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It pays to pay attention: How firm's and competitor's marketing levers affect investor attention and firm value

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ABSTRACT

Investors' attention to a firm's stock has been demonstrated to influence stock returns (Da et al., 2011). But does a firm's marketing information draw attention to a firm's stock? Research in finance, accounting, and marketing has investigated advertising as one potential driver of investors' attention to a firm's stock. How about other potential marketing drivers? The authors develop hypotheses related to the impact of the changes in four marketing levers: advertising, product development announcements, WOM, and customer satisfaction on the change in investor attention to a firm's stock. Furthermore, they investigate the moderating role of competitors' marketing levers in these relationships.

To test the hypotheses, they compile a panel dataset with 349 firms covering the 2007–2017 period. The results suggest that the changes in the focal firm's advertising and WOM have a positive and significant impact on the changes in investor attention to the focal firm's stock. Furthermore, these effects are amplified when there is an increase in competitors' advertising spending and WOM, respectively. For the customer satisfaction lever, the results suggest that the change in competitors' customer satisfaction enhances the impact of the change in focal firm's customer satisfaction on investor attention. Collectively, the results suggest that investors attend to the firm's and its competitors' marketing information in a much more nuanced manner than previously thought.

1. Introduction

In the last two decades, the marketing-finance interface scholarship has significantly advanced our understanding of how marketing affects firm value (Edeling et al., 2021; Srinivasan & Hanssens, 2009). In this stream, studies have found that marketing levers such as advertising, product announcements, word of mouth (WOM), and customer satisfaction have a positive effect on a firm's stock price (Joshi & Hanssens, 2010; Tirunillai & Tellis, 2012; Warren & Sorescu, 2017). The core argument in this research is that changes in marketing levers affect investors' expectations about firms' operating performance, which

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Table 1
Relevant Literature.

Study	Effects of Budgetary Marketing Levers	Effects of Customer-based Levers	Competitive Budgetary Levers	Competitive Customer-based Levers	Mediating Process
Panel A: Studies that focus on the link between marketing metrics and stock returns					
Fornell et al. (2006)	No	Customer satisfaction	No	No	No
McAlister, Srinivasan, & Kim (2007)	Yes	No	No	No	No
Joshi & Hanssens (2010)	Yes	No	No	No	No
Luo et al. (2014)	No	Customer satisfaction	No	No	Institutional investors holdings
Borah & Tellis (2016)	Product recalls	No	Yes	No	No
Chandrasekaran, Srinivasan, & Sihi, (2017)	Yes	No	Yes	No	No
Warren & Sorescu (2017)	Product announcements	No	No	No	No
Cillo et al. (2018)	Product introduction	No	No	No	Institutional investors holdings
Colicev, Malshe, Pauwels, et al., (2018)	No	Social Media	No	Yes	Mind-set metrics
Malshe et al. (2020)	No	Customer satisfaction	No	No	Short Selling
Nguyen et al. (2020)	No	Social Media	No	No	Institutional investors holdings
Panel B: Studies that specifically focus on the link between marketing metrics and investor attention					
Grullon, Kanatas, & Weston (2004)	Advertising	No	No	No	No
Luo & de Jong (2012)	Advertising	No	No	No	Analysts' recommendations
Lou (2014)	Advertising	No	No	No	Investor Attention
Chemmanur & Yan (2019)	Advertising	No	No	No	Investor Attention
Focke, Ruenzi, & Ungeheuer, (2019)	Advertising	No	No	No	Investor Attention
Madsen & Niessner (2019)	Advertising Product Launch	No	No	No	Investor Attention
Fang, Madsen, & Shao (2020)	Advertising	No	No	No	Investor Attention
Liaukonyte & Zaldokas, (2020)	Advertising	No	No	No	Investor Attention
This Study	**Advertising Product Development Announcements**	**Word-of-mouth Customer Satisfaction**	**Yes**	**Yes**	**Investor Attention**

are reflected in the firm's market value (Srinivasan & Hanssens, 2009; Srivastava et al., 1998). For instance, advertising affects the interest in a firm's stock from a wider pool of investors as it signals higher future product market performance (Grullon et al., 2004). Similarly, positive changes in customer satisfaction lead to future cash flow expectations that result in higher firm valuation (Gruca & Rego, 2005; Lim et al., 2020; Tuli & Bharadwaj, 2009).

Yet, research in marketing has only started to examine the process by which marketing levers influence firm value (see Table 1). For instance, studies have shown that investor behavior and analysts' recommendations are important routes through which innovation, social media chatter, and customer satisfaction, affect firm value (Cillo et al., 2018; Luo et al., 2014; Nguyen et al., 2020). Advancing this research, we propose that investor attention to a firm's stock is an important route through which marketing levers affect firm value.

Investor attention, which we define as "the process that encompasses the noticing, encoding, interpreting, and focusing time and effort by investors on information relevant to the price of the stock" based on the work by Ocasio (1997), has been shown to have a positive impact on abnormal returns (Da et al. 2011). More recently, several empirical studies report that advertising expenditures are positively related to investor attention, which affects firm value (Focke et al., 2019; Liaukonyte & Zaldokas, 2020) (see Table 1 Panel B). However, investors also pay more attention to a firm's stock because of the firm's other marketing levers, such as product development announcements, customer satisfaction, and WOM. Across firms in our sample, we find instances where news reports about a firm's marketing levers lead to investor reactions. Apple's announcement of its new iPad in 2013 was associated with investors' optimistic reaction about its potential[1]. Pepsi's ad spend during Super Bowl was associated with an 0.8% increase in its stock price one day after the ad aired[2]. Nokia's increase in customer satisfaction swayed investors resulting in higher stock market performance[3]. United Airlines' stock market cap tanked by $770 million to $21.5 billion after negative WOM went viral due to its mishandling of a passenger[4]. In response to the increasing importance of WOM, VanEck Securities Corporation launched the Exchange Traded Fund called "BUZZ" which tracks the performance of the 75 large cap U.S. stocks based on the content aggregated from "online sources including social media, news articles, blog posts and other alternative datasets."[5]

[1] https://www.redherring.com/mobile/apple-product-launch-preview-how-did-investors-react-to-the-last-five-events/
[2] https://www.thestreet.com/lifestyle/sports/super-bowl-ads-stock-prices-14854700
[3] https://phys.org/news/2013-08-customer-satisfaction-company-investors.html
[4] https://money.com/united-airlines-fiasco-overbooked-passenger-dragged-stock-price-value/
[5] https://www.vaneck.com/us/en/investments/social-sentiment-etf-buzz/

Motivated by the above evidence and the findings from the overview of the marketing-finance interface (Edeling et al., 2021), we test the unexplored relationships between four marketing levers (advertising expenditures, product development announcements, customer satisfaction, and WOM) and investor attention. As studies have shown that marketing activities of a firm spillover to rivals (Sorescu et al., 2007), we also test the moderating role of competitors' marketing levers. Specifically, we study the following questions:

1. Do focal firm's advertising, product development announcements, WOM, and customer satisfaction affect investor attention to the focal firm?
2. Do a focal firm's competitors' advertising, product development announcements, WOM, and customer satisfaction moderate the above relationships?
3. Does investor attention mediate the effect of the focal firm's advertising, product development announcements, WOM, and customer satisfaction on focal firm value?

To address these questions, we collect focal and competitor firms' advertising expenditures from Kantar Media AdSpender, product development announcements from Standard & Poor's Capital IQ database, customer satisfaction, and WOM from YouGov. In addition, we collect data on investor attention from the Securities and Exchange Commission's (SEC) EDGAR website (Madsen & Niessner, 2019; Ryans, 2018). We test our hypotheses on a sample of 349 firms across ten years of quarterly data from 2007 to 2017. We analyze these data using a system of equations with cross-correlated errors, selection correction, and a fixed-effects specification.

We make the following contributions to the marketing literature. First, beyond advertising, we examine the effect of three more marketing levers on investor attention. We find that the changes in WOM and advertising of the focal firm positively impact the changes in investor attention. Second, we investigate the moderating role of competitive marketing levers and show that competitor's advertising, WOM, and customer satisfaction moderate the effect of changes in focal brand's respective marketing levers on investor attention. Thus, we contribute to the nascent field of how competitor actions affect focal firms' stock market performance. We show that competitor's advertising, WOM, and customer satisfaction moderate the effect of focal brand's advertising, WOM, and customer satisfaction on investor attention, respectively. Third, we find that investor attention partially mediates the relationship between the focal firm's advertising, WOM, and firm value. Our findings suggest that investor attention mediates the relationship between WOM and firm value apart from the advertising path, further emphasizing the need to consider a broad set of marketing levers as drivers of investor attention.

2. Conceptual background

We begin by providing the background for the investor attention construct and then develop hypotheses on how advertising, product development announcements, customer satisfaction, and WOM affect investor attention and how competitors' marketing levers moderate these effects. We conclude with the hypothesis on the mediating role of investor attention in the focal firm's marketing levers – abnormal returns link. We present our conceptual framework in Fig. 1.

2.1. Investor attention

Attention is a scarce resource for decision-makers (Kahneman, 1973). In organizational settings, Ocasio (1997) argues that managers can pay attention only to a subset of all the available information and thus have bounded rationality in their decision-making. Consequently, "what managers do depends on what issues and answers they focus on (Focus of Attention)" (Ocasio, 1997). In the finance literature, researchers have proposed that investors operate with limited cognitive resources when making investment decisions (Odean, 1999). Thus, we rely on the definition proposed by Ocasio 1997 and adapt it to the investment context (p.189, 1997).

Investor attention is defined as a "process that encompasses the noticing, encoding, interpreting, and focusing time and effort by investors on information relevant to the price of the stock". As researchers cannot fully observe the process behind investor decision-making, previous studies have used direct and indirect proxies for investor attention. Traditionally studies relied on indirect proxies such as analyst following (Bushman, 1989) and business press coverage (Bushee et al., 2010; Engelberg & Parsons, 2011). Recently, researchers have used more direct proxies of investor attention such as searches of stock tickers in Google (Da et al., 2011), downloads and/or requests of financial statements from SEC's EDGAR website (Drake et al., 2016), and news searching and reading activity on Bloomberg terminals (Ben-Rephael et al., 2017). We use the number of downloads from the EDGAR platform as the investor attention proxy, aligning well with our hypotheses.

2.2. Antecedents of investor attention

Research on the antecedents of investor attention to a firm's stock focuses on various factors such as advertising spending, earnings announcements, and analyst following (Da et al., 2011; Madsen & Niessner, 2019). There are two processes through which these antecedents may influence investor attention. First, investors may pay more attention to a firm's stock because they are more often exposed to the firm (e.g., Starbucks, Apple). For example, heavy advertising can create frequent exposure

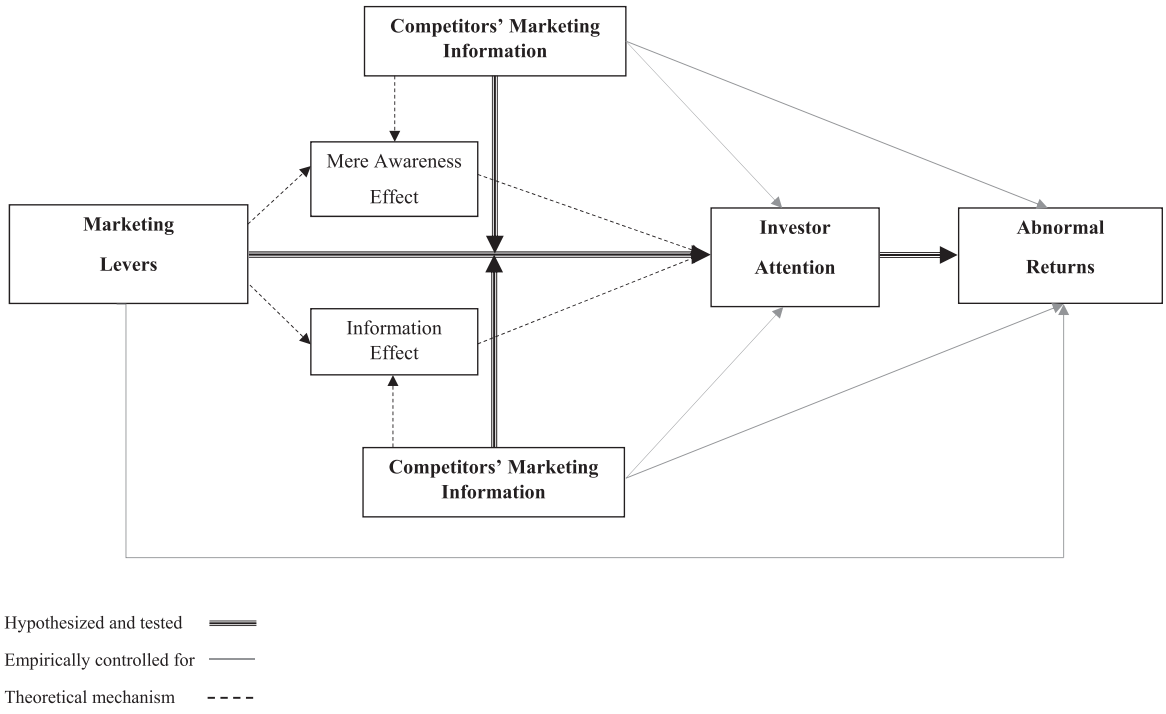

Fig. 1. Conceptual Framework.

of the firm to investors (Joshi & Hanssens, 2010). We label this effect as *mere awareness* effect. Second, new information about the firm can help investors deduce a firm's future cash flows. For example, investors pay greater attention to a firm's stock during earnings announcements, acquisitions, and earnings forecasts as these events have upshots for a firm's future value (Drake et al., 2016). We term this effect as *information effect*[6].

We propose that a firm's marketing levers influence investor attention through both the awareness and information effects. We focus on four levers that firms use to create value. We rely on the overview of the marketing-finance interface since 1985 (Edeling et al., 2021) to select the most relevant and important marketing levers. Second, we use advertising spending and product development announcements as two key budgetary levers related to value appropriation and value creation (Mizik & Jacobson, 2003). These two marketing levers have a long history of being examined in the marketing-finance interface literature (Edeling et al., 2021; Srinivasan & Hanssens, 2009). Third, we use WOM and customer satisfaction as the two key customer-based marketing levers that have attracted increased attention from marketing-finance scholars (Babić Rosario et al., 2016; Edeling et al., 2021). Finally, as firm advertising, product development announcements, WOM, and customer satisfaction information are often benchmarked against the competition, we examine the contingent effect of competitors' marketing levers on investor attention.

2.3. Marketing levers and investor attention

Focal Firm's Advertising Spending. Advertising enables firms to enhance the awareness of their brands and increase sales. Whether a firm pursues a cost-leadership or differentiation strategy to achieve a competitive advantage, prior research finds strong support for the positive and significant relationship between advertising and sales (McAlister et al., 2016). In their meta-analysis, Edeling & Fischer (2016) report that 77% of 296 advertising elasticities are positive and significant. Such an effect is of interest to investors as the change in sales can lead to higher cash flows and firm value. The value-relevance of advertising expenditures to firm value motivates investors to pay considerable attention to changes in advertising. Moreover, advertising draws investor attention both through the exposure effect of a firm's marketing strategies and the new information effect of increased advertising expenditures (Focke et al., 2019; Liaukonyte & Zaldokas, 2020; Lou, 2014). In other words, when firms increase their advertising expenditures, they are more likely to be noticed by investors.

[6] Firms pursue various corporate branding strategies such as corporate-brand strategy or house-of-brands strategy. For the information effect, we think that the conceptual processes are not different for firms that purse corporate brand strategy and the firms that pursue other branding strategies for two reasons: (i) baseline knowledge of investors about brands, (ii) low search cost of finding out the corporate owner of a brand. Also, we empirically address this issue which we discuss in the "Robustness Checks" section.

H1a. Positive (negative) changes in the focal firm's advertising spending are positively (negatively) associated with investor attention to the focal firm.

Focal Firm's Product Development Announcements. To reach as many customers as possible and create buoyant anticipation for a new product, firms organize product launch events (Lee & O'Connor, 2003). For example, Apple's new product launch events, such as the "Time Flies" event in 2020, have influenced investor attention as analysts from leading investment banks follow such events (Peterson, 2020). Also, movie producers and game developers work with social media companies to create interest for their latest movies or games (Gelper et al., 2018). Firms use a mix of online (social media) and offline (launch events) channels to create multiple customer touchpoints. Simultaneously, the investor's exposure to the new product and the firm increases, which increases the investor's awareness of the firm's stock.

Investors also attend to a firm's product development information because of the relationship between new products and future cash flows. Rubera & Kirca (2012) conduct a meta-analysis of innovation and firm performance and find a positive effect of innovation on market share and sales growth. Several other studies report a positive relationship between product development announcements and stock returns (Pauwels et al., 2004). Furthermore, investors could react to product development announcements because they may also signal an increase in uncertainty around a firm's future performance. Sood & Tellis (2009) report that investors react to the commercialization of new products and earlier phases of the product development process (i.e., initiation and development). Typically, all phases of the product development process are defined by uncertainty. There is no guarantee that any initiated project will be commercialized and whether it will be profitable. Thus, investors are more likely to seek additional information about the firm due to new product development announcements.

H1b. Positive (negative) changes in focal firm's product development announcements are positively (negatively) associated with investor attention to the focal firm.

Focal Brand's WOM. Consumers often engage in conversations about brands, and as a brand becomes more popular, word-of-mouth (WOM) also increases (Lovett et al., 2013). When people engage in positive or mixed-valenced conversations about brands, they are more likely to retransmit the information about the brand to others (Baker et al., 2016). Hewett et al. (2016) report a positive carryover effect of the volume of WOM. In other words, increases in WOM in the current period translate into higher WOM in the ensuing periods. Such steady growth in conversations about the brand increases the investors' exposure to the brand, elevating the investors' awareness of the firm's stock.

WOM can also signal important information about firm performance (Hewett et al., 2016; You et al., 2015). For instance, studies have shown that the volume and valence of WOM are significantly related to customer-acquisition metrics (De Vries et al., 2017) and stock market reactions (McAlister et al., 2012; Tirunillai & Tellis, 2012). Empirical results suggest that WOM changes reflect the current and future shifts in a firm's cash flows. Overall, as investors are increasingly relying on WOM as a leading indicator of brand performance (Hewett et al., 2016), we postulate that:

H1c. Positive (negative) changes in the focal firm's WOM are positively (negatively) associated with investor attention to the focal firm.

Focal Firm's Customer Satisfaction. The mere awareness impact of customer satisfaction on investor attention can operate in several different ways. Marketplaces such as Amazon.com highlight the brands that receive the highest consumer ratings. YouGov, a prominent market research company, updates customer satisfaction performance of the brands they monitor daily, and they publicize the brands with high satisfaction. In some industries, such as the auto industry and financial services, firms receive awards based on customer satisfaction. For example, J.D. Power, a market research company with expertise in the auto industry, and the recipients of customer satisfaction awards regularly publicize these accomplishments[7]. Thus, brands with high levels of customer satisfaction are likely to be more popular, which increases investors' exposure and enhances investors' awareness of the brand.

Customer satisfaction also affects firm performance outcomes such as profitability, cost of selling, and stock returns (Anderson et al., 2004; Lim et al., 2020). In a recent meta-analysis, Otto et al. (2020) report a statistically significant positive association between customer satisfaction and revenue (average correlation = 0.104) and a positive association between customer satisfaction and profit (average correlation = 0.134). Thus, we argue that changes in customer satisfaction performance of a firm should be of interest to investors.

H1d. Positive (negative) changes in the focal firm's customer satisfaction are positively (negatively) associated with investor attention to the focal firm.

2.4. Moderating role of competitors' marketing information

Ocasio (1997) argues (p.190): "The principle of situated attention indicates that what decision-makers focus on, and what they do depends on the particular context they are located in." In paying attention to a firm's stock, a key contextual factor for investors is competition (e.g., Szymanski et al. 1993). Recent studies report that competitive marketing actions can affect a firm's firm value (Warren & Sorescu, 2017). Furthermore, these studies suggest that investors trade a firm's stock based on

[7] https://www.jdpower.com/awards

competitors' actions. Thus, our research conjectures that the impact of the focal firm's marketing levers on investor attention to its stock is contingent upon its competitor's marketing levers.

The Moderating Role of Competitors' Advertising. Findings from field data on product markets suggest that firms may benefit from competitors' advertising regarding brand recognition and consideration (Lewis & Nguyen, 2015). This is because advertising may contain a form of comparison between a set of competing firms. Thus, when investors observe a firm's advertising, they may also be exposed to a broader set of competing firms. In other words, when competitors increase their advertising spend, investors may also be exposed to the focal firm.

Similar to managers who rely on competitive heuristics when setting advertising budgets (Kolsarici et al., 2020), investors also assess competitive investments in advertising for benchmarking purposes. Competitive dynamics of firms' advertising spending motivates such comparisons. Gijsenberg & Nijs (2019) report that it is common to observe a simultaneous rise in focal and competitor's brand advertisement incidence and spending. Furthermore, the focal firm's sales can benefit from competitors' advertising activity (Sahni, 2016). Therefore, the increase in competitors' advertising spending should motivate investors to understand better the impact of focal firm's advertising on future cash flows.

H2a. The positive impact of an increase in the focal firm's advertising spending on investor attention to the focal firm is higher (lower) when the increase in competitors' advertising spending is high (low).

The Moderating Role of Competitors' Product Development Announcements. Like advertising, a product development announcement can contain comparisons of several competing firms. For instance, in consumer reports, new car seats for kids are evaluated according to their safety features and performance (Simonsohn, 2011). Likewise, the new generation of competing video game consoles are compared in detail on websites and magazines (PS5 vs. Xbox X). For high-technology products such as microprocessors, similar comparisons are made not only in the consumer space but also in the business press and analyst reports (Arya, 2020; King & Bass, 2020). Thus, simultaneous new product development activities in a product category increase investor's exposure to the new product activities of the focal firm because of the comparative coverage of firms' innovative activities by third parties (e.g., websites, magazines).

While the cash flow effect of the focal firm's investments in products partially depends on its capabilities and resources, it also depends on the innovation activities of its competitors. For example, when a firm announces a product, the stock market reaction is lower in industries with higher product announcement activity (Warren & Sorescu, 2017). In contrast, horizontal product line expansions can increase the rival firm's profitability if the focal firm increases the price of its incumbent product to avoid cannibalization (Thomadsen, 2013). When both the focal firm and its competitors increase their product development announcements, investors search for the focal firm's information as they get curious regarding the repercussions of these events. If competitors increase product development, is the focal firm's product development sufficient? Would the investments pay off? For example, an increase in industry-level innovation activity may mean moving towards value-creation from value-appropriation, which signals a shift in the cash flows of firms operating in the industry (Mizik & Jacobson, 2003). In that case, investors would be interested in understanding whether the focal firm is keeping up with investing in innovation. The investors would need to obtain more information on the firm and its product development strategy to address such questions. Therefore, we hypothesize that:

H2b. The positive impact of an increase in focal firm's product development announcements on investor attention to the focal firm is higher (lower) when the increase in competitors' product development announcements is high (low).

The Moderating Role of Competitors' WOM. Empirical studies suggest that WOM about competitors may enhance the focal firm's WOM (Lovett et al., 2013; Tirunillai & Tellis, 2012). This process is enhanced by presenting famous firms' social media rankings (e.g., trending topics on Twitter). Such comparative presentation of information exposes the investors to focal firms and the competitors, which increases the investors' awareness of the firm's stock.

Investors can also relate the competition's WOM to the focal firm's performance. Indeed, studies show that WOM spills over to competitors and vice-versa (Lovett et al., 2013). However, the spillover from competitors to the focal brand depends on the characteristics of the content (e.g., diagnosticity) and brand associations (e.g., typicality) (Sanchez et al., 2020). Thus, an increase in competitor's WOM implies that investors would need to gather further information about the focal firm and its products to ascertain the competitive impact of WOM on the focal firm. Thus, we hypothesize,

H2c. The positive impact of an increase in the focal firm's WOM on investor attention to the focal firm is higher (lower) when the increase in competitors' WOM is high (low).

The Moderating Role of Competitors' Customer Satisfaction. Customer satisfaction information often becomes available to investors in comparative form and is categorized based on the industry. For example, in the financial services sector, the customer satisfaction ranking is announced as "Capital One tops J.D. Power rankings for customer satisfaction" (Americanbanker.com, December 17, 2020). This announcement also discusses how Capital One's competitors, such as Chase Bank and PNC, performed. Similarly, ACSI releases the customer satisfaction scores by industry. Thus, investors can simultaneously observe changes in customer satisfaction of a set of competing firms. In other words, investors can compare the customer satisfaction of several firms and then further scrutinize the firms' financials. Overall, because of the established practice of benchmarking firms' customer satisfaction performance with competitors in the same industry, the impact of a change

in focal firm's customer satisfaction on investor attention will be more significant when there is a greater change in competitors' customer satisfaction.

A firm's customer satisfaction can predict its future market share when it is benchmarked against its nearest rival (Rego et al., 2013). For example, Mittal and Kamakura 2001, (p. 134) find that evaluating customers' "true" satisfaction ratings (i.e., those that will affect their actual repurchase behaviors) requires the value of customers' next-best alternative, which is "based on not only the satisfaction from the brand but also the expected satisfaction from competing brands." When the competitors' customer satisfaction increases, it is unclear to investors whether this can persuade the focal firm's customers to switch. Therefore, investors would need to compare the competitor firm's customer satisfaction, focal firm's customer satisfaction, and respective cash flows, which enhances their motivation to learn more about the focal firm's stock. Thus, we hypothesize,

H2d. The positive impact of an increase in focal firm's customer satisfaction on investor attention to the focal firm is higher (lower) when the increase in competitors' customer satisfaction is high (low).

2.5. Investor attention as a mediator

Prior research on the consequences of investor attention reports a significant positive relationship between investor attention and a stock's ownership and liquidity (Grullon et al., 2004), abnormal trading volume (Ben-Rephael et al., 2017), and abnormal returns (Da et al., 2011; Lou, 2014). Given the importance of the link between marketing levers and firm value, we focus on the mediating role of investor attention in this relationship.

Prior research in finance literature suggests that investors are more likely to invest in stocks they are familiar with (Grullon et al., 2004). Thus, from the mere awareness perspective, familiarity with a stock leads an investor to perceive that she has an information advantage over other stocks (Aspara, 2013), which increases the likelihood of investing in that stock. From the information effect perspective, paying attention to a firm's stock and learning about it because of the changes in the marketing levers increases the investor's confidence in her knowledge of the firm. An investor is more likely to invest in a stock when the investor's confidence in her firm knowledge is higher (Aspara, 2013). Both mechanisms explain how the changes in marketing levers lead to investing in stocks through investor attention. But how does this affect stock price movements?

In the finance literature, the relationship between investor attention and abnormal returns is explained by the buy-sell imbalance theory (Chemmanur & Yan, 2019). According to the buy-sell imbalance theory, investor attention affects the imbalance between buyers and sellers because buyers have to search from a large set of options. In contrast, sellers only consider the limited number of stocks they own in their portfolios (Barber & Odean 2008). Thus, buyers consider investing in only those stocks they pay attention to (and ignore the others). Prior research finds strong evidence on the contemporaneous and one-quarter increases in prices of stocks that the investors pay greater attention to (Da et al., 2011).

Furthermore, Madsen & Niessner (2019) report a significant mediating effect of investor attention between print advertising and abnormal returns, while Liaukonyte & Zaldokas (2020) find similar results using TV advertising data. Based on the buy-sell imbalance theory, we propose that investor attention is triggered by the changes in the focal firm's four marketing levers. This attention then increases the odds of inclusion of the stock in the investor's consideration set, which increases stock prices. Thus, we hypothesize,

H3. Investor attention mediates the effect of changes in focal firm's marketing levers and abnormal stock returns.

3. Data and methods

To answer our research questions, we merge multiple datasets that have observations collected at different time frequencies. We obtain advertising data from Kantar Media's *AdSpender* database, which is available at a monthly frequency. We obtain customer satisfaction and brand WOM data from YouGov Group, which is available daily. We obtain product development announcements from the Standard & Poor's Capital IQ database that is available daily. We obtain investor attention data from Edgar SEC (Securities and Exchange Commission) at a daily frequency. We retrieve stock market data available at a daily frequency from the Center for Research in Security Prices (CRSP). Finally, we obtain our control variables from quarterly financial statements data from S&P COMPUSTAT. Table 2 describes these variables and the source of the specific data items. Tables 3 and 4 show the summary statistics and correlation coefficients, while Table A1 shows that multicollinearity is not an issue in our analysis.

Because the focal investor attention and abnormal returns measures and control variables are at the company level, our unit of analysis is the company-quarter. Our main starting point is the YouGov brand universe, which consists of 1800 brands (for a similar sample selection strategy, see Stäbler & Fischer, 2020). We manually identify the corporate owners of brands by following a precise procedure that combines searching the brand name on Google and Wikipedia, reading brand history on the website, and checking other relevant sources (e.g., company reports). For each brand, we find the brand owner and possible change of ownership throughout our sample period. Out of 1800 brands, on manual inspection, 1500 brands belong to

Table 2
Variables and Datasets.

Variable	Purpose	Definition	Data Source	Supporting Literature
Investor Attention	Main dependent variable	The sum of unique IP addresses to request a firm i's total regulatory filings on EDGAR in a quarter	Edgar SEC	e.g. Drake et al., (2016)
Abnormal Returns	Main dependent variable	Monthly abnormal returns derived from the 4-factor model and compounded at the quarterly level	CRSP	e.g., Srinivasan and Hanssens (2009)
Advertising	Main independent variable	Total advertising expenditures for a) focal brand and b) the average for the competitors at two digits SIC code	Kantar and Compustat	e.g., Du, Joo, and Wilbur (2019); Wilbur (2008)
Product Development Announcements	Main independent variable	Sum of mentions of "product announcements" and "business expansions" in Capital IQ's key development types for a) focal brand and b) the average for the competitors at two digits SIC code	S&P's Capital IQ database	e.g., Sood & Tellis (2009)
WOM	Main independent variable	The volume of WOM around the brand given by the sum of negative and positive WOM for a) focal brand and b) the average for the competitors at two digits SIC code	YouGov	e.g., Hewett et al. (2016)
Customer Satisfaction	Main independent variable	The net measure of customer satisfaction given by the difference between the number of customers who are satisfied and dissatisfied for a) focal brand and b) the average for the competitors at two digits SIC code	YouGov	e.g., Colicev et al. (2018)
Competitive Intensity	Control variable	Reciprocal of the Herfindahl-Hirschman Index	Compustat	e.g., Anderson et al. (2004)
Total Assets	Control variable	Natural logarithm of the total assets of the firm in (ATQ)	Compustat	e.g., Warren and Sorescu (2017)
Institutional Ownership	Control variable	Percentage of institutional ownership	Thomson Reuters	e.g., Bushee et al., (2010)
Analysts coverage	Control variable	Number of analysts covering the stock	Thompson Financial I/B/E/S database	e.g., Malshe et al. (2020)
Profit Margin	Control variable	Firm's profit margin	Compustat	e.g., Malshe and Agarwal (2015)
R&D	Control variable	R&D expenditures	Compustat	e.g., Malshe and Agarwal (2015)
Earnings	Control variable	The date of the earning announcements	Thompson Financial I/B/E/S database	e.g., Colicev et al. (2018)
Dividends	Control variable	The date of the dividends announcements		
Financial announcements	Control variable	The number of financial announcements	S&P's Capital IQ database	e.g., Borah & Tellis (2016)
Organization announcements	Control variable	The number of organizational announcements		
Negative announcements	Control variable	The number of negative announcements		
Recession Dummy	Control variable	Dummy that takes a value of 1 for the 2008 year	Compustat	e.g., Malshe et al. (2020)

Table 3
Summary Statistics.

	Mean	Standard Deviation
Abnormal Returns	−0.022	(0.206)
Ln (Investor Attention)	3.726	(0.946)
Advert(focal)	78.380	(161.866)
Advert(comp2SIC)	54.237	(52.494)
Prod(focal)	3.456	(9.013)
Prod(comp2SIC)	3.987	(3.849)
WOM (focal)	12.119	(9.616)
WOM (comp2SIC)	11.787	(5.085)
Satisf(focal)	12.305	(11.959)
Satisf(comp2SIC)	12.005	(5.029)
Ln(comp intensity)	3.576	(0.476)
Institutional ownership	0.489	(0.228)
Earning announcements	0.578	(1.413)
Dividend announcements	0.184	(0.368)
Analysts coverage	16.561	(9.895)
R&D	148.699	(567.126)
Assets	71855.312	(265903.194)
Profit Margin	0.125	(0.168)
Key developments(finance)	15.269	(36.062)
Key developments(negative)	1.515	(3.252)
Key developments(organization)	4.234	(5.602)
Recession dummy	0.301	(0.459)

Table 4
Correlation Coefficients among Key Variables in the Model.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(09)	(10)
Abnormal Returns	1.00									
Investor Attention	0.03b	1.00								
Advertising(focal)	0.03a	0.37a	1.00							
Advertising (comp)	0.02	0.08a	0.27a	1.00						
Satisfaction (focal)	0.01	0.19a	0.16a	0.17a	1.00					
Satisfaction(comp)	−0.01	−0.06a	0.07a	0.32a	0.43a	1.00				
WOM(focal)	0.01	0.25a	0.29a	0.12a	0.52a	0.19a	1.00			
WOM (comp)	0.00	−0.19a	0.11a	0.26a	0.12a	0.44a	0.47a	1.00		
Product(focal)	0.01	0.23a	0.39a	0.16a	0.06a	0.11a	0.25a	0.16a	1.00	
Product(comp)	0.01	0.03b	0.23a	0.35a	0.05a	0.25a	0.19a	0.41a	0.32a	1.00

[c] $p < 0.1$, [b] $p < 0.05$, [a] $p < 0.01$.

405 publicly traded corporate owners. Some of these companies have only one brand (mono-brand firms such as Nike), while others have multiple brands (e.g., P&G). We check the overlap of these 405 firms with the rest of the data. For all 405 firms, we obtain financial information from COMPUSTAT, investor attention, and product development announcements. Of the 405 firms, advertising expenditure data were available for 349 firms in the Kantar Media database, which constituted our final sample. We observe a large number of industries represented in the final sample, including 40 different 2-digit SIC codes (e.g., 13 = "Oil & Gas Extraction", 23 = "Apparel & Other Textile Products").

After aggregating the datasets at a quarterly frequency, we compute the 1-quarter changes in the variables as our model specification uses the changes approach. Besides, we create temporal separation among our key variables and for every firm in quarter *t*. Abnormal returns are from the same quarter *t,* while the other variables are from quarter *t-1*. The final merged dataset covers over a decade from June 30 (Q2) of 2007 to June 30 (Q2)-2017, yielding an unbalanced panel of 9105 firm-quarter observations for 349 firms.

3.1. Description of focal variables

3.1.1. Advertising expenditures

We measure a firm's advertising by the dollar spend on advertising (e.g., Du et al., 2019; Wilbur, 2008) which we obtain from Kantar Media. Kantar Media is a leading database for advertising data that tracks brand advertising activity across print, broadcast, radio, internet, and outdoor media channels and translates this information to monetary amounts by surveying agency and media rates (Cheong et al., 2021). Kantar Media's Ad$pender database tracks and records advertising expenditures at the parent firm (e.g., The Coca-Cola Company), brand (e.g., Coca-Cola), and even product (e.g., Diet Coke) levels. Our starting point is the YouGov brand universe, and YouGov collects data at the brand level. Thus, to examine the key relationships in our framework, we first match the brand names reported in Ad$pender to the brand names used in YouGov. In other

words, the preferred matching procedure is the lowest possible aggregation level available in the dataset. We then aggregate the brand-level data from Ad$pender at the parent-firm level for all of our financial information. For instance, if a parent firm in our data owns two brands, we sum the advertising expenses for these two brands to come up with the parent firm-level advertising expense.

There are multiple firms in our sample with missing observations in the Kantar database. Overall, we have Kantar advertising expenditures for 210 firms. We tackle this issue by replacing the missing values with the advertising expenses obtained from COMPUSTAT for the remaining 139 firms. As COMPUSTAT only reports annual advertising expenditures (item XAQ), we divide it by four to derive the quarterly metric[8]. We believe this approach yields a complete advertising expenditure variable rather than discarding firms with missing values[9]. To ensure that our approach is valid, we find the correlation between the annual COMPUSTAT and Kantar advertising is 0.793. Similarly, a study by Focke et al. (2019, p. 12) reports a 0.79 correlation between Kantar and COMPUSTAT advertising. Also, when we estimate our model using only the sample of firms for which there is advertising data in Kantar, thereby reducing the sample size, we find results consistent with our main findings.

3.1.2. Product development announcements

In their review of research on the marketing-finance interface, Srinivasan & Hanssens (2009) argue that it is theoretically possible to obtain daily level information on innovation activities by tracing the firm's announcement of product development events. Prior researchers have used event studies to evaluate the effect of innovation announcements on stock returns (Sorescu et al., 2007; Warren & Sorescu, 2017). Following this research, we obtain every product development announcement for each firm in our sample. To do so, we use S&P's Capital IQ database, which has a *Key Developments* feature that provides categorized news and corporate event data. The *Key Developments* feature categorizes a firm's developments into different types. *Key Developments* types include categories of announcements such as Alliances, Business Expansions, Client Announcements, Product-Related Announcements, Mergers & Acquisitions, etc. To determine if an announcement can be classified as product development, we conduct a text mining analysis within the text of all ''product announcements'' and ''business expansions'' *Key Development* types. For the text mining analysis, we create a dictionary of terms related to product development announcements (launch, patent, shipping, new product, new process, etc.) and code an instance as 1 if the text contains these terms. To validate this approach, we independently check the accuracy of our classification with the help of two research assistants. First, we randomly select 500 product development announcements from the Capital IQ database. Then, two research assistants independently read each announcement and classify the announcement as a product development announcement. The inter-rater agreement is 88%. We find a classification accuracy of 84%, i.e., 84% of the announcements classified as product development announcements by the text algorithm are also classified as product development announcements as per both research assistants. Our measure is a count measure for the number of product development announcements in each quarter.

3.1.3. WOM

We obtain brand WOM from YouGov (Hewett et al., 2016). Respondents are prompted for anything they have heard in the media—news, advertising, social media, or any other sources of information—to determine whether they have noticed good or bad news, advertising, public relations campaigns, product launches, and/or whether there is any ''word on the street.'' The positive WOM score on a given day represents the number of people who answered ''Yes'' to the question, ''Have you heard anything positive about a brand X?'' Similarly, the negative WOM on a given day is the number of people who have answered ''Yes'' to the question, ''Have you heard anything negative about a brand X?'' Therefore, for each brand on a given day, we have a separate score of whether people have heard something (1) positive or (2) negative about a brand. The volume of WOM thus captures the sum of positive and negative WOM around the brand in each quarter.

As YouGov also accounts for social media chatter in their WOM measure, we also check the robustness of YouGov's WOM measure with social media data, which we obtain for 19 firms for the 2012 year. For example, the correlation between the YouGov WOM measure and Facebook's ''People Talking About This'' (''PTAT'') measure, which measures the extent to which users voluntarily engage in telling a story about a brand (from the Facebook Insights tool), is 0.3207. We also compute the correlation with the user posts on Facebook (users posting on a brand's Facebook wall) and find a similar result (0.317). Thus, we can moderately be sure that our WOM measure from YouGov also captures social media WOM.

3.1.4. Customer satisfaction

We collect customer satisfaction from YouGov, which collects the number of satisfied customers and dissatisfied customers for brands on a daily basis[10]. Customer satisfaction measures the number of customers who have answered yes to the question ''Of which of the following brands would you say that you are a "SATISFIED CUSTOMER"? Similarly, customer dis-

[8] There is a data item listed as quarterly advertising spending (XADQ) in the COMPUSTAT online manual. However, this data item is not available anymore in the WRDS COMPUSTAT database and only annual advertising expenses (XAD) are reported (Luo et al., 2010).

[9] As a robustness check, we created a dummy variable for COMPUSTAT covered firms and then separately for Kantar covered firms. We include each dummy separately in the analysis and find that the results do not change.

[10] Studies have often used the ACSI as a measure of customer satisfaction which provides information on a limited number of firms in selected industries. In addition, the ACSI scores are reported only once a year. Yet, customer satisfaction can change from quarter to quarter and even at higher frequencies (Colicev et al., 2018).

satisfaction measures the number of customers who have answered yes to the question "Of which of the following brands would you say that you are a "DISSATISFIED CUSTOMER"? We subtract the number of dissatisfied customers from the number of satisfied customers to obtain our measure of customer satisfaction. We then take the quarterly average score across the daily measure of customer satisfaction. We provide a detailed overview of YouGov panel characteristics and data collection in Part A of the Web Appendix.

Previous research has used the American Customer Satisfaction Index (ACSI) as a measure of customer satisfaction. Importantly, Malshe et al. (2020) compare the ACSI's measurement scale, YouGov's measurement scale, and a single item overall satisfaction measure used by Mittal & Kamakura (2001). They report a 0.9 correlation between the ACSI and YouGov satisfaction measure, and they also load on a single principal component. In summary, this analysis shows that the ACSI and YouGov metrics are measuring the same underlying construct.

3.1.5. Competitors' advertising, product development announcements, WOM, customer satisfaction

We rely on Standard Industry Classification (SIC) codes from COMPUSTAT to compute the competitor metrics for each of our focal advertising, product development announcements, customer satisfaction, and WOM measures. SIC codes are 4-digit codes based on the principal end-product of the firm. They are chosen so that the companies are aggregated into broader but still similar groups as the lowest order digits are removed. Research on stock prices indicates that the estimates of the importance of industry are insensitive to the level of aggregation. Thus, we separately compute the variables for the competitors at 2, 3, and 4-digit codes, excluding the focal firm. Notwithstanding the findings that the level of aggregation of SIC codes does not matter for stock market return models, some papers advocate the use of two-digit codes (Servaes, 1996). Thus, for the main results, we report the two-digit SIC codes. Most of the substantive findings do not change when we use three and 4-digit SIC codes (Part D, Web Appendix).

3.1.6. Abnormal returns

We calculate the abnormal stock returns using the Fama-French four-factor model, along with the three-factor model that includes the market, size, and value factors (Fama & French, 1993), also comprises Carhart's momentum factor (Carhart, 1997). We use the CRSP (Center for Research in Security Prices) database to obtain the stock prices for the firms in our studies and obtain the Fama-French 4 factors from Kenneth French's website.

$$R_{it} - R_{Ft} = \alpha_i + \beta_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + m_i UMD_t + \epsilon_{it} \quad (1)$$

Here i stands for firm, t stands for time, R_{it} denotes the returns for firm i on day t, RF_t is the risk-free rate of return (thirty-day treasury bill), RM_t is the return on the value-weighted (VW) market portfolio, SMB_t denotes the returns on a portfolio of small stocks minus returns on large stocks, HML_t stands for returns on a portfolio of stocks with high book-to-market ratio minus the returns on a portfolio of stocks with low book-to-market ratio, MOM_t is the momentum factor calculated as the difference between the returns of firms with rising stock returns and declining stock returns. We estimate the firm's expected monthly stock returns using the prior 36 months' stock returns. The level residual from the regression in equation (1) is the metric of abnormal stock returns that we use in the paper. This metric has eliminated the part of stock returns, which could be explained by the four factors. We calculate abnormal returns (AR) for firm i in quarter t by using a compounding formula: $AR_{it} = \{\Pi(1 + AR_{i,j})\} - 1$, where $AR_{i,j}$ is the abnormal return of firm i in month j of quarter t and $j \in [1, 2, 3]$.

3.1.7. Investor attention

We use a measure of investor attention that captures search by investors who are familiar with and motivated to search for financial information and who can make investment decisions based on objective information than rely on heuristics. Thus, we use the breadth of investor interest in a firm's regulatory filings on the Securities and Exchange Commission (SEC) Electronic Data Gathering, Analysis, and Retrieval system (EDGAR) as our measure of search by investors. Starting from February 2003, the SEC has been tracking such search traffic via the EDGAR access log files. These log files contain detailed information about the users' IPs, corporations, filings, and the detailed time stamp (nearest to the second). Recently, the SEC released these log files to the public, and a growing number of academic studies have utilized this dataset for topics relating to investor attention and information acquisition (Drake et al., 2016; Ryans, 2018). In addition, the SEC EDGAR system hosts all mandatory filings by public companies. The goal of EDGAR is to "increase the efficiency and fairness of the securities market. . . . . by accelerating the receipt, acceptance, dissemination, and analysis of time-sensitive corporate information filed with the agency." By creating and maintaining the EDGAR system, the SEC enables interested parties to locate necessary financial information. All public firms must submit financial information to the SEC.

We obtain our SEC EDGAR search data from Ryans (2018). This dataset is taken from the online EDGAR system, which maintains a log file for all activity performed by system servers. Thus, for each request by an interested user, the log file locates the firm that investors are inquiring about, the request time, and the type of filing request. There are about 451 unique filing types in the EDGAR system. The regulatory filings (e.g., annual (10-K), quarterly (10-Q) reports of firm's financial position, large corporate events (8-K), 424, S, SC, 4, DEF, and Other) are more likely accessed by knowledgeable investors, who have the wherewithal to make stock investments, as these reports are complex, intricate, and lengthy.

To correctly compute investors' use of financial information, we discard downloads made by robots (vs. humans). Ryans (2018) assumes humans download no more than 25 items or three different firms' items in a single minute, and humans

download no more than 500 items in a single day. Other downloads are labeled as "robots" and removed. For robustness, we also use the measure of investor attention from Drake et al. (2016), which assumes that humans do not download more than 1000 items during a day or more than five items per minute (see Table A10). To construct our quarterly measure of investor attention, we count unique IP addresses to make a request for a firm *i*'s total regulatory filings on EDGAR on day *t*. Accordingly, we sum the number of requests across the quarter ($\sum_{t=1}^{90} Search_t$).

3.1.8. Control variables

We include profit margin and R&D expenditures to control firms' accounting performance that can affect investor attention and abnormal returns (Edeling & Fischer, 2016; Srinivasan & Hanssens, 2009) and competitive intensity to control for competition effects. We include total assets to control for firm size effects (Warren & Sorescu, 2017). Larger firms are usually well-covered by analysts, news media, and security research firms, making them less opaque compared to small firms. We also control for institutional ownership (Cillo et al., 2018) and include a recession dummy (Q2 2008 to Q4 2010) to control for the effects of trading and recession. Furthermore, we include the number of analysts covering the stock, which we collect from the Institutional Brokers Estimate System (IBES) to control for the exposure to the stock due to the analyst's coverage. Finally, research has shown that investors react to key corporate events (Sood & Tellis, 2009). Thus, we include earnings and dividend announcements and other financial, organizational, and negative key developments from the Capital IQ database (see Part B of Web Appendix for further details).

4. Model

4.1. System of equations with abnormal returns, investor attention, and selection equations

We follow Tuli and Bharadwaj (2009) and estimate the model in changes for all variables, which removes the first-order autocorrelation bias. We create temporal separation between abnormal returns and other model variables to capture the mediating process (see Pieters, 2017). We estimate the following system of equations with cross-correlated errors:

$$\text{Selection}_{it} = \pi_0 + \pi_1 \ln(\text{Sales}_{it}) + \hat{\tau}\,\text{CTRL1}_{it} + \epsilon 1_{it} \tag{2}$$

$$\begin{aligned}\Delta Attention_{it} = {} & \alpha_0 + \alpha_1 \Delta\text{Adv}_{it} + \alpha_2 \Delta\text{Adv\_comp}_{it} + \alpha_3 \Delta\text{CS}_{it} + \alpha_4 \Delta\text{CS\_comp}_{it} + \alpha_5 \Delta\text{WOM}_{it} + \alpha_6 \Delta\text{WOM\_comp}_{it} \\ & + \alpha_7 \Delta\text{Prod}_{it} + \alpha_8 \Delta\text{Prod\_comp}_{it} + \alpha_9 \Delta\text{Adv}_{it} * \Delta\text{Adv\_comp}_{it} + \alpha_{10} \Delta\text{CS}_{it} * \Delta\text{CS}_{\text{comp}_{it}} + \alpha_{11} \Delta\text{WOM}_{it} \\ & * \Delta\text{WOM}_{\text{comp}_{it}} + \alpha_{12} \Delta\text{Prod}_{it} * \Delta\text{Prod}_{\text{comp}_{it}} + \alpha\, \Delta\text{CTRL1}_{it} \\ & + \alpha \sum \text{YDUMMY} + \beta \sum \text{QDUMMY} + \epsilon 2_{it}; \text{when Selectionit} = 1\end{aligned} \tag{3}$$

$$\begin{aligned}\Delta\text{AR}_{it+1} = {} & \beta_0 + \beta_1 \Delta\text{Attention}_{it} + \beta_2 \Delta\text{Adv}_{it} + \beta_3 \Delta\text{Adv\_comp}_{it} + \beta_4 \Delta\text{CS}_{it} + \beta_5 \Delta\text{CS\_comp}_{it} + \beta_6 \Delta\text{WOM}_{it} \\ & + \beta_7 \Delta\text{WOM\_comp}_{it} + \beta_8 \Delta\text{Prod}_{it} + \beta_9 \Delta\text{Prod\_comp}_{it} + \beta_9 \Delta\text{Adv}_{it} * \Delta\text{Adv\_comp}_{it} + \beta_{10} \Delta\text{CS}_{it} * \Delta\text{CS}_{\text{comp}_{it}} \\ & + \beta_{11} \Delta\text{WOM}_{it} * \Delta\text{WOM}_{\text{comp}_{it}} + \beta_{12} \Delta\text{Prod}_{it} * \Delta\text{Prod}_{\text{comp}_{it}} + \alpha\, \Delta\text{CTRL2}_{it} \\ & + \alpha \sum \text{YDUMMY} + \beta \sum \text{QDUMMY} + \epsilon 3_{it+1};\end{aligned} \tag{4}$$

when $\text{Selection}_{it} = 1$ where, for each firm *i* and quarter *t*, $\Delta\text{Attention}_{it}$ is the changes in investor attention, ΔAR_{it+1} are the changes in abnormal returns in quarter *t + 1*, ΔAdv_{it} is the changes in advertising expenditures, ΔCS_{it} is the changes in customer satisfaction, ΔWOM_{it} is the changes in brand WOM, ΔProd_{it} is the changes in product development announcements for the focal firm while the subscript *_comp* denotes the changes in competitors' variables. ΔCTRL1_{it} represents all the changes in control variables (see Table 2). Sales_{it} is the quarterly revenues, and YDUMMY and QDUMMY are a set of year and quarter dummy variables, which control for time variation.

We control for selection issues that are pertinent to YouGov covered and non-covered firms. Most likely, the firms covered by YouGov are systematically different from firms that YouGov does not cover. We create a dummy variable, "Selection," that equals 1 for the firms with YouGov coverage and 0 for the firms without YouGov coverage. Next, we model "Selection" as a function of all the control variables that we use in Eqs. (3) and (4). We include the natural logarithm of revenue that serves as the excluded variable from Eqs. (3) and (4) as we learned that YouGov includes brands to sell their data to them later. Also, revenue, *measured in levels*, is unlikely to be theoretically and empirically correlated to the *changes* in investor attention (the correlation between these variables is 0.01). We model Selection_{it} as an indicator variable such that:

$$\text{Selection}_{it} \begin{cases} 0; Firm_{it} \notin YouGov \\ 1; Firm_{it} \in YouGov \end{cases}$$

In Equation (4), we create time separation between abnormal returns and other model variables to capture the mediating process. Equation (4) includes controls for all the variables from Equation (3) and the dummy for recession. To accommodate our model's many features, we use the Conditional Mixed Process estimator (Roodman, 2011), which relies on a simulated maximum likelihood algorithm.

4.2. Addressing endogeneity concerns

We correct for possible endogeneity bias with the Gaussian Copula method, an instrument-free approach used in previous research (Papies et al., 2017; Park & Gupta, 2012). This method directly models the correlation between the endogenous regressor and the error utilizing Gaussian copulas (Papies et al., 2017). Specifically, we incorporate the following variables as additional regressors in our model:

$$\text{Adv} = \Phi^{-1}[H_{Adv}(Adv_{it})] \tag{5a}$$

$$\text{Prod} = \Phi^{-1}[\text{H}_{\text{Prod}}(\text{Prod}_{\text{it}})] \tag{5b}$$

$$\text{WOM} = \Phi^{-1}[\text{H}_{\text{WOM}}(\text{WOM}_{\text{it}})] \tag{5c}$$

$$\text{CS} = \Phi^{-1}[\text{H}_{\text{CS}}(\text{CS}_{\text{it}})] \tag{5d}$$

where Φ^{-1} is the inverse of the cumulative distribution function, and $H_{Adv}(\blacksquare)$, $H_{CS}(\blacksquare)$, $H_{WOM}(\blacksquare)$, $H_{Prod}(\blacksquare)$, represent the empirical cumulative distribution functions of advertising, customer satisfaction, WOM, and product development announcements, respectively. We use Kolmogorov–Smirnov and Shapiro–Wilk tests to check for nonnormal distribution. We reject the null hypothesis of normality in both tests for all four variables.

For robustness, we also use an instrumental variable approach. We follow Madsen & Niessner (2019) and use the quarterly difference in the advertising, product development, WOM, and customer satisfaction between the prior three and four quarters as instruments. Investors are more likely to pay attention to the most recent information. Thus, it is unlikely that the *previous* advertising, product development, WOM, and customer satisfaction independent of unmeasured confounders from three to four quarters earlier will have a direct influence on current investor attention; rather, any possible influence will go through the *latest* advertising, product development, WOM and customer satisfaction. In other words, our instruments are theoretically linked to endogenous independent variables[11].

We found that most of the values were above the rule-of-thumb threshold of 10 in Stock-Yogo F-test (Stock & Yogo, 2005), with one value of 8.84, which should not cause major concern. The Hansen test does not reject the null hypothesis that the instruments are exogenous in our estimation results (Hansen's J = 0.242, p = .6225). Specifically, we estimate the following four auxiliary regressions:

$$\text{Adv}_{\text{it}} = \theta_0 + \Theta\,\text{CTRL1}_{\text{it}} + \theta_1 \text{Lag3\_Adv}_{\text{it}} + \text{CF1}_{\text{it}} \tag{6a}$$

$$\text{Prod}_{\text{it}} = \rho_0 + \text{P}\,\text{CTRL1}_{\text{it}} + \rho_1 \text{Lag3\_Prod}_{\text{it}} + \text{CF4}_{\text{it}} \tag{6b}$$

$$\text{WOM}_{\text{it}} = \pi_0 + \Pi\,\text{CTRL1}_{\text{it}} + \pi_1 \text{Lag3\_WOM}_{\text{it}} + \text{CF3}_{\text{it}} \tag{6c}$$

$$\text{CS}_{\text{it}} = \psi_0 + \Psi\,\text{CTRL1}_{\text{it}} + \psi_1 \text{Lag3\_CS}_{\text{it}} + \text{CF2}_{\text{it}} \tag{6d}$$

where for every focal firm i and quarter t, $\text{Lag3\_Adv}_{\text{it}}$ is the lagged difference of advertising between quarter 3 and quarter 4 prior to our focal period, $\text{Lag3\_CS}_{\text{it}}$ is the lagged difference of satisfaction between quarter 3 and quarter 4 prior to our focal period, $\text{Lag3\_WOM}_{\text{it}}$ is the lagged difference of WOM between quarter 3 and quarter 4 prior to our focal period, and $\text{Lag3\_Prod}_{\text{it}}$ is the lagged difference of product development between quarter 3 and quarter 4 prior to our focal period. We use the estimated error terms, CF1_{it}, CF2_{it}, CF3_{it} and CF4_{it} as control function corrections for potential endogeneity of the focal variables.

5. Results

We present the estimation results for Equation (2)–(4) in Table 5. The baseline model is the model without the endogeneity correction. We then add the instrumental variable correction as the secondary model. Finally, we present the results for the model with Gaussian copulas. The majority of the substantive results remain the same across the three models. For brevity, we present the results based on the model with Gaussian copulas. To ease interpretation, we multiply the coefficients (and standard errors) by 1000. Our models show a good overall fit with respect to alternative models (see Table A-7 in Part D of the Web Appendix). Note that though our model is in changes form, for expositional purposes, our presentation of the results is indifferent to the language used for a levels or changes specification.

[11] Previous research has used the information about peers or peers-of-peers as instrumental variables (Lim et al., 2020; Malshe et al., 2020). We cannot use peers' marketing information as instruments because the objective of our research is to investigate the role of competitors' marketing information in investors' attention to the focal firm. In other words, we cannot use competitors' marketing information as an excluded variable from the main model. Thus, we rely on lagged values of focal variables as instruments. We thank the anonymous reviewer for bringing this issue to our attention.

Table 5
Main Results.

	Baseline Model: No instruments				Second Model: Instrumental Variables				Main Model: Gaussian Copula correction			
	Attention		Abnormal Returns		Attention		Abnormal Returns		Attention		Abnormal Returns	
Investor Attention			**43.53*** **	**(16.69)**			**44.03****	**(17.30)**			**43.75*** **	**(16.68)**
Advertising (focal)	**0.32*** **	(0.09)	0.02	(0.07)	**1.07****	(0.49)	−1.56***	(0.44)	**0.31*** **	(0.09)	0.02	(0.07)
Advertising (comp)	**0.83*** **	(0.21)	−0.07	(0.21)	**1.02*** **	(0.24)	−0.22	(0.22)	**0.83*** **	(0.21)	−0.07	(0.21)
Product(focal)	0.42	(0.59)	0.71	(0.46)	−4.74	(11.34)	−1.33	(11.07)	**0.34**	(0.61)	0.58	(0.46)
Product(comp)	**7.28*** **	(2.18)	1.01	(2.37)	**10.45*** **	(2.34)	1.94	(2.54)	**7.20*** **	(2.18)	0.97	(2.37)
WOM(focal)	**6.97*** **	(1.72)	3.30	(2.14)	14.23	(51.41)	91.15	(61.11)	**7.16*** **	(1.72)	3.46	(2.14)
WOM(comp)	−**7.23****	(3.20)	−0.01	(4.09)	−**7.29****	(3.44)	−1.65	(4.35)	−**7.19****	(3.21)	0.06	(4.09)
Satisfaction (focal)	0.08	(2.40)	−0.84	(2.56)	180.89	(232.98)	−402.37	(245.72)	0.16	(2.40)	−0.75	(2.56)
Satisfaction (comp)	**20.00*** **	(4.71)	13.97***	(4.76)	**20.25*** **	(5.30)	10.95**	(5.18)	**20.26*** **	(4.71)	14.31***	(4.77)
Advertising (focal) # Advertising(comp)	**0.01****	(0.00)	−0.01	(0.00)	**0.01****	(0.00)	−0.00	(0.00)	**0.01****	(0.00)	−0.01	(0.00)
Product(focal) # Product(comp)	−0.40	(0.32)	−0.19	(0.20)	−0.36	(0.30)	−0.13	(0.22)	−0.44	(0.32)	−0.24	(0.20)
WOM(focal) # WOM(comp)	**1.06***	(0.61)	−0.38	(1.04)	**1.42****	(0.61)	−1.27	(1.03)	**1.18***	(0.62)	−0.29	(1.05)
Satisfaction (focal) # Satisfaction(comp)	**6.18****	(2.83)	3.14	(2.30)	**9.13*** **	(3.26)	5.60**	(2.52)	**6.16****	(2.83)	3.16	(2.31)
Ln(comp intensity)	49.43***	(14.20)	20.83	(17.60)	17.01	(68.09)	152.51**	(72.70)	49.63***	(14.22)	21.09	(17.60)
Institutional ownership	184.69**	(83.44)	137.10*	(72.39)	129.59	(183.69)	376.73**	(188.35)	186.00**	(83.62)	138.04*	(72.32)
Earning announcements	2.90	(2.08)	−2.81	(3.59)	2.83	(2.65)	2.42	(3.80)	2.93	(2.09)	−2.78	(3.57)
Dividend announcements	12.97**	(6.00)	−11.73**	(5.88)	8.84	(7.59)	0.51	(7.71)	12.96**	(5.98)	−11.73**	(5.88)
Analysts coverage	−0.22	(1.83)	−0.56	(1.21)	0.79	(2.82)	1.49	(2.68)	−0.18	(1.82)	−0.53	(1.21)
R&D	−0.01	(0.00)	−0.00	(0.00)	−0.01*	(0.01)	−0.00	(0.00)	−0.01	(0.00)	−0.00	(0.00)
Assets	0.00	(0.00)	−0.00	(0.00)	0.00	(0.00)	−0.00	(0.00)	0.00	(0.00)	−0.00	(0.00)
Profit Margin	−65.78**	(33.06)	−90.09**	(38.91)	−51.74	(42.08)	−98.91**	(46.94)	−65.62**	(33.07)	−90.08**	(38.96)
Key developments(finance)	0.58***	(0.18)	0.03	(0.13)	0.75*	(0.41)	−0.20	(0.43)	0.58***	(0.18)	0.03	(0.13)
Key developments(negative)	8.53***	(1.53)	−0.57	(0.97)	9.47**	(4.12)	−9.16**	(4.49)	8.52***	(1.53)	−0.58	(0.97)
Key developments(organization)	9.42***	(0.84)	0.98	(0.85)	11.23***	(1.96)	−3.27	(2.06)	9.41***	(0.84)	0.98	(0.85)
CF (Advertising)					−0.76	(0.49)	1.62***	(0.44)				
CF (Product)					5.05	(11.42)	2.03	(11.03)				
CF (WOM)					−6.51	(51.33)	−88.84	(60.97)				
CF (Satisfaction)					−181.06	(232.98)	400.91	(24.580)				
Copula (Advertising)									4.62	(4.88)	4.23	(5.54)
Copula (Product)									3.05	(4.46)	5.39	(5.03)
Copula (WOM)									−6.08	(4.35)	−5.37	(4.79)
Copula (Satisfaction)									3.70	(3.57)	2.31	(3.67)
Recession dummy			1.46	(17.39)			−61.46**	(25.07)			3.03	(17.44)
Constant	−14.77	(15.73)	28.13	(19.30)	166.58***	(19.86)	30.84	(20.68)	−19.96	(19.74)	21.97	(22.78)
Firm Fixed Effects	YES											
Year Fixed Effects	YES											
Quarter Fixed Effects	YES											

Notes: All models are estimated with a selection equation and is estimated using multiple equation Conditional Mixed Effect process (CMP) in STATA.
Standard errors are in parentheses and heteroskedasticity corrected. To ease interpretation, we have multiplied the coefficients (and standard errors) by 1000, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

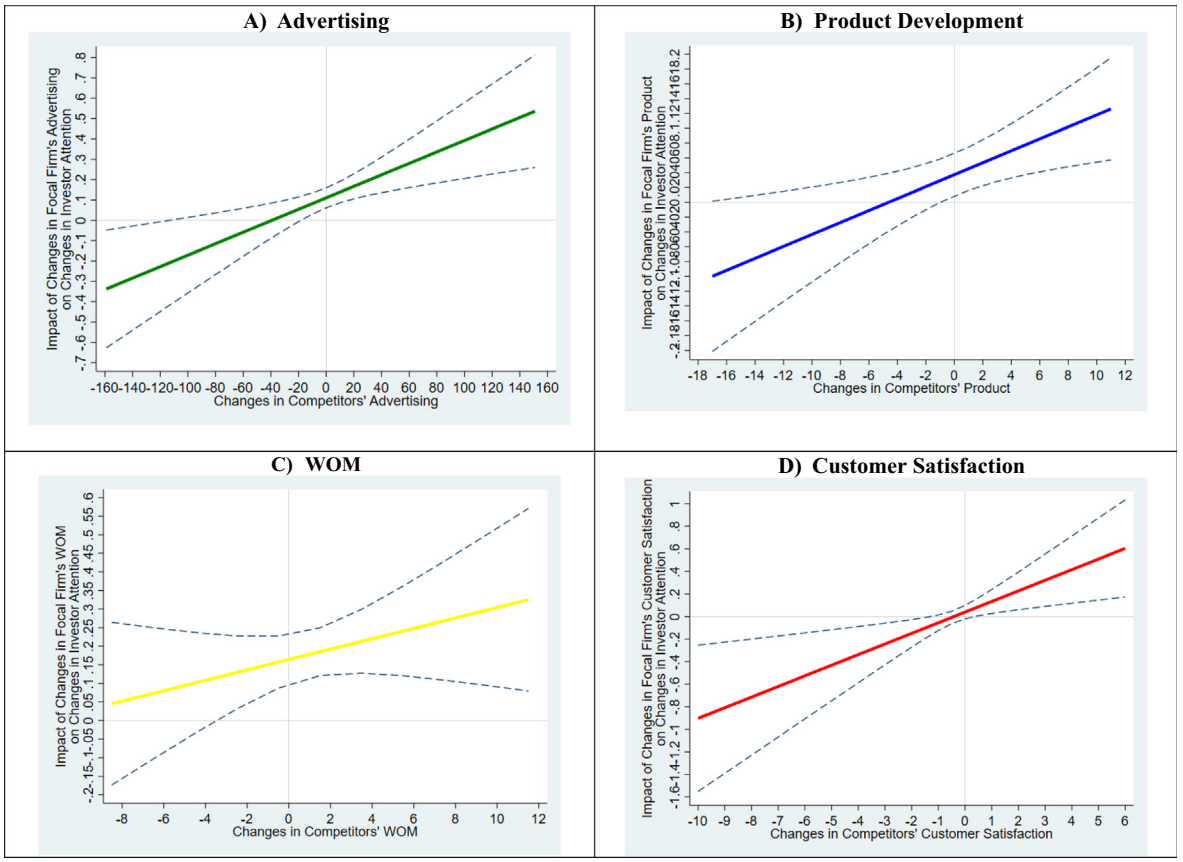

Fig. 2. Interaction Plots.

Selection equation. We find that the natural log of sales is statistically significant (361.78, $p < .01$), indicating that firms with higher sales have a higher probability of YouGov coverage. Thus, addressing YouGov's coverage of firms is important to the reliability of estimation results. We present the selection equation estimation results in Table A2-A4 in Part C of the Web Appendix.

5.1. Test of hypotheses

We calculate the marginal effects of changes in the focal firm's marketing levers on investor attention and plot it against the changes in competitors' marketing levers in Fig. 2.

First, supporting H1a, changes in focal firm's advertising are positively associated with changes in investor attention (0.31, $p < .01$). As expected, the changes in competitors' advertising have a direct positive impact on investors' attention to the focal firm (0.83, $p < .01$). Also, we find that the impact of changes in advertising spending on investor attention is amplified with a positive change in competitive advertising spending (0.01, $p < .05$), supporting H2a. Fig. 2A illustrates that the positive effect of the change in the focal firm's advertising spending on investor attention is higher when the change in competitors' advertising spending increases.

We do not find support for H1b. The changes in product development announcements for the focal firm are not positively associated with changes in investor attention (0.34, $p > .1$). Similarly, we do not find support for H2b. That is, the impact of the changes in the focal firm's product announcements on investor attention does not depend on the changes in the competitors' product development announcements (−0.44, $p > .1$). Another result that is relevant to these findings is the significant positive impact of the changes in competitors' product development announcements on investor attention (7.20, $p < .01$). This result suggests that investors' attention to product development announcements is primarily driven by the competitors' actions. Although the effects are statistically insignificant, Fig. 2B shows the positive impact of the change in competitors' product development announcements on the positive impact of the change in focal firm's product development announcements on investor attention.

We find that an increase in WOM related to the focal firm positively impacts investor attention, which supports H1c (7.16, $p < .01$). The impact of the increase in WOM related to the focal firm on investors' attention to the firm's stock increases with

positive changes in competitors' WOM (1.18, $p < .1$). Thus, we find support for H2c. Fig. 2C shows the positive effect of the increase in the focal firm's WOM on the change in investor attention, which becomes stronger as the change in competitors' WOM increases. This result is striking in the presence of the negative and significant main effect of the increases in competitors' WOM on investor attention to the focal firm's stock (−7.19, $p < .05$). While an increase in competitors' WOM draws investor attention away from the focal firm's stock, the effect of the focal firm's WOM on investor attention becomes larger when there is an increase in competitors' WOM.

Finally, the results suggest that the increase in the focal firm's customer satisfaction is not associated with a change in investor attention, which does not support H1d (0.16, $p > .1$). However, we find that the change in focal firm's customer satisfaction on the change in investor attention increases with a positive change in competitors' customer satisfaction (6.16, $p < .05$), which supports H2d. Fig. 2D illustrates how the increase in the change of competitors' customer satisfaction positively impacts the effect of the change in the focal firm's customer satisfaction on the changes in investor attention. Furthermore, the increase in competitors' customer satisfaction significantly impacts the investors' attention to the focal firm's stock (20.26, $p < .01$). These results suggest that the change in the focal firm's customer satisfaction on investor attention is primarily dependent on the change in the competitors' customer satisfaction.

5.2. Mediating role of investor attention

We hypothesize that investor attention mediates the link between the focal firm's marketing levers and abnormal returns[12]. We find that investor attention significantly impacts abnormal returns (43.75, $p < .01$). We then test the significance of the products of the coefficients of our independent variables in eq. (3), with the coefficient of investor attention in eq. (4) (Baron & Kenny, 1986; Preacher & Hayes, 2004). We use 1000 bootstrapped samples with replacement from our data to obtain the standard error of the product of the regression coefficients. First, advertising has a significant positive indirect impact on abnormal returns (0.000013, 95% CI = [0.000004, 0.000310]). Second, product development announcements has no significant indirect impact on abnormal returns (0.000020, 95% bootstrap CI = [−0.00004, 0.00088]). Third, WOM has a significant positive indirect impact on abnormal returns (0.000310, 95% CI = [0.00001, 0.00064]). Finally, satisfaction has no significant indirect impact on abnormal returns (0.000007, 95% CI = [−0.00021, 0.00022]).

In terms of economic significance, we focus on the indirect effects of the mediation analysis between our focal variables and abnormal returns through investor attention. Considering the market capitalization of 100 million dollars, a 1 million dollar change in advertising expenses from quarter to quarter leads to a positive quarterly change of the firm value of 1.3 million dollars (1.3% of 100 million). In addition, a one-unit change in WOM from quarter to quarter (out of 100 units) leads to a positive quarterly change of the firm value of 31 million (31% of 100 million). Finally, we do not report the dollar estimates for product development and satisfaction as we do not observe significant effects.

5.3. Robustness checks

Model without competitor variables. To show the justification for including the competitor variables in our empirical setup, we estimate models without them and present the results in Table A5 and Table A6 in Part D of the Web Appendix. We note that the significant results for the focal brand variables remain unchanged. In Table A7 (Part D of Web Appendix), we report the results of the three log-likelihoods of the models. The log-likelihood improves as we move from the model without competitor variables (log-likelihood = −34822.15) to the model with competitive variables but without interactions (log-likelihood = −34740.08) to the full model (−34729.03).

Different definitions of competition: To show the robustness of our results to how we define competition, we compute competitors' variables at 3 and 4 SIC digits codes. Our main results hold across these competitive definitions (Tables A8 and A9 in Part D of the Web Appendix).

Different measure of investor attention. In our main analysis, we used Ryans' (2018) measure of investor attention that controls robot IP accesses. Alternatively, Drake et al. (2016) developed a measure that assigns a different rule for robots to be removed from the data. Specifically, this measure removes requests from IP addresses accessing more than five filings in each minute or more than 1000 filings during a day. Thus, we also test the robustness of our results by using this alternative measure. As shown in Table A10, Part D of the Web Appendix, our substantive results remain the same.

Google Search as an additional control variable. As an alternative proxy for investor attention, we use Google search of tickers (Da et al., 2011). We collect the data using the Google Trends API and obtain weekly (or monthly because of data sparsity) searches of the firm's ticker symbol on Google from June 3, 2007, to June 30, 2017, using the Python programming language. Our results remain unchanged (see Table A11, Part D of the Web Appendix).

Mono vs. Multi-brands. There are 258 mono-brand firms (e.g., Nike) and 89 multi-brand firms (e.g., P&G) in the estimation sample. When running our model only for 258 mono-brand firms, we confirm that our substantive results remain the same (Table A12, Part D of the Web Appendix).

[12] Prior studies test for moderated mediation with a "spotlight analysis" for cross-sectional data (Aiken et al., 1991). This method is not appropriate for our sample because of the panel structure of the data.

6. Discussion

6.1. Summary of findings

Research in the marketing-finance interface has shown that marketing levers can affect the firm's stock market value (Edeling et al., 2021; Srinivasan & Hanssens, 2009). This study posits that investor attention to the firm stock is a key route through which marketing information affects financial outcomes. We contribute to the marketing-finance literature by developing and testing hypotheses related to changes in the focal firm's marketing levers (advertising, product development announcements, WOM, and customer satisfaction) on investor attention. We also test the moderating role of competitors' marketing levers in these relationships and whether investor attention mediates the changes in the focal firm's marketing levers on abnormal stock returns. The key findings are the following:

- Focal firm's advertising and WOM positively affect investor attention, while customer satisfaction and product development announcements do not.
- Competitor's advertising, WOM, and customer satisfaction moderate the relationship between the focal firm's advertising, WOM, customer satisfaction, and investor attention.
- Changes in investor attention mediate the relationship between the changes in the focal firm's advertising and WOM and firm value.

6.2. Focal firm's marketing levers and investor attention

The differences among the effects of the various marketing levers on investor attention are noteworthy. These differences might stem from the scope of transmission channels of marketing levers and the transmission speed of marketing levers to firm performance (Cillo et al., 2018). From the mere awareness perspective of investor attention, advertising and WOM may have a greater impact on investor attention than product development announcements and customer satisfaction. Investors are exposed to the firm's advertisements via channels ranging from advertisements in investment magazines to TV and online ads (Liaukonyte & Zaldokas, 2020; Madsen & Niessner, 2019). Similarly, investors get exposed to WOM about firms on many online platforms such as Reddit, as has been recently the case with the Gamestop stock. On such platforms, many investors or individuals produce content about the firm's stock (Blankespoor et al., 2014; Tirunillai & Tellis, 2012). Product development announcements and customer satisfaction may not be present in a similar range of outlets as they are primarily publicized through the business press. The results suggest that product development announcements and customer satisfaction may not draw investor attention due to the awareness disadvantages compared to advertising and WOM.

From the information perspective, there may be differences among the marketing levers with respect to their speed of impact on firm performance. Advertising and WOM have the potential to impact the focal firm's sales faster than product development announcements and customer satisfaction (Sethuraman et al., 2011; You et al., 2015). In contrast, there are conditions that need to be satisfied for product development and customer satisfaction to achieve a meaningful increase in a firm's future cash flows. Investments in a new product may prove fruitful years later. Thus, investors may not be interested in product development announcements as their impact on the firm's future performance is quite uncertain. Firms in our sample may have a history of consistently launching products. Unless there is a significant deviation from their historical product strategy, investors do not incur the cost of searching for information for these firms[13]. Investors may also ignore such announcements due to vaporware (Sorescu et al., 2007).

The results suggest that investors pay attention to a change in the focal firm's customer satisfaction only when there is a change in competitors' customer satisfaction performance. While we hypothesized the impact of the changes in competitors' satisfaction on the relationship between focal firm's customer satisfaction and investor attention, we did not expect such dominating effects of competitor information. From an information effect perspective, the change in customer satisfaction of a firm without the competitive benchmark may not provide information to investors to increase their attention to that firm. Investors may be implementing a wait-see approach to receive competitive information before allocating attention to the firm.

6.3. Moderating effect of competitors' marketing levers

Our findings illustrate the nuanced dynamics between focal firm's and competitors' marketing information in influencing investor attention to the focal firm's stock. Increases in the focal firm's and the competitors' advertising spending have a synergistic effect on investor attention. In addition, competitors' WOM has a dual impact on the change in investor attention. As Fig. 2C shows, the increase in competitors' WOM enhances the impact of the focal firm's WOM on investor attention to the focal firm's stock.

[13] We compute a stock variable as the cumulative sum of product development announcements. The measure takes value of 1 if this variable > its mean + 1 std. dev, else 0. We find a positive effect of this dummy ($p<.1$).

The moderating effect on the relationship between the change in the focal firm's customer satisfaction and investor attention is positive (Fig. 2D). As we do not find support for the main effect of the change in focal firm's customer satisfaction, we conclude that the changes primarily drive investor attention to customer satisfaction at the industry level. This result implies that investors process satisfaction performance information in a relative manner by contextualizing a focal firm's customer satisfaction performance vis-à-vis its competitors. Prior literature highlights the importance of studying customer satisfaction relative to competitors when investigating its link to performance outcomes such as market share (Rego et al., 2013).

We do not find support for the moderating role of competitors' product development activity in the relationship between the changes in the focal firm's product development and investor attention. However, we find that the increase in competitors' product development has a positive impact on the change in investor attention. We formally check the differential effects of focal vs. competitor product development announcements by testing the coefficients $(\alpha_3 + \alpha_4) \neq 0$ in Eqs. (2)–(4). We find that the association between product development announcements for the competitors and investor attention is stronger than the association between the focal firm's product development announcement and investor attention (0.0069, $p = .003$). Prior research on new products provides support for this finding because, in most industries, firms are required to invest in their products (Warren & Sorescu, 2017). So, for investors to pay more attention to the focal firm's product development announcements, the new information has to incorporate novel and innovative products. Else, investors are more likely to allocate more attention to the changes in competitors' product development announcements.

6.4. Implications

Research implications. From a theoretical perspective, the relationship between marketing levers and investor attention is more nuanced than previously thought (e.g., Madsen & Niessner, 2019). Investors seem to allocate their attention differently depending on the type of marketing information. The underlying reason for this behavior is possibly related to the limited attention resources of investors (Barber & Odeon 2008). Investors seem to consider the changes in the firm's and competitors' marketing actions simultaneously when these changes could impact short-term revenues and profitability (i.e., advertising or WOM). However, when there is greater uncertainty between a firm's marketing lever and short-term performance due to a longer time horizon of the marketing action (i.e., product development or customer satisfaction), investors allocate their attention to these levers in the case of industry-level change. By doing so, investors simplify their attention allocation by focusing on potentially more value-relevant information (Hirshleifer, 2001). Consequently, marketing actions influence investors' expectation formation process through the firm's actions as well as its competitors. The relative effect of the firm's and competitors' actions on investor attention depends on the specific marketing lever.

Managerial implications. Managers should recognize the importance of competitors' marketing actions to the attention of investors to their firm's stock. As demonstrated by Fig. 2A-D, the changes in competitors' marketing levers moderate the impact of a change in firm's marketing levers on investor attention. More specifically, managers would benefit from monitoring competitors' product development announcements and customer satisfaction and contextualize their strategies within an industry to better communicate with the market.

Next, marketing analysts can use the EDGAR search data, which is freely available. Metrics such as the number of unique visitors to SEC, downloads of financial statements, etc., are available at a high temporal frequency (daily). Marketing managers can monitor the effects of marketing levers on firm value by using this data.

Finally, our findings suggest that the participation of senior marketing executives in investor relations is a necessary condition to facilitate investors' assimilation of marketing information as investors pay attention to a wide range of marketing levers. It is the marketing executives who we believe have the best knowledge and expertise related to the firm's advertising or WOM as well as the competitors' marketing strategies. Thus, investor relations functions could achieve greater investor attention to a firm by collaborating with marketing functions within their organizations.

6.5. Limitations

First, we only use advertising expenditures and not the advertising content that can interest investors. Second, we do not capture the investors' knowledge of stocks or their level of sophistication in our empirical model due to a lack of data on these factors. Finally, investor attention may vary at a higher frequency than quarterly changes used in this paper. For instance, several studies have shown that investors might react to daily social media sentiment (Tirunillai & Tellis, 2012) or hourly advertising (Liaukonyte & Zaldokas 2020). We think that future research can benefit from more fine-grained data.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijresmar.2021.09.009.

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