2000, 162). The discrimination parameter tells us how effectively each item can distinguish between lower versus higher levels of I-FoMO. Item discrimination parameters between 0.65-1.35 are moderate, between 1.35-1.69 are high, and those greater than 1.70 are very high (Baker 2001).

⁹ The correlation between the traditional FoMO scale and our I-FoMO scale is 0.31, implying relatively low overlap between the scales. This is consistent with our tests for divergent validity above. However, it is also important to note that although traditional FoMO and I-FoMO appear to be conceptually distinct, this does not mean that they are mutually exclusive. That is, an individual with higher traditional FoMO could also have higher *or* lower I-FoMO, because the two scales capture distinct aspects of an individual's personality.

Given our ability to capture differences between lower and higher I-FoMO individuals, we now develop expectations about how these individuals will respond to differences in information release and push notification when using mobile devices to acquire investment information.

IV. HYPOTHESIS DEVELOPMENT

Effects of Information Release and Push Notifications on Investment Allocations

Mobile device apps have quickly become the main way for individuals to access information online and there is fierce competition among news agencies to capture the attention of these individuals (Reuters Institute 2017). To build loyalty with readers, the news media has made at least two important changes to mobile device information delivery. First, in response to the increased use of mobile devices to access information, news sources now modify the format of information content to optimize it for mobile delivery (Farhi 2014). Namely, users are more likely to receive shorter information releases that are easier to read on mobile screens.¹⁰ These releases necessarily contain “ungrouped” content in that shorter releases cannot contain as much information as longer releases. Thus, publishing the additional content would require an additional release. This trend toward shorter, ungrouped disclosures may have important implications for how investors make judgments in response to investment news.

We base our predictions on the consumer products literature, which examines the effects of ungrouping on individual judgments.¹¹ This literature finds that even when total information is held constant, grouping versus ungrouping information affects how it is evaluated. Ungrouped

¹⁰ Not only does information ungrouping result in news releases that are easier for individuals to read, they are also advantageous for the news agencies because they result in a greater view count – a key performance metric for news agencies, which results in additional advertising revenue.

¹¹ Prior accounting research has examined managers’ strategic choice to group/ungroup information contained in firm disclosures (e.g., Kothari et al. 2009; Rogers and Van Buskirk 2013; Segal and Segal 2016), but has not examined the effects of grouping/ungrouping absent strategic concerns. Hirshleifer and Teoh (2009) note that individuals frequently treat investment decisions as similar to consumer product decisions and the literature in this area allows us to understand the effects of grouping/ungrouping in situations that are outside of managements’ control, such as when the news media makes the decision to ungroup content.

information is separated into more pieces than is grouped information and the breaks between these pieces of information attract recipients' attention, thereby increasing their curiosity (Kupor and Tormala 2015) and intensifying their experience (Nelson and Meyvis 2008). As a result, information is more persuasive if it is ungrouped (Kupor and Tormala 2015). Thus, in the case of positive news, users view ungrouped information more favorably than grouped information (Nelson, Meyvis, and Galak 2009; Redden 2008). Further, users who receive ungrouped (rather than grouped) information express a greater willingness to pay for consumer products (Kupor and Tormala 2015; Nelson and Meyvis 2008).¹²

Applying this research to our accounting setting suggests that if the news media ungroups news releases into smaller pieces to accommodate mobile users, investors will receive more of these smaller releases and these releases will attract more attention from investors. As a result, investors are likely to respond more strongly to these news releases than they would have if the media had provided the same information in fewer, longer releases. If all of these releases provide positive firm news, then the stronger response to ungrouped content will manifest in more favorable reactions to the information and a willingness to invest more in the firm.

Of course, our setting is distinct from that of the marketing literature in that news apps may use push notifications to alert users to the availability of information releases. As competition increases among news agencies, so too does the use of push notifications. These messages pop up over the content on a smartphone's screen, capture users' attention, and alert users to the arrival of new information in real-time, regardless of whether an app is open or not. Push notifications debuted in 2009 and their usage has increased steadily as news agencies vie for

¹² Prior marketing research has referred to ungrouped content as segmented, partitioned, broken apart, disrupted, subcategorized, etc.

users' attention.¹³ These notifications have the potential to affect whether users view information releases as relatively more or less grouped because they highlight information delivery.

Market researchers have found that in the presence of push notifications, users access apps more frequently, either by directly clicking on the push notification banner or by separately opening the app in response to a recent push notification (Grennan 2016), with some research indicating that users are up to 50 percent more likely to access news-related apps in response to push notifications (Urban Airship 2016). As a result, investors who receive push notifications are more likely to process news releases individually as they occur whereas those who do not receive push notifications are more likely to process multiple news releases at the same time (i.e., when they happen to open the app and realize that news releases have accumulated). Thus, the effects of ungrouped (versus grouped) information releases on investor judgments should be larger when accompanied by push notifications, but should be smaller in the absence of push notifications.

Taken together, we expect that ungrouping versus grouping information will have a greater effect on investor allocation decisions when push notifications are present because push notifications highlight this difference in information release and encourage users to process these releases as they occur, leading to more favorable evaluations of the information when news is positive. In contrast, ungrouping versus grouping information will have less of an effect on investor allocation decisions when push notifications are absent because investors will be less aware of each information release *and* will be more likely to read multiple releases at the same time, thereby reducing the effects of information ungrouping. We formally state our predicted interaction below:

¹³ Some mobile applications require users to opt-in before receiving push notifications whereas others automatically opt-in users and users must opt-out if they no longer want to receive push notifications (Urban Airship 2015). Users are particularly likely to allow push notifications for breaking news alerts (O'Connell 2016) and business apps have a median opt-in rate of 54 percent according to industry research (Urban Airship 2015).

H1: The effect of ungrouped versus grouped news information on investors' investment allocations is greater when push notifications are present than when they are absent.

Beyond the overall interaction that we predict in H1, differences in individuals' personality traits can also determine the extent to which information ungrouping affects individuals' judgments (Kupor and Tormala 2015; Nelson et al. 2009). In our setting, we investigate I-FoMO as a specific personality trait that could moderate H1. As described in Section III and shown in Table 1, the items included in the final I-FoMO scale capture individuals' propensity to experience negative emotions (i.e., fear, worry, bother, and anxiousness) at the thought of missing out on investment information. Accordingly, we expect that higher I-FoMO individuals, who are most concerned with receiving investment information will be most affected by differences in the delivery of that information. Thus, we expect that the pattern of results that we predict in H1 will be stronger for those who are higher in I-FoMO than for those who are lower in I-FoMO. We state this formally in the hypothesis below:

H2: The interactive effect of push notification and news release ungrouping is greater for individuals higher in I-FoMO than for those who are lower in I-FoMO.

In sum, we predict that ungrouped information has a greater effect on investment allocations in the presence of push notifications and we predict that higher and lower levels of I-FoMO moderate this effect such that it is greater for individuals with higher I-FoMO. An alternative possibility, which provides tension for our hypotheses, is that the convenience of mobile devices in investment settings provides individuals with both the ability and desire to acquire and process investment news regardless of whether it is ungrouped or accompanied by a push notification. If this is the case, then we would not observe differences in judgment regardless of individuals' level of I-FoMO. Below we describe the experiment that we use to test our predictions.

V. EXPERIMENT

Participants and Design Overview

We recruit 230 participants from Amazon Mechanical Turk to serve as nonprofessional investors in our experiment and obtain 178 useable responses.¹⁴ Study participants have an average age of 35.71 years and average work experience of 14.04 years. Participants have taken an average of 2.52 accounting courses, and 87 percent have either purchased or plan to purchase stocks and/or mutual funds. On average, participants complete the task in 18.04 minutes. As compensation, participants receive \$2.00 and, as described more fully below, have the opportunity to be entered into two drawings for additional \$15 bonuses.

Our experiment includes three independent variables. First, we manipulate the form of information release and the presence or absence of push notifications in a 2×2 between-participants design. We randomly assign participants to one of these four conditions. Further, for all participants, we measure I-FoMO using the scale described in Section III. Participants complete the experiment in Qualtrics using a “virtual iPhone” that includes two apps, as described below. Screenshots of the virtual iPhone appear in Appendix 1.

Instructions and Procedures

Before beginning the experiment, we ask participants to complete a sound test to confirm that they can hear computer audio. This requirement is important for participants who receive push notifications, which are accompanied by an audible “ding.” Participants receive general task

¹⁴ We excluded participants for having duplicate IP addresses, declining to provide an investment amount or full set I-FoMO scale responses, providing investment justifications that were coded as “nonsense” by two independent raters blind to the study’s objectives, failing our requirement of being a native English speaker (i.e., could not explain the term “couch potato”), and having an IP address registered as part of the I-FoMO scale development. Relaxing these exclusion criteria does not change our inferences, but does reduce the significance of some results. Specifically, only excluding participants that were in the scale development or did not provide full responses left us with 198 useable responses. Rerunning our analyses with this dataset, the significance of our three-way interaction in the ANCOVA falls to $p = 0.14$ (one-tailed). However, the two way ANOVAs for High and Low I-FoMO participants remain significant ($p < 0.01$, one-tailed) and non-significant ($p = 0.99$, two-tailed), respectively.

information, indicating that they will interact with a virtual iPhone and that they will learn about a hypothetical company via an investment news app. We tell participants that they will receive news articles, be asked to make an investment judgment, and be asked to justify that judgment. We incentivize participants to take the investment judgment seriously by telling them that they will be entered into a drawing for one of five \$15 bonuses if their justification is judged to be in the top 20 percent of responses. We also tell participants that they will have access to a game app that they can use for entertainment when not reading about the company. The purpose of this game app is to simulate investors' actual interactions with mobile devices, in which smartphone users have multiple apps competing for their attention. Participants can pause and resume the game as needed. We incentivize participants to interact with the game by telling them that we will enter those who score in the top 20 percent into a drawing for one of five \$15 bonuses.

Next, participants complete training that walks them through the virtual iPhone, including the investment news and game apps. This training indicates to participants the number of articles that they will receive via the news app and tells participants that they will not be able to proceed with the study until they have accessed all of the articles. We enforce this rule by programming Qualtrics to hide the 'Next' button until a participant has opened all of the articles in the news app. To mimic real-life interaction with mobile devices, participants must only *access* an article to have it "count" as read. We do not require participants to read the article or to spend any specific amount of time with the article open. This design choice holds constant the information set across our information release conditions while allowing users to naturally choose the extent to which they wish to interact with this information. Before proceeding with the study, we require participants to demonstrate their understanding of the virtual iPhone and the apps by correctly answering questions about these features.

The articles that appear in the investment news app are press releases issued by a hypothetical company in the consumer goods industry and delivered by a third-party news provider. We base all of the articles, which report positive news, on actual releases issued by companies in the consumer goods industry. The articles are split evenly; half of the articles provide nonfinancial information and half provide financial information. The nonfinancial information describes the company's sustainability efforts, its receipt of an employee choice award, and its recognition as an ethical company. The financial information discloses fourth-quarter results, updates the company's full-year guidance, and outlines the company's long-term growth strategy. Once participants have accessed all of the press releases in the news app, they proceed to the final section of the task. This section does not include the virtual iPhone, and we stylize it as a more traditional survey. In this section, participants respond to the dependent measures, the I-FoMO scale described in Section III, and provide demographic information.

Dependent Variable

As our primary dependent variable, we endow participants with \$10,000 to invest in the hypothetical company, and we tell participants that any money not invested in the company will be invested in competitor companies.¹⁵ Participants use a slider bar to indicate how much they would like to invest in the focus company, and the screen displays the amount invested in the company versus the amount invested in competitors. On a conceptual level, this dependent variable captures the strength of participants' desire to invest in the company. All else equal, willingness to invest will drive market demand for the company's stock, thereby affecting stock price (Koonce and Lipe 2010). After recording the investment amount, participants advance to the next screen, on which we ask them to explain how they chose the amount to invest.

¹⁵ For exploratory purposes, we also ask participants to rate (1) the company's future prospects and (2) the perceived timeliness of the information. The pattern of results for these measures is similar to that of our dependent variable.

Independent Variables

We manipulate push notifications (present versus absent) between-participants. Participants in the *push notification present* conditions receive banner notifications whenever a new article is available. Each banner notification includes an audio alert and appears at the top of the virtual iPhone screen. During the five seconds while the notification is visible, participants may click on the notification to be taken directly to the news app. In addition, they can click on the news app on the home screen to see the list of articles. Participants in the *push notification absent* conditions do not receive a notification when news is released and, accordingly, must click on the news app via the home screen to access the news releases. In all conditions, the icon for the news app on the home screen of the virtual iPhone has a red “badge” that shows the number of articles that are available but have yet to be accessed by the participant.

We manipulate the form of information release (grouped versus ungrouped) between-participants by providing either two or six news releases about the hypothetical company. We hold total information constant by presenting the same disclosure as either two longer releases or six shorter releases. An example of grouped versus ungrouped information is available in Appendix 1. In all conditions, we hold constant the order in which the articles appear, with participants receiving the nonfinancial news releases first and the financial news releases after.¹⁶ Thus, in the *grouped* condition, participants receive one three-part nonfinancial article and then one three-part financial article. In the *ungrouped* condition, participants receive three nonfinancial articles and then three financial articles. Regardless of whether they are accompanied by push notifications or not, the news releases appear in the app at pre-specified

¹⁶ The strength of the individual news items and the order in which these items appear should not affect investors' judgments as long as the news items all have the same valence (as they do in our experiment) (Ashton and Ashton 1988; Hogarth and Einhorn 1992). Holding the order of information constant across conditions further ensures that the strength of individual news items cannot explain our experimental results because if primacy or recency effects were to occur they would be based on the same piece of information in all conditions.

intervals (unknownst to the participants). In the *ungrouped* conditions, articles appear 45, 90, 150, 235, 295, and 340 seconds after a participant begins the task. We vary the time between news releases so that participants cannot detect a pattern, and are therefore unable to predict exactly when new information will arrive. In the *grouped* conditions, the news articles appear 150 and 340 seconds after a participant begins the task.

Our third independent variable is the I-FoMO scale factor score for each participant. Participants complete this ten-item scale on a separate screen after responding to the dependent variable and providing their investment justification.

VI. RESULTS

Hypothesis Tests

Our primary dependent variable is the amount of money that participants invest in the target company. We report descriptive statistics for this variable in Table 2, Panel A. Our first hypothesis predicts that receiving ungrouped versus grouped releases has a greater effect on investors' investment allocations in the presence, rather than absence, of push notifications. Our second hypothesis predicts that the overall effect of push notification and information release ungrouping on investment allocations is greater for higher I-FoMO individuals.¹⁷

Because our independent variables are both categorical (*Information Release* and *Push Notification*) and continuous (*I-FoMO* factor score), we rely on a fully-crossed analysis of covariance (ANCOVA) for our primary analysis, presented in Table 2, Panel B. As predicted in H1, the coefficient on the *Information Release* \times *Push Notification* interaction term is significant ($F_{1,170} = 3.32$, $p = 0.03$, one-tailed). However, we note that the form of our interaction differs somewhat from what we predicted in H1. We return to this point in the additional analyses

¹⁷ Our analysis uses standardized factor scores. If we examine the raw I-FoMO scores, we find that participants had a mean (median) score of 2.78 (2.85) on a five-point scale with scores ranging from 1.00 to 5.00. Consistent with the idea that I-FoMO is a stable trait, average I-FoMO scores do not differ by experimental condition (all $p > 0.32$).

below. Further, this significant two-way interaction is qualified by a significant three-way interaction with *I-FoMO* ($F_{1,170} = 2.18, p = 0.07$, one-tailed). Consistent with H2, I-FoMO moderates the effects of push notifications and information ungrouping.

Insert Table 2 about here

To better understand the role of I-FoMO as a moderator of the combined effect of push notification and information release, we use participants' standardized I-FoMO factor scores to discriminate between Low and High I-FoMO individuals. These scores are centered at zero and range from -1 to $+1$. Accordingly, we classify individuals with factor scores less than zero as "Low I-FoMO" and individuals with factor scores greater than zero as "High I-FoMO." We present descriptive statistics by I-FoMO level in Table 3, Panel A. Finally, we conduct follow-up two-way between-participants ANOVAs and prepare interaction plots for the Low I-FoMO and High I-FoMO subgroups separately and report these results in Table 3, Panel B and Figure 1, respectively. For Low I-FoMO participants, The ANOVA for Low I-FoMO participants shows no significant main effects or interaction (all p 's ≥ 0.40). However, the ANOVA for High I-FoMO participants shows a significant information release \times push notification interaction ($F_{1,86} = 8.92, p < 0.01$).

Insert Table 3 about here

Given the significant information release \times push notification interaction for the High I-FoMO individuals, we also examine the follow-up simple effects to better understand the form of this interaction (untabulated). Consistent with our expectations, the effect of information ungrouping is significant when push notifications are present (\$8,920.22 vs. \$7,049.77, $F_{1,86} = 6.93, p < 0.01$,

one-tailed), but not when push notifications are absent (\$6,972.20 vs. \$8,105.28, $F_{1,86} = 2.17$, $p = 0.12$, two-tailed). For completeness, we also examine the two remaining simple effects and find that push notifications have a significant effect when information is ungrouped (\$8,920.22 vs. \$6,972.20, $F_{1,86} = 7.32$, $p < 0.01$, two-tailed), but not when it is grouped (\$7,049.77 vs. \$8,105.28, $F_{1,86} = 2.07$, $p = 0.13$, two-tailed). These results support our prediction that individuals with higher I-FoMO are more sensitive to the effects of push notification and information release ungrouping.

Insert Figure 1 about here

Additional Analyses

Process Data

As shown in Figure 1, for High I-FoMO participants, ungrouping information appears to reduce investment allocations in the absence of push notifications. Although this result does not reach conventional levels of significance ($p = 0.12$), it is directionally surprising because we would expect this line to be flat rather than downward sloping. Accordingly, we examine unobtrusively-collected process data to provide greater insight into the behaviors of higher I-FoMO individuals that could suggest an explanation for our pattern of results.

First, we examine the extent to which High I-FoMO individuals access the news app relative to Low I-FoMO individuals. Specifically, we examine *Total Opens*, which captures the total number of times individuals open the news app by clicking on either a banner notification or the icon directly. To control for the differential number of information releases, we collapse across the grouped and ungrouped conditions. An (untabulated) two-way ANOVA that fully crosses *I-FoMO* (High versus Low) with *Push Notification* (present versus absent) reveals a significantly

greater mean number of *Total Opens* for High than for Low I-FoMO individuals (5.07 vs. 4.57; $F_{1,174} = 2.67, p = 0.10$, two-tailed).¹⁸

Second, we examine the extent to which High I-FoMO individuals “over-check” the news app relative to Low I-FoMO individuals. To calculate over-checking, we subtract the number of times the individual clicks on the news app from the number of times an individual clicks on the home button. This variable captures the number of times that an individual views the home screen to see if there are unread news items (as shown by the notification badge on the news app), but then does not click on the news app as it does not show any unread items. An (untabulated) two-way ANOVA that fully crosses *I-FoMO* (High versus Low) with *Push Notification* (present versus absent) reveals significantly more over-checking for High than for Low I-FoMO individuals (3.46 vs. 2.93; $F_{1,171} = 3.56, p = 0.06$, two-tailed).¹⁹

Overall, these analyses indicate that High I-FoMO individuals fear missing out on investment information and, as a result, more actively seek out this information. Thus, the downward slope that we observe in the absence of push notifications could result from the High I-FoMO individuals knowing that they are going to receive six pieces of information, being concerned that they will not be alerted to this information as it arrives, checking for it more often than is necessary, and becoming frustrated as a result. Although admittedly post hoc, if this frustration colors their view of the firm, then it can result in the lower investment allocation that we observed in the push notification absent/ungrouped information release condition.

¹⁸ We did not find evidence to support an I-FoMO \times push notification interaction ($F_{1,174} = 1.08, p = 0.30$, two-tailed).

¹⁹ This analysis omits three individuals who remained in the news app for the duration of the task, which precludes us from calculating their level of over-checking, as they are, in effect, checking continuously by having the news app open. This main effect is qualified by a significant I-FoMO \times push notification interaction. ($F_{1,171} = 3.10, p = 0.08$, two-tailed). The form of this interaction indicates that when push notifications are present, High and Low I-FoMO individuals engage in a similar amount of over-checking. However, when push notifications are absent, High I-FoMO individuals engage in more over-checking than Low I-FoMO individuals, which is consistent with the behavior that we would expect from High versus Low I-FoMO individuals.

To help corroborate our post hoc explanation, we look to additional measures that we collected during the experiment. If High I-FoMO individuals experience frustration in the absence of push notifications, we would expect this frustration to increase as the opportunity to receive more information increases. We assert that this frustration occurs because, absent notifications, High I-FoMO individuals may feel as if they are not receiving this information in a timely fashion. Consistent with this, we find that High I-FoMO individuals who do not receive push notifications perceive information to be less timely when they receive six releases (72.85) than when they receive two releases (84.04) and this difference is significant ($t_{85} = -1.72, p = 0.08$, two-tailed).²⁰ In addition to providing evidence consistent with our post hoc explanation and underlying theory, this analysis enriches our understanding of High I-FoMO individuals and also suggests additional opportunities for research that examines their behavior.

Ruling out Alternative Explanations

Given that I-FoMO is a measured independent variable, there is a concern that it proxies for a correlated construct that would explain our observed pattern of results. For example, the results for High I-FoMO individuals could be due to a different level of intelligence or ability relative to Low I-FoMO individuals. To address this concern, we look to post-experimental demographic questions that can serve as proxies (albeit imperfect) for intelligence/ability. We find that Low and High I-FoMO individuals do not differ in their education level or their propensity to have read financial statements (all $p > 0.39$). They also do not differ in their experiences with smartphones, news apps, or financial apps (all $p > 0.38$). Thus, we do not find any evidence to suggest that our results for H2 are driven by intelligence/ability differences.

²⁰ We capture timeliness on a 101-point scale with endpoints of 0 (100) labeled, ‘Not at All Timely’ (‘Extremely Timely’).

We do find, however, that High I-FoMO individuals are more likely to have purchased stocks via direct investment ($p = 0.04$). They also have taken significantly more accounting classes (2.87 vs. 2.17, $p = 0.05$), have less work experience (11.7 vs. 16.4 years, $p < 0.01$), and are younger (32.7 vs. 38.8 years, $p < 0.01$).²¹ These results suggest that higher I-FoMO individuals are more interested in investment settings than are lower I-FoMO individuals, consistent with the idea that higher I-FoMO individuals are more fearful of missing out on investment information.

Another possibility is that higher I-FoMO individuals are more easily distracted than are lower I-FoMO individuals, thereby explaining our pattern of results for H2. To examine this possibility, we conduct a brief follow-up survey using a separate sample of 300 individuals from Amazon Mechanical Turk.²² Participants complete the ten-item I-FoMO scale, a 15-item distractibility sub-scale from the Short Imaginal Processes Inventory (SIPI) (Huba, Singer, Aneshensel, and Antrobus 1982), and answer demographic questions. We provide the distractibility scale in Appendix 2. We find that I-FoMO is not significantly correlated with distractibility ($r_{271} = 0.06$, $p = 0.35$), suggesting that our main results are not driven by differences in the ease with which lower and higher I-FoMO individuals may become distracted. Overall, we conclude that higher I-FoMO individuals are likely more concerned with missing out on investment information due to their inherent interest in investment settings, but do not exhibit differences in intelligence/ability or distraction in ways that could explain our observed results.²³

²¹ Although these demographic variables differ between Low and High I-FoMO individuals, we conduct four separate ANCOVAs to confirm that they do not substitute for I-FoMO in the three-way interaction with information release and push notification to predict individuals' investment judgments (all p 's > 0.35).

²² We retained 273 responses, excluding participants that have duplicate IP addresses and fail the test for native English speaker. Our conclusions are not sensitive to any exclusion criteria ($p > 0.31$ regardless of decision rule).

²³ In a separate Amazon Mechanical Turk survey, we find that I-FoMO is not significantly correlated with risk aversion ($r_{275} = -0.04$, $p = 0.53$), but is significantly correlated with three of the Big-Five personality dimensions – agreeableness ($r_{275} = -0.12$, $p = 0.04$), conscientiousness ($r_{275} = 0.10$, $p = 0.09$), and openness to experience ($r_{275} = -0.13$, $p = 0.04$). The correlations with the Big-Five are markedly different than those observed for traditional FoMO, which is significantly negatively correlated with emotional stability and conscientiousness (Stead and Bibby 2017). This suggests that individuals higher in I-FoMO have different personality characteristics, and likely different behaviors, than do individuals higher in traditional FoMO. While we believe that this is a reasonable inference, we

VII. CONCLUSIONS AND IMPLICATIONS

Advances in information technology have changed the way that the media disseminates information to users. Investors increasingly rely on mobile devices to obtain information and, in response to increased mobile usage, news agencies have begun to ungroup information into shorter releases (Farhi 2014). The number of these releases, and the push notifications that often accompany them, have increased as news agencies vie for users' attention (Reuters Institute 2017). Both the ungrouping of news, as well as push notification technology, have the potential to exacerbate some users' fears that they may be missing out on investment information, and both have the potential to affect how individuals interpret information. However, to date, we have little understanding of how these trends affect investment judgments. Our research investigates these issues. We develop and validate a scale for measuring investment-related FoMO (I-FoMO), a relevant personality trait, to examine how it affects the relationships between information release ungrouping, push notifications, and investor judgments.

We find that information ungrouping interacts with the presence of push notifications such that ungrouped information results in more favorable investment judgments in the presence of push notifications. Further, we find that investors in our study differ in their degree of I-FoMO, and this difference interacts with our manipulated variables. Namely, those higher in I-FoMO are more sensitive to the interactive effects of push notifications and information ungrouping than are investors lower in I-FoMO. Finally, our process data sheds light on the differences in behavior between lower and higher I-FoMO individuals, and our post-experimental questions and additional survey data allow us to rule out alternative explanations for our results.

note that it is not something that we tested directly, thereby creating an opportunity for future research.

Our research contributes to the literature in accounting that examines how technology and media affect investors' reactions to information (see, e.g., Brown, Stice et al. 2015; Cade 2018; Grant 2019; Guggenmos and Bennett 2019; Rennekamp and Witz 2019; Brown, Grant, and Winn 2019). Smartphones and their features (e.g., news, investment, and social media apps), increase both the media's and investors' ability to disseminate information, which improves investors' ability to act on this information (Miller and Skinner 2015). We examine how receiving information via mobile apps, which often involves push notifications and ungrouping of news, affects investors and interacts with their personality to influence investment judgments. Given the increased use of smartphones to access information (Brown, Dodini et al. 2015; Carey 2014; E*TRADE 2019), and the change in how the news media disseminates this information, there are opportunities for additional research in this area (Miller and Skinner 2015).

We also make a methodological contribution to the literature. Namely, we extend prior literature that has examined individuals' fear of missing out (FoMO) (Przybylski et al. 2013). Whereas that literature addresses the fear of missing out on rewarding social experiences, we develop a scale that captures individuals' fear of missing out on information that can be used to generate economic returns (I-FoMO). Traditional FoMO has been anecdotally applied to investment settings in the past (Saft 2015), but we demonstrate that our I-FoMO scale captures a separate construct that is more specific to investment settings. Although we investigate how I-FoMO affects individuals' evaluations of target investment firms, we believe I-FoMO may also play an important role in decisions within firms. Future research can explore this possibility.

From a practical perspective, our results have implications for investors in that they highlight how common mobile technology features can affect investment behavior. Even when total information content is held constant, ungrouped information can interact with push notification,

which can lead to increased reliance on the information and thereby affect investors' overall views of the firm. These results highlight a consequence of increased mobile device use for investment tasks. If investors suspect that push notifications could result in behavior that is not congruent with their investment goals, then one solution would be to disable push notifications that relate to investment news. Ironically, higher I-FoMO individuals may have a difficult time determining whether push notifications are helpful or harmful to their investment goals, thereby making them less likely to disable these notifications, even if it would be beneficial to do so.

Our study provides several opportunities for future research. First, we chose to hold constant the valence associated with the news releases. We view this choice as consistent with most real-world scenarios in which the media primarily receives positive news from firms (Graham et al. 2005; Jung et al. 2018; Kothari et al. 2009). However, future research could examine how mobile technology affects investors' evaluations of negative or mixed-valence information. Presumably, investors' evaluations of negative information would be analogous to those of positive information (i.e., ungrouped negative information would result in less favorable investment judgments in the presence of push notifications), whereas investors' evaluations of mixed-valence information would likely be more nuanced. Second, we chose to randomly assign investors to receive (or not receive) push notifications to understand the effects while controlling for self-selection. However, future research could investigate the circumstances under which investors choose to opt-in versus opt-out of receiving investment-related push notifications.

Third, we examine the effects of mobile technology on only one subset of market participants. We view nonprofessional investors as an important subset, as over 54.5 million U.S. households own equities and roughly 70 percent of these households have made investment decisions without the help of an investment advisor (ICI and SIFMA 2008). Further, popular

brokerage firms provide mobile investment apps as a way to attract and retain retail clients, again indicating the importance of studying this subset. That said, future research could examine the effect of mobile technology and the role of I-FoMO in other areas of the capital markets.

Fourth, the focus of our study was to establish our predicted effects at the individual level before considering how market forces either exacerbate or attenuate these effects. Accordingly, we did not conduct a laboratory market. Thus, we cannot determine whether investors in our setting would experience favorable or unfavorable market outcomes as a result of their choices. On the one hand, if individuals with higher I-FoMO are more affected by the interactive effects of push notifications and information ungrouping, then these individuals may be able to act more quickly in response to new information and reap financial rewards as a result. On the other hand, acting more quickly may not be beneficial if investors do not spend sufficient time evaluating information quality or if investors are more likely to overtrade in response to this information. Future research could examine these competing possibilities, and the results of such work would be of interest to regulators (such as the SEC) tasked with protecting individual investors.

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APPENDIX 1

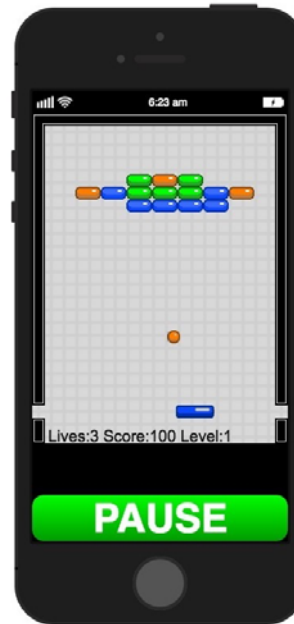
Excerpts from Experimental Materials

Panel A



Virtual iPhone Homescreen with one unread news alert.

Panel B



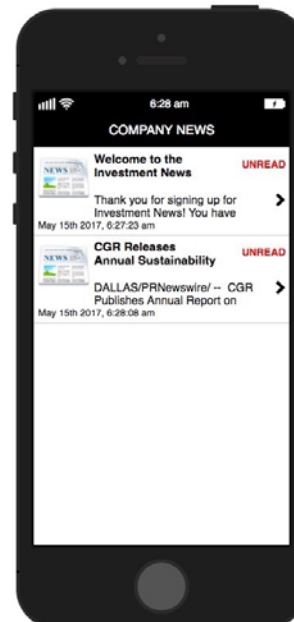
BreakOut! game in progress.

Panel C



Push notification appearing during BreakOut! game.

Panel D



Investment app with two unread news articles.

Panel E

Grouped Information Release

CGR Releases Annual Sustainability Report, Honored as One of the Best Places to Work, and Named as One of the World's Most Ethical Companies

DALLAS/PRNewswire/--
CGR Publishes Annual Report on Sustainability
CGR Corporation (NYSE: CGR) today published its annual report on sustainability, providing a comprehensive overview of the company's sustainability efforts, focusing on case studies that highlight social and environmental progress throughout the company's global operations.

"Our vision to lead the world in the essentials for a better life is not limited to the products we provide. It also calls us to deliver them in ways that prioritize clean air and water, healthy forests and strong communities, while delivering shareholder value," said CGR Chairman and CEO Tom Smith. "More than ever, sustainability is part of how we operate to move our business forward."

The 2016 Sustainability Report highlights CGR's progress toward its multi-year sustainability goals and introduces the framework for the company's new 2022 platform. The target year, 2022, will coincide with the celebration of the company's 150th anniversary.

"In shaping our new Sustainability 2022 platform, we considered the global mega-trends that will impact our business as well as insights from a collaborative process involving our internal stakeholders, business and brand leaders," said Lisa Jones, senior director of global sustainability for CGR. "We believe this new platform will continue to align with the interests of our stakeholders while furthering our mission to lead the world in essentials for a better life."

CGR Honored with a Glassdoor Employees' Choice Award
For the fourth consecutive year in a row, CGR Corporation (NYSE: CGR) has been honored with a Glassdoor Employees' Choice Award, recognizing the Best Places to Work. CGR ranked 9th on this year's list, making it the highest-ranked consumer packaged goods company. The Employees' Choice Awards program, now in its eighth year, relies solely on the input of employees, who elect to provide feedback on their jobs, work environments and companies via Glassdoor.

"We are honored that our associates have once again placed us in the top 10 for four consecutive years," said CGR Chairman and CEO Tom Smith. "This recognition is a testament to the people who every day make CGR a great place to work by embodying our core values of integrity, passion, expertise, performance and innovation. This is a company with an outstanding culture and great work environment."

"Everyone wants a job and company they love," said Glassdoor co-founder and CEO Robert Holder. "At Glassdoor, we're working to make that a reality for the millions of job seekers around the world who are turning to Glassdoor for information they can't find anywhere else. Programs like the Employees' Choice Awards allow us to honor employers that stand out for their efforts in providing an enjoyable work environment and culture."

CGR Listed as One of the World's Most Ethical Companies
Ethisphere, a global leader in defining and advancing the standards of ethical practices in business, has listed CGR as one of the World's Most Ethical Companies for a third year in a row. "CGR's 100-plus years demonstrate a sustainable business advantage that is supported by their values and commitment to ethics and innovation," explained Ethisphere's Chief Executive Officer, Timothy Black. "Congratulations to everyone at CGR for being recognized as one of the World's Most Ethical Companies."

At CGR Corporation (NYSE: CGR), ethical standards are woven throughout the company's core, from its Company Vision, to its Code of Conduct and the Leadership Behaviors that all employees must demonstrate in their annual review. CGR's ethical culture has strengthened during its history and is setting an example for businesses around the world.

"CGR's people are the champions for our Code of Conduct and embody the company's longstanding commitment to ethics and integrity," said Kristen Wells, CGR's vice president and chief compliance officer. "Together, CGR teams create trust with customers and value for shareholders by doing business the right way, every day and everywhere in the world. Our Code of Conduct is a core part of CGR's business playbook and is integral to advancing CGR's corporate vision to improve every life."

---End of Article---

Ungrouped Information Release

CGR Releases Annual Sustainability Report

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--- End of Article ---

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Ethisphere, a global leader in defining and advancing the standards of ethical practices in business, has listed CGR as one of the World's Most Ethical Companies for a third year in a row. "CGR's 100-plus years demonstrate a sustainable business advantage that is supported by their values and commitment to ethics and innovation," explained Ethisphere's Chief Executive Officer, Timothy Black. "Congratulations to everyone at CGR for being recognized as one of the World's Most Ethical Companies."

At CGR Corporation (NYSE: CGR), ethical standards are woven throughout the company's core, from its Company Vision, to its Code of Conduct and the Leadership Behaviors that all employees must demonstrate in their annual review. CGR's ethical culture has strengthened during its history and is setting an example for businesses around the world.

"CGR's people are the champions for our Code of Conduct and embody the company's longstanding commitment to ethics and integrity," said Kristen Wells, CGR's vice president and chief compliance officer. "Together, CGR teams create trust with customers and value for shareholders by doing business the right way, every day and everywhere in the world. Our Code of Conduct is a core part of CGR's business playbook and is integral to advancing CGR's corporate vision to improve every life."

--- End of Article ---

Note: This appendix contains screenshots of the "Virtual iPhone" used by participants in our experiment and a visual depiction of grouped versus ungrouped information release. Panel A shows the virtual iPhone home screen. The badge indicator on the investment app icon informs the user there is currently one unread news article. Panel B portrays a game of "BreakOut!" in progress. Panel C demonstrates a user receiving a push notification during a game of BreakOut!, and Panel D shows the investment news app with two unread news items. Panel E shows the nonfinancial news information in the study as both grouped and ungrouped information releases.

APPENDIX 2

Distractibility Scale

Below is a collection of statements about your experience. Using the scale provided please indicate to what extent each statement **applies to you**, or is **true for you**. Please answer according to what really reflects your experiences rather than what you think your experiences should be. Please treat each item separately from every other item.

1. I tend to be quite wrapped up and interested in whatever I am doing.
2. I am the kind of person whose thoughts often wander.
3. My mind seldom wanders from my work.
4. I find that I easily lose interest in things that I have to do.
5. I am not easily distracted.
6. My ability to concentrate is not impaired by someone talking in another part of my house or apartment.
7. No matter how hard I try to concentrate, thoughts unrelated to my work always creep in.
8. I can work at something for a long time without feeling the least bit bored or restless.
9. Faced with a tedious job, I notice all the other things that I could be doing.
10. I tend to be easily bored.
11. I find it hard to read when someone is on the telephone in a neighboring room.
12. I am seldom bored.
13. I find it difficult to concentrate when the TV or radio is on.
14. My thoughts seldom drift from the subject before me.
15. I have difficulty in maintaining concentration for long periods of time.

Note: Participants responded to each statement on a separate 5-point scale as follows:

Definitely untrue of me	Moderately untrue of me	Neither true nor untrue of me	Moderately true of me	Definitely true of me
1	2	3	4	5

The scale is scored by beginning with 42 points, then adding the responses to items 2, 4, 7, 9, 10, 11, 13, and 15 and subtracting the responses to items 1, 3, 5, 6, 8, 12, and 14.

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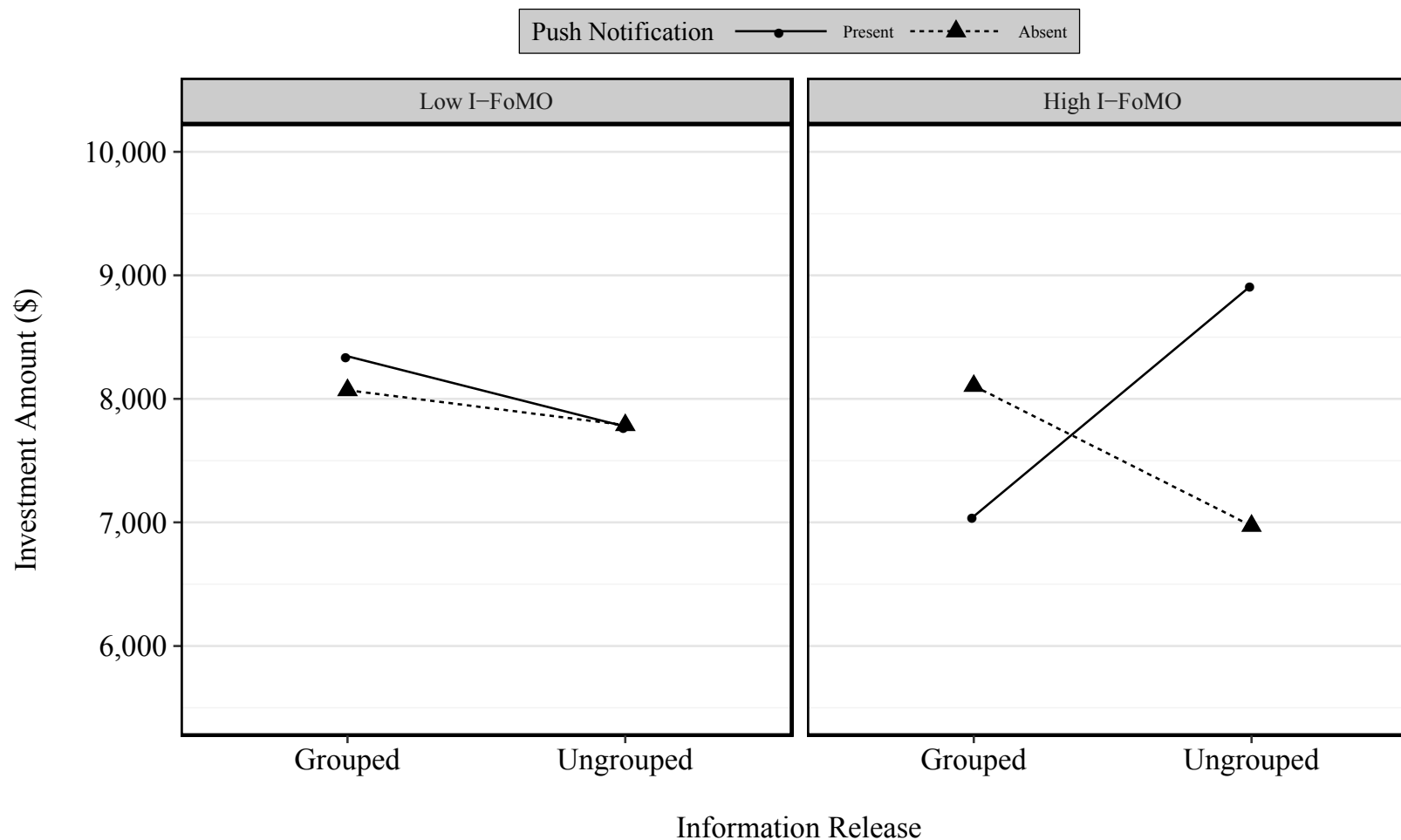


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FIGURE 1
The Effect of Push Notification, Information Release, and I-FoMO on Investment Amount



Note: This figure plots participants' investment amounts by condition and separates the plots by participants' I-FoMO scores. Our experiment manipulates the presence or absence of push notification and the form of information release in a 2×2 between-participants design. A total of 178 participants provide an investment amount for a hypothetical company. In addition, participants' individual I-FoMO factor scores, calculated from the I-FoMO scale developed and validated in Section III of the paper, are used to group participants into "Low I-FoMO" and "High I-FoMO" groups, by classifying participants with factor scores less than (greater than) zero as "Low I-FoMO" ("High I-FoMO"). This Figure was prepared using the ggPlot2 package and the R Statistical Computing Language (R Core Team 2019; Wickham 2009)

TABLE 1
I-FoMO Scale Development

	A		B			C
	Discriminant Validity		Item Reduction			Final Scale
	Factor 1	Factor 2	Factor	Discrimination	Information	Factor
I-FoMO Candidate Items						
1: I worry that investment information moves too quickly.	0.44	0.26	0.56	0.72	0.34	
2: It bothers me when I don't hear news about my investments until the next day.	0.84	0.07	0.87	1.91	1.03	0.87
3: I would rather have investment information that is less accurate, if I can learn of the information as soon as news breaks.	0.40	0.20	0.49	0.61	0.26	
4: I get anxious when I don't know what the companies I'm investing in are planning.	0.77	0.04	0.79	1.38	0.78	0.82
5: I believe that the best way to maximize investment returns is to have the most recent information about potential investments.	0.67	-0.03	0.69	0.95	0.52	
6: It is important to me that I am "on top" of the latest news for the companies I'm interested in investing in.	0.84	-0.12	0.80	1.46	0.86	0.81
7: It bothers me when I miss a good investing opportunity.	0.67	0.05	0.71	1.02	0.57	
8: When I go on vacation, I continue to keep tabs on my investments.	0.85	-0.13	0.80	1.51	0.88	0.84
9: It bothers me when I hear news about one of my investments from another investor.	0.61	0.13	0.68	0.98	0.52	
10: I feel like I have an advantage in the market when I have the most timely information.	0.70	-0.04	0.71	1.02	0.57	
11: I feel anxious if I'm "unplugged" from news about my investments.	0.80	0.11	0.83	1.65	0.90	0.86
12: I would prefer to be interrupted by breaking news about my investments rather than to receive the information later at a more convenient time.	0.85	-0.12	0.81	1.51	0.92	0.82
13: When I read information about my investments in the newspaper, I feel like that information is too old to be useful.	0.57	-0.02	0.60	0.81	0.42	
14: I get worried when I am not able to check in on my portfolio.	0.81	0.01	0.81	1.54	0.84	0.86
15: I feel that if I don't receive business news as soon as it breaks, the news isn't really worth hearing at all.	0.58	0.14	0.65	0.88	0.44	
16: I would get anxious if my phone battery ran out when I was expecting news about one of my stocks.	0.76	-0.01	0.76	1.30	0.78	0.80
17: When I miss out on industry news it bothers me.	0.81	0.02	0.82	1.54	0.79	0.85
18: I feel like television media doesn't keep me up-to-date enough on my investments.	0.57	-0.01	0.59	0.77	0.39	
19: I feel like occasionally having dinner interrupted by market news is part of being an astute investor.	0.76	-0.09	0.74	1.18	0.62	
20: Sometimes, I think I hear or feel an investment notification from my mobile device, but when I check, there wasn't one there.	0.49	0.23	0.59	0.88	0.44	
21: I believe that investors that turn off breaking news notifications for their investments are not serious about investing.	0.65	0.01	0.68	0.94	0.50	
22: I fear being the last to know about news that is relevant to my portfolio.	0.74	0.14	0.81	1.47	0.82	0.79
23: I think that investors that do not have the most timely information about their investments are at a huge disadvantage.	0.65	-0.02	0.67	0.93	0.51	
FoMO Scale Items (Przybylski et al. 2013)						
1: I fear others have more rewarding experiences than me.	0.00	0.69				
2: I fear my friends have more rewarding experiences than me.	-0.04	0.73				
3: I get worried when I found out my friends are having fun without me.	-0.06	0.81				
4: I get anxious when I don't know what my friends are up to.	0.04	0.73				
5: It is important that I understand my friends' "in jokes".	0.10	0.51				
6: Sometimes, I wonder if I spend too much time keeping up with what is going on.	0.34	0.35				
7: It bothers me when I miss an opportunity to meet up with friends.	0.02	0.63				
8: When I have a good time it is important for me to share the details online.	0.11	0.49				
9: When I miss out on a planned get-together it bothers me.	-0.01	0.60				
10: When I go on vacation, I continue to keep tabs on what my friends are doing.	0.15	0.45				
Eigenvalue	13.09	3.86	12.04			6.92
Cronbach's alpha			0.96			0.95

TABLE 1, continued.

Note: This table reports the results of three procedures designed to assess the psychometric properties of the scale items, and to reduce the I-FoMO scale to an acceptable number of items. Two hundred ninety-four participants from Amazon Mechanical Turk rate the 23 I-FoMO statements and 10 FoMO statements shown above on five-point Likert-type scales: Not at all True of Me; Slightly True of Me; Moderately True of Me; Very True of Me; or Extremely True of Me. In all sections, we report the results of factor analysis with oblimin rotation. In Section A, we find that all 23 I-FoMO items and all ten standard FoMO items meaningfully load on separate factors. We italicize all values that are above the generally accepted cut off of 0.40 (Hatcher 1994). In Section B, we use Item Response Theory (de Ayala 2009) to determine an Information (AUC) and Discrimination parameter for each I-FoMO item. We retain, and show in bold font, the ten items that have the highest scores for each parameter. Finally, in Section C, we reported the new factor loadings and reliability coefficient for our reduced I-FoMO scale.



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TABLE 2
Descriptive Statistics and Analysis of Covariance – Investment Amount

Panel A: Descriptive Statistics by Condition – Means, (standard deviations), and [counts]			
	Ungrouped	Grouped	Row Means
Push Notification Present	8,336.21 (2,410.99) [47]	7,697.27 (2,444.82) [44]	8,027.28 (2,435.12) [91]
Push Notification Absent	7,408.30 (2,782.58) [43]	8,090.18 (1,913.50) [44]	7,753.16 (2,393.67) [87]
Column Means	7,892.88 (2,622.12) [90]	7,893.73 (2,191.56) [88]	7,893.30 (2,412.04) [178]

Panel B: Analysis of Covariance					
Source	Sum of Squares	df	Mean Squares	F-Statistic	p-value
Information Release (Info)	2,977	1	2,977	< 0.01	0.98
Push Notification (Push)	3,181,677	1	3,181,677	0.55	0.46
I-FoMO	142,126	1	142,126	0.02	0.88
Info × Push – H1	19,254,169	1	19,254,169	3.32	0.03 [†]
Info × I-FoMO	9,224,193	1	9,224,193	1.59	0.21
Push × I-FoMO	500,672	1	500,672	0.09	0.77
Info × Push × I-FoMO – H2	12,628,603	1	12,628,603	2.18	0.07 [†]
Error	984,704,783	170	5,792,381		

Note: Panel A provides descriptive statistics for participants’ investment amounts in our experiment by condition. Panel B provides hypothesis test results for the effect of Information Release and Push Notification (H1) and the effect of Information Release, Push Notification, and I-FoMO (H2) on participants’ investment amounts. Our experiment manipulates the presence or absence of push notification and the form of information release in a 2×2 between-participants design. A total of 178 participants provide an investment amount for a hypothetical company. Participants’ individual I-FoMO factor scores, calculated from the I-FoMO scale developed and validated in Section III of the paper, are included as a continuous covariate. We conducted this analysis, as well as the rest of the analyses presented in the paper, using the R language for Statistical Computing (R Core Team 2019). All p-values provided are two-tailed, except the tests of our hypotheses. These directional expectations are indicated in the table with a dagger, as noted below.

[†] One-tailed equivalent.

TABLE 3
Descriptive Statistics and Analysis of Variance – Investment Amount split on I-FoMO

Panel A: Descriptive Statistics by Condition – Means, (standard deviations), and [counts]					
	Ungrouped		Grouped		Row Means
High I-FoMO					
Push Notification Present	8,920.22 (1,461.62) [23]		7,049.77 (2,937.95) [22]		8,005.78 (2,466.14) [45]
Push Notification Absent	6,972.20 (2,970.90) [20]		8,105.28 (1,940.42) [25]		7,601.69 (2,487.84) [46]
Column Means	8,014.16 (2,465.44) [43]		7,611.21 (2,487.65) [47]		7,803.73 (2,471.42) [90]
Low I-FoMO					
Push Notification Present	7,776.54 (2,985.70) [24]		8,344.77 (1,651.93) [22]		8,048.30 (2,431.47) [46]
Push Notification Absent	7,787.52 (2,614.53) [23]		8,070.32 (1,930.23) [19]		7,915.45 (2,307.37) [42]
Column Means	7,781.92 (2,779.66) [47]		8,217.59 (1,768.75) [41]		7,984.90 (2,360.38) [88]
Panel B: Analysis of Variance					
Source	Sum of Squares	df	Mean Squares	F-Statistic	p-value
High I-FoMO					
Information Release (Info)	3,188,156	1	3,188,156	0.56	0.45
Push Notification (Push)	3,216,052	1	3,216,052	0.57	0.45
Info × Push	50,416,470	1	50,416,470	8.92	< 0.01 [†]
Error	486,326,466	86	5,654,959		
Low I-FoMO					
Information Release (Info)	4,093,617	1	4,093,617	0.72	0.40
Push Notification (Push)	324,727	1	324,727	0.06	0.81
Info × Push	444,653	1	444,653	0.08	0.78
Error	479,787,336	84	5,711,754		

Note: Panel A of this table provides descriptive statistics for participants' investment amounts in our experiment by condition and I-FoMO factor score. Panel B provides follow-up two-way ANOVA results for the effect of Information Release and Push Notification on participants' investment amounts, split by I-FoMO. Our experiment manipulates the presence or absence of push notification and the form of information release in a 2×2 between-

participants design. Participants' individual I-FoMO factor scores, calculated from the I-FoMO scale developed and validated in Section III of the paper, are used to classify participants with factor scores less than (greater than) zero as "Low I-FoMO" ("High I-FoMO"). We split participants on their individual I-FoMO factor scores, and conduct separate ANOVAs for each subgroup. A total of 178 participants provide an investment amount for a hypothetical company. All p-values provided are two-tailed, except the tests of our hypotheses. These directional expectations are indicated in the table with a dagger, as noted below.

† One-tailed equivalent.



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