Financial Literacy as a Catalyst for Pro-Environmental Behavior: A Structural Modelling Analysis of Ecological Sustainability

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Abstract
Financial literacy is increasingly recognised as a factor that influences individual decision-making beyond economic contexts. This study examines the role of financial literacy in shaping pro-environmental behavior and ecological sustainability through attitudinal and behavioral pathways. A quantitative cross-sectional design was employed using survey data from 146 respondents. Composite-based structural modelling was applied to test the proposed framework, with environmental commitment examined as a mediating variable. The results indicate that financial literacy has a significant positive effect on ecological commitment and pro-environmental behavior. Environmental commitment also exerts a significant influence on pro-environmental behavior. Pro-environmental behavior demonstrates a positive effect on ecological sustainability, while the direct relationship between financial literacy and ecological sustainability is not significant. These findings suggest that financial literacy influences ecological sustainability primarily through indirect pathways involving attitudes and behavior. Measurement properties were assessed using partial least squares-based validation procedures, which confirmed adequate reliability and validity for all constructs. The study contributes to sustainability research by integrating financial capability into behavioral models of ecological sustainability and highlights the potential role of financial education in supporting environmentally responsible behavior.

Keywords: financial literacy; environmental commitment; pro-environmental behavior; ecological sustainability; structural modelling

AIMS

This study aims to examine how financial literacy influences pro-environmental behavior and ecological sustainability through attitudinal and behavioral pathways. The study investigates financial literacy as an antecedent of environmental commitment. It then evaluates how environmental commitment contributes to pro-environmental behavior. The research also assesses the influence of pro-environmental behavior on ecological sustainability.

A secondary aim is to evaluate whether financial literacy exerts both direct and indirect effects on pro-environmental behavior and ecological sustainability. The study, therefore, examines a multi-stage relationship in which financial literacy affects environmental attitudes, which in turn shape environmental actions. This approach is consistent with contemporary behavioral and sustainability research that highlights the interaction of cognitive, motivational, and behavioral factors[1].

The study also aims to validate the measurement properties of the constructs through a confirmatory assessment of reliability and validity. This ensures that the indicators used for financial literacy, environmental commitment, pro-environmental behavior, and ecological sustainability are suitable for structural modelling[2].

BACKGROUND

Financial literacy has become an important component of individual decision-making in modern economies. It influences how people plan resources, evaluate risks, and consider long-term outcomes. Several studies show that individuals with higher financial capability tend to display stronger forward-looking behavior and greater personal responsibility in daily choices [1]. These characteristics also appear in research on environmental behavior, where responsible decision making is linked to awareness, commitment, and pro-environmental action.

Environmental commitment refers to an individual's sense of responsibility toward the natural environment. It is associated with personal values, motivation, and willingness to engage in actions that protect ecological systems. Prior research finds that environmental commitment helps translate environmental beliefs into behavior[2]. Pro-environmental behavior reflects actions undertaken to reduce environmental impact. These actions include conservation, waste reduction, and support for sustainable practices. Such behaviors are influenced by personal attitudes, knowledge, and situational factors[3].

Ecological sustainability requires behavior that protects natural resources and supports long-term environmental quality. Studies show that individual behavior is a significant determinant of sustainability outcomes in households, workplaces,

and community settings[4]. Integrating financial literacy with environmental models may therefore provide insight into how financially competent individuals consider ecological outcomes when making decisions.
Structural modelling approaches allow researchers to examine the pathways through which cognitive and attitudinal variables influence behavior and sustainability outcomes. They are well-suited for testing multi-stage processes that involve latent constructs measured with multiple indicators[5]. The present study adopts this approach to investigate how financial literacy functions as an antecedent to environmental commitment, pro-environmental behavior, and ecological sustainability.

HYPOTHESIS DEVELOPMENT

Financial literacy supports informed and future-oriented decision-making. Such cognitive orientation may extend beyond financial contexts and influence environmental attitudes and behaviors. Individuals who plan resources responsibly may also develop stronger environmental commitment and engage more consistently in pro-environmental actions. On this basis, the study proposes the following hypotheses.
H1: Financial literacy has a positive effect on environmental commitment.
H2: Environmental commitment has a positive effect on pro-environmental behavior.
H3: Financial literacy has a positive effect on pro-environmental behavior.
H4: Pro-environmental behavior has a positive effect on ecological sustainability.
H5: Financial literacy has an indirect effect on ecological sustainability through environmental commitment and pro-environmental behavior.
These hypotheses reflect a multi-stage process in which financial literacy influences ecological sustainability primarily through attitudinal and behavioral mechanisms. The proposed relationships are examined using structural modelling to assess both direct and indirect effects within an integrated framework.

EXPERIMENTAL

STUDY DESIGN

This study used a quantitative cross-sectional design to examine the relationships among financial literacy, environmental commitment, pro-environmental behavior, and ecological sustainability. The analytical approach drew on composite-based structural equation modelling. This approach is suitable for prediction-oriented research and for studies that involve multiple latent variables measured through reflective indicators (6; 5).

DATA SOURCES AND SAMPLE

The study used a complete dataset of 146 observations obtained through a structured questionnaire. The questionnaire contained indicators that measured pro-environmental behavior, environmental commitment, financial literacy, and ecological sustainability. All responses were recorded on a five-point Likert scale that ranged from strongly disagree to strongly agree. Respondents provided usable information for all constructs, which allowed the full sample to be used in the analysis.

MEASUREMENT INSTRUMENTS

Four focal constructs were included in the structural model. Pro-environmental behavior was measured through three indicators that reflected self-reported environmentally responsible actions. Environmental commitment was measured through three indicators that assessed personal attachment to environmental preservation. Financial literacy was measured using five items based on the OECD financial literacy toolkit. These items assessed personal financial monitoring, saving behavior, planning, and responsible decision making[7]. Ecological sustainability was measured using three indicators that reflected perceived contributions to long-term ecological protection. Demographic variables included gender, age group, educational level, employment status, and income category.

PROCEDURE

The items were screened for completeness and consistency prior to analysis. Construct scores were computed by averaging the indicators for each variable. Composite-based structural modelling was selected because it allows the estimation of predictive relationships among constructs without requiring large sample sizes or multivariate normality[6]. All analyses were conducted using standardised indicators to ensure comparability across constructs.

RELIABILITY ASSESSMENT

Internal consistency reliability was examined using Cronbach's alpha. All constructs demonstrated strong reliability. Financial literacy achieved an alpha of 0.94. Environmental commitment achieved an alpha of 0.83. Pro-environmental behavior achieved an alpha of 0.90. Ecological sustainability achieved an alpha of 0.87. These values exceed recommended thresholds and support the reliability of the indicators.

MEASUREMENT MODEL VALIDATION USING PLS-SEM

Measurement properties were assessed using confirmatory procedures from partial least squares structural equation modelling. Item reliability was evaluated through outer loadings. All indicators loaded strongly on their respective constructs, with loading values ranging between 0.84 and 0.92 for the focal variables. These values exceed recommended thresholds for reflective measurement models.
Composite reliability values ranged between 0.90 and 0.95. All average variance extracted values were above 0.75. These results support convergent validity for all constructs. Discriminant validity was examined using the HTMT criterion. All

HTMT ratios were below 0.50. These results indicate that the constructs were empirically distinct and that the measurement model satisfied recommended validity criteria[8, 9].

STRUCTURAL EQUATIONS

The structural model specified three equations that represented the hypothesised relationships among the constructs.

$$EC = \beta_0 + \beta_1 FL + \varepsilon_1$$

$$PEB = \gamma_0 + \gamma_1 FL + \gamma_2 EC + \varepsilon_2$$

$$ES = \theta_0 + \theta_1 FL + \theta_2 PEB + \varepsilon_3$$

These equations allowed the estimation of direct and indirect effects among the constructs. This analytical strategy followed accepted guidelines for prediction-oriented modelling in behavioral research[5]. The estimation of direct and indirect effects followed established guidelines for mediation analysis in structural and path models[11].

Results And Discussion

DESCRIPTIVE STATISTICS

Descriptive statistics were examined for all indicators and construct scores. The mean values of the four focal constructs ranged between 3.01 and 3.42 on the five-point scale. Standard deviations indicated adequate variation across responses. Visual inspection and moment statistics showed acceptable distributional properties for all indicators. No issues were observed that would prevent the use of regression-based structural modelling.

MEASUREMENT MODEL EVALUATION

The measurement properties were examined through a confirmatory assessment using procedures from partial least squares structural equation modelling. All outer loadings exceeded recommended thresholds for reflective indicators. Composite reliability values ranged between 0.90 and 0.95. All average variance extracted values exceeded 0.75. These results support internal consistency and convergent validity. Discriminant validity was examined using the HTMT criterion. All HTMT ratios were below 0.50, which indicates that all constructs were empirically distinct.

Table 1. Measurement Model Evaluation

Construct	Indicator	Loading	CR	AVE
FL	FL1	0.90	0.951	0.795
FL	FL2	0.87		
FL	FL3	0.89		
FL	FL4	0.89		
FL	FL5	0.90		
EC	EC1	0.84	0.902	0.754
EC	EC2	0.89		
EC	EC3	0.87		
PEB	PEB1	0.90	0.941	0.841
PEB	PEB2	0.92		
PEB	PEB3	0.92		
ES	ES1	0.89	0.922	0.797
ES	ES2	0.89		
ES	ES3	0.89		

Note. CR = Composite Reliability. AVE = Average Variance Extracted.

Discriminant validity was confirmed through HTMT ratios. All values for construct pairs ranged between 0.12 and 0.50, which is below the recommended threshold of 0.85[8, 9].

STRUCTURAL MODEL RESULTS

The structural model was estimated with three regression equations that corresponded to the hypothesised paths. Financial literacy had a positive effect on environmental commitment. Financial literacy and environmental commitment both had positive effects on pro-environmental behavior. Pro-environmental behavior had a positive effect on ecological sustainability. Financial literacy did not have a notable direct effect on ecological sustainability.

The model explained 18.3 percent of the variance in environmental commitment. It explained 20.7 percent of the variance in pro-environmental behavior. It explained 14.8 percent of the variance in ecological sustainability. The explained variance values are consistent with effect size interpretations commonly reported in behavioral research[12].

Table 2. Structural Model Results

Path	Coefficient	p value	R^2 (endogenous variable)
FL → EC	0.428	< .001	0.183
FL → PEB	0.196	.042	0.207
EC → PEB	0.333	.004	
FL → ES	0.041	.615	0.148
PEB → ES	0.359	.001	

Environmental commitment partially mediated the relationship between financial literacy and pro-environmental behavior. Pro-environmental behavior served as a behavioral pathway to ecological sustainability. These findings align

with previous research that links financial decision making, personal responsibility, and environmentally responsible actions [5, 6].

HYPOTHESIS EVALUATION

H1 predicted a positive effect of financial literacy on environmental commitment. This hypothesis was supported.
H2 predicted a positive effect of environmental commitment on pro-environmental behavior. This hypothesis was supported.
H3 predicted a positive effect of pro-environmental behavior on ecological sustainability. This hypothesis was supported.
H4 predicted a direct effect of financial literacy on pro-environmental behavior. This hypothesis was supported, although the effect was modest.
H5 predicted an indirect effect from financial literacy to ecological sustainability. This hypothesis was supported through the sequential pathway of environmental commitment and pro-environmental behavior.

INFERENCES

The results support all hypothesised relationships except the direct effect of financial literacy on ecological sustainability. Financial literacy emerged as a meaningful predictor of environmental commitment. This supports the argument that financially capable individuals tend to adopt forward-looking attitudes and may extend these attitudes to environmental domains. Environmental commitment demonstrated a significant positive influence on pro-environmental behavior. This is consistent with theoretical arguments and empirical findings that highlight the role of commitment and attitudes in shaping pro-environmental actions[2, 3].
Pro-environmental behavior demonstrated a clear effect on ecological sustainability. Studies in higher education and organizational contexts similarly show that stronger pro-environmental behavior is associated with more sustainable outcomes at the institutional and community level[4]. The lack of a direct effect from financial literacy to ecological sustainability suggests that the influence of financial understanding is expressed through attitudes and behaviors rather than through direct sustainability perceptions. Behavioral characteristics, including financial literacy, have been shown to influence sustainable investment choices, highlighting the link between financial capability and sustainability preferences[10].
The findings support a multi-stage relationship in which financial literacy promotes environmental commitment. Commitment then influences pro-environmental behavior. Behavior finally contributes to ecological sustainability. This multi-pathway structure is consistent with frameworks that combine cognitive, attitudinal, and behavioral processes in sustainability research and with recent evidence on mediated pathways from knowledge and values to pro-environmental behavior[3].

Conclusions

This study examined the relationships among financial literacy, environmental commitment, pro-environmental behavior, and ecological sustainability within a structured behavioral framework. The findings show that financial literacy plays an important role in shaping environmental attitudes. Individuals with stronger financial competencies reported higher levels of environmental commitment. This suggests that responsible financial decision-making may encourage a longer-term outlook that supports pro-environmental attitudes.
Environmental commitment influenced pro-environmental behavior to a significant degree. This reinforces the idea that personal dedication to environmental values is a central determinant of behavioral outcomes. The results also demonstrate that pro-environmental behavior contributes meaningfully to ecological sustainability. This relationship aligns with empirical evidence from sustainability research that highlights individual behavior as a crucial mechanism that supports ecological outcomes.
The absence of a direct relationship between financial literacy and ecological sustainability suggests that financial understanding operates through attitudinal and behavioral pathways rather than through direct perceptions of sustainability. This insight contributes to the broader literature by clarifying the channels through which financial competencies may influence ecological outcomes. The strength of the indirect pathway highlights the importance of integrating financial education with environmental initiatives. Programs that strengthen financial capability may enhance environmental responsibility when they encourage future-oriented thinking and personal accountability.
This study provides evidence for a multi-stage process that links financial literacy to ecological sustainability. The results support a model in which financial literacy precedes environmental commitment, which then influences pro-environmental behavior and sustainability outcomes. Future research should consider longitudinal designs to examine temporal relationships among these constructs. Cross-cultural comparisons would also improve understanding of how financial literacy interacts with environmental attitudes in different socio-economic contexts. Further work may also explore how institutional factors or policy frameworks moderate the pathways observed in this study.

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