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Cognitive Biases in Investment Decision: Do Education and Income Make a Difference?

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Abstract

This study aims to extensively research the effects of cognitive biases on individual investment decisions. The population of this research is investors in Indonesia and the sampling technique used is random sampling, obtained 574 respondents from 34 provinces in Indonesia. Quantitative data were collected through structured questionnaires and analyzed using multiple linear regression and moderated-moderation model in the PROCESS Procedure for SPSS Version 4.1 by Hayes. Results indicate that herding bias has a negative influence, discouraging investors from following market trends, while loss aversion, framing, anchoring, and mental accounting positively impact investment decisions; these biases are moderated by demographic factors. The findings imply that demographic factors do not interact jointly but operate independently to impact investment behavior. This research is novel in its exploration of moderated-moderation effects to reveal nuanced interactions between cognitive biases and demographics in shaping investment decisions.

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INTRODUCTION

In the era of globalization, characterized by rapid technological advancements and dynamic economic development, the necessity for individuals to possess comprehensive knowledge and insight into financial management has become increasingly paramount (Grima et al., 2019). Effective and precise management of personal finances is no longer an optional skill, but a fundamental requirement for handling the complexities of modern economic life. Given the pervasive influence of financial considerations on daily activities, individuals must cultivate sufficient financial literacy and capability to make informed decisions about their assets and wealth (Mehmood et al., 2024). Sound financial planning is essential, as it provides the foundation for economic stability and enables individuals to adapt to both opportunities and challenges within an ever-evolving global economy (Rasool & Ullah, 2020).

Individual investment refers to the allocation of resources in the present with the goal of generating profits in the future. Investments can take various forms, such as real investments (e.g., property or infrastructure) or financial investments (e.g., stocks, bonds) (Zahera & Bansal, 2018). Several factors influence investment decisions, including psychological factors, emotions, access to information, and the broader economic environment. Behavioral finance, a field that explores the psychological influences on financial decision-making, has shown that investors often make decisions that deviate from rationality (Badola et al., 2023). Mental errors or cognitive biases, such as overconfidence, loss aversion, and herding, can distort how investors perceive risks and rewards, ultimately affecting their expected returns. It has been widely demonstrated that these biases lead to suboptimal financial decisions, as investors misinterpret or mismanage information (Goyal et al., 2021).

Research on cognitive biases and their effects on investor decisions highlights the critical role these psychological factors play in shaping investment behavior (Othman, 2024). Biases such as herding, loss aversion, framing, anchoring, and mental accounting significantly influence how investors interpret and respond to market information (Basarir & Yilmaz, 2019). These biases do not simply lead to irrational decision-making but introduce systematic patterns that can both enhance and impair investment outcomes (Badola et al., 2023). While biases like loss aversion may promote caution and prevent excessive risk-taking, others, such as herding or anchoring, can cause investors to overlook key information or follow market trends without proper analysis. A deeper understanding of these cognitive biases is essential, as it not only helps explain deviations from traditional economic models of rationality but also offers insights into improving investment strategies and decision-making processes.

Despite extensive research on the effects of cognitive biases on individual investor decisions, significant gaps remain, particularly in understanding these biases in emerging markets such as Indonesia compared to non-emerging markets (Bouteska & Regaieg, 2020; Jain et al., 2020). The economic, cultural, and informational asymmetries between these regions may result in varying levels of susceptibility to cognitive biases in investment decision-making (Adiputra, 2021; Badola et al., 2023; Othman, 2024). Investors in emerging markets might exhibit heightened herding behavior due to less developed financial infrastructure, or greater loss aversion due to economic volatility (Fassas, 2020; Messaoud & Ben Amar, 2024; Saltik et al., 2024). To address these gaps, this study incorporates key demographic factors—gender, age, level of education, and income—into its analysis.

Moderator variables such as gender, age, gender, education, and income can significantly impact the relationship between behavioral finance factors and investment decisions. Research suggests that generational differences are crucial, with millennials tending to exhibit stronger herding behavior compared to older generations, who may rely more on their

own analysis (Adielyani & Mawardi, 2020; Rosdiana, 2020). Gender also plays a role, as women generally display higher risk aversion and lower overconfidence than men, which reduces their likelihood of engaging in risky investments (Shaikh et al., 2019; Srijanani & Vijaya, 2018).

In addition to the two factors above, education and income are proposed as relevant factors as moderating variables in this study. This is because both factors shape investors' ability to process information, assess risk, and reduce cognitive biases. Education level affects financial literacy, with individuals possessing higher education typically better at managing biases like mental accounting and loss aversion (Iram et al., 2021). Investors with higher education tend to implement analytical rather than heuristic reasoning in their decision-making, leading to more rational investment decisions (Islam et al., 2024; Khan et al., 2017). In contrast, lower educational attainment is often associated with reliance on intuitive judgment, which increases herding behavior and framing effect (Jain et al., 2020). Furthermore, this study also proposes that income plays an important role in moderating investment decisions. Income levels further moderate these relationships, as those with higher income tend to show less status quo bias, likely due to their increased access to financial resources and information (Atmaningrum et al., 2021; Rasyid et al., 2018). In contrast, lower-income investors may exhibit greater risk aversion and loss sensitivity due to facing financial constraints, thus making them more susceptible to panic-driven decisions during market downturns (Bouteska & Regaieg, 2020).

By examining how these demographic variables interact with cognitive biases, this study recognizes that cognitive biases do not operate in a segregated manner, but are influenced by an investor's ability to understand and navigate financial markets. By evaluating such issues, this study makes several contributions to the emerging literature. First, the integration of demographic factors allows for the exploration of variations in bias susceptibility, offering implications and novelties to improve investor behaviors and investment decisions. Second, while previous studies have been conducted in developed countries, studies on cognitive bias in investment decisions in developing countries (e.g. Indonesia) are limited. Indonesia is a developing country with a large population and experiencing significant economic growth. However, the financial market tends to be less mature, where information asymmetry, instability of economic conditions, and a culture that is different from conditions in developed countries may strengthen or reduce cognitive bias. By incorporating demographic factors in the model of cognitive bias and investment decisions, this study provides a breakdown of how investor characteristics shape susceptibility to cognitive bias and offers insights that go beyond common assumptions about the behavior of homogeneous investors. Third, this study offers practical implications for investor education, financial advisory services, and policy interventions aimed at reducing suboptimal investment behavior. Finally, this study contributes to the field of economic learning by emphasizing the importance of financial literacy and investor education in reducing cognitive bias. By understanding how demographic factors play a role in the relationship between cognitive bias and investment decisions, it enables the development of targeted education programs to improve rational decision-making, especially in developing countries such as Indonesia where financial literacy levels vary widely. These findings inform the importance of developing economic and financial education curricula to equip future investors with the analytical skills needed to make prudent investment decisions.

METHODS

The research employed an explanatory survey design to investigate relationships among variables by collecting quantitative data through structured questionnaires. This

approach allows for the clear identification of independent and dependent variables, enabling researchers to explore potential causal relationships. By analyzing the collected data, the design helps to explain how specific factors influence outcomes, providing a structured framework for hypothesis testing. The causal relationships in the model begin with the independent variables, which represent various cognitive biases influencing investment decisions. Herding (X1), where individuals follow the behavior of the majority, has been shown to strongly affect investors' decisions, especially in volatile markets (Compen et al., 2022; Mehmood et al., 2024). Investors who exhibit herding behavior are more likely to make decisions based on collective trends rather than independent analysis, which can lead to both positive and negative outcomes. Loss aversion (X2), another significant factor, reflects the tendency of individuals to prioritize avoiding losses over making gains, often leading to risk-averse investment strategies (Othman, 2024; Tahir & Danarsari, 2023). This bias can cause investors to hold onto underperforming assets too long or avoid beneficial risks, ultimately affecting their overall financial outcomes.

Framing (X3) refers to how the presentation of information influences investor decisions. Depending on whether investment options are framed in terms of potential gains or losses, investors may react differently, often with irrational risk-taking or risk-avoidance behaviors (Badola et al., 2023; Zahera & Bansal, 2018). Anchoring (X4), the tendency to rely heavily on initial information or reference points, also plays a role in shaping investment decisions (Costa et al., 2017; Mamidala et al., 2023). Investors who anchor their decisions to specific prices or market trends may disregard other critical data, leading to suboptimal choices. Mental accounting (X5), where individuals treat money differently depending on its source or intended use, further influences investment behavior. This bias can cause investors to compartmentalize their assets irrationally, affecting how they allocate resources and manage risks (Iram et al., 2021; Muehlbacher & Kirchler, 2019).

The dependent variable, Investment Decision (Y), is directly shaped by these cognitive biases, with investors' choices often reflecting the combined influence of herding, loss aversion, framing, anchoring, and mental accounting (Badola et al., 2023; Mittal, 2019; Ogunlusi & Obademi, 2021; Uhr et al., 2021; Zahera & Bansal, 2018). The presence of these biases may lead to irrational or suboptimal investment decisions, reducing the likelihood of achieving expected returns. Understanding the causal link between cognitive biases and investment behavior is crucial for developing approaches to mitigate their negative effects.

The model introduces moderating variables, such as gender and age (Gen*Age), which further shape the strength and direction of the relationships between cognitive biases and investment decisions (Bairagi & Chakraborty, 2021; Phan et al., 2018; Rosdiana, 2020; Srijanani & Vijaya, 2018). For example, women tend to exhibit higher risk aversion compared to men, which can weaken the influence of biases like herding and framing. Similarly, younger investors may be more susceptible to cognitive biases than older ones, as experience and financial literacy play a role in mitigating irrational behaviors. In addition, the moderating effects of education and income (Edu*Inc) introduce a complex interaction, where higher levels of education and income are likely to reduce the influence of cognitive biases. These demographic factors, in a moderated-moderation framework, help explain the varying degrees to which investors are affected by cognitive biases, providing a more comprehensive understanding of investment decision-making across different groups. The main effect model can be described in Figure 1 and the moderated-moderation model in Figure 2.

In main effect model, the analysis uses multiple linear regression after confirming the classical assumption (linearity, normality, homoscedasticity, and independency test). The main effect in multiple regression analysis can be formulated in Equation (1) while the

moderated-moderation model in Equation (2). To calculate the moderated-moderation, the Model 3 in PROCESS Procedure for SPSS Version 4.1 by Hayes is used.

(1)

$$Y = \beta_0 + \beta_1.X1 + \beta_2.X2 + \beta_3.X3 + \beta_4.X4 + \beta_5.X5 + \varepsilon$$

$$Y = \beta_0 + \sum_{i=1}^{5} \beta_i X_i + \sum_{j=1}^{2} \beta_{6+j} W_j + \sum_{k=1}^{2} \beta_{8+k} Z_k + \sum_{i=1}^{5} \sum_{j=1}^{2} \beta_{9+i+j} (X_i * W_j) + \sum_{i=1}^{5} \sum_{k=1}^{2} \beta_{11+i+k} (X_i * Z_k) + \epsilon$$

(2)

Where:

W_j are the demographic moderators (Gender, Age),

Z_k are Education and Income moderators.

The population was all individual Indonesian investors totaling 2,404, who were registered and still active, have SID and RDN Accounts, invested in other than stocks, and made transactions other than trading, registered on the stock exchange, and as active members spread across 34 provinces in Indonesia. Based on the random sampling formula (Isaac & Michael, 1981), a minimum sample of 332 was obtained. The final sample size of this study was 574.

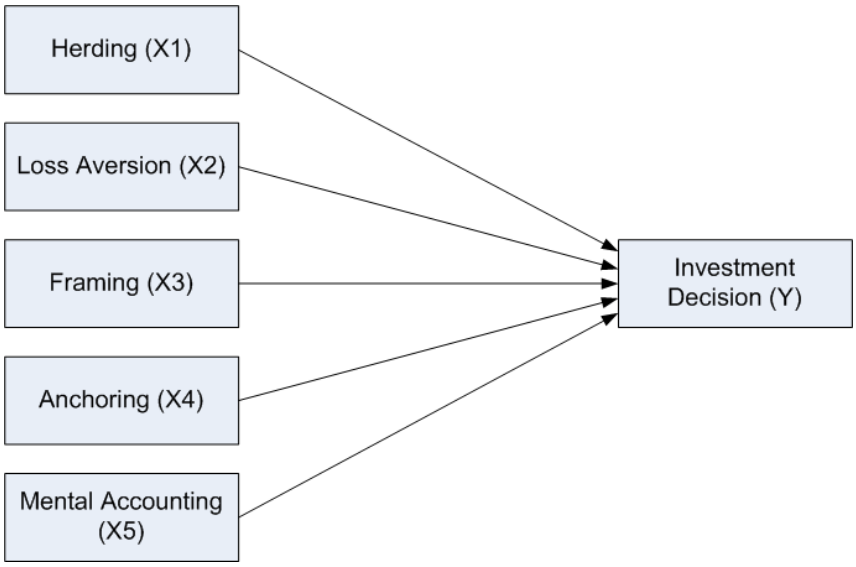

Figure 1. Main Effect Model

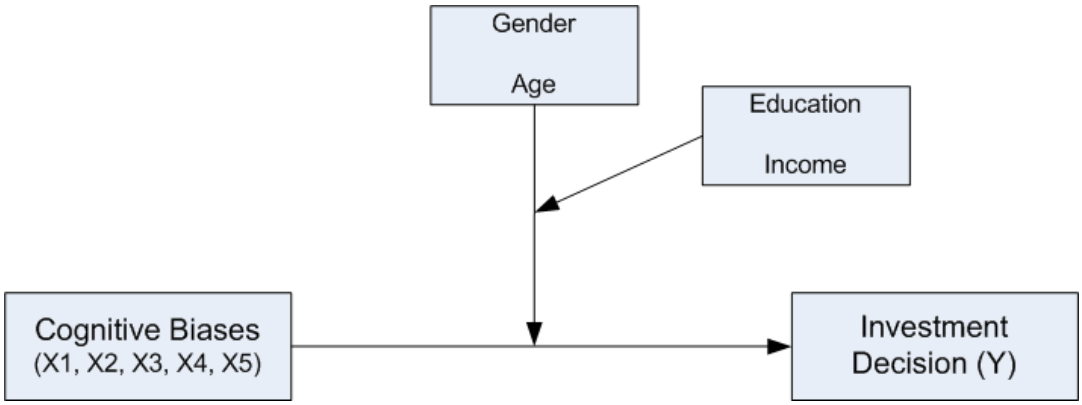

Figure 1. Moderated-moderation Model

RESULT AND DISCUSSION

Profiles of Respondents

The 572 data collected could be analyzed because they met the minimum sample criteria of 332 data. The crosstabulation of Gen*Age and Edu*Inc was composed of 4x4 matrix as depicted in Table 1.

This crosstabulation showed how different gender and age groups were distributed across combined education and income categories, indicating patterns in demographic composition. For instance, there was a notable concentration of young males and females in the "High-High" (high education and high income) category (163 and 160, respectively), while older groups were sparsely represented in most categories. Younger investors may represent newer entrants to the market, who are typically more willing to take on higher risks, often in exchange for potential higher returns. Their presence in larger numbers, particularly in the "High-High" (high education and high income) category, suggests that younger, well-educated, and high-income individuals are prominent in this investor sample. The older investors might represent a more conservative segment of the investor population. The smaller representation of older groups could imply either a lower engagement with investment or a higher preference for different investment types outside the categories captured here.

The concentration of high-education high-income in this category suggests that higher-income and well-educated individuals are more likely to be active in investing. This aligns with the tendency for people with higher financial literacy and disposable income to invest more (Mehmood et al., 2024). The category of high-education low-income might represent individuals who have strong financial literacy or professional knowledge (from education) but limited capital, possibly recent graduates or young professionals entering the investment space cautiously. The smaller numbers in "Low-Low" and "Low-High" categories might suggest that investors with lower education levels are either fewer or invest less actively, which could reflect general trends where financial literacy correlates with investment engagement (Rosdiana, 2020). Higher education and income levels seem correlated with greater participation, while younger investors dominate the sample, which aligns with broader trends in investment behavior.

Main Effects

The main effect estimations involved five cognitive biases as independent variables and investment decision as dependent variable. Table 2 presents the estimations of the main effects.

$$Y = 1.477 - 0.043X1 + 0.201X2 + 0.096X3 + 0.130X4 + 0.558X5 + \varepsilon$$

Table 2 presents the estimated effects of various behavioral biases on the outcome variable. Each variable is evaluated through its coefficient, standard error (S.E.), standardized coefficient, t-statistic, and p-value. The constant term has a coefficient of 1.477 with

Table 1. Crosstabulation of Gen*Age and Edu*Inc

Low-Low		Edu*Inc				Total
		Low-High	High-Low	High-High		
Gen*Age	Young-Male	74	2	39	163	278
	Young-Female	49	4	22	160	235
	Old-Male	0	0	8	34	42
	Old-Female	0	0	6	13	19
Total		123	6	75	370	574

Source: Processed primary data (2024)

a t-statistic of 2.709 and a p-value of 0.007, indicating that the intercept is significant within the model. This significance suggests that even without the specific effects of the included biases, there is a baseline influence on the outcome variable.

The table reveals that all hypotheses are accepted, as all p-values are below the 0.05 threshold. The first bias, Herding (X1), has a coefficient of -0.043 and a standardized coefficient of -0.076, indicating a negative impact on investment decision. The significance of herding is confirmed with a t-statistic of -3.782 and a p-value of 0.000. Loss aversion (X2), on the other hand, shows a positive effect with a coefficient of 0.201 and a standardized coefficient of 0.158; its t-statistic of 5.465 and p-value of 0.000 further support the acceptance of its hypothesis. Similarly, Framing (X3), with a coefficient of 0.096, also has a positive influence, with a t-statistic of 2.478 and a p-value of 0.013, affirming its hypothesis.

The last two biases, Anchoring (X4) and Mental accounting (X5), also exhibit significant positive effects. Anchoring has a coefficient of 0.130 and a standardized coefficient of 0.138, with a t-statistic of 3.799 and a p-value of 0.000, supporting its impact on investment decision. Mental accounting, the strongest predictor, shows a substantial positive effect with a coefficient of 0.558, a standardized coefficient of 0.593, a t-statistic of 15.870, and a p-value of 0.000. In summary, all behavioral biases tested are significant predictors, with p-values below 0.05, confirming that each hypothesis is accepted and affirming their roles in influencing the investment decision variable.

The study's findings, with a negative coefficient for herding, indicate that investors affected by this tendency are more likely to make decisions that deviate from optimal and rational investment choices, which negatively impacts their overall financial results. Thus, the conclusion is that herding bias, as reflected in the items in the questionnaire, can reduce good investment decision-making (Mamidala et al., 2023). This means that most investors in Indonesia still experience this herding bias. Next, loss aversion has a positive effect on investment decision. On the positive side, loss aversion can lead investors to exercise caution, reducing impulsive or risky decisions that might lead to significant losses. This tendency to avoid losses can motivate investors to carefully evaluate investment choices, so its can protecting their capital, particularly during market downturns (Mallik et al., 2017).

A positive effect of framing on investment decisions suggests that how information is presented influences investors in a way that leads to beneficial decisions. Framing can positively impact decision-making by shaping perceptions in ways that emphasize important information, simplify complex data, or guide focus toward long-term goals and overall strategy. It also implies that when information is presented thoughtfully, it enables investors to interpret choices more clearly and confidently, making decisions that align with their long-term financial goals rather than reacting impulsively (Badola et al., 2023).

Table 2. Main Effect Estimations

Variables	Coefficient	S.E.	Standardized	t-stat	p-value
(constant)	1.477	0.545		2.709	0.007
Herding (X1)	-0.043	0.011	-0.076	-3.782	0.000
Loss aversion (X2)	0.201	0.037	0.158	5.465	0.000
Framing (X3)	0.096	0.039	0.095	2.478	0.013
Anchoring (X4)	0.130	0.034	0.138	3.799	0.000
Mental accounting (X5)	0.558	0.035	0.593	15.870	0.000

Source: Processed primary data (2024)

Anchoring can have a positive influence on investment decisions when used appropriately. Anchoring refers to the tendency to rely heavily on an initial piece of information, such as an asset's previous price or a benchmark index, as a reference point (Othman, 2024). When investors use sensible anchors—like long-term historical averages, established stock performance metrics, or realistic valuation benchmarks—this tendency can guide more disciplined decision-making. Anchoring on a stock's average price over several years can help investors avoid overpaying during market peaks or panic-selling during drops. However, while beneficial when the reference point is logical and contextually relevant, anchoring can be risky if investors fixate on outdated or irrelevant data (Costa et al., 2017). Thus, when applied thoughtfully, anchoring can serve as a stabilizing reference, fostering balanced, informed investment choices.

Mental accounting having the strongest effect on investment decisions in this model suggests that individuals categorize and evaluate their money differently based on subjective "accounts" rather than treating all money as fungible. This behavior often leads to distinct approaches to risk, spending, and saving based on how funds are "labeled" (e.g., as income, bonuses, or savings). Research supports this, highlighting the role of mental accounting in financial decision-making. Iram, et al. (Iram et al., 2021) found that awareness and financial literacy enhance prudent decision-making, particularly among women, by improving mental accounting practices. Similarly, Muehlbacher and Kirchler (Muehlbacher & Kirchler, 2019) showed that individual differences in mental accounting influence how people manage and allocate resources, indicating that mental categorization can significantly shape investment strategies and choices.

Moderated-Moderation Effects

The calculations of the moderated-moderation involved several steps, namely incorporated the Model 3 in PROCESS Procedure for SPSS Version 4.1 by Hayes. For example, to calculate the moderated-moderation for X1 on Y, the other independen variables (X2, X3, X4, and X5) were put as covariates.

Table 3. Moderated-Moderation Effect Estimations

	X1	X2	X3	X4	X5
X -> Y	N/S	Sig	Sig	Sig	Sig
W -> Y	Sig	N/S	N/S	N/S	N/S
Z -> Y	N/S	Sig	Sig	Sig	Sig
X*W	Sig	N/S	N/S	N/S	N/S
X*Z	N/S	Sig	Sig	Sig	Sig
W*Z	N/S	N/S	N/S	N/S	N/S
X*W*Z	N/S	N/S	N/S	N/S	N/S

Source: Processed primary data (2024)

Table presents the results of moderated-moderation effect estimations for five behavioral biases (herding, loss aversion, framing, anchoring, and mental accounting) on investment decisions, with moderating effects of demographic factors. The independent variables (X1 to X5) reflect specific biases, and the dependent variable (Y) is investment decision. The two moderating variables, W (gender and age) and Z (education and income), reveal how demographic factors shape these relationships. The significance values show that biases and their interactions with moderators significantly impact investment decisions.

The first row shows the direct influence of each cognitive bias (X1 to X5) on investment decisions (Y). Herding (X1) is not significant, implying it does not directly impact investment decisions. However, Loss aversion (X2), Framing (X3), Anchoring (X4), and Mental accounting (X5) all have significant impacts, indicating that these biases play a notable role in investment decision-making. This finding suggests that people's choices in investments are more affected by these biases than by herding behavior, likely due to the individualistic nature of loss and gain perception, as well as how information is presented and processed.

The influence of gender and age (W) and education and income (Z) as individual moderators on investment decisions is partially significant. Gender and age (W) significantly affect investment decisions, indicating that demographic factors like gender and age can shape how individuals make financial choices. Education and income (Z) also show significant impacts when moderated with specific biases like Loss aversion (X2) and Framing (X3), highlighting that individuals' financial literacy and income levels might influence the effect of certain biases on investment behavior.

Examining the two-way interactions (e.g., XW and XZ), we see that gender/age (W) only significantly moderates the relationship between Herding (X1) and investment decisions. This interaction suggests that herding effects on investment choices are notably different across gender and age groups, possibly due to varying social influences or risk perceptions. In particular, young investors tend to exhibit stronger herding behavior and overconfidence, whereas older investors are less likely to have and rely on experience and risk aversion strategies (Gonzalez-Igual et al., 2021). In addition, gender differences highlight that women generally exhibit higher risk aversion, thus influencing their behavioral susceptibility to certain cognitive biases such as herding.

Meanwhile, education/income (Z) significantly moderates the influence of loss aversion, framing, anchoring, and mental accounting on investment decisions, indicating that higher education or income levels might mitigate or amplify these biases in financial choices. Higher education levels are associated with better financial literacy (Hasan et al., 2021), which enables investors to recognize and reduce biases such as framing and anchoring effects (Santoso et al., 2023). Instead, lower education tends to exacerbate errors in decision-making, resulting in suboptimal investment decisions. Similarly, income plays a significant role. Investors with higher income have more access to financial information, more diverse investment opportunities, and access to better investment education (Goyal & Kumar, 2021). thus reducing their reliance on cognitive bypass. In this regard, investors with lower incomes are more prone to loss aversion due to financial insecurity, leading to a more conservative investment approach. Such investors also tend to focus on short-term profits and thus engage more in anchoring and mental accounting.

The three-way interactions (XWZ) show no significant moderation effects across all variables, implying that the combination of gender, age, education, and income does not jointly influence the effects of biases on investment decisions. This absence of significance in three-way interactions suggests that the influence of behavioral biases may be nuanced by individual demographic factors, but these factors do not interact in a way that jointly impacts how biases affect investment behavior.

The findings in this study are consistent with prior literature that highlights the impact of behavioral biases on investment decisions. For example, the significance of Loss aversion, Framing, Anchoring, and Mental accounting aligns with Badola et al. (Badola et al., 2023), who found that these biases critically influence individual investment choices. Loss aversion, as highlighted by Mamidala et al. (Mamidala et al., 2023), strongly impacts risk-averse behavior, where investors tend to avoid losses over acquiring gains, aligning with this study's findings on the significance of Loss aversion. Similarly, the Framing effect, which refers to the way information is presented to investors, is highlighted as influential by Othman (Othman, 2024), suggesting that investors are swayed by the framing of potential outcomes, which supports the observed significant effect of Framing in this study.

The study's findings on the moderating effects of demographics such as education and income on biases are also supported by previous research. Uhr et al. (2021) found that individuals with higher financial literacy and income are less susceptible to biases like Anchoring and Framing, as they possess better self-control and analytical skills, a finding that aligns with the significant moderation of edu-

cation/income on biases observed here. Additionally, the limited impact of gender and age as a moderator on biases other than herding resonates with Bibi (2021), who noted that demographic factors like self-attribution bias and control illusions have varying impacts across age and gender but may not drastically change the influence of most biases on investment decisions. This study's insights contribute to understanding how individual demographics selectively interact with behavioral biases, supporting previous research on bias susceptibility among individual investors.

CONCLUSION

This study concludes that behavioral biases significantly impact individual investment decisions among investors in Indonesia. Specifically, the main hypotheses are accepted, demonstrating that herding, loss aversion, framing, anchoring, and mental accounting all play important roles in shaping investment choices. However, the effects differ in direction: herding bias has a negative influence, discouraging investors from following market trends, while loss aversion, framing, anchoring, and mental accounting positively impact investment decisions by influencing how investors perceive risks, process information, and evaluate gains and losses.

Using moderated-moderation effect estimations, the results indicate that the significance of these biases can be moderated by demographic factors. Gender and age significantly moderate only the relationship between herding bias and investment decisions, suggesting that the tendency to follow others' investment choices is influenced by specific demographic profiles. In contrast, education and income significantly moderate the effects of loss aversion, framing, anchoring, and mental accounting, highlighting that higher financial literacy and income levels may either strengthen or lessen these biases, depending on individual circumstances. Overall, while demographic factors like gender, age, education, and income shape the influence of behavioral biases, they do not interact jointly to impact investment behavior. This indicates that individual characteristics influence susceptibility to biases, but they operate independently rather than synergistically in moderating investment decisions.

Based on the findings, this study has several practical implementations that can improve investment decision-making. First, targeted financial literacy programs should be developed to address cognitive biases, such as loss aversion, framing, anchoring, and mental accounting, to ensure that all investors get the necessary information and education despite having lower backgrounds, so as to make more optimal decisions. Second, personalized investment advisory services based on demographic profiles will play a big role in investment decisions, such as younger investors who tend to be overconfident and follow other investors, while investors with lower income can be guided on strategies to minimize excessive risk. Third, policy adjustments that can provide more protection to investors, such as certain information disclosure schemes by companies to reduce information asymmetry, credibility of disclosed information, and good public relations. By integrating these insights, financial institutions, policymakers, and educators can create a more inclusive and effective investment environment to help investors navigate cognitive biases and make more rational decisions.

This study has several limitations. First, this study uses a sample from Indonesia so it may limit generalization to other markets with different financial infrastructure and regulatory environment. Indonesia is an archipelago so each region may have different implications. Second, this study takes the perspective of investor behavior at the time, whereas a longitudinal approach can reveal how cognitive biases evolve over time, which needs to be studied further in future studies. Lastly, this study only considers the perspective of education level, whereas in Indonesia there are quite a lot of universities with greater freedom to establish new universities, so there may be a gap

between educational institutions even though the level of education pursued by investors is the same. Recognizing these limitations, this study provides opportunities for future studies. First, exploring the cognitive bias behavior of investors in each island in Indonesia. Second, examining other dimensions of education such as college reputation, majors, and informal education. Finally, a qualitative study on investors' perspectives on cognitive bias in investment decisions would provide more comprehensive insights.

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