

Sustainable Investing in Emerging Markets: Evidence from an Extended TPB Approach

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ABSTRACT

This study aims to analyze the factors influencing green investment intention and behavior in the context of a developing country, particularly Indonesia, by employing an extended Theory of Planned Behavior (TPB) framework. Specifically, this study examines the effects of attitude, subjective norms, and perceived behavioral control on green investment intention, as well as the effects of intention and income on green investment behavior. In addition, income is examined as a moderating variable in the relationship between green investment intention and green investment behavior. Data were collected through an online survey of 155 respondents and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results indicate that attitude, subjective norms, and perceived behavioral control have positive and significant effects on green investment intention. Green investment intention is found to be the main predictor of green investment behavior. Income does not have a significant direct effect on green investment behavior; however, it significantly strengthens the effect of intention on green investment behavior. The R-square values show that the model explains 65.8% of the variance in green investment intention and 34.7% of the variance in green investment behavior. These findings confirm the relevance of the TPB in explaining green investment behavior and demonstrate that structural factors, such as financial capacity, remain important in determining the extent to which intention can be translated into actual behavior. This study provides implications for policymakers and financial industry practitioners in designing green investment products that are more inclusive, accessible, and aligned with individuals' financial capacity.

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Introduction

Global discussions on sustainable development and climate change mitigation have positioned green investment as one of the key instruments for accelerating the transition toward a low-carbon economy. Green investment is not only relevant for developed countries but is also crucial for developing countries that are seeking to shift their economic

structures toward more environmentally sustainable models. Previous studies have shown that green investment behavior cannot be explained solely by financial considerations, but is also shaped by psychological, social, and policy-related factors surrounding individuals.

The studies by Hemdan and Zhang (2024) in Egypt and Yee et al. (2022) in Malaysia serve as important references for understanding green investment intention in developing countries. Both studies employed the Theory of Planned Behavior (TPB) as their main theoretical framework, emphasizing three determinants of behavioral intention: attitude, subjective norms, and perceived behavioral control. In the context of green investment, these three factors have been shown to contribute to individuals' intention to participate in sustainable financial instruments.

Hemdan and Zhang (2024) demonstrated that positive attitudes, supportive subjective norms, and strong perceived behavioral control significantly increase green investment intention in Egypt. Their study also incorporated the role of social media as a moderating variable, as information and opinions related to environmental issues and green investment opportunities are widely disseminated through digital platforms. This finding highlights the significance of digital technology in promoting sustainable financial participation, although the study remains limited to individual investors.

Yee et al. (2022) extended the TPB by incorporating risk aversion and regulatory framework evaluation as additional variables. Risk aversion was found to have no significant effect on renewable energy investment intention, whereas regulatory framework evaluation played an important mediating role. Clear and consistent government policies strengthened the relationship between perceived behavioral control and the intention to invest in green instruments. However, non-investor respondents were not included in the study, leaving the psychological and structural barriers faced by this group insufficiently understood.

Beyond the context of green investment, the relevance of the Theory of Planned Behavior has also been widely confirmed in studies on sustainable and pro-environmental behavior. Akhound et al. (2022) showed that an extended TPB framework can be used to explain energy-saving intentions in the workplace within the context of a developing country. Liu et al. (2021) further emphasized that TPB constructs can help explain household energy-saving behavior by considering individuals' psychological factors. Furthermore, Qalati et al. (2022) found that the core constructs of TPB and its extended variables were able to explain household energy-saving intentions and behavior. These findings indicate that the extended TPB is relevant for analyzing sustainable behavior, including green investment as a form of sustainability-oriented financial behavior.

A comparison of the studies by Hemdan and Zhang (2024) and Yee et al. (2022) underscores the importance of geographical and social contexts in explaining green investment intention. In Egypt, social media serves as a key channel in shaping subjective norms, whereas in Malaysia, a conducive regulatory framework and supportive government policies emerge as critical factors. This suggests that external factors, such as digital technology and public policy, may exert different effects depending on a country's socio-

economic conditions. Accordingly, there remains room to examine other factors, such as environmental awareness and demographic characteristics, including income, in explaining how green investment intention is formed and translated into actual behavior.

Conceptually, research on green investment behavior requires a strong understanding of investment behavior itself. Chawla et al. (2022) define investment behavior as the actions and decisions individuals make in managing their funds, including investment frequency, portfolio diversification, and participation in the stock market. This approach emphasizes the practical and actual behavioral aspects of investment from a behavioral finance perspective. In contrast, Shah et al. (2024) propose the concept of Objectives-Oriented Investment Behavior (OOIB), which emphasizes that investment behavior should ideally be systematically planned based on financial goals, time horizon, risk evaluation, and personal preferences. These two approaches complement each other and affirm that investment behavior is multidimensional, encompassing both action-oriented dimensions and cognitive-psychological dimensions.

Within the Theory of Planned Behavior (TPB) framework, intention to engage in green investment is shaped by three main constructs: attitude, subjective norms, and perceived behavioral control (Ajzen, 1991). Studies conducted in developing countries show that positive attitudes toward sustainable investment consistently increase green investment intention (Adil et al., 2022; Yee et al., 2022; Kumari et al., 2023; Wang et al., 2024; Hemdan & Zhang, 2024). Similarly, social norms that support environmentally friendly behavior, whether in the form of injunctive norms or subjective norms, encourage individuals to align their investment decisions with social expectations (Yee et al., 2022; Zhou et al., 2024; Hemdan & Zhang, 2024). Furthermore, perceived behavioral control reflects the extent to which individuals feel capable of and possess the necessary resources to execute investment decisions, thereby strengthening their intention to engage in green investment.

Intention is subsequently regarded as a direct predictor of actual investment behavior. The financial behavior literature indicates that investors with stronger intentions tend to be more consistent in realizing their investment decisions (Ajzen, 1991; Adil et al., 2022; Chawla et al., 2022; Kumari et al., 2023). In the context of green investment, intention toward green investment reflects individuals' psychological readiness to choose investment instruments that consider not only financial returns but also social and environmental impacts. Therefore, the stronger an individual's intention to invest in green instruments, the more likely such intention is to be manifested in investment behavior (Ajzen, 1991; Hemdan & Zhang, 2024; Yee et al., 2022).

Income is a relevant demographic characteristic in the study of investment behavior. Within the Theory of Planned Behavior framework, intention does not always automatically translate into actual behavior, as behavioral realization also depends on actual control and the availability of individual resources (Ajzen, 1991). Limited financial resources may hinder the realization of intention, even when attitudes and social norms are supportive. Individuals with higher income have greater capacity to allocate funds, tolerate risk, and

diversify their portfolios. Herawati and Dewi (2020) explain that income is correlated with investment; the higher an individual's income, the greater the tendency to invest, as basic needs have been fulfilled and individuals have greater financial room to consider investment. The findings of Kurniawati et al. (2022) also show that income has a positive effect on investment behavior among capital market investors. In addition, higher income provides individuals with greater opportunities to access financial technology and engage in productive financial activities. Thus, income not only has the potential to directly influence investment behavior but may also strengthen the relationship between green investment intention and green investment behavior. In other words, the effect of intention on green investment behavior is expected to be stronger among individuals with better financial capacity.

The literature also emphasizes that investment behavior is influenced by a combination of external and internal factors. External factors include market conditions, regulations, social environment, social media exposure, and public campaigns related to green investment (Hemdan & Zhang, 2024; Yee et al., 2022). Internal factors include self-discipline, planning ability, risk preferences, and personal values related to sustainability (Chawla et al., 2022; Wang et al., 2024). In the context of developing countries, regulatory uncertainty often serves as a barrier to the growth of green investment, while income disparities create unequal opportunities to participate in sustainable financial instruments. Therefore, income can be positioned as a form of financial capacity that strengthens individuals' ability to translate green investment intention into actual investment behavior.

In the context of Indonesia as a developing country, green investment still faces several challenges, including limited investor understanding, variations in financial capacity, and unequal access to sustainable investment products. These conditions make Indonesia a relevant context for examining how green investment intention can be translated into actual behavior, particularly when individuals have different income levels. This study offers novelty by positioning income as a moderating variable in the relationship between intention toward green investment and investment behavior. Previous studies on green investment have generally focused on the formation of intention through the core TPB constructs, such as attitude, subjective norms, and perceived behavioral control, as well as model extensions through social media, regulation, risk aversion, or other psychological factors (Yee et al., 2022; Kumari et al., 2023; Wang et al., 2024; Hemdan & Zhang, 2024). Meanwhile, studies on investment behavior in general have shown that income is associated with investment intention or interest because it reflects individuals' financial capacity to allocate funds to investment instruments (Herawati & Dewi, 2020). However, limited research has specifically explained how income functions as a boundary condition that determines the extent to which green investment intention can be translated into actual investment behavior, particularly in the context of developing countries. Thus, the main contribution of this study lies in extending the TPB by integrating income as a form of financial capacity that

moderates the intention–behavior relationship, thereby providing a more comprehensive understanding of the gap between willingness and ability in sustainable investing.

Based on the preceding discussion, the research hypotheses are formulated as follows:

H1: Attitude has a positive effect on Intention Toward Green Investment.

H2: Subjective Norms have a positive effect on Intention Toward Green Investment.

H3: Perceived Behavioral Control has a positive effect on Intention Toward Green Investment.

H4: Intention Toward Green Investment has a positive effect on Investment Behavior.

H5: Income has a positive effect on Investment Behavior.

H6: Income strengthens the effect of Intention Toward Green Investment on Investment Behavior.

Method

This study employs a quantitative approach with a survey design and a causal-explanatory orientation to examine the effects of various factors on green investment intention and green investment behavior as the criterion variables. The main predictor variables examined in this study include attitude, subjective norms, and perceived behavioral control, which are formulated based on the Theory of Planned Behavior (Ajzen, 1991; Hair et al., 2019). Income is treated both as a variable that has a direct effect on green investment behavior and as a moderating variable that may strengthen or weaken the relationship between green investment intention and green investment behavior.

Data were collected using a structured questionnaire based on a five-point Likert scale and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with the assistance of SmartPLS 4.0. Model evaluation was conducted through the assessment of both the measurement model and the structural model, including validity, reliability, path coefficients, R-square values, and the significance of relationships among variables (Hair et al., 2021). The moderating effect of income was tested through the interaction term between Intention Toward Green Investment and Income using the two-stage approach, while the significance of the model was assessed using bootstrapping with 10,000 subsamples (Hair et al., 2021).

Results and Discussion

The measurement model was evaluated by assessing internal consistency reliability and convergent validity based on the criteria suggested by Hair et al. (2021). Convergent validity was examined using outer loadings, Composite Reliability (CR), and Average Variance Extracted (AVE). As presented in Table 1, all retained indicators demonstrated acceptable outer loading values, ranging from 0.745 to 1.020. These values indicate that the indicators adequately represent their respective constructs. The single-item construct, Income, showed a loading value of 1.000, which is acceptable for a single-indicator variable. In addition, the Composite Reliability values ranged from 0.893 to 1.000, exceeding the

recommended minimum threshold of 0.70 and indicating satisfactory internal consistency reliability. The AVE values also surpassed the minimum criterion of 0.50, ranging from 0.624 to 1.000. These results confirm that the constructs of Attitude, Impulsive Buying, Income, Intention Towards Green Investment, Moderating Effect, Perceived Behavioral Control, and Subjective Norms have adequate convergent validity. Therefore, the measurement model satisfies the requirements for construct reliability and convergent validity.

Table 1. Estimation of Outer Loading, CR, and AVE

Constructs	Items	Loading	CR	AVE
Attitude	ATT1	0.875	0.941	0.799
	ATT2	0.908		
	ATT3	0.891		
	ATT4	0.899		
Impulsive Buying	IB1	0.922	0.893	0.806
	IB2	0.874		
Intention	INT1	0.873	0.923	0.800
	INT2	0.892		
	INT3	0.917		
Perceived Behavioral Control	PCB1	0.842	0.923	0.751
	PCB2	0.894		
	PCB3	0.875		
	PCB4	0.855		
Subjective Norm	SN1	0.812	0.909	0.624
	SN2	0.745		
	SN3	0.822		
	SN4	0.788		
	SN5	0.769		
	SN6	0.801		
Income	Income	1	1	1

Discriminant validity was assessed using the Fornell–Larcker criterion, which compares the square root of the Average Variance Extracted (AVE) of each construct with the correlations among constructs. According to Fornell and Larcker (1981), discriminant validity is established when the diagonal values are higher than the off-diagonal correlation values in the corresponding rows and columns. As presented in Table 2, the diagonal values for Attitude, Impulsive Buying, Income, Intention Towards Green Investment, Perceived Behavioral Control, and Subjective Norms are greater than their respective inter-construct

correlations. This indicates that each construct shares more variance with its own indicators than with other constructs in the model. Therefore, the Fornell–Larcker results confirm that the measurement model demonstrates adequate discriminant validity.

In addition, discriminant validity was further evaluated using the Heterotrait–Monotrait Ratio (HTMT), which provides a more rigorous assessment of construct distinctiveness. The HTMT results, as shown in Table 3, indicate that all values are below the recommended threshold of 0.90. The highest HTMT value is found between Perceived Behavioral Control and Intention Towards Green Investment at 0.787, which remains within the acceptable range. These findings provide further evidence that the constructs in the model are empirically distinct from one another. Thus, the measurement model satisfies the requirements for discriminant validity.

Table 2. Fornell Larcker Criterion

	ATT	IB	INCOME	INT	PCB	SN
ATT	0.894					
IB	0.249	0.898				
INCOME	0.162	0.124	1			
INT	0.67	0.526	0.109	0.894		
PCB	0.469	0.651	0.19	0.702	0.867	
SN	0.462	0.493	0.164	0.6	0.601	0.79

Table 3. Heterotrait-Monotrait Ratio (HTMT)

	ATT	IB	INCOME	INT	PCB
ATT					
IB	0.282				
INCOME	0.177	0.145			
INT	0.741	0.623	0.114		
PCB	0.512	0.779	0.200	0.787	
SN	0.488	0.615	0.172	0.670	0.685

The structural model was evaluated using the bootstrapping procedure in SmartPLS with 10,000 subsamples to determine the significance of the hypothesized relationships among the constructs. The results of the bootstrapping analysis, including path coefficients, t-statistics, p-values, and R² values, are presented in Figure 1 and Table 4. The path coefficients indicate the direction and strength of the relationships between the independent and dependent variables, while the t-statistics and p-values determine whether these relationships are statistically significant. In addition, the R² values were examined to assess the explanatory power of the model. R² represents the proportion of variance in an endogenous construct that can be explained by its predictor variables. Therefore, the R² values provide insight into how well the independent variables explain Intention Towards Green Investment and Investment Behavior in the proposed model.

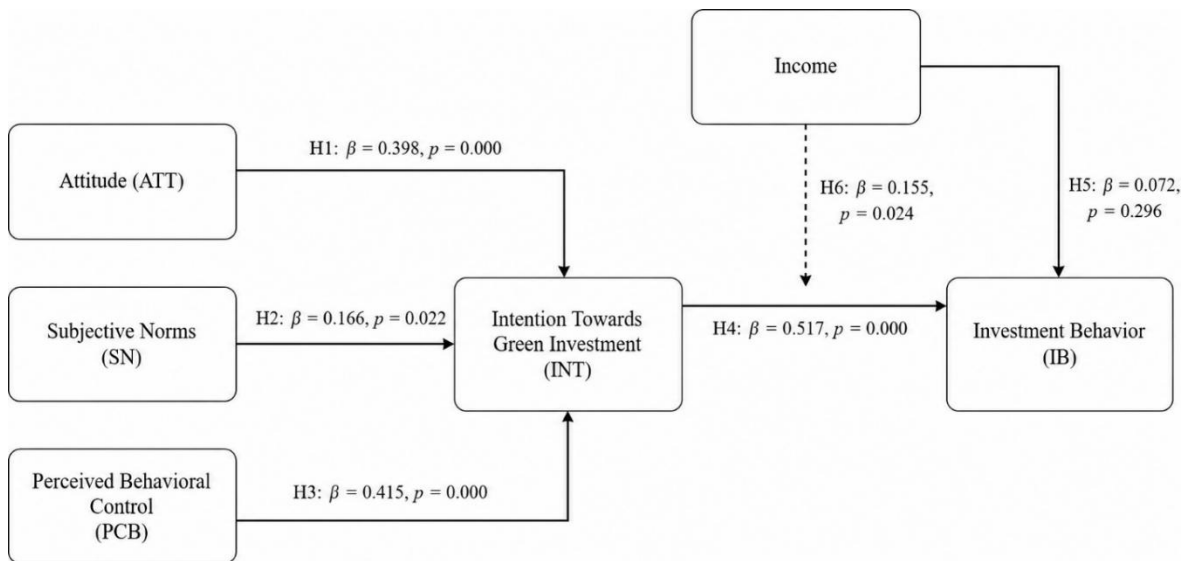


Figure.1 Structural Model with Path Coefficient and Significance; * $p < 0.05$;

Table 4. T-Statistics of Path Coefficient (Inner Model) with R^2 estimation

Hypothesis	Path	Path Coefficient	T Statistics	P Values	R^2	Decision
H1	ATT → INT	0.398	5.122	0.000	0.658	Supported
H2	SN → INT	0.166	2.288	0.022		Supported
H3	PCB → INT	0.415	5.174	0.000		Supported
H4	INT → IB	0.517	8.575	0.000	0.308	Supported
H5	INCOME → IB	0.072	1.046	0.296		Not Supported
H6	INCOME × INT → IB	0.155	2.266	0.024		Supported

The PLS-SEM results presented in Figure 1 and Table 4 indicate that five hypotheses are supported, while one hypothesis is not supported. Attitude has a positive and significant effect on Intention Towards Green Investment, with a path coefficient of 0.398, a t-statistic of 5.122, and a p-value of 0.000. Therefore, H1 is supported. Subjective Norms also have a positive and significant effect on Intention Towards Green Investment, as shown by a path coefficient of 0.166, a t-statistic of 2.288, and a p-value of 0.022, supporting H2. Furthermore, Perceived Behavioral Control has a positive and significant effect on Intention Towards Green Investment, with a path coefficient of 0.415, a t-statistic of 5.174, and a p-value of 0.000. Thus, H3 is supported.

The results further show that Intention Towards Green Investment has a positive and significant effect on Investment Behavior, with a path coefficient of 0.517, a t-statistic of 8.575, and a p-value of 0.000. Therefore, H4 is supported. This finding indicates that individuals with stronger intentions toward green investment are more likely to engage in green investment behavior. However, Income does not have a significant direct effect on

Investment Behavior, as indicated by a path coefficient of 0.072, a t-statistic of 1.046, and a p-value of 0.296. Accordingly, H5 is not supported.

In contrast, the moderating effect of Income on the relationship between Intention Towards Green Investment and Investment Behavior is significant, with a path coefficient of 0.155, a t-statistic of 2.266, and a p-value of 0.024. Therefore, H6 is supported. This result suggests that Income strengthens the influence of Intention Towards Green Investment on Investment Behavior. In other words, individuals with higher income are more likely to translate their intention toward green investment into actual investment behavior.

The R² results indicate that Attitude, Subjective Norms, and Perceived Behavioral Control explain 65.8% of the variance in Intention Towards Green Investment. Meanwhile, Income, Intention Towards Green Investment, and the moderating effect explain 30.8% of the variance in Investment Behavior. Overall, these findings suggest that intention plays a central role in explaining green investment behavior, while income functions more strongly as a moderating factor than as a direct predictor.

The findings indicate that the Theory of Planned Behavior (TPB) framework works well in explaining respondents' green investment intention and behavior. Attitude toward green investment has a positive and significant effect on intention to invest in green instruments. This finding is consistent with previous studies conducted in various developing countries, which confirm that positive perceptions of sustainable investment instruments encourage individuals' interest in participating in green investment (Adil et al., 2022; Yee et al., 2022; Kumari et al., 2023; Wang et al., 2024; Hemdan & Zhang, 2024). In other words, when respondents believe that green investment provides not only financial benefits but also social and environmental value, they are more likely to develop a stronger intention to invest.

Subjective norms are also found to have a positive and significant effect on green investment intention. This indicates that support from the social environment, including family, friends, and communities, remains an important reference point in the investment decision-making process. This result is in line with Yee et al. (2022), Zhou et al. (2024), and Hemdan and Zhang (2024), who show that social pressure and group expectations can serve as strong drivers of participation in sustainability-oriented financial activities, particularly in societies with more collectivist cultural characteristics.

Perceived behavioral control emerges as one of the strongest predictors of green investment intention. The positive and significant path coefficient indicates that respondents who perceive themselves as having the ability, resources, and access to information related to green investment tend to have a stronger intention to invest. This finding reinforces the central premise of TPB, which states that perceived control over a behavior is an important prerequisite for individuals to form a strong intention to act (Ajzen, 1991). This result is also consistent with Hemdan and Zhang (2024) and Yee et al. (2022), who demonstrate that perceived behavioral control plays an important role in shaping intentions toward green investment and renewable energy investment. Thus, the stronger individuals' perceived

ability and access to green investment instruments, the stronger their intention to participate in sustainable investment.

Furthermore, green investment intention is found to be the main predictor of actual investment behavior. The high path coefficient between intention and behavior indicates that respondents with stronger intentions are relatively consistent in translating those intentions into actual actions through green investment decisions. This finding supports the TPB assumption regarding the central role of intention as a bridge between psychological factors and actual behavior (Ajzen, 1991). In the context of investment behavior, this finding is also consistent with Adil et al. (2022), Chawla et al. (2022), and Kumari et al. (2023), who emphasize that investors' intention or planned behavior plays an important role in explaining individuals' tendency to make investment decisions. Therefore, this study strengthens empirical evidence from the context of developing countries that the intention–behavior link in the domain of green investment is relatively strong.

Income does not have a significant direct effect on green investment behavior. This finding indicates that the level of income, to some extent, does not automatically encourage respondents to participate in green investment. Within the TPB framework, actual behavior is not determined solely by resources or actual control, but also by intention, attitude, social norms, and individuals' perceived control over the behavior (Ajzen, 1991). This result differs from Herawati and Dewi (2020) and Kurniawati et al. (2022), who found that students' income has a positive effect on investment interest, suggesting that income is generally viewed as a supporting factor for investment tendencies. However, in the context of green investment, higher income does not necessarily translate directly into investment behavior if individuals have not yet prioritized green instruments, do not fully understand their sustainability benefits, or still perceive green investment as a relatively new and unfamiliar product. Therefore, income in this study is better understood as a supporting factor that strengthens the realization of intention, rather than as a direct driver of green investment behavior.

Nevertheless, income is found to strengthen the relationship between intention and green investment behavior. This moderating effect indicates that the influence of intention on behavior becomes stronger among respondents with higher income levels. In other words, although the intention to invest in green instruments may be formed across different income groups, the ability to realize such intention is greater among individuals with sufficient financial capacity. This finding clarifies that, in the context of green investment, income is more appropriately understood as an enabling condition rather than a direct predictor. Put differently, income does not automatically lead individuals to engage in green investment, but it helps individuals with strong intentions translate those intentions into actual behavior.

Overall, the findings confirm the relevance of TPB in explaining green investment intention and behavior, while also extending the framework by incorporating income as an individual characteristic that influences the process through which intention is translated into action. The difference between the insignificant direct effect and the significant moderating

effect indicates that income is not necessarily the primary driver of investment behavior, but rather functions as an actual capacity that enables green investment intention to be realized in action.

Conclusion

This study aimed to examine the effects of attitude, subjective norms, and perceived behavioral control on green investment intention, as well as to investigate the roles of intention and income in shaping green investment behavior. Using a PLS-SEM approach on online survey data collected from 155 respondents, the findings show that the three core constructs of the Theory of Planned Behavior (TPB), namely attitude, subjective norms, and perceived behavioral control, have positive and significant effects on intention to invest in green instruments. Green investment intention is subsequently found to be the main predictor of green investment behavior.

Theoretically, this study confirms the validity of the TPB in the context of green investment in a developing country and enriches the literature by incorporating income as an additional variable. Income does not have a direct effect on green investment behavior; however, it positively moderates the intention–behavior relationship, indicating that financial capacity is an important factor in realizing green investment intention. This finding suggests that strong intention alone may not be sufficient; financial capacity is still required for intention to be translated into actual behavior.

The practical implication of this study is the need for green investment promotion strategies that focus not only on shaping positive attitudes and pro-environmental social norms, but also on creating an environment that enhances perceived behavioral control. This can be achieved, for example, through product simplification, information transparency, and ease of access. In addition, policies that facilitate the participation of lower- and middle-income groups, such as low-initial-capital investment products or fiscal incentives, are important to ensure that green investment becomes more inclusive.

This study has several limitations. First, the data were collected through an online survey using convenience sampling; therefore, the generalizability of the findings should be interpreted with caution. Second, the study employed a cross-sectional design, which does not allow for the observation of changes in green investment intention and behavior over time. Third, income was measured as a demographic variable; therefore, future studies may develop a more comprehensive measure of financial capacity, such as disposable income, financial assets, or risk-bearing ability. Future research is also encouraged to incorporate other variables, such as environmental concern, trust, perceived greenwashing, and regulatory support, to provide a broader understanding of green investment behavior.

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