INFORMATION CHOICE WITHIN DISCLOSURES, MOBILE DEVICES, AND INVESTOR ESTIMATES OF FUNDAMENTAL VALUE

BY

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DISSERTATION

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ABSTRACT

I examine how information choice within financial disclosures interacts with the screen size used to view the disclosure (traditional computer or small mobile device size) to influence investors’ estimates of fundamental value. One proposed solution to concerns of investors’ increasing information processing costs is providing information choice within financial disclosures, meaning investors have the flexibility to choose the sections and order of information to read within the disclosure. However, theory suggests processing costs could increase, rather than decrease, if the disclosure is viewed on a smaller screen mobile device, which is an emerging technology used by investors. Consistent with predictions, results of an experiment show that high information choice positively affects investors’ effort and information integration when estimating fundamental value if the disclosure is viewed on a traditional screen. Conversely, high information choice negatively affects investors’ effort and information integration if viewed on a small screen. These findings suggest screen size could be an important moderator of some disclosure presentation effects, which is increasingly important as more investors use mobile devices to access, read, and trade on financial information. My findings also caution firms and regulators about expanding the use of disclosures providing information choice without considering the screen size used to access the disclosure.
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CHAPTER 1
INTRODUCTION

Regulators, accounting firms, and academics are concerned that growing disclosure volume is increasing investors’ information processing costs (Ernst and Young 2014; KPMG 2011; SEC 2013), causing investors to allocate capital less efficiently (Lawrence 2014; Miller 2010) and delaying the impounding of information into price (You and Zhang 2009, Cohen and Lou 2010). Investors’ increasing use of smaller screen mobile devices (e.g., smartphones, wireless PDAs, etc.) to access and read financial disclosures is likely intensifying the problem. Small screens display disclosures in a variable spatial layout, so information is even more difficult to process than when displayed in a fixed spatial layout (i.e. traditional computer size screen). One proposed solution is leveraging Internet technology to change the presentation of disclosures for both mobile and traditional device access. Specifically, some suggest providing information choice within disclosures, which I define as providing investors the flexibility to choose the sections and order of information to read within the disclosure, is an especially mobile friendly presentation option (PR Newswire 2013). However, theory suggests that high information choice together with a variable spatial layout (i.e. small screen) could increase, rather than decrease, processing costs and negatively impact investors’ judgments. In this study I examine how information choice within disclosures interacts with spatial layout (operationalized as screen size) to influence investors’ estimates of fundamental value.

Firms vary in whether they provide information choice within disclosures. Traditionally firms provide all information in a continuous PDF or web-based document so after investors choose to read a disclosure, they make no further choices within the disclosure. For example, Apple’s 2015 third quarter press release is a web-based disclosure containing all information on
continuous pages. Other firms are increasingly providing information choice within disclosures. For example, Microsoft’s 2015 fourth quarter press release splits information into clickable tabs. The top of the page includes tabs linking to the press release and webcast, financial statements, performance narrative, KPIs, and segment results (Appendix A contains examples of high and low choice disclosures). Investors may choose the sections and order of information they want to read by clicking on the tabs. Firms are providing information choice within a variety of other disclosures, including annual reports, press releases, proxy statements (Lin 2015), and SEC disclosures (SEC 2015). Further, newswires now offer high choice disclosures, consulting firms continue to promote their use, and investors increasingly request them (Business Wire 2014; PR Newswire 2014; Roach 2014). Many of these disclosures are designed to maintain information choice functionality when accessed on mobile devices.

Investors increasingly use mobile devices to access, read, and trade on financial information (Fidelity 2014). For example, in 2014 mobile devices accounted for 25% of visits to investor relations websites (Roach 2014) and 25% of visits to PR Newswire press releases, and in 2015, these types of mobile visits are expected to increase to 50% and 31%, respectively (PR Newswire 2014a, b; Roach 2014). Further, in a recent survey, Fidelity investors reported performing sophisticated investing tasks on mobile financial apps, including technical research (43%), fundamental research/reading analyst reports (44%), and trading (41%) at least once a month. Overall, major brokerage houses estimate that 15% to 20% of all retail trades are now coming from mobile devices (Carey 2014; Patel 2014), ultimately impacting market activity (Brown, Elliott, and White 2014; Brown, Stice, and White 2015).

One of the most noticeable and fundamental differences between mobile devices and personal computers (i.e. desktops and laptops) is the smaller physical screen size. Computers
have an average screen size of 11 to 27 inches while mobile phones have an average screen size of just 3 to 6 inches. Smaller screens display less of a document at one time, relative to a traditional larger screen, and thus require incremental scrolling to read a document. Further, information is no longer in a fixed spatial location. Instead, information is in a variable spatial location as it could appear at the top or bottom of the screen, depending on how much scrolling the reader has completed. Variable spatial layouts increase the difficulty of relocating or recalling information and integrating information from various locations in a document (Piolat et al. 1997). In other words, a small screen increases investors’ processing costs.

I draw on prior information processing research to develop my predictions. Decision makers adapt their information processing effort based on features of the task, including attributes of information displays (Kleinmuntz and Schkade 1993; Payne 1982; Payne et al. 1993). Specifically, decision makers trade off the benefits and costs of exerting effort to process information. Attributes of information displays, such as information choice and spatial layout (hereafter screen size), affect the benefits and costs of exerting effort.¹ I predict that actively choosing the sections and order of information to view in a high choice disclosure on a traditional screen encourages investors to exert more effort, so their estimates of fundamental value reflect more information integration. However, making choices and navigating small screens both draw on the same pool of limited resources necessary to engage in effortful processing (Schmeichel et al. 2003; Vohs et al. 2008). In other words, high choice together with small screens increase the costs of exerting effort. Therefore, I expect investors will exert less effort when they view disclosures with high choice on a small screen, ultimately causing estimates of fundamental value to reflect less information integration.

¹ I refer to the construct of spatial layout at the operational level (i.e. screen size) throughout the paper for expositional simplicity.
To test my predictions, I use a 2 x 2 + 1 between-subjects experimental design, manipulating information choice and spatial layout (i.e. screen size). In the experiment, graduate business student participants assume the role of prospective investors evaluating information provided in a press release about a firm to estimate its fundamental value. I manipulate information choice by providing all press release sections on tabs which participants can navigate sequentially by clicking on “next” and “back” buttons (“low choice”) or allowing participants to choose the sections and order of the press release they view via clickable tabs (“high choice”). I manipulate spatial layout (i.e. screen size) by presenting the press release in a traditional computer size box (“fixed spatial layout”) or a small mobile device size box (“variable spatial layout”) on the computer screen. To enhance external validity, I also run an additional small screen condition where participants use their own personal mobile devices to access a press release with high choice. I expect other mobile device features (i.e. handheld, ability to change screen orientation, etc.) increase processing costs even further, thus decreasing investors’ effort and information integration. I measure information integration by asking participants to estimate fundamental value. If participants integrate information about a transitory gain described on one tab with the financial statements on another tab, they should notice that earnings fell short of the prior year. Participants who do not fully integrate the information in the press release will estimate higher fundamental value. I measure participants’ effort by tracking the time they spend reading the disclosure and estimating fundamental value. Participants also answer questions that measure processing costs and other post-test and demographic questions.

Results support my prediction that the influence of information choice on investors’ estimates of fundamental value depends on the screen size used to view the disclosure. Specifically, investors’ estimates of fundamental value reflect more information integration.
when they have high choice relative to low choice on a traditional screen. In contrast, investors’ estimates of fundamental value reflect less information integration when they have high choice on a small screen relative to a traditional screen or low choice on a small screen. Consistent with theory, high choice on a traditional screen prompts investors to exert more effort. However, high choice together with a small screen make the disclosure more difficult to process, so investors exert less effort. Results are inferentially identical when I manipulate high choice on a small screen using an actual mobile device. I provide some evidence that actual mobile devices further increase investors’ processing costs, causing investors’ estimates of fundamental value to reflect less information integration. Further, results are robust to participants’ information acquisition, mobile device usage, and innate processing ability. Supplemental analyses suggest that the price investors are willing to pay per share follows a similar pattern as their estimates of fundamental value.

This study makes several contributions. First, I contribute to the literature investigating how narrative presentation attributes impact investors’ ease of processing and subsequent judgments (see Libby and Emett 2014 review). Specifically, I contribute to the medium presentation attribute line of research in two ways. Compared to traditional text-only mediums, new disclosure mediums provide a rich sensory experience that attract attention and are engaging. For example, examples of new disclosure mediums examined in prior research include XBRL (Hodge, Kennedy, and Maines 2004), infographics (Elliott, Grant, and Rennekamp 2016), video (Elliott, Hodge, and Sedor 2012), and social media (Elliott, Grant, and Hobson 2016; Elliott, Grant, and Hodge 2016). Consistent with proponents’ claims, I find that online disclosures providing information choice on a traditional screen encourage more effortful processing than static online disclosures, ultimately improving investors’ information
integration. I also introduce screen size to the accounting literature, which influences processing costs and investment judgments. I find that a small screen combined with a new medium disclosure decreases investors’ information integration. My results suggest screen size could be an important moderator of other medium effects documented in prior research. These findings are particularly important as investors are expected to increasingly use mobile devices to access, read, and trade on financial information (Fidelity 2014; PR Newswire 2014).

Second, I contribute to the literature on how technology impacts investors’ receipt and processing of disclosures (Miller and Skinner 2015). Computers and the internet allow investors to access disclosures electronically (Ashbaugh, Johnstone, and Warfield 1999; Ettredge, Richardson, and Scholz 2002; Hodge 2001), via Google searches (Drake, Roulstone, and Thornock 2012) and in open webcast conference calls (Bushee, Matsumoto, and Miller 2003). I contribute by isolating the impact of information choice, which differs in several ways from previous experimental work examining online disclosures. Specifically, Hodge (2001) finds that hyperlinking two disclosures causes investors to blend the information when evaluating the firm. In my study investors choose to view tabs of information in one disclosure. Hodge et al. (2004) and Hodge, Hopkins, and Wood (2010) find that presentation of related information in close proximity (i.e. on the same screen) improves investors’ information integration. In my study I hold information proximity constant at a “low” level by presenting related information on different tabs. I also contribute to recent archival literature examining the consequences of mobile technology for trading (e.g. Brown et al. 2014; Brown et al. 2015). I provide evidence of a potential cost of mobile devices in addition to mobile devices being distracting (e.g. Brown et al. 2014). Specifically, I find that small screens increase processing costs because information is not in a fixed spatial location.
Finally, my study has practical implications for regulators, investors, and managers. The SEC suggests providing information choice as one way to reduce investors’ processing costs. My results that information choice combined with a small screen *increase* rather than decrease investors’ processing costs should inform the SEC as it continues disclosure reform initiatives. Second, investors increasingly report performing complex financial statement analysis tasks on their phones (Fidelity 2014). My evidence that information choice together with smaller screens results in lower information integration should caution investors about performing complex tasks on their phones, especially as disclosures increasingly feature information choice. Finally, my study also has practical implications for managers. Firms continue providing disclosures with information choice for computer and mobile access. My results suggest high choice disclosures improve investors’ information integration when viewed on traditional screens, but that firms should consider alternative presentation forms for mobile access.
CHAPTER 2
BACKGROUND AND LITERATURE REVIEW

For many years, the SEC has promoted “the vital role of the Internet and electronic communications in modernizing the disclosure system under the federal securities laws and in promoting transparency, liquidity and efficiency in our trading markets” (SEC 2008). This commitment to modernizing disclosures is evident in many SEC decisions. For example, in 2008 the SEC approved company websites as an acceptable disclosure channel under Regulation Fair Disclosure. The SEC further encouraged companies to present their website disclosures in an innovative, creative, and interactive way, rather than in a format comparable to paper-based information (SEC 2008).\(^2\) Traditionally, firms provided online press releases (i.e. quarterly and annual announcements of financial results) and annual reports as PDFs or web-based documents with all information in continuous pages or screens. However, firms are increasingly providing investors information choice within disclosures as firms split information provided in online disclosures into clickable tabs.

Traditionally, investors report accessing and using financial information via computers to make investment decisions. However, investors are increasingly using mobile devices to access, read, and trade on information about firms (MarketWatch 2014).\(^3\) Investors can access financial

\(^2\) The SEC’s interest in modernizing disclosures extends to mandated disclosures as well. For example, in 2009 the SEC began requiring public companies to file their annual financial statements with the SEC using interactive tagged data called Extensible Business Reporting Language (“XBRL”) (SEC 2008). The requirements were phased in over a couple of years, and finally in 2014 the SEC started enforcing XBRL filing requirements by sending letters to public companies failing to meet all requirements (Cohn 2014). In addition, the SEC intends to eventually replace the static EDGAR system with a fully interactive filing system called the interactive data electronic applications (IDEA) system. The SEC is also increasingly interested in providing interactivity within 10-K or S-1 disclosures. The SEC has even mentioned starting a Commission-authorized pilot program to evaluate disclosure interactivity. In the program, volunteer companies would produce websites of disclosure information drawn from existing SEC filings and feedback would be solicited from investors (SEC 2015).

\(^3\) Generally, the use of mobile devices has expanded significantly in the United States. As of December 2014, there are approximately 355 million wireless subscriptions in the U.S., up from 159 million in December 2003. The number of wireless subscriptions in the U.S. now exceeds the number of people in the U.S. (CTIA 2013). Americans are increasingly using their mobile devices for internet access. In 2014, for the first time Americans used mobile
disclosures by using a mobile internet browser to navigate to a third party intermediary, the SEC, or exchange, brokerage house, and firm investor relations websites. In 2014 mobile devices accounted for 25% of visits to investor relations websites (Roach 2014) and 25% of visits to PR Newswire press releases. In 2015, these types of mobile visits are expected to increase to 50% and 31%, respectively (PR Newswire 2014; Roach 2014). Investors can also download applications, or “apps”, which are self-contained programs for mobile devices. Many third party news intermediaries offer apps, including news outlets like Bloomberg, TheStreet, MarketWatch by WSJ, and CNBC. The NASDAQ exchange offers an app featuring real-time last sale data, stock quotes, and other financial news. Finally, investor relations apps typically provide information about stock-related data and company communications such as presentations, videos, audiocast conference calls, and fact sheets, just like investor relations websites. A search on the iOS App Store reveals over 250 companies have investor relations apps, including firms like Citi Bank, Shell, and Walmart.4

Investors also report performing complex investing-related tasks on their mobile devices. For example, more than 1.8 million proxy ballots were cast from a mobile device in 2014, a 500% increase from 2011 (Murphy 2015). Further, a recent survey of Fidelity investors reported performing sophisticated investing tasks on mobile apps, including technical research/charting (43%), fundamental research/reading analyst reports (44%), and trading (41%) at least once a month. Investors can complete trades from most of the major brokerages’ mobile apps and major brokerage houses estimate that 15% to 20% of all retail trades are now coming from mobile devices more than desktops to access the internet (comScore 2014). In fact, 45 million Americans use mobile phones as their primary internet access device (CTIA 2013). This time is spent on an increasing variety of activities, including web browsing, email, social media, online banking, shopping, and investing activities.

4 Companies have a few options to obtain an IR App. First, companies like theIRapp offer turn-key investor relations apps for publicly traded companies. Second, companies already using the Nasdaq’s IR website hosting service are now provided with the option of a mobile app. Third, companies can develop proprietary apps.
devices, up from 2% to 7% two years ago (Carey 2014; Patel 2014). More than half of investors (53%) indicated they placed their first mobile trade in the past 12 months, suggesting that mobile trading may become increasingly popular (Fidelity 2014).

2.1 The Influence of Earnings Presentation Attributes on Investors’ Decisions

I rely on prior information processing research to develop predictions about how informationally-equivalent disclosures can have different effects on investor judgments and decisions depending on presentation attributes. Since investors have limited processing resources, they often make trade offs when processing information (Simon 1978). For example, rather than use effortful (i.e. analytical) processing to unwind differences in information presentation, they often use less effortful (i.e. heuristic) processing and consider the information as presented (Payne 1982; Payne et al. 1993). Therefore, small differences in information presentation have significant implications for investors’ decisions. Presentation attributes can affect both information acquisition and integration, which are two stages necessary to make an investment decision. Information acquisition occurs when investors identify and read specific pieces of information sufficiently well to recall that information. Information integration involves evaluating the characteristics of the information and assimilating the various pieces of information to arrive at an overall judgment or decision (Elliott, Hodge, Kennedy, and Pronk 2007; Hodge et al. 2004; Maines and McDaniel 2000).

Prior research has found that several narrative presentation attributes impact investors’ judgments and decisions (Libby and Emett 2014). For example, the location of amounts within narratives (Elliott 2006), readability (Li 2008; Miller 2010; Rennekamp 2012; You and Zhang 2009), timing (DellaVigna and Pollet 2009; Hirshleifer et al. 2009), and medium are all narrative disclosure presentation attributes that influence investor decisions. Presentation attributes can
affect both decision stages (i.e. acquisition and integration) by changing investors’ processing
costs, or the cognitive difficulty of extracting information (Bloomfield 2002). Information with
higher processing costs is less likely to be acquired and integrated than information with lower
processing costs (Elliott, Hobson, and White 2015; Hirshleifer and Teoh 2003). As a result,
investors are less likely to base their investment decisions on information with higher processing
costs (Bloomfield 2002). Consistent with this, archival research finds that high processing costs
affect investors’ capital allocation and market outcomes. For example, when processing costs are
high, investors trade less (Miller 2010), allocate less capital, and have significantly lower returns
(Lawrence 2013). Further, the impounding of information into price is delayed for firms with
difficult to process disclosures (You and Zhang 2009, Cohen and Lou 2010).

To summarize, prior research has found that narrative presentation attributes can
influence investors’ judgments and decisions. At least part of this effect is because investors fail
to acquire information presented in a format with high processing costs. Moreover, even if
acquired, investors might also fail to integrate related information if the information is presented
in a format with high processing costs.

2.2 The Effect of Attributes of Information Displays on Decision Strategies

As discussed above, decision makers adapt how they process information based on
features of the task (Payne 1982; Payne et al. 1993), including attributes of information displays
(Kleinmuntz and Schkade 1993; Schkade and Kleinmuntz 1994). Specifically, decision makers
trade off the benefits and costs of different decision strategies when they “decide how to
decide”. Attributes of information displays facilitate some decision strategies and hinder others

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Every cognitive task can be described on a continuum from effortless to highly effortful, which produces a
corresponding metacognitive experience ranging from fluent to disfluent (Alter and Oppenheimer 2009). Decision
makers likely also consider processing fluency when weighing the costs and benefits of a particular decision
by altering the benefits and costs of the strategy. Prior research highlights three important conceptual attributes of information displays: form, organization, and sequence. New information technologies introduce many new examples of each of these three conceptual attributes of information displays that could influence investors’ decision processes. Below I outline new examples of these attributes of information displays.

*Form* refers to whether information appears in numerical, verbal, or pictorial form (Kleinmuntz and Schkade 1993). Recently, two new trends in online financial reporting are changing the form of information displays. First, firms are providing separate summarized numerical information on the investor relations portion of the website. These “financial highlights” or “financial factbooks” tabulate key facts and figures without long narratives that verbally describe performance. Second, firms are depicting quantitative performance information in a style that highlights pictures rather than words. For example, Target uses different sized images of water drops to represent a decrease in water use in addition to word depictions. This new example of the form attribute of information display is increasingly prevalent in a variety of disclosures, including press releases, annual reports, and CSR reports. Specifically, in 2013, 26 percent of the Fortune 100 annual reports and 52 percent of the Fortune 100 CSR reports highlight infographic depictions of financial information (Elliott, Grant, and Rennekamp 2016). Prior research suggests that numerical form or pictorial form will encourage investors to use a more effortful decision strategy relative to a verbal form (Huber 1980; Stone and Schkade 1991).

*Organization* refers to the structure of information. Prior research finds that the organization of information across different sheets of paper increases the costs of processing information across sheets of paper (Bettman and Kakkar 1977; Bettman and Zins 1979; strategy. For example, disfluent information sometimes triggers a more effortful strategy (Alter, Oppenheimer, Epley, and Eyre 2007).
Jarvenpaa 1989). Prior research in accounting extends this research on organization to financial information displayed on computer screens. For example, information in close proximity displayed on the same computer screen reduces the costs of integrating information than when separated on different computer screens (Hodge, Hopkins, and Wood 2010). Similarly, related information presented in close proximity and linked by XBRL tags reduces the costs of integrating that information than when the information is not linked by XBRL tags (Hodge, Kennedy, and Maines 2004). An emerging technology—small screen mobile devices—is introducing new organization issues that affect the costs of processing information. Specifically, even holding information proximity constant, smaller screens increase the costs of effortfully processing information because information is in a variable spatial layout.

*Sequence* refers to the order in which individual items or groups of items appear. Some prior research suggests that initially searching information listed first is a less costly strategy (Schkade and Kleinmuntz 1994), consistent with salience effects documented in prior accounting literature. Specifically, information presented first is integrated more in investors’ judgments than information presented later (Elliott 2006). However, a new trend in online financial reporting is changing the sequence of information displays. Specifically, firms are increasingly providing investors information choice within disclosures. In other words, firms are leveraging technology to split information provided in online disclosures into clickable tabs rather than providing the information in continuous pages or screens. This new attribute could prompt investors to use a more effortful directed information search strategy to choose the sections and order of information to read according to their individual preferences. Information choice could increase the benefits of effortfully processing the disclosure, causing judgments to reflect more integration of information traditionally presented later within disclosures.
To summarize, new information technologies introduce many new attributes of information displays that could influence investors’ judgments. In this study, I examine information choice and screen size because both are salient and increasingly prevalent attributes of information displays that I expect will interact to influence investors’ decision strategies and ultimately investment judgments.
CHAPTER 3

THEORY AND HYPOTHESIS DEVELOPMENT

3.1 Information Choice Within a Disclosure

Information choice within disclosures is an attribute that encourages investors to use more effort (Ariely 2000; Warnick et al. 2005). Investors must actively choose which tabs to click and in what order when reading disclosures with high information choice. Investors’ attention is more focused and they are more engaged when continually choosing which tabs to click compared to passively reading a disclosure with low information choice. I predict that actively choosing the tabs and order of tabs to view on a traditional screen encourage investors to exert more effort, so their estimates of fundamental value reflect more information integration.

This prediction is consistent with prior research in psychology on information choice or information pursuit. This research finds that making choices causes decision makers’ judgments to reflect more integration of that information than when it is supplied without an explicit choice (Bastardi and Shafir 1998; Redelmeier, Shafir, and Aujla 2001). Accounting researchers have extended this work to financial statement analysis and auditing contexts. First, Nelson and Tayler (2007) found that when users performed the analysis necessary to transform the financial statements to appear as if disclosed information had been recognized, that information affected users’ judgments more than it would have if it had been recognized initially. Second, Smith et al. (2015) found that auditors who chose to obtain information integrated that information more in an inventory obsolescence scenario than auditors provided the information without explicitly choosing to obtain it.

I extend prior work on information choice in three ways. First, prior experiments on information choice explicitly ask participants if they would like to view additional information.
In my setting, the clickable tabs simply provide participants the flexibility to choose the sections and order of information to read. This natural feature of clickable tabs allows me to examine the influence of choice without interrupting investors’ natural processing. Second, prior research provides participants the choice of viewing a single information item. In my setting, participants choose among multiple tabs of information, which is more consistent with the complexity of choices investors face in the natural investment setting. Finally, I examine screen size as a moderator, which is becoming increasingly important as more investors use mobile devices to access and read clickable disclosures.

3.2 The Interaction of Information Choice and Screen Size

Investors increasingly report using smaller screen devices to access, read, and trade on financial information. A significant difference between mobile devices and computers (i.e. desktops and laptops) is the smaller physical screen size.\(^6\) Specifically, computers have an average screen size of 11 to 27 inches while mobile phones have an average screen size of just 3 to 6 inches.\(^7\) A smaller screen displays less of a document at one time, so incremental scrolling is necessary to read the document relative to reading the document on a larger screen. Scrolling means that, since information “overflows” off the screen out of immediate view, users must access this off-screen information via a toolbar, mouse, finger, or other pointing device. An

\(^6\) Mobile devices differ from computers in several other conceptual ways. For example, mobile devices are portable, handheld, and provide the ability to change screen orientation by rotating the device. Mobile devices also typically do not have a keyboard. Instead, the entire screen is touch-sensitive, requiring a finger or stylus pen to act as a mouse. I hold constant these other conceptual differences and focus on screen size. However, I perform a robustness check in section 4.2 where participants use actual mobile devices to complete the experiment.

\(^7\) While the average size of new smartphones has increased from 2.6 inches in 2007 to 4.9 inches in 2014, new smart devices are again shrinking the size of screens. For example, smartwatches like Apple Watch, Pebble, and Sony Smartwatch provide the same capabilities of other mobile devices at an even smaller screen size of 1 to 2 inches. Analysts expect 25 to 40 million smartwatches will ship in 2015 (Hamblen 2015).
important consequence of this incremental scrolling is that information is no longer in a fixed spatial layout on the screen.\footnote{For expositional simplicity I refer to a traditional screen as a fixed spatial layout and a small screen as a variable spatial layout. In the natural setting, spatial layout can be thought of as a continuum with completely fixed at one end (i.e. disclosures with distinct pages viewed either in hard copy or on screen) and completely variable at the other end. Research in information technology finds a negative relationship between the degree of variable spatial layout and processing costs (Piolat et al. 1997; Sanchez and Branaghan 2011; Sanchez and Goolsbee 2010; Sanchez and Wiley 2009). However prior research finds mixed results of variable spatial layouts on participants’ ultimate judgments. I contribute to this literature by examining the interaction of spatial layout and information choice, which provides a potential explanation for prior disparate findings.}

I expect a variable spatial layout (i.e. small screen) to increase investors’ processing costs in two ways. First, readers typically acquire both information and its spatial location on a page and within a document (Rothkopf 1971; Lovelace and Southall 1983). This spatial memory enables a reader to easily find information again and also improves subsequent recall (Lovelace and Southall 1983). Small screens change the location of information because information is not in a fixed spatial layout. The information could appear at the top or bottom of the screen depending on how much scrolling the reader has completed. As a result, readers cannot use the spatial location on the page as a visual cue to relocate or recall information. Instead, readers must create a memory for information based on its location relative to other information, which increases processing costs to relocate and recall that information (Piolat et al. 1997). Second, small screens also increase processing costs because the scrolling movement on the screen in peripheral vision unintentionally attracts attention. The act of scrolling moves read text off the screen so unread text can appear on the screen. Since movement in peripheral vision involuntarily captures attention (Remington et al. 1992, Wieczorek et al. 2014), even if a reader is carefully reading while scrolling, the peripheral scrolling movement attracts attention and increases processing costs.
Prior research finds that decision makers adapt their information processing strategies depending on features of the task (Payne 1982; Payne et al. 1993). If the costs of processing information outweigh the benefits, investors are more likely to use less effort (Payne 1982). Making choices and navigating small screens both draw on the same pool of limited processing resources necessary to use effortful processing (Schmeichel et al. 2003; Vohs et al. 2008). In other words, high information choice together with small screens increase the costs of exerting effort. Therefore, I expect investors will exert less effort when they have high choice in an environment with already high processing costs (i.e. small screens), ultimately causing decisions to reflect less integration of information.

To summarize, I expect information choice within a disclosure viewed on a traditional screen to increase investors’ effort, causing estimates of fundamental value to reflect more information integration. However, I expect that information choice when processing costs are high (i.e. a small screen) to decrease investors’ effort, causing estimates of fundamental value to reflect less information integration. These differing effects of information choice should result in an interaction between information choice and screen size, which is formally hypothesized as follows:

**H1:** When estimating fundamental value, high information choice will positively (negatively) affect investors’ information integration when they view the disclosure on a traditional (small) screen.\(^9\)\(^10\)\(^11\)

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\(^9\) Neoclassical economics without the assumption of bounded rationality would predict invariant estimates of fundamental value across conditions. Therefore, observing differences in estimates across conditions indicates bias.

\(^10\) My predictions for the dependent variable are at the construct level (i.e. integration). In my setting, if participants integrate information about a transitory gain, estimates of fundamental value will be lower. Therefore, the prediction at an operational level is: investors’ estimates of fundamental value will be lower (higher) when they have high choice on a traditional screen (small screen) than when they have high choice.

\(^11\) I do not make a directional prediction about information integration when investors view a disclosure with low choice on a small screen compared to a traditional screen. Investors could perceive that a small screen significantly increases processing costs, so they decrease their effort and ultimately integrate less information. However, this
CHAPTER 4

EXPERIMENTAL METHOD

To test my predictions, I conduct an experiment with a 2 x 2 + 1 between-subjects design, with information choice and screen size as manipulated independent factors. I manipulate information choice by providing participants high (clickable tabs) or low (no clickable tabs) choice over the sections and order of information they view in a press release. I manipulate screen size by presenting the press release on a traditional computer size screen or a small mobile device size screen. I include an additional small screen condition where participants use their own personal mobile devices to access a press release with high choice.

4.1 Judgment and Decision-Making versus Experimental Economics Style Design

I choose a behavioral judgment and decision-making (“JDM”) style experiment rather than an experimental economics style experiment for several reasons. First, I choose a contextually rich JDM setting because I am interested in how presentation attributes influence investors’ information processing. An experimental economics approach necessitates a great deal of abstraction in experimental materials. Participants need to know exactly what is and is not relevant to determine value when making buying and selling decisions. This level of abstraction could create difficulties observing an information processing effect when one exists simply because the judgment task is more transparent than in the natural setting (Kachelmeier and King 2002).

Second, my specific research question minimizes two common concerns about JDM studies. The two common criticisms of JDM settings are the lack of performance-based incentives and lack of market forces, which would potentially drive the suboptimal behavior difficulty could serve as a cue that the task is difficult and trigger more effort, ultimately causing investors to integrate more information (Alter et al. 2007).
away. In my study, students participate in the experiment in exchange for course extra credit. I did not offer performance-based monetary incentives for practical and theoretical reasons. First, in my setting no normative fundamental value benchmark exists to compute participants’ performance-based payment. Normatively, participants should adjust net income for the transitory gain when estimating fundamental value, but could also consider the influence of the transitory gain on the other inputs to the residual income model. Second, providing performance-based incentives likely does not interact with my manipulated independent variables in a way that changes the inferences drawn. Performance-based incentives could improve participants’ performance across all conditions, or even exacerbate the differences I observe across conditions (Bonner and Sprinkle 2002). Further, few experiments have shown that market forces eliminate information processing biases. Even when market forces mitigate a bias, they typically affect the magnitude rather than the sign of the bias. Since directional effects, not magnitudes, are generalized from experiments, a market does not usually alter an experiment’s inferences (Libby, Bloomfield, and Nelson 2002).

4.2 Participants

Participants are 134 graduate business students from a large, public university.12 Participants have taken on average 11.2 accounting courses and 4.3 finance courses. All participants have used financial statements to evaluate a firm’s performance at least once. Overall, 22.4 percent of participants have purchased common stock or debt securities, while 79.1 percent plan to do so in the next five years. I choose student subjects for several reasons. First, I match participants’ knowledge to the task without using more sophisticated subjects than necessary (Libby, Bloomfield, and Nelson 2002). In the task, participants have to integrate a

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12 The Institutional Review Board (IRB) at the affiliated university approved the use of human subjects for the experiment reported in this paper.
transitory gain described in the narrative with the financial statements. I choose graduate business students because they are familiar with different persistence of earnings components and have experience integrating information in this type of task. Second, students have reasonable familiarity with mobile devices (discussed in more detail in section 6.1). Finally, I conduct experimental sessions in a lab to maintain control over the screen size manipulation. Using a lab I can ensure all participants use the same size computer so the manipulation appears identical for every participant. Participants complete the study via an online instrument within the lab.

4.3 Task and Procedures

Participants arrive at a computer lab session, sit at a computer, and are randomly assigned to a condition by the online instrument. I instruct participants to assume the role of an investor evaluating a potential investment. The firm they are considering is FreshHouse, a fictitious firm in the fast-casual restaurant industry. After reading instructions, participants view background information about the firm and its industry and a press release containing summary financial statement information. FreshHouse’s press release narrative and financial statements indicate that reported revenues and net income increased over the prior year. While not explicitly discussed, all income statement line items changed approximately +/- 1% except general and administrative expenses and net income. G&A expenses decreased 6% from the prior year and net income increased 8% from the prior year. The narrative portion of the press release indicates that the “decrease in G&A expenses in 2014 was due to a one-time benefit of approximately $8 million related to the favorable resolution of an insurance settlement”. The firm does not disclose

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13 The materials were constructed from press releases, Forms 8-K and 10-K, and Internet websites for companies operating in the fast-casual restaurant industry.
a non-GAAP earnings per share amount. If participants integrate the transitory gain with the financial statements, FreshHouse’s net income actually falls short of prior period net income.

I choose a setting of a transitory gain without the disclosure of non-GAAP earnings amount per share for several reasons. First, including the transitory gain in the narrative requires participants to integrate this information with the financial statements to determine that the firm’s persistent earnings decreased from the prior period. This allows me to test if high processing costs decrease investors’ ability to integrate information from the narrative and the financial statements. Second, a transitory gain rather than loss is consistent with managers’ reporting incentives. Reporting a non-GAAP earnings per share amount that excludes the transitory gain results in lower non-GAAP earnings than GAAP earnings. Therefore, suppressing non-GAAP earnings per share could cause higher inferences about persistent earnings. Finally, an insurance settlement gain is a common transitory gain described in the narrative (e.g. Baumker, Biggs, McVay, and Pierce 2014). Further, some managers do not report non-GAAP earnings and only describe a transitory gain in the narrative (e.g. Curtis, McVay, and Whipple 2014). After reviewing this information, participants respond to dependent variable measures, manipulation check questions, and other post-test questions.

4.4 Information Choice Manipulation

I manipulate information choice by providing FreshHouse’s press release in either a high choice or low choice format. In both conditions, the top of the screen lists tabs labeled as “Company Overview”, “Industry Conditions,” “Financial Highlights,” “Performance Changes,” “Income Statement,” “Balance Sheet,” and “Financial Ratios.” Also in both conditions, only one section of information appears on the screen at a time. In high choice conditions, participants click on the tabs to display that section of the press release. Participants can click on the tabs in
any order they want and as many times as they want. In low choice conditions, participants cannot click on these tabs to move throughout the press release. Instead, they must click “next” and “back” buttons to move sequentially through the press release. I hold constant the amount of information shown at one time and hold constant the categorical nature of the tabs across conditions to isolate the effect of information choice. Images of my manipulations are included in Appendix C.

4.5 Screen Size (i.e. Spatial Layout) Manipulation

I manipulate screen size by varying whether information is in a large box (i.e. fixed spatial layout) or in a small box (i.e. variable spatial layout) on the computer screen. The large screen box is 11.25 inches wide x 6.5 inches high, which is the size of a 13-in MacBook Pro. Information on each tab fits in the box with no scrolling necessary. The small screen box is 5.44 inches wide x 2.64 inches high, which is the size of an iPhone 6 in landscape mode. I display the small screen box in landscape format so the financial statements fit in the width of the screen without scrolling left or right, which are current mobile-friendly guidelines (Winkler 2015). A scroll bar appears on the right side of the small screen manipulation so participants know scrolling is necessary to view all information in the tab. The large and small screen size manipulations only occur for the press release. The remainder of the experiment—introductory material, dependent variables, and other post-test questions—is completed on a full computer screen without a box on the screen. Images of my manipulations are included in Appendix C.

I present both screen size manipulations on a computer to hold constant all other differences between traditional and small screen devices (e.g. sitting on table versus handheld, mouse versus touchscreen, fixed screen orientation versus ability to change screen orientation, etc.). However, I run an additional high choice/small screen condition using participants’ actual
mobile devices. I expect that actual mobile device features (i.e. scrolling, handheld, ability to change screen orientation, etc.) increase processing costs even further, thus decreasing investors’ effort and information integration. This condition is important to examine because actual mobile devices are a more externally valid manipulation than a small screen manipulated on a computer. In this condition, participants begin the experiment on a computer, but view the firm’s press release on their personal mobile device. Consistent with the primary experiment, the screen size manipulation (i.e. using a mobile device) only occurs for the press release. The remainder of the experiment—introductory material, dependent variables, and other post-test questions—is completed on a full computer screen.

4.6 Dependent and Process Variables

4.6.1 Information Integration—Estimates of Fundamental Value and Adjustments to Net Income

My hypothesis focuses on investors’ information integration. My primary proxy for information integration is participants’ estimates of fundamental value. After reviewing the press release, participants estimate the fundamental value of the firm’s stock. To derive an estimate of fundamental value, participants provide estimates necessary to complete a residual earnings valuation template in a spreadsheet (adapted from Elliott et al. 2014, 2015a). Participants provide their best estimate of the current year’s net income (i.e., they could use earnings as reported or adjust it), forecasts of earnings for each of the four subsequent years, a cost of capital estimate, and an estimated residual earnings growth rate after the fourth year (Penman 2012). The template then calculates and displays the resulting estimate of fundamental value, which participants record in the online survey. Appendix D reproduces one participant’s completed template. I
provide additional support for H1 by using an additional proxy for information integration: the number of participants who adjust net income when estimating fundamental value.

Prior research has proxied for information integration with numerous investment judgment measures. Some measures capture relatively more heuristic judgments, which are investors’ affective responses or “gut feelings.” For example, prior research has asked investors to allocate investment dollars between two or more firms (Elliott et al. 2007; Hodge et al. 2004), judge current and future earnings potential (Elliott 2006), and assess the attractiveness and likelihood of investing in a firm’s stock, or “willingness to invest” (Elliott, Hobson, and Jackson 2011). Other measures capture relatively more analytical judgments, requiring more calculated, effortful processing. For example, prior research has asked investors to estimate a P/E multiple (Clor-Proell, Proell, and Warfield 2014), estimate future cash flows (Hodge, Hopkins, and Wood 2010), or to provide estimates necessary to complete a residual earnings valuation.

In this study I chose residual earnings valuation, an analytical judgment, as a proxy for information integration for several reasons. First, this proxy minimizes measurement error. Heuristic measures introduce the possibility of noise in the dependent measure from participants’ idiosyncratic interpretations of the response scale. As a result of measurement error, I could fail to find a significant effect of my manipulated independent variables on the dependent variable when one actually exists. My measure minimizes this possibility because participants do not need to interpret a response scale. Instead, they either demonstrate information integration by adjusting net income or do not. Second, I maximize construct validity by choosing a proxy that closely maps to the construct. Heuristic measures like willingness to invest likely capture information integration, but could also capture other constructs, for example, assessments of firm risk. The residual earnings valuation template allows me to disentangle these constructs by
separately analyzing information integration based on participants’ adjustments to net income and risk assessments based on cost of capital estimates. Finally, I actually bias against finding support for my predictions by choosing an effort-inducing proxy, which makes my findings even more compelling.

4.6.2 Effort Measure

I measure participants’ effort as the total amount of time spent reading the disclosure and estimating fundamental value (Bettman et al. 1990; Sprinkle 2000). The online platform for my experimental materials tracks participants’ time spent.

4.6.3 Processing Cost Measures and Post-Experimental Questions

I ask three questions to measure participants’ processing costs: 1) “How hard did you have to work in your attempt to understand the contents of the press release?”, 2) “How irritated and/or annoyed did you feel?”, and 3) “How much mental and physical activity was required, e.g., thinking, deciding, calculating, remembering, looking, searching etc.?”. Participants respond to all processing cost questions on a 101-point scale with endpoints 0 (“Very Low”) and 100 (“Very High”) (modified from Hart and Staveland 1988).

Finally, participants answer two manipulation-check questions, and respond to questions regarding their use of mobile devices, demographics, potential alternative explanations, controls, and innate processing ability.
CHAPTER 5

RESULTS

5.1 Manipulation Checks

To assess the effectiveness of the information choice manipulation, I ask participants, “How did you view FreshHouse’s press release?” with answer choices “I could only click next and back buttons and did not have choices over the order I viewed information” or “I could click on orange tabs and had choices over the order I viewed information.” Eighty-seven percent of participants in the primary conditions and 95 percent of participants in the actual mobile device condition correctly answer this question. To assess the effectiveness of the screen size manipulation, I ask participants, “How was the FreshHouse press release formatted?” with answer choices “There was a large box on the screen. I could see all the information in the box at one time without scrolling up and down” or “There was a small box on the screen. I had to scroll up and down to see all the information in the box.” Ninety-five percent of participants in the primary conditions and 95 percent of participants in the actual mobile device condition correctly answer this question. There are no significant differences in correct response rates across conditions for either question (all p-values > 0.77, two-tailed). Thus, it appears my manipulations were successful.\footnote{Results are inferentially identical if I exclude participants who fail either manipulation check.}

5.2 Test of Hypothesis 1—Information Integration

5.2.1 Estimates of Fundamental Value per Share

H1 predicts that information choice will positively (negatively) affect investors’ information integration when they view the disclosure on a traditional (small) screen. If investors integrate information from FreshHouse’s narrative and financial statements, they discover that...
persistent earnings actually fell short of the prior period. Therefore, lower estimates of fundamental value reflect more information integration. Table 1 Panel A reports cell sizes, means, and standard deviations for estimates of fundamental value for the four primary conditions and supplemental actual mobile device condition. Figure 1 displays the pattern of cell means for estimates of fundamental value.

Table 1 Panel B presents a two-way analysis of variance (ANOVA) model for the four primary conditions with estimates of fundamental value as the dependent variable. Results reveal a significant information choice by screen size interaction (p < 0.01).\(^{15}\)\(^{16}\) Table 1 Panel C presents the follow-up simple effects tests for the four primary conditions. Lower estimates of fundamental value reflect more information integration. Results show that investors’ estimates of fundamental value reflect significantly more information integration when they have high choice compared to low choice on a traditional screen ($63.84 < $73.03; p = 0.01, one-tailed). However, investors’ estimates of fundamental value reflect less information integration when they have high choice on a small screen compared to a traditional screen ($70.89 > $63.84; p = 0.04, one-tailed) or low choice on a small screen ($70.89 > $65.34; p = 0.07, one-tailed). Taken together, these results are consistent with H1.

Ex ante I did not make a directional prediction about investors’ estimates of fundamental value when they have low choice on a small screen compared to a traditional screen. Results show that investors’ estimates of fundamental value reflect significantly more information integration...
integration when they have low choice on a small screen compared to a traditional screen ($65.34 < $73.03; p = 0.04, two-tailed). This simple effect is consistent with prior research finding that when information is presented in a way that is difficult to process, this difficulty serves as a cue that the task itself is difficult and prompts more effort (Alter et al. 2007).

I run an additional condition where investors use an actual mobile device to view a disclosure with high information choice. Table 1 Panel D presents planned comparisons confirming that as expected, results are inferentially identical when I manipulate high choice/small screen on an actual mobile device. Specifically, I find that investors’ estimates of fundamental value reflect significantly less information integration when they have high choice an actual mobile device compared to a traditional screen (p < 0.01) or low choice on a small screen manipulated on a computer (p < 0.01). Further, investors’ estimates of fundamental value reflect marginally less information integration when I manipulate high choice/small screen on an actual mobile device compared to a computer (p = 0.07, one-tailed). This is consistent with my expectation that scrolling, resizing text, rotating the phone, etc. required on an actual mobile device increase participants’ processing costs and thus decrease investors’ effort and information integration. I provide process evidence consistent with this increased processing costs explanation in section 5.3.2.

5.2.2 Additional Support for H1: Adjustments to Net Income

For robustness, I also examine the number of investors who adjust net income as additional support for H1. In applying the residual income model, investors can input net income as reported by the firm or adjust it for nonrecurring items. If investors integrate information about the transitory gain described in the narrative with the firm’s financial statements, they will adjust current period net income down. Table 2 Panel A reports the percentage and proportion of
investors by condition who adjust current period net income for the transitory gain for the four primary conditions and supplemental actual mobile device condition.

Table 2 Panel B reports planned comparisons for the four primary conditions. Results show that significantly more investors adjust net income when they have high choice compared to low choice on a traditional screen (p = 0.03, one-tailed). Further, fewer investors adjust net income when they have high choice on a small screen compared to a traditional screen (p = 0.05, one-tailed).

Table 2 Panel C presents planned comparisons confirming that as expected, results are inferentially identical when I manipulate high choice/small screen on an actual mobile device. Specifically, I find that fewer investors adjust net income when they have high choice on an actual mobile device compared to high choice on a traditional screen (p = 0.02, one-tailed) or low choice on a small screen manipulated on a computer (p = 0.10, one-tailed). Taken together, these results provide additional support for H1 that information choice will positively (negatively) affect investors’ information integration when they view the disclosure on a traditional (small) screen. Further, this suggests my theory and results generalize to actual mobile devices, which is a more externally valid manipulation.

5.3 Measures of the Underlying Process

In this section I examine if, as expected, investors integrate more information when they exert more effort (section 5.3.1). I also examine if investors exert less effort when they view a disclosure with high choice on a small screen because processing costs are high (section 5.3.2).

5.3.1 Effort

I expect that investors integrate more information when they exert more effort. I measure effort using the time investors spend reading the disclosure and estimating fundamental value.
Therefore, I expect that high choice will positively (negatively) affect investors’ effort when they view the disclosure on a traditional (small) screen. Table 3 Panel A reports cell sizes, means, and standard deviations for time spent in seconds for the four primary conditions and the supplemental actual mobile device condition.

Table 3 Panel B presents a two-way analysis of variance (ANOVA) model for the four primary conditions with time spent as the dependent variable. Results reveal a significant information choice by screen size interaction (p < 0.01). Table 3 Panel C presents the follow-up simple effects tests for the four primary conditions. Results show that investors spend significantly more time when they have high choice compared to low choice on a traditional screen (p < 0.01, one-tailed). Conversely, investors spend marginally less time when they have high choice on a small screen compared to a traditional screen (p = 0.06, one-tailed). Finally, while not significant at conventional levels, investors spend less time when they have high choice compared to low choice on a small screen (p = 0.13, one-tailed). This final simple effect is not significant when small screen is manipulated on a computer, but is significant when small screen is manipulated on an actual mobile device, as reported below.

I expect actual mobile device features (i.e. handheld, ability to change screen orientation, etc.) increase processing costs even further than a small screen manipulated on a computer, thus decreasing investors’ effort. As reported in Table 3 Panel D, these effort comparisons are statistically significant, as expected, when small screen is manipulated on an actual mobile device. Results reveal that investors spend significantly less time when they have high choice on an actual mobile device compared to on a traditional screen (p = 0.01, one-tailed) or low choice on a small screen manipulated on a computer (p = 0.03, one-tailed).17 Taken together, this

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17 The data for the time measure is not normally distributed, so I also run nonparametric tests. Results are inferentially identical using nonparametric or parametric tests.
provides evidence that high information choice positively (negatively) affect investors’ effort when they view the disclosure on a traditional (small) screen.

5.3.2 Processing Costs

In the previous section, I provide evidence that investors exert significantly less effort when they have high choice on a small screen compared to a traditional screen, especially when small screen is manipulated on an actual mobile device. I expect that investors exert less effort because making choices while clicking tabs together with a small screen increases processing costs. I also expect high choice together with actual mobile device features (i.e. scrolling, handheld, ability to change screen orientation, etc.) increases processing costs even further. I measure investors’ processing costs by asking three questions: 1) “How hard did you have to work in your attempt to understand the contents of the press release?” 2) “How irritated and/or annoyed did you feel?” and 3) “How much mental and physical activity was required, e.g., thinking, deciding, calculating, remembering, looking, searching etc.?”. Investors respond to all questions on a 101-point scale with endpoints 0 (“Very low”) and 100 (“Very high”). Inconsistent with my expectation, processing costs are not statistically different across any of the primary conditions (all p-values > 0.18). For example, participants with high choice on a small screen report statistically similar processing costs as participants with high choice on a traditional screen (46.60 = 52.24, t (50) = 1.35, p = 0.18, two-tailed). However, as expected I do find that participants with high choice on an actual mobile device report higher processing costs than participants with high choice on a traditional screen (mean of 64.95 > 52.24, t (43) = 2.91, p < 0.001, untabulated).

The insignificant differences across my primary conditions are likely due to the order I ask questions in the experiment. In the experiment, participants see the press release containing
the information choice and screen size manipulations, estimate fundamental value, and then answer processing costs questions. I ask the questions in this order to avoid interrupting investors’ natural processing. However, processing costs from the press release and effort exerted to estimate fundamental value both draw on the same pool of cognitive processing resources (Neys 2006). Therefore, asking the processing costs questions after both the press release and fundamental value question likely introduced noise into the measures. I examine this possibility by providing additional out of sample evidence in section 5.3.3.

5.3.3 Processing Costs Out of Sample Evidence

To ensure that high choice together with small screens increase processing costs, I run modified high choice/traditional screen and high choice/small screen conditions. In these conditions, 43 participants from the same population complete the experiment, but answer processing cost questions immediately after viewing the press release and then proceed to estimate fundamental value and finish the rest of the experiment. A Cronbach’s alpha of 0.75 confirms that the three questions are capturing the same underlying construct, with higher (lower) values indicating higher (lower) processing costs. As expected, I find that investors with high choice on a small screen manipulated on a computer report higher processing costs than investors with high choice on a traditional screen (mean processing costs of $42.64 > 31.52$, $t(41) = 2.00$, $p = 0.03$ one-tailed untabulated).\textsuperscript{18}

\textsuperscript{18} Consistent with the primary analyses reported in section 5.2.1, investors’ estimates of fundamental value reflect marginally less information integration when they have high choice on a small screen compared to a traditional screen ($p = 0.08$, one-tailed).
6.1 Examining Alternative Explanations

In the post-experiment questionnaire, I collect several additional measures to rule out potential alternative explanations. I examine whether investors’ information acquisition, mobile device use, or innate information processing ability influence my results.

6.1.1 Alternative Explanations and Controls — Information Acquisition

I ask six multiple choice information acquisition questions to assess investors’ acquisition of specific numerical information and narrative explanations from the press release. The questions ask about information appearing on the top, middle, and bottom of the various tabs. I ask relatively difficult questions to ensure that differences in information acquisition can be detected. On average investors answer 3.82 out of 6.00 questions correctly. The number of questions answered correctly does not differ across conditions (all p-values > 0.33).

Nevertheless, I include investors’ information acquisition scores as a control in my hypothesis test. As expected, I find that the coefficient on information acquisition is significant (p = 0.01), but the coefficient on the interaction of information choice and screen size remains significant (p < 0.01). This suggests that, while information acquisition affects investors’ estimates of fundamental value, acquisition is not driving my results.

One of the information acquisition questions assesses if participants’ acquired that the insurance gain was transitory. I separately analyze only the 72 participants who acquire the transitory gain to provide further support that information integration rather than acquisition drives estimates of fundamental value. An untabulated ANOVA reveals a significant information choice by screen size interaction ($F_{1,73} = 10.84, p < 0.01$). All four follow-up simple effects are
significant (all p-values < 0.02 one-tailed). Taken together, these results are inferentially identical to the primary analyses and consistent with H1.

6.1.2 Alternative Explanations and Controls—Mobile Device Use

I randomly assign participants to an experimental condition to maintain control over extraneous variables that could affect my dependent variable, thus enabling me to make causal inferences. A potential concern is that if I had allowed participants to self-select to an experimental condition, I would not observe an effect of information choice and screen size on estimates of fundamental value. In other words, high mobile experience participants would self-select to small screen conditions and integrate more information when estimating fundamental value compared to participants randomly assigned to small screen conditions. I collect two measures in the post-test about participants’ mobile device use to address this concern.

Specifically, I ask participants about the activities for which they use their mobile device and the amount of time per day they use their device. I find that participants use their mobile devices for a variety of activities, including texting/emailing (99%), phone calls (96% of participants), social media (96%), banking (75%), shopping (53%), school work/work (51%), and reading (40%). I create a mobile activity intensity measure by summing the number of activities for which participants indicate using their mobile device with smaller (larger) values indicating lower (higher) mobile intensity. Further, I find that three percent of participants use their mobile device for 1 – 30 minutes per day, 14 percent use their mobile device for 31 – 60 minutes per day, 45 percent use their mobile device for 61 – 120 minutes per day, 21 percent use their mobile device for 121 – 180 minutes per day, and 15 percent use their mobile device more than 181 minutes per day.
I perform three analyses to address concerns that high mobile experience participants are more likely to integrate information when estimating fundamental value. First, I examine correlations between participants’ mobile device use and estimates of fundamental value. I find that participants’ mobile activity intensity and mobile time are not significantly correlated with estimates of fundamental value ($r_s = 0.005$, $p = 0.95$ two-tailed; $r_s = -0.006$, $p = 0.95$ two-tailed, respectively). Further, I separately calculate correlation coefficients for participants assigned to small screen conditions. Again, I find that participants’ mobile activity intensity and mobile time are not significantly correlated with estimates of fundamental value ($r_s = 0.04$, $p = 0.74$ two-tailed; $r_s = 0.03$, $p = 0.85$ two-tailed, respectively).

Second, I include participants’ mobile activity intensity or mobile time as a covariate in my hypothesis test, and find that the coefficients are not significant (all $p$-values $> 0.55$) and the interaction of information choice and screen size remains significant ($p = 0.01$). Finally, I interact participants’ mobile activity intensity and mobile time with my independent variables. I find that the main and interactive effects of mobile activity intensity are insignificant (all $p$-values $> 0.23$) and the interaction of information choice and screen size remains significant ($p < 0.01$). I also find that the main and interactive effects of mobile time are insignificant (all $p$-values $> 0.16$) and the interaction of information choice and screen size remains significant ($p = 0.01$). Taken together, this provides evidence that high mobile experience participants, the participants most likely to self-select to view disclosures on small screens, are not more likely to integrate information when estimating fundamental value.

6.1.3 Alternative Explanations and Controls—Innate Processing Ability

I measure innate processing ability at the very end of the experiment using the short computerized version of the Automated Operation Span (AOSPAN) task (Foster et al. 2014).
This task requires the simultaneous processing and storage of unrelated information. Specifically, participants are presented with a series of simple math equations and evaluate the equation by clicking a “correct” or “incorrect” button. Participants are then given a letter to remember for a later test. After completing the set, participants select the letters that were presented after the equations from a matrix of 12 possible choices. Participants’ score is the number of letters recalled in the correct serial position. I find that participants’ innate processing ability is not correlated with responses to processing costs questions (all $r < 0.11$ and $p > 0.14$). Further, I find that the innate processing ability score is not significant (all $p$-values $> 0.66$) when included as a control variable in my hypothesis test, leaving my inferences unchanged.

6.2 Supplemental Analysis: Investors’ Willingness to Pay

Thus far I have provided evidence that information choice and screen size interact to influence investors’ estimates of fundamental value. A potential concern is that investors in small screen conditions are less likely to act on their estimates of fundamental value than investors in traditional screen conditions. I address this concern in supplemental analysis by examining if investors’ estimates of fundamental value have implications for the price they are willing to pay for shares of the firm’s stock. Examining price effects also serves as a robustness check of my primary analyses. I expect investors’ willingness to pay displays a similar pattern as estimates of fundamental value and that investors using small screens are not less willing to act on their estimates of fundamental value than investors using traditional screens. Specifically, I expect investors with high choice on a traditional screen are willing to pay less than investors with low choice on a traditional screen. I also expect investors with high choice on a small screen are willing to pay more than investors with high choice on a traditional screen or low choice on a
small screen. In other words, I expect that investors’ willingness to pay is driven by their estimates of fundamental value.

A post-test portion of my materials elicited investors’ willingness to pay. After investors estimate fundamental value, I measure willingness to pay by asking investors to “assume that you have received an inheritance of $100,000 in cash from a distant relative. Please indicate the maximum price per share at which you would be willing to invest the following amounts in FreshHouse’s stock.” I ask the maximum price they would pay to allocate “$50,000, or 50 percent, of your inheritance,” “$25,000, or 25 percent, of your inheritance,” “$10,000 or 10 percent of your inheritance,” and “$5,000 or 5 percent of your inheritance”. Table 4 Panel A reports cell sizes, means, and standard deviations for willingness to pay prices by condition. I measure each participant’s “price profile” rather than asking for a single price at which they would be willing to invest in order to better control for participant-specific determinants of willingness-to-pay. A repeated-measures design reduces participant-specific variation and increases the power of my tests (Stevens 1996; Kutner, Nachtsheim, Neter, and Li 2005). Figure 2 graphically displays the pattern of cell means for willingness to pay prices.

Table 4 Panel B presents a three-way mixed ANOVA. The mixed ANOVA includes information choice and screen size as between-subjects independent variables and investors’ four willingness to pay prices as the dependent variables. Results reveal a significant Percentage of Inheritance Invested within-subjects effect ($F_{1,107} = 156.58, p < 0.001$). As expected, the positive slope indicates that investors would pay more per share to invest smaller portions of their inheritance in the firm’s stock than larger portions. Also as expected, results reveal a significant information choice by screen size between-subjects interaction ($F_{1,107} = 5.92, p$ =

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19 In this supplemental analysis, I exclude two participants who did not respond to the willingness to pay measures.
I further analyze this significant interaction by separately running mixed ANOVAs for traditional screen and small screen conditions.

Table 4 Panel C presents a mixed ANOVA for traditional screen conditions. The mixed ANOVA includes information choice as a between-subjects independent variable and investors’ four willingness to pay prices as the dependent variables. Results reveal a significant Percentage of Inheritance Invested within-subjects effect ($F_{1,51} = 71.21, p < 0.001$). As expected, the positive slope indicates that investors would pay more per share to invest smaller portions of their inheritance in the firm’s stock than larger portions. Also as expected, results reveal a marginally significant information choice between-subjects effect ($F_{1,51} = 3.26, p = 0.08$), and an insignificant within-subjects information choice by percentage of inheritance interaction ($F_{1,51} = 0.82, p = 0.37$). This suggests that investors with high choice on a traditional screen are willing to pay less than investors with low choice on a traditional screen across all percentage levels of inheritance invested.

Table 4 Panel D presents a mixed ANOVA for small screen conditions. The mixed ANOVA includes information choice as a between-subjects independent variable and investors’ four willingness to pay prices as the dependent variables. As with traditional screen conditions, the within-subjects effects indicate prices increase as percentage of inheritance increases ($F_{1,56} = 86.80, p < 0.001$). Results also reveal a marginally significant information choice between-subjects effect ($F_{1,56} = 2.97, p = 0.09$), and an insignificant within-subjects information choice by percentage of inheritance interaction ($F_{1,56} = 2.36, p = 0.13$). This suggests investors with high choice on a small screen are willing to pay more than investors with low choice on a small screen across all percentage levels of inheritance invested.

In untabulated results, I confirm that differences in willingness to pay are driven by
investors’ estimates of fundamental value. When investors’ estimates of fundamental value are included as a covariate in the mixed ANOVA for traditional screen conditions, the between-subjects coefficient is significant \( F_{1,50} = 57.76, p < 0.001 \), and the information choice main effect is no longer significant \( F_{1,50} = 0.001, p = 0.98 \). Similarly, when investors’ estimates of fundamental value are included as a covariate in the mixed ANOVA for small screen conditions, the between-subjects coefficient is significant \( F_{1,55} = 9.05, p < 0.001 \), and the information choice main effect is not significant \( F_{1,55} = 1.60, p = 0.21 \). Taken together, these results suggest that investors in small screen conditions are not less likely to act on their estimates of fundamental value than investors in traditional screen conditions. Further, these results are consistent with theory and are a robustness check for my primary analyses.

6.3 Supplemental Analysis: Investors’ Information Search Strategies

In this section, I examine the information search strategies investors use as they analyze the firm’s press release. Specifically, I examine whether investors use a sequential or directed search strategy (section 6.3.1), the number of direction changes investors make while reading the press release (section 6.3.2), and the total number of tabs investors view (section 6.3.3).\(^{20}\)

6.3.1 Directed versus Sequential Search Strategy

My theory suggests that information choice provides investors the flexibility to choose the sections and order of information to read within a disclosure. In this section I provide evidence that investors viewing a disclosure with high choice actually make choices to view information in a directive search manner according to his/her preferred sequence. I create an “overall search strategy” measure to capture whether investors use a sequential or directed search

\(^{20}\) I use Mouseflow website tracking to capture the tabs participants view and in what order. Mouseflow did not capture tracking information for four participants in the primary conditions or any participants in the additional actual mobile device condition. Therefore, I report results only for the primary conditions.
strategy. I track the order in which participants view each tab and compare the order of each tab view to the order in which the tabs appear on the screen. Each tab view is coded as a 0 if the tab immediately precedes or follows the previous tab view, or is coded as a 1 if the tab does not immediately precede or follow the previous tab view. The tab view codes are summed for each participant and divided by the total number of tabs the participant viewed to arrive at an overall search strategy score. A score of 0 indicates an entirely sequential search strategy while a score of 1 indicates an entirely directed search strategy. Since participants in no clickable tab conditions can only view tabs in sequential order, by design their search strategy must be a perfectly sequential value of 0.

In untabulated results, I examine if investors in high information choice conditions use an overall search strategy that differs significantly from a sequential search strategy (i.e. zero). I find that investors with high choice on a traditional screen use a search strategy that differs significantly from a perfectly sequential search strategy (0.58 > 0.00; t (19) = 5.34, p < 0.001, two-tailed). I also find that investors with high choice on a small screen also use a search strategy that differs significantly from a perfectly sequential search strategy (0.30 > 0.00, t (25) = 2.83, p < 0.01, two-tailed). Finally, I find that investors with high choice on a traditional screen use a more directed search strategy than investors with high choice on a small screen (0.58 > 0.30, t (48) = 2.51, p = 0.01, two-tailed). This provides evidence consistent with theory that information choice provides investors the flexibility to choose the sections and order of information to read within a disclosure. I also provide evidence that investors take advantage of that flexibility to a greater extent when they view a disclosure with high choice on a traditional screen compared to a small screen.

6.3.2 Direction Changes
In the previous section I provide evidence consistent with theory that information choice provides investors the flexibility to choose the sections and order of information to read within a disclosure. However, the design of my experiment forces investors in no clickable tab conditions to view information in a sequential manner. Therefore, in this section I create a “direction changes” measure as an alternative measure of search strategy. I track the order in which investors view each tab. I code 1 every time a participant changes directions (either forward or backward) while reading the press release. The direction changes are summed for each participant and divided by the total number of tabs the participant viewed to arrive at an overall direction changes measure. Lower (higher) values indicate fewer (more) changes in direction. Table 5 Panel A reports cell sizes, means, and standard deviations for direction changes for the four primary conditions.

Table 5 Panel B presents a two-way analysis of variance (ANOVA) model for the four primary conditions with direction changes as the dependent variable. Results reveal a marginally significant information choice by screen size interaction (p = 0.07). Table 5 Panel C presents the follow-up simple effects tests. Results show that investors change directions more frequently when they view a disclosure with high choice compared to low choice on a traditional screen (0.25 > 0.08 direction changes; p < 0.001, two-tailed) or high choice on a small screen (0.25 > 0.17 direction changes, p = 0.07, two-tailed). However, the number of direction changes does not differ when investors view a disclosure with low choice on a small screen compared to high choice on a small screen (0.10 = 0.17 direction changes; p = 0.16, two-tailed) or low choice on a traditional screen (0.10 = 0.08 direction changes; p = 0.64, two-tailed).

6.3.3 Total Tabs Viewed
Finally, I examine the number of tabs investors view within the disclosure as a measure of information search strategy. All investors view all seven tabs within the disclosure, so the number of tabs above seven reflects repeated tab views. Table 6 Panel A reports cell sizes, means, and standard deviations for total tabs viewed for the four primary conditions.

Table 6 Panel B presents a two-way analysis of variance (ANOVA) model for the four primary conditions with total tabs viewed as the dependent variable. Results reveal a significant information choice by screen size interaction (p = 0.05). Table 6 Panel C presents the follow-up simple effects tests for the four primary conditions. Results show that investors view significantly more tabs when they view a disclosure with high choice compared to a low choice on a traditional screen (11.22 tabs > 8.81 tabs; p = 0.02, two-tailed) or high choice on a small screen (11.22 tabs > 9.22 tabs; p = 0.05, two-tailed). However, the number of tabs investors view does not differ when they view a disclosure with low choice on a small screen compared to high choice on a small screen (9.34 tabs = 9.22 tabs; p = 0.90, two-tailed) or low choice on a traditional screen (9.34 tabs = 8.81 tabs; p = 0.56, two-tailed).

In section 5.3.1 I provide evidence that investors exert more effort viewing the press release and estimating fundamental value when they view a disclosure with high choice on a traditional screen or low choice on small screen. In this section, I provide evidence that investors in those conditions differ in their effortful information search strategies. Investors viewing a disclosure with high choice on a traditional screen view more tabs and take advantage of the high choice by using a directive search strategy to choose the order they view the tabs. Conversely, investors viewing a disclosure with low choice on a small screen spend more time viewing each tab rather than moving frequently between tabs.
CHAPTER 7

CONCLUSION

In this study, I provide experimental evidence that the influence of information choice on investors’ judgments depends on the size of the screen used to view the disclosure. Specifically, investors with high choice on a traditional screen exert more effort, so their estimates of fundamental value reflect *more* information integration than investors with low choice on a traditional screen. However, information choice combined with a small screen increase investors’ processing costs. Therefore, investors with high choice on a small screen exert less effort, so their estimates of fundamental value reflect *less* information integration than investors with high choice on a traditional screen or low choice on a small screen. I find the same effect if investors view a disclosure with high choice on a small screen manipulated using a box on a computer screen or on an actual mobile device.

My study has important implications for regulators, managers, and investors. First, managers are increasingly providing clickable disclosures for both traditional screen and mobile screen access. Further, the SEC is currently promoting disclosure reform initiatives to provide clickability within mandated disclosures. My findings caution firms and regulators about expanding the use of clickable disclosures without considering the screen size used to access the disclosure, especially as more investors use mobile devices to access, read, and trade on financial information. My findings also caution investors about performing complex tasks on their phones, especially as disclosures increasingly feature clickability. More broadly, my findings have important implications in the future as technological advances continue to change the devices investors use to access and read financial information. Specifically, creating a functional pairing
between screen size and the amount of information choice within disclosures is important for investors’ processing of the underlying financial information.

My study has several limitations that provide opportunities for future research. First, I limit the amount of information investors receive relative to what is traditionally available on a company’s website so that the task could be completed in a reasonable amount of time. This reduced information biases against my predictions and suggests that information choice and screen size could have a greater impact on investors’ judgments in the natural setting than in my study. Second, I focus on investors’ reactions to information choice rather than on management’s disclosure choices. Future research can examine how managers might intentionally provide information choice to influence investors’ judgments. Third, I use graduate business students as proxies for nonprofessional investors. Future research can examine the influence of mobile devices on older investors or analysts who may differ in their levels of familiarity with using mobile devices to acquire financial information. Finally, I randomly assign participants to a condition rather than allowing participants to self-select information display attributes. Variation exists in firms providing disclosures with information choice and investors’ familiarity and comfort with high choice and small screens. Future research can examine how allowing participants to self-select into an information display condition might mitigate or amplify the effects I observe.
Figure 1
The Effects of Information Choice and Screen Size on Estimates of Fundamental Value—Observed Effects

Figure 1 graphically represents observed mean values for participants’ estimates of fundamental value. If participants integrate information from the press release narrative and financial statements, persistent earnings fell short of the prior period. Therefore, lower estimates of fundamental value reflect more information integration. Table 1 presents descriptive statistics for estimates of fundamental value.
Figure 2
The Effects of Information Choice and Screen Size on Investors’ Willingness to Pay Price

Figure 2 graphically represents observed mean values for investors’ willingness to pay price per share. Investors were asked to assume they had inherited $100,000 and to specify maximum prices at which they would invest 50 percent, 25 percent, 10 percent, or 5 percent of their inheritance in FreshHouse’s stock. Table 4 presents descriptive statistics for willingness to pay price per share.
### Table 1
How Information Choice and Screen Size Affect Estimates of Fundamental Value—Tests of H1

**Panel A: Descriptive Statistics—Fundamental Value per Share Mean [std. dev.]**

<table>
<thead>
<tr>
<th>Information Choice</th>
<th>Traditional Screen</th>
<th>Small Screen</th>
<th>Small Screen – Actual Mobile Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Choice</td>
<td>73.03 [14.17]</td>
<td>65.34 [13.00]</td>
<td>65.34 [13.00]</td>
</tr>
<tr>
<td></td>
<td>n = 31</td>
<td>n = 31</td>
<td>n = 31</td>
</tr>
<tr>
<td>High Choice</td>
<td>63.84 [12.12]</td>
<td>70.89 [17.29]</td>
<td>77.10 [11.03]</td>
</tr>
<tr>
<td></td>
<td>n = 25</td>
<td>n = 27</td>
<td>n = 20</td>
</tr>
</tbody>
</table>

**Panel B: Two-Way ANOVA Model of Fundamental Value per Share (Excluding Actual Device Condition)**

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F-stat</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Choice</td>
<td>54.58</td>
<td>1</td>
<td>54.58</td>
<td>0.27</td>
<td>0.60</td>
</tr>
<tr>
<td>Screen Size</td>
<td>15.40</td>
<td>1</td>
<td>15.40</td>
<td>0.08</td>
<td>0.78</td>
</tr>
<tr>
<td>Information Choice x Screen Size</td>
<td>1,349.45</td>
<td>1</td>
<td>1,349.45</td>
<td>6.70</td>
<td>0.01</td>
</tr>
<tr>
<td>Error</td>
<td>21,967.46</td>
<td>109</td>
<td>201.54</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Panel C: Follow-Up Tests of Simple Effects (Excluding Actual Mobile Device Condition)**

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>t-stat</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of Information Choice given Traditional Screen</td>
<td>2.40</td>
<td>0.01†</td>
</tr>
<tr>
<td>Effect of Information Choice given Small Screen</td>
<td>1.48</td>
<td>0.07†</td>
</tr>
<tr>
<td>Effect of Screen Size given High Choice</td>
<td>1.78</td>
<td>0.04†</td>
</tr>
<tr>
<td>Effect of Screen Size given Low Choice</td>
<td>2.12</td>
<td>0.04</td>
</tr>
</tbody>
</table>

**Panel D: Planned Comparisons of Supplemental Actual Mobile Device Condition**

<table>
<thead>
<tr>
<th>Comparison:</th>
<th>t-stat</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Choice/Small Screen (Actual Mobile Device)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; High Choice/Traditional Screen</td>
<td>3.15</td>
<td>&lt; 0.01†</td>
</tr>
<tr>
<td>High Choice/Small Screen (Actual Mobile Device)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; Low Choice/Small Screen (Computer)</td>
<td>2.96</td>
<td>&lt; 0.01†</td>
</tr>
<tr>
<td>High Choice/Small Screen (Actual Mobile Device)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; High Choice/Small Screen (Computer)</td>
<td>1.50</td>
<td>0.07†</td>
</tr>
</tbody>
</table>

Table 1 presents tests of H1. The dependent variable is participants’ estimates of fundamental value per share. Figure 1 provides an illustration of these results. Panel A presents descriptive statistics. Panel B presents an ANOVA for the primary conditions and Panel C presents follow-up simple effects tests. Finally, Panel D presents planned comparisons for the supplemental actual mobile device condition.

Participants estimated fundamental value by providing the following inputs to a residual earnings model template: best estimate of the current year’s net income (i.e., earnings as reported or adjusted), earnings forecasts for four subsequent years, cost of capital, and a long-term growth rate for residual earnings. In the experiment, I manipulate information choice by providing participants high or low choice over the sections and order of information they view in a press release. I manipulate screen size by presenting the press release on a traditional computer size screen or a small mobile device size screen.

† p-values are one-tailed equivalents for directional predictions.
### Table 2
How Information Choice and Screen Size Affect Adjustments to Net Income—Additional Support for H1


<table>
<thead>
<tr>
<th>Information Choice</th>
<th>Screen Size</th>
<th>Traditional Screen</th>
<th>Small Screen</th>
<th>Small Screen—Actual Mobile Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Choice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>35.5% [11 / 31]</td>
<td>48.4% [15 / 31]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Choice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>60.0% [15 / 25]</td>
<td>37.0% [10 / 27]</td>
<td>30.0% [6 / 20]</td>
<td></td>
</tr>
</tbody>
</table>

#### Panel B: Planned Comparisons (Excluding Actual Mobile Device Condition)

<table>
<thead>
<tr>
<th>Comparison</th>
<th>$\chi^2$ Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Choice/Traditional Screen &gt; Low Choice/Traditional Screen</td>
<td>3.34</td>
<td>0.03†</td>
</tr>
<tr>
<td>High Choice /Small Screen &lt; Low Choice/Small Screen</td>
<td>0.76</td>
<td>0.19†</td>
</tr>
<tr>
<td>High Choice/Traditional Screen &gt; High Choice/Small Screen</td>
<td>2.74</td>
<td>0.05†</td>
</tr>
<tr>
<td>Low Choice/Traditional Screen vs. Low Choice/Small Screen</td>
<td>1.06</td>
<td>0.30</td>
</tr>
</tbody>
</table>

#### Panel C: Planned Comparisons of Supplemental Actual Mobile Device Condition

<table>
<thead>
<tr>
<th>Comparison:</th>
<th>$\chi^2$ Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Choice/Small Screen (Actual Mobile Device) &lt; High Choice/Traditional Screen</td>
<td>4.02</td>
<td>0.02†</td>
</tr>
<tr>
<td>High Choice/Small Screen (Actual Mobile Device) &lt; Low Choice /Small Screen (Computer)</td>
<td>1.70</td>
<td>0.10†</td>
</tr>
<tr>
<td>High Choice/Small Screen (Actual Mobile Device) &lt; High Choice/Small Screen (Computer)</td>
<td>0.25</td>
<td>0.30†</td>
</tr>
</tbody>
</table>

Table 2 presents additional support for H1. The dependent variable is the percentage of participants in each condition who adjust net income for a transitory gain when estimating fundamental value. Panel A presents descriptive statistics. Panel B presents planned comparisons for the primary conditions. Panel C presents planned comparisons for the supplemental actual mobile device condition. Participants estimated fundamental value by providing the following inputs to a residual earnings model template: best estimate of the current year’s net income (i.e., earnings as reported or adjusted), earnings forecasts for four subsequent years, cost of capital, and a long-term growth rate for residual earnings. In the experiment, I manipulate information choice by providing participants high or low choice over the sections and order of information they view in a press release. I manipulate screen size by presenting the press release on a traditional computer size screen or a small mobile device size screen. † p-values are one-tailed equivalents for directional predictions.
**TABLE 3**

How Information Choice and Screen Size Affect Effort—Evidence of the Underlying Process

**Panel A:** Descriptive Statistics—Time Spent in Seconds Mean [Standard Deviation]

<table>
<thead>
<tr>
<th>Information Choice</th>
<th>Screen Size</th>
<th>Traditional Screen</th>
<th>Small Screen</th>
<th>Small Screen – Actual Mobile Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Choice</td>
<td></td>
<td>442.33</td>
<td>590.11</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[235.43]</td>
<td>[238.76]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>n = 31</td>
<td>n = 31</td>
<td></td>
</tr>
<tr>
<td>High Choice</td>
<td></td>
<td>619.46</td>
<td>517.13</td>
<td>462.88</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[291.98]</td>
<td>[185.02]</td>
<td>[170.34]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>n = 25</td>
<td>n = 27</td>
<td></td>
</tr>
</tbody>
</table>

**Panel B:** Two-Way ANOVA Model of Time Spent (Excluding Actual Mobile Device Condition)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F-stat</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Choice</td>
<td>37,412.05</td>
<td>1</td>
<td>37,412.05</td>
<td>0.71</td>
<td>0.40</td>
</tr>
<tr>
<td>Screen Size</td>
<td>40,740.52</td>
<td>1</td>
<td>40,740.52</td>
<td>0.77</td>
<td>0.38</td>
</tr>
<tr>
<td>Information Choice x Screen Size</td>
<td>335,358.40</td>
<td>1</td>
<td>335,358.40</td>
<td>6.40</td>
<td>0.01</td>
</tr>
<tr>
<td>Error</td>
<td>5,734,294.42</td>
<td>109</td>
<td>52,608.21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Panel C:** Follow-Up Tests of Simple Effects (Excluding Actual Mobile Device Condition)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>t-stat</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of Information Choice given Traditional Screen</td>
<td>2.75</td>
<td>&lt; 0.01†</td>
</tr>
<tr>
<td>Effect of Information Choice given Small Screen</td>
<td>1.16</td>
<td>0.13†</td>
</tr>
<tr>
<td>Effect of Screen Size given High Choice</td>
<td>1.54</td>
<td>0.06†</td>
</tr>
<tr>
<td>Effect of Screen Size given Low Choice</td>
<td>2.43</td>
<td>0.02†</td>
</tr>
</tbody>
</table>

**Panel D:** Planned Comparisons of Supplemental Mobile Device Condition

<table>
<thead>
<tr>
<th>Comparison:</th>
<th>t-stat</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Choice/Small Screen (Actual Mobile Device)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; High Choice/Traditional Screen</td>
<td>2.26</td>
<td>0.01†</td>
</tr>
<tr>
<td>High Choice/Small Screen (Actual Mobile Device)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; Low Choice/Small Screen (Computer)</td>
<td>1.92</td>
<td>0.03†</td>
</tr>
<tr>
<td>High Choice/Small Screen (Actual Mobile Device)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; High Choice/Small Screen (Computer)</td>
<td>0.80</td>
<td>0.21†</td>
</tr>
</tbody>
</table>

Table 3 presents evidence of the process underlying H1. The dependent variable is participants’ effort proxied by time spent reading the disclosure and estimating fundamental value. Panel A presents descriptive statistics. Panel B presents an ANOVA for the primary conditions and Panel C presents follow-up simple effects tests. Finally, Panel D presents planned comparisons for the supplemental actual mobile device condition.

In the experiment, I manipulate information choice by providing participants high or low choice over the sections and order of information they view in a press release. I manipulate screen size by presenting the press release on a traditional computer size screen or a small mobile device size screen.

† p-values are one-tailed equivalents for directional predictions.
**TABLE 4**
Supplemental Analysis of Investors’ Willingness to Pay Per Share

**Panel A:** Descriptive Statistics—Willingness to Pay Per Share Mean [Standard Deviation]

<table>
<thead>
<tr>
<th>Information Choice / Screen Size</th>
<th>N</th>
<th>50%</th>
<th>25%</th>
<th>10%</th>
<th>5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Choice / Traditional Screen</td>
<td>25</td>
<td>$48.89</td>
<td>$53.50</td>
<td>$57.61</td>
<td>$60.91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[$16.86]</td>
<td>[$15.48]</td>
<td>[$14.83]</td>
<td>[$15.29]</td>
</tr>
<tr>
<td>Low Choice / Traditional Screen</td>
<td>29</td>
<td>$58.23</td>
<td>$62.02</td>
<td>$65.27</td>
<td>$68.29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[$13.07]</td>
<td>[$12.68]</td>
<td>[$13.55]</td>
<td>[$15.12]</td>
</tr>
<tr>
<td>Low Choice / Small Screen</td>
<td>31</td>
<td>$47.27</td>
<td>$51.51</td>
<td>$55.04</td>
<td>$58.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[$18.76]</td>
<td>[$18.85]</td>
<td>[$18.97]</td>
<td>[$19.12]</td>
</tr>
<tr>
<td>High Choice / Small Screen</td>
<td>27</td>
<td>$52.63</td>
<td>$58.28</td>
<td>$63.66</td>
<td>$67.55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[$15.16]</td>
<td>[$14.57]</td>
<td>[$14.41]</td>
<td>[$15.13]</td>
</tr>
</tbody>
</table>

**Panel B:** Mixed ANOVA Model of Willingness to Pay Price

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F-stat</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Subjects Source of Variation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information Choice</td>
<td>59.55</td>
<td>1</td>
<td>59.55</td>
<td>0.69</td>
<td>0.79</td>
</tr>
<tr>
<td>Screen Size</td>
<td>1,475.13</td>
<td>1</td>
<td>1,475.13</td>
<td>1.71</td>
<td>0.19</td>
</tr>
<tr>
<td>Information Choice x Screen Size</td>
<td>5,116.57</td>
<td>1</td>
<td>5,116.57</td>
<td>5.92</td>
<td>0.02</td>
</tr>
<tr>
<td>Error</td>
<td>92,469.1</td>
<td>3</td>
<td>107</td>
<td>864.20</td>
<td></td>
</tr>
</tbody>
</table>

Within Subjects Source of Variation *a*

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F-stat</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Inheritance Invested</td>
<td>8,910.24</td>
<td>1</td>
<td>8,910.24</td>
<td>156.58</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Information Choice x Percentage of Inheritance Invested</td>
<td>169.49</td>
<td>1</td>
<td>169.49</td>
<td>2.98</td>
<td>0.09</td>
</tr>
<tr>
<td>Screen Size x Percentage of Inheritance Invested</td>
<td>43.47</td>
<td>1</td>
<td>43.47</td>
<td>0.76</td>
<td>0.38</td>
</tr>
<tr>
<td>Information Choice x Screen Size x Percentage of Inheritance Invested</td>
<td>13.08</td>
<td>1</td>
<td>13.08</td>
<td>0.23</td>
<td>0.63</td>
</tr>
<tr>
<td>Error</td>
<td>6,088.96</td>
<td>107</td>
<td>56.91</td>
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<td></td>
</tr>
</tbody>
</table>
Table 4 presents evidence of investors’ willingness to pay. The dependent variable is the maximum price per share participants would be willing to pay to allocate 50%, 25%, 10%, and 5% of an inheritance. Panel A presents descriptive statistics. Panel B presents a Mixed ANOVA for traditional screen conditions and Panel C presents a Mixed ANOVA for small screen conditions.

In the experiment, I manipulate information choice by providing participants high or low choice over the sections and order of information they view in a press release. I manipulate screen size by presenting the press release on a traditional computer size screen or a small mobile device size screen.

Mauchly’s test of sphericity indicated the assumption of sphericity has been violated, (χ²(5) = 229.63, p < 0.01, traditional screen; χ²(5) = 239.81, p < 0.01, small screen). This test rejects the null hypothesis that the variances of the differences between the levels of the within-subjects factor (i.e. willingness to pay price) are equal. Results are inferentially identical when I conduct the Greenhouse-Geisser procedure to correct the degrees of freedom of the F test.

### Panel C: Mixed ANOVA Model of Willingness to Pay Price — Traditional Screen

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F-stat</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Subjects Source of Variation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information Choice</td>
<td>1,944.43</td>
<td>1</td>
<td>1,944.43</td>
<td>3.26</td>
<td>0.08</td>
</tr>
<tr>
<td>Error</td>
<td>30,388.1</td>
<td>6</td>
<td>5,064.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Subjects Source of Variation a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of Inheritance Invested</td>
<td>3,681.01</td>
<td>1</td>
<td>3,681.01</td>
<td>71.21</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Information Choice x Percentage of Inheritance Invested</td>
<td>42.22</td>
<td>1</td>
<td>42.22</td>
<td>0.82</td>
<td>0.37</td>
</tr>
<tr>
<td>Error</td>
<td>2,636.43</td>
<td>51</td>
<td>51.70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Panel D: Mixed ANOVA Model of Willingness to Pay Price — Small Screen

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F-stat</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Subjects Source of Variation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information Choice</td>
<td>3,295.35</td>
<td>1</td>
<td>3,295.35</td>
<td>2.97</td>
<td>0.09</td>
</tr>
<tr>
<td>Error</td>
<td>62,080.9</td>
<td>6</td>
<td>10,347.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Subjects Source of Variation a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of Inheritance Invested</td>
<td>5,351.42</td>
<td>1</td>
<td>5,351.42</td>
<td>86.80</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Information Choice x Percentage of Inheritance Invested</td>
<td>145.20</td>
<td>1</td>
<td>145.20</td>
<td>2.36</td>
<td>0.13</td>
</tr>
<tr>
<td>Error</td>
<td>3,452.54</td>
<td>56</td>
<td>61.65</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5 presents evidence of investors’ information search strategy. The dependent variable is the extent to which participants change direction forward and backward while reading the press release tabs. I track the order in which participants view each tab. I code each change in direction forward or backward as a 1. The direction change codes are summed for each participant and divided by the total number of tabs the participant viewed to arrive at an overall direction change score. Lower (higher) values indicate fewer (more) changes in direction.

Panel A presents descriptive statistics. Panel B presents an ANOVA and Panel C presents follow-up simple effects tests.

In the experiment, I manipulate information choice by providing participants high or low choice over the sections and order of information they view in a press release. I manipulate screen size by presenting the press release on a traditional computer size screen or a small mobile device size screen.
Table 6 presents evidence of investors’ information search strategy. The dependent variable is the total number of press release tabs viewed within the disclosure. All participants view all seven tabs, so values above seven reflect repeated tab views. Panel A presents descriptive statistics. Panel B presents an ANOVA and Panel C presents follow-up simple effects tests.

In the experiment, I manipulate information choice by providing participants high or low choice over the sections and order of information they view in a press release. I manipulate screen size by presenting the press release on a traditional computer size screen or a small mobile device size screen.
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APPENDIX A
EXCERPTS FROM PRESS RELEASES WITH HIGH AND LOW INFORMATION CHOICE

Panel A: Microsoft Press Release with High Information Choice

Panel B: Apple Press Release with Low Information Choice

Apple Reports Record Third Quarter Results

iPhone, Apple Watch, Mac & App Store Drive Revenue Growth of 33%

CUPERTINO, California — July 21, 2015 — Apple® today announced financial results for its fiscal 2015 third quarter ended June 27, 2015. The Company posted quarterly revenue of $49.6 billion and quarterly net profit of $10.7 billion, or $1.85 per diluted share. These results compare to revenue of $37.4 billion and net profit of $7.7 billion, or $1.28 per diluted share, in the year-ago quarter. Gross margin was 39.7 percent compared to 39.4 percent in the year-ago quarter. International sales accounted for 44 percent of the quarter’s revenue.

The growth was fueled by record third quarter sales of iPhone®, Mac®, all-time record revenue from services and the successful launch of Apple Watch™.

“We had an amazing quarter, with iPhone revenue up 59 percent over last year, strong sales of Mac, all-time record revenue from services, driven by the App Store, and a great start for Apple Watch,” said Tim Cook, Apple’s CEO. “The excitement for Apple Music has been incredible, and we’re looking forward to releasing iOS 9, OS X El Capitan and watchOS 2 to customers in the fall.”

“In the third quarter our year-over-year growth rate accelerated from the first half of fiscal 2015, with revenue up 33 percent and earnings per share up 45 percent,” said Luca Maestri, Apple’s CFO. “We generated very strong operating cash flow of $15 billion, and we returned over $33 billion to shareholders through our capital return program.”

Apple is providing the following guidance for its fiscal 2015 fourth quarter:

- revenue between $49 billion and $51 billion
- gross margin between 38.5 percent and 39.5 percent
APPENDIX B
EXCERPTS FROM A PRESS RELEASE VIEWED ON A SMALL SCREEN MOBILE DEVICE AND TRADITIONAL SCREEN COMPUTER

Panel A: Starbucks Press Release Viewed on a Small Screen Mobile Device

Panel B: Starbucks Press Release Viewed on a Traditional Screen Computer
APPENDIX C
MANIPULATIONS

Panel A: Low Choice (i.e. tabs are not clickable) on Traditional Screen (11.25 inches wide x 6.5 inches high) Manipulation

Financial Highlights
(BUSINESS WIRE)—January 24, 2015—Earlier today FreshHouse Southeast Asian Kitchen (NYSE: FRESH), reported its financial results for the full year ended December 31, 2014. The Company reported revenues for the year of $1,759 million compared to $1,742 million in 2013. Net income for the year of $102 million, or $4.27 per share compared to net income of $95 million, or $3.96 per share in 2013.

“We continue to make significant progress on our important journey to change the way people think about and eat fast food,” said Steve Johnson, CEO of FreshHouse. “Consumer trends are changing, which we believe is a great result of people becoming more discerning about where their food comes from, how it was raised, and how their meal was prepared. The continued loyalty we see from our customers, as well as third party research, all point to the relevance of our vision and the impact we are having on food culture. We are delighted to see that this vision, a very lofty goal, is becoming a reality.”

Panel B: Low Choice (i.e. tabs are not clickable) on a Small Screen (5.44 inches wide x 2.64 inches high) Manipulation

Financial Highlights
(BUSINESS WIRE)—January 24, 2015—Earlier today FreshHouse Southeast Asian Kitchen (NYSE: FRESH), reported its financial results for the full year ended December 31, 2014. The Company reported revenues for the year of $1,759 million compared to $1,742 million in 2013. Net income for the year of $102 million, or $4.27 per share compared to net income of $95 million, or $3.96 per share in 2013.
Panel C: High Choice (i.e. tabs are clickable) on a Traditional Screen (11.25 inches wide x 6.5 inches high) Manipulation

Panel D: High Choice (i.e. tabs are clickable) on a Small Screen (5.44 inches wide x 2.64 inches high) Manipulation
## APPENDIX D
### EXAMPLE OF RESIDUAL EARNINGS MODEL TEMPLATE

**Residual Earnings Model for FreshHouse**

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income (in thousands)</td>
<td>99,968</td>
<td>101,335</td>
<td>109,289</td>
<td>117,847</td>
<td>127,087</td>
</tr>
<tr>
<td></td>
<td>Box 1</td>
<td>Box 2</td>
<td>Box 3</td>
<td>Box 4</td>
<td>Box 5</td>
</tr>
<tr>
<td>Opening book value of equity</td>
<td>695,755</td>
<td>790,763</td>
<td>892,098</td>
<td>1,001,378</td>
<td>1,119,225</td>
</tr>
<tr>
<td>Closing book value of equity</td>
<td>790,763</td>
<td>892,098</td>
<td>1,201,378</td>
<td>1,119,225</td>
<td>1,246,312</td>
</tr>
<tr>
<td>Residual earnings</td>
<td>45,192</td>
<td>45,982</td>
<td>46,831</td>
<td>47,751</td>
<td>48,741</td>
</tr>
<tr>
<td>PV of residual earnings</td>
<td>45,192</td>
<td>42,974</td>
<td>40,906</td>
<td>38,579</td>
<td>37,184</td>
</tr>
</tbody>
</table>

\[
790,763 + 160,042 + 758,556 = 1,709,361
\]

Cost of capital
(assume industry average is 7.00%)

Long-term growth rate for RESIDUAL earnings
(assume industry average is 2.00%)

\[
\text{Estimated fundamental value per share} \text{ (Please record this value in your survey)}
\]

\[
\text{Box 8}
\]

*Because Fresh-House uses clean surplus accounting and pays no dividends, closing book value of equity is simply equal to the previous year’s closing book value plus net income for the year.*