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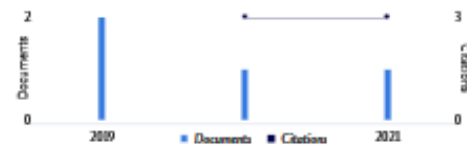
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First-home buyers and herding behavior in Surabaya, Indonesia

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Abstract

Purpose – This study aims to determine the causality of herding which was traced down to social and normative influences from first-home buyers represented by undergraduate students.

Design/methodology/approach – The Perception Alignment Hypothesis was used in this experimental research, and was conducted on a sample of 125 undergraduates studying finance representing first-home buyers. The experiment provides the subjects property brochures in Surabaya to appraise a value that they see fit for purchase. The subjects were given both social- and normative-induced treatments separately using information cascade, and their valuation shifts were recorded. Their valuations were then divided into three sections under the treatment groups, consisting of initial, "social" and "normative" valuations.

Findings – In contrast to previous findings, the results showed that first-home buyers succumbed to both social and normative influences, causing them to herd. Further analysis of the credibility of information was conducted and it showed that the undergraduates were only prone to social influence, whereas other aspects regarding normative influences must be further researched.

Practical implications – The decline of homeownership on a global scale is concerning, especially when 60% of the market represents young adults under the age of 35. This implies that both the government and property developers may need to enact strict measures to regulate property purchases.

Originality/value – This is the first experimental study on herding of Surabaya, Indonesia, mainly focusing on human behavior and information cascade. Thus, this study could be a viable reflection to future policies in Indonesia being made to answer actual demands in the residential market.

Keywords Herding, Behaviour, Social influence, First-home buyers, Information cascade, Normative influence

Paper type Research paper

Introduction

The act of copying one person's action has been an effective way of learning, such as the event when a baby copies her mother's expression for the first time (Seiler *et al.*, 2014). Such a term was named herding, and its definition is how individuals in a group can act collectively without centralized direction. Smith (1790) described how humans have the tendencies to follow one another for a specific purpose, regardless of the cause. Furthermore, herding has been a topic that attracts researchers studying the financial crisis, some even described herding as one of the possible aspects that caused the financial crisis (Szyszka, 2010). Lan (2014) finds that Chinese residential housing markets tend to herd before a financial crisis. Within the period of the post-financial crisis, there have been countless researchers trying to find a way to better the traditional methods in predicting market fluctuations (Wang, 2013).

Traditional approaches toward predicting market fluctuation have always assumed that investors act rationally in decision-making (Malkiel, 2003). The Efficient Market Hypothesis (EMH), Expected Utility Theory (ETU) and the Prospect Theory (PT) have been the key methods in predicting the market through utility. The three methods have been able to depict how economic cycles caused risks in investments. However, Keynes (1936) stated that even when investors tried their best at making rational decisions, the mind still surrenders to desire, feelings or simply the level of courage in deciding a risky investment. In the research of behavior in simple games rose those three theories (EMH, ETU and PT) which were applied to the stock market for over half a century. By the end of the 1990s, behavioral finance was a new topic to be discussed in economic instances. Kumar and Goyal (2015) described herding as the most discussed behavioral biases when it comes to investment decision-making in the indirect real estate stock market.

In the year 2016, the Indonesian economy was at its lowest since the 1998 crisis, and an economic crisis from one of Asia's leading economic countries could potentially affect the global market, and thus methods to avoid it is essential. Now focusing on the direct real estate market, Indonesian residential properties are considered as the most profitable investment an individual could make (Lamudi, 2017). Investors consider house investments to have higher profitability because land prices continue to grow, but this belief may be the potential cause of the financial crisis or property bubbles. There are two types of possible investors that would be discussed in this paper, one which seeks property to gain profit, and the other for a first-home purchase. Individuals who purchased homes for the first time may consider such a decision as one of the biggest decisions they have ever made (Dreier, 1982). The two perspectives were intriguing to observe as Diaz and Hansz (1997) suggested how individuals would use the opinion of others when they have no experience in a field. In other words, information cascade is crucial to individuals who have no prior knowledge before deciding. Banerjee (1992) proved that information cascade can lead investors to neglect real values and follow the market instead.

Creating moments that enable groups of people from all sorts of backgrounds to buy a product is the very essence of marketing. The problem is the market inefficiency and its decline, which Lee and Reed (2014) stated, that there was a noticeable decline in homeownership among first-time buyers in many countries, particularly households at the age of fewer than 35 years. Cribb et al. (2018) further confirmed that those who were born in the late 1980s had a homeownership rate of 25 per cent, compared with 33 per cent for those who were born 5 years earlier. Monico (2013) surveyed that first-home buyers prefer to delay their purchase of residential properties. On top of that, Lamudi (2017) specifies that the most dominant consumers of the Indonesian real estate market vary from 18 to 34 years old at over 60 per cent of the entire market, while the city of Surabaya contributes the third highest residential housing purchase after Jakarta and Bekasi in Indonesia. Every business owner around the world would want their product and/or services to be known and used by the public for a specific purpose, which implies that there needs to be a better comprehension of herding behavior to achieve market stability.

There were some but few researchers who studied the effect of herding in the direct real estate market. Baddeley (2005) found that herding can be an additional aspect to the traditional theories in depicting the real estate property cycles. Dalko (2016) has suggested the Perception Alignment Hypothesis (PAH), which hypothesized how information cascade may be the cause of herding. Baddeley (2011) also suggested an experimental method through the valuation of residential property representing investor's decision-making in property purchase, which was considered as the willingness to pay or purchase. The

experiment beforehand was done with the consideration of social, normative and psychological aspects.

Upon the investigation of the three aspects to herding, which considered social, normative and psychological influences, it was apparent that both social and normative influences were important and that psychological influence was not because of group effects in the experiment. Supporting such findings, Cohen (1968) also revealed that personality does not differ statistically between men and women around the world.

This paper attempts to separate the social and normative influences in herding by modifying a previous experimental method and integrating PAH into it. The remainder of this paper is organized as follows: the second section presents supporting theories and experimental design and procedures; the third section provides results and discussion; and the fourth section concludes.

Literature review

This study was the result of three strands of research. The first literature examined the applications of herding throughout various instances, and it provided current approaches to modeling herding behavior. The second literature suggests a new approach to herding referred to the PAH, which examined the causality of herding through information cascade. The third literature examined the causality of herding in residential real estate associated with social and normative influences.

Prior studies in the twentieth century have found how individuals were affected by others in decision-making (Asch, 1955). The research expanded as researchers applied the theory toward trading tasks and found that social pressure does exist in trading as well (Baddeley *et al.*, 2007). In the early twenty-first century, the efficient market theory had received many critiques, and researchers have since begun to migrate from the traditional economic theories to behavioral finance with herding as one of the key factors of the inefficient market (Sheifler, 2000).

Information Cascade

As part of the herding behavior, Shiller (2000) explained that information cascade was a possible cause of herding. Banerjee (1992) first created a model based on the assumption that each individual makes the same decision to the prior decision-maker if they were given such a piece of information. Raafat *et al.* (2009) modeled two main approaches of herding, which were pattern-based approaches and transmission-based approaches. The first focuses on physical traits, queue models, network topologies and biological flocking in herding. The other branch of the herding model depicts the transmission-based approach to herding, which mainly consists of non-mentalizing and mentalizing models. This paper focuses on the mentalizing section on the herding model, which consists of rational models of herding, information cascades, social psychology, social influence and conformity.

The aim of this paper is to investigate how a controlled experiment can further the understanding of the effects of information cascade toward herding when limiting the investor's surroundings through social and normative influences. The PAH hypothesized that information cascade occurs through three main factors:

(1) credibility;

(2) source of information; and

(3) media of information.

Indonesian people have a specific set of unique characteristics related to PAH. Credibility was measured by the trust of Indonesian investors toward the source of information, which Nielsen (2015) stated as the investor's own relations. It was also found in numerous cases that trust was measurable by the integrity of an individual, and was measured using three aspects:

(1) responsibility;
(2) truthfulness; and
(3) reputation (Wong, 2017).

Nielsen stated that the source of information that was to be trusted originated from the investor's relation, and thus can be separated into two groups of internal relations and external relations. Ho *et al.* (2016) found that the word-of-mouth was the most trusted way for Indonesians to receive information. Hence, the three aspects of PAH were used as some limitations in this paper.

Social and normative influences
Alongside information cascade, the influences that cause herding is just as important. Asch (1952) conducted an experiment which tested social influence toward the decision-making, and it was proven that individuals were susceptible to the words of others when an opinion represents 25 per cent of the majority. Normative influence occurs when the desire of an individual in fulfilling the expectation of others in a group was deemed necessary. The normative influence was closely related to reputational herding, which Keynes stated that individuals tend to have their reputations untainted when failing because of a decision as a group rather than failing alone. It was further confirmed when Scharfstein and Stein (1990) found out that investors herd in the stock market to retain their reputation. In contrast, Anderson and Holt (1996) stated that when information can be exchanged between both sender and receiver, that particular individual will tend to uphold their own opinion.

Herding and the market complexity
The emphasis given on herding as a behavioral bias can be seen throughout prior researches. Individuals were susceptible to the opinion of others when making decisions, as seen in multiple research results. However, Anderson and Holt (1996) stated that the acceptance of information gained from others only happens if one thinks that such information was rational to their understanding. Anderson and Holt (1997) also emphasized that when a two-directional exchange of information occurs, individuals tend to uphold their personal opinions. Demography has a role in segmenting the market, but regardless of age, Hott (2012) stated that herding was a viable behavioral bias in depicting house prices fluctuations when compared to the traditional methods.

Prior researchers have also done multiple analysis of herding behavior in the stock market (Choi, 2016). Olsen (1996) stated that herding causes abnormal returns in investments, and hence deepens the intriguing topic of behavioral bias. Lee *et al.* (2004) found that individual investors were more susceptible to herding behavior, while on the other hand, institutional investors can still be subdued by informed traders in the Taiwanese stock exchange. Similarly, Caparrelli *et al.* (2004) confirmed that investors were more likely to herd under extreme market conditions. Some researchers have also analyzed how herding applies to the direct market and have found that herding exists there as well.

Herding and heuristics
Herding is very closely related to heuristics and is often considered as the same thing, such as anchoring and adjustment. Herding is a type of behavior for an individual to follow the group. In other words, herding is the reaction of how an individual receives some influence (Shiller, 2000). On the other hand, Epley and Gilovich (2006) stated that anchoring and adjustment is the process where an individual already has a grasp or basic understanding of something and is able to adjust their thoughts on the very same object because of a variety of influences. Epley and Gilovich (2006) also found that adjustments on anchors may be diminished by incentives to engage in effortful thoughts.

Herding behavior itself may be either rational or irrational in concept. In retrospect, traditional theories suggest that investors act rationally by calculating all sorts of information before making a decision. However, investors may also act irrationally, and they may buy a residential estate at a given price in hopes of it increasing in the future (Fitzpatrick and McQuinn, 2007). Limiting the type of herding that is discussed in this paper, the authors focus only on the mental, rational model of herding, which focuses on information cascade in relation to the PAH theory.

First-home buyers
Young adults, or often referred to millennials, are currently the main buyers of residential housing in Indonesia; therefore, they can be considered as an influential group in the Indonesian economy (Lamudi, 2017). However, reports show that the Indonesian property sector is stated as not ready to shine yet, and has hit rock bottom in 2016 (DBSVI, 2017). Demands of the property would only move at a slow pace and marketing sales could only be driven by price growth, rather than volume pick-up because of an oversupply of housing, especially apartments. This may have resulted in the preference of using bank loans as the primary payment method of buying houses (Lamudi, 2017). Furthermore, the increase of subsidies in bank loans also increases the housing price, and the extent to which escalating house prices exacerbates is not only risks faced by households but also by house-builders (Lee and Reed, 2014).

The Indonesian Government has issued new regulations toward property developers to suppress foreclosure of bank loans because of the lack of buyers. They provided regulations that support home purchase by minimum-wage laborers, which lead to the construction of 1 million landed residential housing across Indonesia (*Program Satu Juta Rumah*). Indeed, such plans may be one stepping stone toward raising the demand for residential housing in Indonesia, especially for young adults. This further emphasizes that preventive measures must be taken in times of homeownership decline.

Realizing the decline of homeownership, first-home buyers are essential to this predicament. Although first-home buyers need a house to live in, their income may be relatively low, and the amount of loan approved depends on that income, hence determining the house value that can be purchased. Such events lead the first-home buyers to be more rational than the regular property investors, whose investment stimulus is stronger than their actual need because they have the income to spare (Goss, 2010; Monico, 2013 and Hood, 1999). Anastasia *et al.* (2018) supported such theories and discussed how younger individuals or families in Indonesia tend to be more rational in decision-making.

Valuation, the decision-making process and cognitive constraints
The key model to analyze the decision-making process of individuals is by measuring their willingness to pay to buy houses. The willingness of individuals who want to purchase a house requires a cognitive process, and so they are closely related to the anchoring effect

and loss-aversion effect (Baddeley, 2011). Furthermore, they would consider the value of the house and adjust their judgments by experience or other information until they reach a value that is acceptable to their belief. Of course, the value regarding the house consists of a few things, such as the objective information related to the house, including land and building area, location or other information related to fundamental values (Baddeley, 2016). Only when an acceptable value is reached, will it lead to the decision of the purchase.

Hypothesis development
The approaches from prior research were modified to our approach to further understand herding. Through the integration of experimental method with limitations from the PAH and the controlled investor environment, this paper attempts to experiment on the behavioral bias called herding. Previous findings show that individuals are susceptible to both social and normative influences. However, none specifies which of them drives individuals whether to herd or not. Herding is thus influenced by the available alternatives:

H1. Herding sets the difference between the final and prior valuation because of social influence.

By receiving the social influence after making an initial valuation of how much money the first-home buyers are willing to pay to buy a residential property, it is important to consider how such information can influence them, especially when a majority of people's opinion may be in contrast to their own.

H2. Socially influenced information moderates herding behavior in investor valuation in the context of social influence.

In theory, trust is the key to how an individual may or may not regard the information given to them. This is an application of the PAH theory that information cascade is the media used to deliver information to individuals. However, the decision whether to follow the herd solely depends on each individual. Henceforth, measuring trust is considered and measured on how the credibility of one information may lead to herding (Rofiq, 2007; Wong, 2017). This applies to all sorts of influences that an individual may receive, may it be either social or normative influences.

H3. The credibility of information moderates herding behavior in investor valuation because of social influence.

Normative influence regards an individual's pride and reputation, and such events may lead them to herd. However, when a two-way interaction (or more) is allowed between individuals, a variety of opinions and information are exchanged and the possibility to herd may actually decrease. Indeed, the flow of information is unrestricted among the individuals; however, this may actually lead to the upholding of individual opinions (Anderson and Holt, 1997).

H4. Herding sets the difference between the final and prior valuation because of normative influence.

Similar to the analysis of credibility on social influence, the same process needs to be done on the normative-influence treatment. This is because of both of the influences being a media for the information cascade.

H5. The Credibility of information moderates herding behavior in investor valuation because of normative influence.

Methodology
Participants
Purposive sampling was done in this research to test herding in specific groups. A pilot study was conducted within two groups of society to test how applicable the experiment method was to Indonesians. The first pilot-test candidates were 30 people consisting of property developers, with the assumption that they have experience in real estate investments. They were invited to join in the experiment by the use of formal letters sent to the related institutions. The second group was postgraduate students representing first-home buyers. Only after analyzing the results from the pilot study, improvements to the experimental method was made and further experimentation was conducted on the undergraduates.

The use of undergraduate students came into consideration as a representation of the first-home buyers to test the PAH theory. On the other hand, both property developers and postgraduate students already have experience in property investments, whereas the undergraduate students have none. Indeed, this means that external validity may become an issue as the undergraduate students are more homogenous as a population than non-students. However, this does not mean that the results are not to be generalized because of its lack of representation. The use of heterogeneous representatives may increase the external validity of one's results, and it may also lead to an inflated "error" variance because background factors would then be ignored (OK *et al.*, 2008).

Study findings in several literatures on the results of students as representatives of consumers are somewhat mixed. Some confirm that students can be reasonable in studying information and is able to follow the decision-making process (Ashton and Kramer, 1980). On the other hand, some also argue that students' results are limited and varied, because the students as a convenience sample may lack interest in engaging with the experiment (Lynch, 1982). Other threats to external validity were the lack of basic knowledge from the participants. However, the students who participated in the experiment have all received courses on property appraisal. Generalization of research findings derived from the students in an experimental setting to "real-world situations" has been analyzed, and recognized to have pros and cons in multiple disciplines over the decades (Peterson, 2001). Indeed, there would be some threats to the "real-world situations"; however, Lynch (1999) suggested that results from settings with sets of "real" people are less generalizable compared to the results from settings with student participants. Realizing such threats, the students can represent first-home buyers; in this case, it is specifically those who are under 25 and who have received higher education.

Without disregarding the external validity threat, internal validity is also considered. The duration of the experiment is a factor that comes into consideration because it is related to participant fatigue in engaging the experiment, and hence every step of the experiment is evaluated on the pilot study. The time regarding when the experiment begins was also considered, because it may render different results at different times of the day. This leads to the decision that the experiment should be done simultaneously for all participants.

Prior research also indicated that gender groups had effects on herding (Mohammadi and Shafi, 2018). For the purpose of minimalizing the errors from other variables, blocking was applied to the gender groups in the pilot study. As for the experience factor, the corresponding participants were selected to differentiate experienced real estate investors

(developers) and the first-home buyers (postgraduate and undergraduate students). As part of the pilot study, ten samples from each group were taken from the developers and postgraduate students. The developer group consists of an all-male group, and the postgraduate students taken in this experiment consist of ten male and 10 female participants, whereas the main study conducted on the undergraduates which consist of 125 people from the finance program and tax accounting program. Participant demographics can be seen in Table I.

	Developer $n = 10$ (%)	Postgraduate students Male $n = 10$ (%)	Female $n = 10$ (%)	Undergraduate students $n = 125$ (%)
Demographics				
Gender				
Male	100	100	–	66
Female	–	–	100	34
Total	*100*	*100*	*100*	*100*
Age				
18-24	–	90	70	100
25-34	30	10	30	–
35-44	30	–	–	–
45-54	30	–	–	–
54-64	10	–	–	–
Total	*100*	*100*	*100*	*100*
Ethnic				
Javanese	40	–	20	2
Chinese	30	100	80	87
Batak	20	–	–	–
Papua	–	–	–	0.8
Toraja	–	–	–	2
Manado	–	–	–	1.6
Ambon	–	–	–	2
Nusa Tenggara Timur	–	–	–	1.6
Dayak Manyan	–	–	–	0.8
Mixed	10	–	–	1.6
Total	*100*	*100*	*100*	*100*
Income				
Low	–	20	40	90
Lower middle	–	40	20	10
Upper middle	30	40	40	–
High	70	–	–	–
Total	*100*	*100*	*100*	*100*
Education				
Junior/senior high school	10	–	–	94
Diploma	10	–	–	–
Bachelor degree	60	100	100	6
Master degree and above	20	–	–	–
Total	*100*	*100*	*100*	*100*

Table I.
Participant
demographics

Source: Author's compilation from statistical data processing

Other than gender differentiation, the experience based on residential property transactions
was also considered. Participants were asked how many times they have purchased
residential properties, and when they last did such transactions. The developers were all
experienced in residential property transactions, whereas most of the students have never
purchased any kind of real estate in their lives. Only some postgraduate students
had purchased one to two properties in their lifetime, and none of the undergraduates had
purchased any kind of property in their lifetime.

Experiment design
The main purpose of the experimental design was to determine the causality of herding,
which lies between both social and normative influences through the limitations of PAH.
The two influences were then analyzed by using moderated regression analysis (MRA) to
determine its significance. The model used for the MRA can be seen in Figure 1, meaning
that the initial valuation would be untainted, whereas the second and third valuations may
differ because of the two influences.

The experimental process created attempts to simulate the decision-making process
made by the participants' valuations of residential properties within the limited amount of
time. The experimental instrument included two main parts, consisting of investor data and
instructions for the house valuation process. The first part consists of the participant
demographic data and their opinions on how credible the people were around them. The
second part of the experiment was the valuation process, by giving participants a set of
instructions and several brochures of houses. Details of the experimental procedure are as
follows:

- Subjects were divided into groups of five and given five sets of property details for
  five real properties. The details were collected from real-world property websites.
  Subjects were told that all five properties were valued in the region of IDR
  1,000,000,000. For the first two properties, the subjects were told the real-world
  values (asking price from brochures) to give them the sense for likely valuations of
  the other three properties. The subjects were given brochures of five houses, each
  containing basic information about the houses, which among them are map marked
  with property location and all nearby landmarks, facilities, house area, land area,
  interior designs, house façade and 3D rendered images.
- For the remaining three properties, the real values were not revealed and subjects
  were asked to state the initial values that they think suitable for each property. For
  the second part of the experiment, subjects were given the social influence-induced
  information by the instructor's word-of-mouth. The values of the three remaining
  properties are stated as follows: 25 per cent of the predecessors before them valued
  house 1 at IDR 950,000,000, 50 per cent of the predecessors before them
  valued house 2 at IDR 975,000,000, and 75 per cent of the predecessors before them
  valued house 3 at IDR 900,000,000. The subjects were then allowed to reconsider
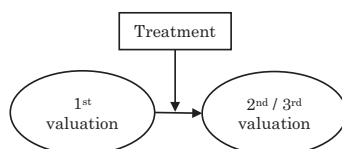 their valuations and given time to re-evaluate.

Figure 1.
Model for moderated
regression analysis

- The third and final part of the experiment tests normative influences by allowing subjects to communicate with each other, and subjects were then asked to place their final valuations for the three remaining houses.

Control variables

The socially influenced information given to the participants and credibility of information act as the control variable. The credibility of information from the investor's surroundings was indicated by the following three indicators:

(1) responsibility;

(2) trustworthiness; and

(3) reputation, which was measured with a Likert scale measuring from 1 to 5, (1) being least certain to (5) most certain.

Time is also controlled at every step of the experiment; the total length of the experiment is scheduled not to last longer than 60 min. Following the schedule, each valuation (initial valuation, social treatment-induced valuation, and normative treatment-induced valuation) is limited to 15 min per valuation session.

Time as in when the experiment was going to take place required all participants to undergo the same process at the same time. Hundreds of participants who are willing and able were then scheduled to engage in the experiment within the same time frame of eight working hours (8.00 a.m.-4.00 p.m.). This is important, because the cognitive ability is affected throughout the day, and is normally high during the day. Undergraduates, for example, are at their optimal condition in terms of cognitive ability starting from 11 a.m. to 9 p.m., reaching its optimal at 11 a.m.-1.00 p.m. (Evans *et al.*, 2017).

Dependent variable

The dependent variables were the second and third valuation of the participants. The second valuation solely depends on the external flow of information which was the socially influenced information given to the participants. The third valuation solely depends on the internal flow of information, which occurs when the participants were allowed to discuss their valuations in groups of 4-7 people.

Independent variable

The independent variable in this experiment was the initial valuation of the participants; it acts as the first untainted values that participants made before getting additional flows of information.

Pilot test results

Through non-parametric tests, it was evident that developers do not herd when subjected to social influence. However, through the analysis of MRA, developers have the tendency to herd when the opinion of others represent a majority of the crowd (75 per cent) with a Z score $= -2.375$, p-value $= 0.018$. This proved that the external flow of information can lead to herding when a majority of the crowd wills it. Row $H2$ shows how the socially influenced information affects the decision of developers, and it was found that under various levels of crowd representations, whether it was 25, 50 or 75 per cent, it had a significant effect on investor decision. The MRA indicated that the moderating effect of socially influenced information is as follows:

- Representing 25 per cent of the crowd's opinion gives the significant value of adjusted $R^2 = 0.631$, $F(1.9) = 18.104$, p-value = 0.002.
- Representing 50 per cent of the crowd's opinion gives the significant value of adjusted $R^2 = 0.635$, $F(1.9) = 18.433$, p-value = 0.002.
- Representing 75 per cent of the crowd's opinion gives the significant value of adjusted $R^2 = 0.539$, $F(1.9) = 12.676$, p-value = 0.006.

The MRA also indicated that credibility of information was only significant at 75 per cent of the crowd's opinion, with adjusted $R^2 = 0.332$, $F(19) = 5.974$, p-value = 0.037. This result was consistent with the first hypothesis, where developers only herd when a majority of the crowd represents a piece of information.

Statistical tests on normative influence toward investor's herding behavior showed that developers do not herd when allowed to discuss results with their co-workers. This result may be a result of a two-directional flow of information because decision-makers tend to retain their opinions in such conditions. The credibility of information was insignificant in all cases within the third valuation and was consistent with the third hypothesis, which evidently showed developers do not herd because of normative influences. The results revealed that male students were susceptible to both social and normative influence, causing them to herd in all cases. Such an event can be explained by Simonsohn and Ariely (2008) who found evidence that experience has effects on herding behavior, where investors with minimum experience tend to make rash decisions.

The socially influenced information model had significant levels and affected the male postgraduates to herd. Within the male student's valuations, the statistical results were as follows:

- Representing 25 per cent of the crowd's opinion gives the significant value of adjusted $R^2 = 0.439$, $F(1.9) = 8.840$, p-value = 0.016.
- Representing 50 per cent of the crowd's opinion gives the significant value of adjusted $R^2 = 0.829$, $F(1.9) = 49.413$, p-value < 0.001.
- Representing 75 per cent of the crowd's opinion gives the significant value of adjusted $R^2 = 0.659$, $F(1.9) = 20.358$, p-value = 0.001.

Statistical tests conducted on the female postgraduates revealed results that mirrored the male counterpart. Unlike its counterpart, the female participants were not susceptible to both social and normative influences, hence proving that the females do not herd. Although the socially influenced information model had significant levels and affected the female postgraduates, it was not able to cause them to herd. The statistical results of the female postgraduates were as follows:

- Representing 25 per cent of the crowd's opinion gives the significant value of adjusted $R^2 = 0.987$, $F(1.9) = 769.365$, p-value < 0.001.
- Representing 50 per cent of the crowd's opinion gives the significant value of adjusted $R^2 = 0.965$, $F(1.9) = 279.001$, p-value < 0.001.
- Representing 75 per cent of the crowd's opinion gives the significant value of adjusted $R^2 = 0.990$, $F(1.9) = 038.869$, p-value < 0.001.

The reason for this predicament may be explainable by Mohammadi and Shafi (2018) who found evidence that females were less likely to herd alongside their female companions.

Adjustments of the experimental procedure
With regard to external validity, the gender block now stands as a questionable variable toward the results of valuations. In the purpose of mimicking real-world situations, gender differentiation cannot be done in real estate purchase situations; adjustments made in the experimental procedure were as follows:

- The time construct must be asserted, and all the participants must undergo the experiment at the same time and conditions because the different times on the pilot study may affect the results. Both real estate developers and postgraduates were tested under different times and places because of work-related circumstances. The real estate developers were experimented on at 15.00-16.00 p.m., whereas the postgraduates at 18.00-19.00 p.m.
- The gender variable was no longer blocked to mimic a real-world situation.

Results
Reliability tests were performed to check whether the participant valuations were reliable before conducting the analysis. Correlation tests were also performed to determine the effects of the treatment. A factor analysis was also conducted to measure whether the indicators from the credibility factor is adequate to measure. Reliability and correlation tests from the valuation process and sampling adequacy test from credibility indicators can be seen in Table II.

The results from Table II indicated that the undergraduate students' valuations were reliable for further testing. Validation of the valuations was represented by the KMO and Bartlett test, which also indicated that the factor analysis for credibility can be conducted in the undergraduate group.

The notations used are as follows:

- $P1_i$ = Participant initial valuation.
- $P2_i$ = Participant valuation after being induced to social influence.

Participant								Cronbach's alpha	
Panel A: Reliability test results									
Undergraduates								0.702	

Panel B: Undergraduate valuation correlation coefficient

	P11	P12	P13	P21	P22	P23	P31	P32	P33
P11	1								
P12		1							
P13			1						
P21	0.655**			1					
P22		0.503**			1				
P23			0.534**			1			
P31	0.181*						1		
P32		0.199*						1	
P33			0.352**						1

Panel C: Sample adequacy tests for factor analysis

Participant	KMO	*p*-value
Undergraduates	0.629	0.000

Note: *p-value <0.05, **p-value <0.01
Source: Author's compilation from statistical data processing

- P3$_i$ = Participant valuation after being induced to normative influence.
- P$_i$S = Socially influenced property type "I" valuation.
- mi$_i$ = Credibility of information as moderator of property type "i."
- I = ith house type.

Hypothesis testing
Participant demographics were also analyzed as covariates using ANCOVA for further checking of internal validity. However, it is to be noted that homogeneity assumptions were violated in the Levene's test, and had a p-value > 0.05; this means that the variance is equal across groups. Such results may be caused by the unequal sample sizes across the groups, and this means that uncertainty is high in the dataset when analyzed using ANCOVA.

Considering the unique dataset, normality tests were also conducted to participant valuations, and the results indicate a non-parametric test method must be used to test the existing hypotheses. Wilcoxon's method of comparing means was used to test whether the initial valuation differs when participants were subjected to social and normative influences. Moderated regression analysis was used once again to test how credibility and socially influenced information may affect participant valuation. The statistical test results from undergraduate valuations can be seen in Table III.

The statistical tests revealed that undergraduate students were susceptible to herding because of social influence as described in panel A of Table III. Panel B shows that socially influenced information had effects on participant valuations as follows;

- Representing 25 per cent of the crowd's opinion gives the significant value of adjusted R^2 = 0.424, $F(1.123)$ = 92.339, p-value = 0.000.

- Representing 50 per cent of the crowd's opinion gives the significant value of adjusted R^2 = 0.247, $F(1.123)$ = 41.578, p-value = 0.000.

- Representing 75 per cent of the crowd's opinion gives the significant value of adjusted R^2 = 0.279, $F(1.123)$ = 49.005, p-value = 0.000.

The MRA in panel C of Table III indicated that the credibility of information is only significant at 25 per cent of the crowd's opinion, at adjusted R^2 = 0.115, $F(1.123)$ = 17.142, p-value = 0.000, and 50 per cent of the crowd's opinion at adjusted R^2 = 0.045, $F(1.123)$ = 6.834, p-value = 0.010. This result was similar to the pilot study, where the experienced developers only herd when a majority of the crowd represents a piece of information. However, a majority of the crowd's opinion (75 per cent) does not change the undergraduate participants' valuation. Such an event may be caused by a lack of experience, causing them unable to process the information given effectively. A second possible reason was the gender differentiation during the pilot study and the actual experiment, and the environment provided for the undergraduates was more accurate to the real-world situation by comparison.

Panels D and E of Table III show that the undergraduate students tend to herd because of normative influence. However, the credibility of information was not significant in causing such events. This may also be caused by the lack of experience in the real estate world; otherwise, it may also be caused by other factors that belong outside of this study's scope of mentalizing herding. Another possible reason for the result was the existence of a two-way flow of information when the participants were allowed to exchange information. However, previous theories stated that when a two-way information exchange occurs, the

Variable	Hypothesis			Z		p-value
Panel A: Wilcoxon test on social influence						
P11–P21	H1			−8.157		0.000
P12–P22	H1			−5.998		0.000
P13–P23	H1			−7.958		0.000

Variable	Sum of squares	Df	Mean squared	Hypothesis	F	p-value
Panel B: Contrast on socially influenced information						
P11*P1S (moderate1)						
Regression	53.172	1	53.172	H2	92.339	0.000
Residual	70.828	123	0.576			
Total	124	124				
P12*P2S (moderate2)						
Regression	31.326	1	31.326	H2	41.578	0.000
Residual	92.674	123	0.753			
Total	124	124				
P13*P3S (moderate3)						
Regression	35.328	1	35.328	H2	49.005	0.000
Residual	88.672	123	0.721			
Total	124	124				

Variable	Sum of squares	Df	Mean squared	Hypothesis	F	p-value
Panel C: Contrast on the credibility of external information						
P11*INT (mi1)						
Regression	15.167	1	15.167	H3	17.142	0.000
Residual	108.833	123	0.885			
Total	124	124				
P12*INT (mi2)						
Regression	6.527	1	6.527	H3	6.834	0.010
Residual	117.473	123	0.955			
Total	124	124				
P13*INT (mi3)						
Regression	1.615	1	1.615	H3	1.624	0.205
Residual	122.385	123	0.995			
Total	124	124				

Variable	Hypothesis			Z		p-value
Panel D: Wilcoxon test on normative influence						
P11–P31	H4			−5.366		0.000
P12–P32	H4			−2.812		0.005
P13–P33	H4			−4.654		0.000

Variable	Sum of squares	Df	Mean squared	Hypothesis	F	p-value
Panel E: Contrast on the credibility of internal information						
P11*INT (mi1)						
Regression	0.202	1	0.202	H5	0.201	0.655
Residual	123.798	123	1.006			
Total	124.000	124				
P12*INT (mi2)						
Regression	3.026	1	3.026	H5	3.076	0.082
Residual	120.974	123	0.984			
Total	124.000	124				
P13*INT (mi3)						
Regression	0.546	1	0.546	H5	0.544	0.462
Residual	123.454	123	1.004			
Total	124.000	124				

Source: Authors' compilation from statistical data processing

Table III.
Hypothesis test on
undergraduate
valuation

subjects tend to withhold their own opinions. In this case, the valuations of the
undergraduates shifted, which was in contrast to the previous theories.

Discussion
First-home buyers and herding
In theory, every individual investor is to be considered rational in decision-making. Indeed,
past reports have shown evidence that first-home buyers tend to be more rational investors.
The amount of time the participants were given in deciding the value of the house which
they are willing to buy should allow them to think rationally. Previous research found that
buyers who were doing more than one property transaction in a limited time tend to decide
rationally (Frederick and Loewenstein, 1999). This was not true for this study, as the first-
home buyers from the results were the exact opposite. It was apparent that even in a limited
time, the first-home buyers of Surabaya may be irrational in decision-making, and were
easily influenced. However, Frederick and Loewenstein (1999) also stated that people are
adaptive beings, such as possessing the automated mechanism that allows us to react to
what comes to our eyes. This means that a behavioral response is required in even the most
basic signals.

Information cascade and the influences
The results showed that the first-home buyers may not be rational in decision-making.
Furthermore, the MRA shows that both social- and normative-induced treatments caused
them to herd. This causality was further tested using the credibility of the information. On
the social-induced treatment, the credibility of information was crucial to the information
cascade causality process. On the other hand, the credibility of information was not
significant. This means that another factor may be the cause of herding when normative
values are applied in a situation.

Previous results argue that lack of experience could be the result of herding. Shusha and
Touny (2016) inferred that experience affects herding, and those who have minimal
experience may make hasty decisions based on their mood. Anastasia *et al.* (2018) stated
that emotional factors may dominate decisions when information is retained from the
buyer's spouse, children or friends. In retrospect, some researchers also argued that first-
home buyers tend to be more rational because they are more interested in homeownership
rather than investments (Goss, 2010; Monico, 2013 and Hood, 1999).

The contradicting results from previous researchers may be viable explanations of why
normative influence causes first-home buyers to herd. Assuming first-home buyers want to
be rational because they lack experience, requiring information from the people around them
is an alternative in the decision-making process. Purchasing the first house in anyone's life
is a big decision, and young adults may still be unable to make individual decisions, and
thus are more likely to herd.

Other possible explanations to the contradicting results may be the effects from the
media of information chosen in exchanging information with the first-home buyers. It was
evident that Indonesians believe that the "word-of-mouth" was the most viable source of
information. Now it is apparent that even when making important decisions such as house
purchase, first-home buyers of Surabaya are more likely to herd because of their high beliefs
in the exchange of information through "word-of-mouth."

Conclusions, implications and suggestions for future study
This paper has attempted to indicate the causality of herding through social influence and
normative influence. The integration of PAH has further focused the causes of herding

through its three aspects of credibility, source and media of information. The experimental results proved that undergraduates were susceptible to both social and normative influences unless they believe that the majority of a crowd upholds a group opinion. The results also showed that the undergraduates did not believe the internal flow of information among themselves, meaning that another variable was the cause of their valuation shifts. On the other hand, undergraduate students have high potential to the herding bias because they lack experience in the real estate world.

The results were somewhat contradictory to the results of previous researchers, who stated that first-home buyers tend to be more cognitive in decision-making. The results showed that social and normative influence was evident in herding behavior for the undergraduates in Surabaya. It has been clearly shown that first-time buyers from Surabaya are prone to herd. Unlike previous evidence in other countries, cognitive abilities in first-home purchase may be ignored, and some research even argues that emotions and personal goals may determine decisions.

Furthermore, the results have confirmed that first-time buyers are easily manipulated, and, therefore, may be considered a threat in market instability. The burden is placed on the local government who should create a counter-intuitive plan or regulation that can provide stability to the market. For example, the "*Program Satu Juta Rumah*" home subsidy which is relatively new in Indonesia, and its effectiveness in battling market stability and homeownership decline could be studied.

Future research could attempt to improve the separation of social and normative influences as the main causes of herding behavior. This study was also limited by one tool, which was the "word-of-mouth" as a media for the information cascade. Gadgets and other frequently used media may be used as another tool for the information cascade. There are still many internal and external factors that were practically impossible to be created in a simulation.

Finally, the experimental procedure limited both treatments to the first-home buyer group; future researchers should try to test it on different subjects for testing replicability; for example, creating a situation where participants can mimic real first-time buyers from all sorts of backgrounds, who might have an interest in purchasing a house. Such results can be compared with this study to test whether heterogeneous subjects differ from the student sample. Furthermore, because the first-home buyers were represented by student participants in this study, generalization of the results can be applied when the target market of property purchase mainly consists of first-home buyers; in this study, it is those who are under 25 and those who have received higher education.

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