MATERIAL IMPACT ON INFORMATION PROCESSING BEHAVIOR IN VIRTUAL COMMUNITIES: EMPIRICAL STUDY ABOUT ONLINE STOCK MESSAGE BOARDS

Research-in-Progress

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Abstract

Individuals may seek and read other's opinions, or they may want to interact with others after participating in virtual communities. Information, opinions, or advice in virtual communities may drive individuals to make decisions. However, the value of the information may vary from person to person. Individual perceptions and experiences will influence how she or he forms different evaluation for the same content of information. Our study thus investigates how individuals process others' opinions on stock message boards for their investment decisions, particularly when they have different levels of investment return. Their gain/loss of wealth may influence investors' information processing behavior. Behavioral finance literature argues that self-attribution bias influences an investor's learning process. The self-attribution bias suggests that investors who lose money after basing their decisions on other's opinions may subsequently value other's opinions less, while those who profited from investments after using other's opinions may overestimate their own investment-related abilities. In the context of online stock message boards, we investigate the influence of investment returns on investors' information processing behavior, starting with an exploration of how they attribute their success or failure to either themselves or other investors on stock message boards.

Keywords: Information processing behavior, material impact, stock message boards, self-attribution

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Introduction

Information System (IS) literature has mainly focused on people's motivations to participate and contribute in virtual communities but not on what they do after participating. Individuals may seek and read other's opinions or want to interact with others after participating in virtual communities. Information, opinions, or advice in virtual communities may drive individuals to make decisions. However, the value of information may vary from person to person. Individual perceptions and experiences will influence how she or he forms different evaluation for the same content of information. Our study thus investigates how individuals process others' opinions on stock message boards for their investment decisions, particularly when they have different levels of investment return.

Unlike in other types of virtual communities, individuals have a clear motivation to participate in online stock message boards: they participate based on their material needs (e.g., returns of investment) rather than on non-material needs (e.g., a sense of belonging). They want to achieve better investment performance by participating online stock message boards. The actual gain and loss of wealth may influence investors' information processing behavior. When investors lose money by following other's opinions, they are likely to value online stock message boards lower and attribute their failure to others' opinions. Their consequent investment performance may influence how investors adjust their evaluation of online stock message boards to the extent that they have used other's opinions. The psychological bias such as self-attribution bias can explain such behavior. Self-attribution bias suggests that investors tend to attribute their success to their abilities and their failures to bad luck or to others (Baber and Odean, 2002). In particular, behavioral finance literature argues that the self-attribution bias will cause successful investors to grow increasingly overconfident about their general trading abilities, which can intensify overreactions and lead to short-term momentum and long-run reversals in stock prices (Daniel et al. 1998)

Our research is also related to the finance literature, which argues that the information from those communities could be more accurate than analyst forecasts (Bagnoli et al., 1999). That literature has shown that online postings can predict the stock returns (Gu et al., 2006) and that the number of postings is positively related with trading volume (Antweiler and Frank, 2004; Tumarkin and Whitelaw, 2001). Those studies highlighted the impact of investment-related communities on the stock market. The underlying principle of those studies is that other investors read online postings to inform their trading decisions and that they are influenced by those postings. However, little is known about how their past investment performance influences investors' evaluation on others' postings. To address this question, we consider the influence of investment return on investors' information processing behavior, starting with an exploration of how they attribute their success or failure to either themselves or other investors on stock message boards.

Literature Review

Research on virtual communities has grown substantially over the years. Early work focused on users' motivations to contribute in virtual communities (Bagozzi and Dholakia, 2002, Asvanund et al., 2004, Butler, 2001). The study suggests that the social and economic benefits are major motivations to participate, despite the costs of participating (e.g., time, efforts). Individuals perceive extrinsic (reciprocity, reputation) and intrinsic benefits (self-efficacy, enjoy helping others) from their participation or contribution. In particular, Information System (IS) literature explains such motivations by using social capital or social exchange theories (Wasko and Faraj, 2005). Ma and Agarwal (2007) also indicated that the perceived confirmation from other members of their identity increases member's participation in virtual communities. Those research studies suggested that individuals seek social recognition and enhanced self-worth from participating in virtual communities.

Other researchers have studied that motivation through the dynamics of the relationship between community members. Sproull and Kiesler (1991) argued that virtual communities can fundamentally change the ways people interact with one another. Those researchers used economic theory in positive and negative network externality to explain how virtual communities both grow and perish dynamically. A large number of members provides more resources to other members, but it also can inhibit participation due to higher information processing costs or network congestion (Asvanund et al., 2003; Butler, 2001; Gu et al., 2007). Participation in virtual communities is, thus, determined by network externality.

A unique feature of virtual communities is that the interaction between members is not based on face-to-face communication. The anonymous relationships in virtual communities may raise a concern about potentially

opportunistic behavior among community members. In such a case, the IS literature suggests that trust is needed for the continuity of the virtual communities (Gefen, 2000; Jarvenpaa et al., 1998). In particular, Ridings et al (2002) studied the multidimensional effects of trust - ability, benevolence, and integrity - on participation in virtual communities (Jarvenpaa et al., 1998, Ridings et al., 2002). When trust exists between members, they are more willing to help others and to request others' help (Gefen, 2000; Jarvenpaa et al., 1998). Trust toward other members should increase the desire to obtain information, since the value of such information depends on the trustworthiness of the person providing it (Ridings et al., 2002).

The weak ties theory plays an important role in the exchange of knowledge or information in virtual communities. A theory of the strength of weak ties, proposed by Granovetter (1973), suggested that relative strangers could offer an advantage over friends and colleagues in obtaining useful information. As individuals access more numerous and diverse potential helpers, they are more likely to have non-redundant and useful information, which improves knowledge transfer. Constant et al. (1996) investigated how weak ties help employees to exchange information or advice on an organizational computer network. They suggested that employees receive more useful help or information depending on the number of ties, the diversity of ties, or the resources of help providers. That study suggested that weak ties may influence the information exchange among members in virtual communities As virtual communities tend to be larger, more dispersed in space and time and to have members with more heterogeneous social characteristics (e.g., lifecycle stage, gender, ethnicity, socioeconomic status), community members are more likely to receive non-redundant and useful information from virtual communities. Those research studies mentioned above (social capital, dynamic of virtual communities, trust, and weak ties) analyze the motivations for users to participate in virtual communities.

Another research stream explicates homophilous behavior among virtual community members. Homophily means that individuals tend to associate with others who share similar backgrounds or beliefs, often referred to as "similarity breeds connection" (McPherson et al., 2001). Brown et al. (2007) suggested that the identity information among virtual community members may help to form a homophily of interests with the user. They also argue that a virtual community itself may create homophily. Since virtual communities have been formed that are based on topics, activities, hobbies, or ideologies, members may have social interactions with those people who share similar interests (Best and Krueger, 2006, Brown et al., 2007). In the context of online stock message boards, Chen et al. (2009) suggested that investors with a strong belief in a stock show homophilous behavior in virtual communities. They explain investors' homophilous behavior using confirmation bias and suggest that such behavior creates a fragmented community.

Our study is also related to the literature on information adoption studies. The study started by recognizing that the actual impact of the information received may vary from person to person. According to an individual's perception and experience, that individual may have a different evaluation of the same content or information. The theoretical basis of the information adoption process is found in the technology/information system acceptance literature. The technology acceptance model was developed to estimate individual perceptions of information system or technology use, and later extended into an e-commerce context, such as the use of websites, e-commerce transactions, or online services (Gefen and Straub, 2000; Moon and Kim, 2001; Pavlou, 2001; Featherman and Pavlou, 2003). In particular, Sussman and Siegal (2005) combined this concept with the informational influence theory and examined how individuals receive advice from e-mail (Sussman and Siegal, 2005; Rabjohn et al., 2008). They explained the information adoption process in terms of information usefulness, source credibility and argument quality and showed how individuals process and adopt advice.In the context of online stock message boards, investors may process and adopt opinions for their investment decisions.

We also contribute to the literature on behavioral finance. In the context of online investing, individuals demonstrate multiple psychological biases that distort decision making and economic outcomes (Barber and Odean, 2002; Kahneman and Tversky, 1996). In particular, Barber and Odean (2001) demonstrated that illusion of control (e.g., people inappropriately estimate their ability to control events, when, in fact, some events are not controllable), illusion of knowledge (e.g., people with access to information believe that they are more knowledgeable than they really are), and self-attribution bias drive investors to be overconfident. Overconfident investors are known to trade more frequently and more speculatively, especially when they are less experienced yet successful. Thus, they may believe that they have more ability to perform tasks such as stock-picking than they actually do. Investor psychological biases demonstrated in financial markets may be rooted in how investors process opinions presented on online stock message boards.

Hypotheses and Research Model

We investigate the material impact (e.g., stock investment performance) on an investor's information processing behavior in online stock message boards. Since investors have used other's opinions to achieve better investment performance, their consequent investment performance may impact how they value online stock message boards. Investors may attribute their success or failure to other investors on online stock message boards to the extent that they have used other's opinions for their investment decisions. When those investors experience loss (gain) from stock investments, they may lower (raise) usefulness of information posted on stock message boards. In addition, the finance literature suggests that investors learn their investment-related abilities over times as rational Bayesian updaters, so their confidence in investment-related competence should increase in response to winning and decrease in response to losing (Gervais and Odean, 2001).

However, behavioral finance literature argues that self-attribution bias influences an investor's learning process. Individuals tend to ascribe their successes to their personal abilities and their failures to bad luck or the actions of others (Langer and Roth, 1975; Miller and Ross, 1975). In particular, Gervais and Odean (2001) posited that investors learn their ability through experience. When investors successfully forecast the market, they improperly update their beliefs, weighting too heavily the possibility that their success was due to their superior ability. On the contrary, when they experience investment losses, they weight too heavily the possibility that their failure was due to others or bad luck. Thus, the self-attribution bias is known to make them overconfident. In our research context, self-attribution bias suggests that investors who used other's opinions when making their decisions may rate the usefulness of those opinions lower when they lose money, while they overestimate their investment-related abilities when profiting from their investments.

Therefore, we investigate how investors correct their investment-related abilities and the value of online stock message boards accordingly.

H1-a: Investors will perceive their investment-related abilities as higher (lower) when they experience an investment success (loss)

H1-b: The perceived usefulness of online stock message boards will increase (decrease) when investors experience an investment success (loss)

H2-a: Self-attribution bias will mediate the effects of stock investment performance on the perceived usefulness of stock message boards

H2-b: Self-attribution bias will mediate the effects of stock investment performance on an individual's perceived investment-related abilities

Online stock message boards offer an electronic platform for investors to learn from others. The opinions stated on online stock message boards are recognized as important sources of information that influence investment decisions. Our study investigates how investors' investment decisions are influenced by opinions stated on online stock message boards. An individual's information processing behavior can be explained by the study on the Elaboration Likelihood Model (ELM) of informational influence (Petty and Cacioppo, 1986). The study argued that individuals can be influenced in different ways by the same information because the extent to which they cognitively elaborate on particular information varies, and these variations in elaboration affect the success of an influence attempt (e.g., attitude or intention). Elaboration involves attending to the content of the message, scrutinizing and assessing its content, and reflecting on issues relevant to the message (Sussman and Siegal, 2003).

According to the literature, when an individual is able and willing to cognitively elaborate on a persuasive communication, the usefulness of the arguments contained within the communication will determine the degree of informational influence (Petty and Cacioppo, 1986). In our research context, there are millions of opinions presented on online stock message boards. The usefulness of all opinions may vary. Investors do not elaborate on every posting they see, and some investors elaborate on less information than others do. When investors cognitively elaborate the opinion and thinks that its usefulness is high, their intention to adopt the opinion will be higher (Rabjohn et al., 2008). According to Rahjohn et al. (2008), the decision to adopt the information is determined by the perceived usefulness of the information to the users (the postings) in a virtual community. People have individual perceptions of whether these opinions could be useful to help them to make a better buying decision. Therefore, they have a greater intention of adopting a opinion if others also think a comment within an online community is useful. The perceptions of usefulness of opinions would predict intentions towards adopting them.

Although the usefulness-intention association was originally derived in an acceptance context, it is likely to hold true in continuance contexts, because human tendencies for subconsciously pursuing instrumental behaviors or striving for rewards are independent of the timing or stage of such behaviors. Therefore, we propose:

H3. Users' continuous intentions to adopt others' opinions is positively associated with the perceived usefulness of using other's opinions

Our study is also related to the Information System (IS) continuance model (e.g., Bhattacherjee, 2001) as we investigate perceived usefulness and satisfaction from using others' opinions presented in virtual communities. Based on the expectation confirmation theory, Bhattacherjee (2001) proposed the IS continuance model to explain user post-adoption of information technologies. IS continuance intention is mainly determined by satisfaction and perceived usefulness. The IS continuance model posits that the post-adoption expectation is the relevant determinant of a user's level of satisfaction with an information technology (IT) and the perceived usefulness is the surrogate for post-adoption expectation.

Perceived usefulness in this context can be defined as an investor's perceptions of the expected benefits of using other's message board opinions to improve their investment performance. We argue that investors who perceive the usefulness of others' opinions will be more satisfied with the stock message boards. That is, investors are more likely to be satisfied when using other investors' opinions. We thus propose:

H4. The perceived usefulness of using others' opinions is positively associated with users' satisfaction from using others' opinions

Satisfaction in this context can be defined as an investor's perceived satisfaction with using other investors' opinions for their previous investment decisions. Previous research shows satisfaction to have a significant positive impact on IS continuance intention (Bhattacherjee, 2001; Bhattacherjee et al., 2008; Brown and Jayakody, 2008; Liao, et al., 2009). Their research confirmed that the relationship between satisfaction and continuous use has been significant in various areas, such as e-commerce, e-learning and online banking. We thus argue that investors who are satisfied with others' opinions will be more likely to use the message board opinions for their next investment decisions (buy, sell or hold decisions). That is, an investor's continuance intention in using others' opinions is determined mainly by their satisfaction with prior opinion use. Therefore, we hypothesize:

H 5. Users' satisfaction level from using others' opinions is positively associated with their continuous intention to adopt others' opinions

Next, we consider the impact of perceived competence on satisfaction with investors' investment experiences. Smith and Barclay (1997) determined that task performance (which is closely allied to perceptions of competence) positively influences mutual satisfaction in partnerships. The SERVQUAL study suggested that reliability and competence are key dimensions along which services are evaluated for quality (Parasuraman et al., 1988). Online investors with high levels of competence may believe that they will potentially be able to do more timely trades and achieve better performance. As investors become more confident in their investment-related competence, they are more likely to be satisfied with their own decisions, which, in turn, satisfy their investment experience (Barber and Odean, 2000).

Our study is also related to behavioral finance theories suggesting that online investors are overconfident. The behavioral finance literature suggests that investors believe the accuracy of their knowledge is greater than it actually is or that their investment-related ability or skill is higher than it actually is (Barber and Odean, 2001). Such investors may make the investment decisions based on their own beliefs, indicating they are less likely to adopt others' advice. Thus, a high confidence in their investment-related abilities reduces investors' need to rely on others' opinions when making investment decisions. This reduces investors' motivations to participate in online stock message boards to get investment advice from others. Optimism bias can also explain the relationship between investors' self-confidence and their adoption of others' opinions. Optimism bias refers to people's tendency to have unrealistically positive views of the self. One important manifestation is that people judge themselves better than others regarding their skills or positive personality attributes. For example, Sutherland (1992) showed that 95% of drivers believe they are better than average. Such optimism drives investors to trade more frequently, because they believe they have better abilities in reading the market than other investors. Accordingly, such investors may trade based on their own beliefs, suggesting they are less likely to use others' opinions in making their investment decisions. On the contrary, investors with lower confidence levels may seek other's advice when making investment decisions (buy, sell or hold decisions). Building on these arguments, we propose the following hypotheses:

H6. Perceived competence positively influences investors' satisfaction with their investment experience.

H7. Perceived satisfaction in their investment experience negatively influences the continuous intention to adopt others' opinions posted on the stock message boards

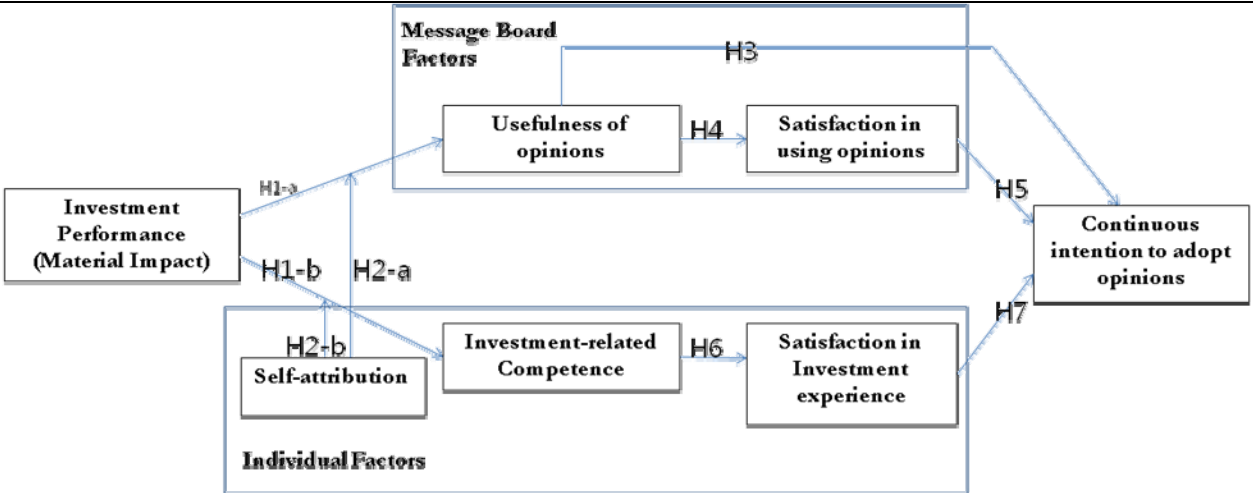

Figure 1. Research Model

Research Methodology

Research context

Our research investigates online investor's continuous intention to adopt other investors' opinions posted on stock message boards. As our research context, we selected one of the largest stock message boards in South Korea. In particular, the message board operator provides a wide range of services, such as a financial news service, stock quotes, stock exchange rates, corporate press releases, experts' reports and recommendations, and popular message boards for discussing a company's prospects and stock valuation. In general, they had around 6,000,000 unique visitors and 460,000,000 page views per day in August 2010. Such a large number of customers created million messages on the stock message boards. In August 2010, there were around 1,900 message boards, and each stock message board covered one stock. These statistics indicate that the influence of the stock message boards on the stock markets is substantial. Our study thus highlights how retail investors adopt information posted on the message boards.

Questionnaire design and refinement

Our model embeds investors' perceptions of stock message boards and relationships between multiple constructs. To estimate such constructs and relationships, we collected investors' self-reported perceptions using an online survey. An initial survey questionnaire was generated based on previous literature, discussions with faculty members, and interviews with managers of the stock message boards. The initial questionnaire included 18 items related to various constructs and 12 items related to investors' demographic information and behavior in online stock investment. This questionnaire was pretested with actual investors who are customers of the stock message boards. In addition, participants were asked to comment on questions, to raise any other concerns related to this survey, and to describe any ambiguities. For the concerns of content validity, the questionnaire was also pretested with three faculty members familiar with the area at McCombs School of Business in University of Texas at Austin. The survey questions were then modified according to their comments, following procedures recommended by Churchill (1979). The final questionnaires have 15 items related to our research constructs.

The sample

Since we are studying investors' participation in and adoption of online stock message boards, we needed to ensure that survey participants were limited to customers of the stock message boards. Thus, our survey was posted at the top of each stock message board from September 30, 2009 to October 06, 2009. Furthermore, all participants were asked to answer whether or not they regularly participated in the stock message boards. To facilitate survey participation and completion, we proposed a monetary award between $100 and $ 300 to be raffled among the participants who completed all survey questions. We also assured them that the results would be reported only in aggregate and that their anonymity would be preserved.

During the survey promotion period, 486 people participated in the survey. Of those responses, we dropped 34 because of scattered and substantially incomplete data. Consequently, we have 452 usable data points used for our model analysis.

At the beginning of the survey, participants visiting a stock message board were asked to participate in a survey by completing an online questionnaire. The questionnaire included investors' demographic information, information search behavior, investment patterns, and questions related to our research constructs. Participants were asked to answer questions specific to the stock associated with the stock message board. For instance, if they participated in the survey on the Samsung Electronics message board, the questions were related only to Samsung Electronics. The participants were then asked to report the date when they bought the Samsung Electronics stock, their current sentiment about the Samsung stock (e.g., strong sell, sell, hold, buy, and strong buy), and their expected return on the stock when they bought the stock.

We found that the survey participants were relatively young. About 61% belong to the 25-35 years old age group. The majority of the participants (70%) have an undergraduate degree or higher education level. The demographic data are similar to other research studies related to virtual communities (e.g., Nonnecke et al., 2006). The majority of the participants were male (87%), consistent with evidence from past research indicating that men outnumber women in investment activities (e.g., Barber and Odean, 2001). Upon examining the participants' income levels, we found that about 85% of the participants earned less than 100 million won per year.

The majority of participants (77%) spend two hours or less per day on stock message boards searching for information, but some investors (about 5%) spend over 7 hours per day. About 48% of participants are passive participants with no postings, whereas about 52% of the participants posted their opinions more than once a week. Most investors are not very experienced (about 70% have less than two years of experience) but have reasonably-sized portfolios. Over 60% of the investors have a portfolio size of more than $5M won (about US$4400). Upon examining their trading frequency, we found that about 57% of the participants traded at least once per week. We found that around 40% of investors who bought the stock held it for more than a month, while 12% held it for only one day. We also found significant heterogeneity in the investors' beliefs about future stock performance. The statistics presented in Table 2 indicate that about 50% of the respondents have a hold opinion about their stock position, 33% of them have directional opinions (e.g., sell or buy), and 17% of them have strong directional opinions (e.g., strong sell or strong buy).

Main variables, scale items, reliability, and convergent validity

In this study, we address item measures and reliability using Cronbach's alpha and Spearman-Brown split-half reliability (Balasubramanian et al., 2003). We find that the Cronbach alphas for the constructs meet the recommended threshold value. We also check convergent validity using confirmatory factor analysis (CFA) and average variance extracted (AVE)1. All CFA and AVE values meet the recommended threshold values. Table 1 summarizes item statistics such as mean and standard deviation and the measurement model results.

Table 2: Variable Statistics, Scale Items, Reliability, and Convergent Validity

Constructs	Mean	S.D	Cronbach Alpha	CFA	AVE

[1] AVE values should be greater than the 0.50 cutoff.

[1]Perceived usefulness of opinions	3.177	1.525	0.909	91.69%	0.914
[2]Perceived satisfaction with using opinions	4.643	1.363	0.922	92.79%	0.923
[3]Perceived confidence related to investment-related tasks	3.674	1.266	0.924	86.77%	0.899
[4]Perceived satisfaction with investment experience	4.281	1.374	0.840	86.21%	0.859
[5]Continuous intention to adopt opinions	4.023	1.145	0.727	78.58%	0.886
[6]Investment performance	0.284	0.47	NA	NA	NA

Three or four items were used to measure our main constructs according to the previous literature. The stock investment performance, however, is measured as follows: The return of the stock is measured for the stock holding period until the survey participation date using the following equation: $R_{i,t} = \frac{P_{i,t} - P_{i,t-k}}{P_{i,t-k}}$, where $R_{i,t}$ represents the return of the stock from day t-k to t. $P_{i,t}$ is the stock price on the survey participation date and $P_{i,t-k}$ is the stock price on the date when they bought a given stock. The prices of all stocks are obtained from the Korean Stock Exchange's stock price database. The i represents the date of survey participation, and the k represents the date when investors bought the stock. Investors were asked to report when they bought a given stock during the survey. We also needed to ensure that investors were users of the message boards when they bought a given stock. If investors bought the stock first and became users of the message boards later, they may not attribute the success (or failure) of their stock investment experience to the other investors' opinions posted on the message boards. With the help of the message board's administrators, we confirmed that very few investors (around 9) were not the users of the message boards when they bought the stock. We removed them from our sample to have better estimates.

Our set of control variables includes time spent on stock message boards per day, investment experience, and amount invested in a stock. Each individual's times spent on stock message boards are self-reported and coded from 1 to 5, with 1 representing spending less than 1 hour per day and 5 representing spending over 10 hours per day. Investors' online investing experience is measured as 1 if an investor's experience is less than 1 year, 2 if the experience is between 1 and 2 years, 3 if the experience is between 3 and 6 years, and 4 if the experience is greater than 6 years. Investors were also asked to report their average amount invested in each stock (in Korean Won). We use the standardized value (i.e., the mean is set to zero and the standard deviation is one) of this variable in our empirical analysis.

We are now constructing the structural equation model to estimate our hypotheses. We believe that we will report the final results on the presentation date.

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