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FROM AWARENESS TO ACTION: HOW ATTITUDE AND ENVIRONMENTAL CONCERN SHAPE INTENTIONS TO ADOPT GREEN FINANCE INITIATIVES

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Abstract

Green finance has gained prominence as a critical mechanism for addressing climate change and promoting sustainability. However, its adoption remains constrained in many developing economies. Grasping behavioral determinants of adoption is crucial in Pakistan, where evolving financial systems intersect with escalating ecological challenges. This study investigates how awareness, perceived benefits, and adoption costs influence intentions to adopt green finance initiatives. It further investigates attitude as a mediator and environmental concern as a moderator. A cross-sectional survey was conducted among Pakistani individuals. Moreover, the data analysis was made by means of structural equation modelling (SEM) to estimate direct, mediating, and moderating relationships. The results demonstrate that awareness and subsidized costs significantly predict adoption intention of such initiatives. However, perceived benefits affect intentions only indirectly through attitudes. Moreover, attitude emerged as a central mediator, reinforcing explanatory value by linking cognitive evaluations to behavioral intentions. Environmental concerns exerted the strongest direct effect on intentions to adopt green finance initiatives. However, the same revealed a selective moderating role, amplifying the impact of perceived benefits while weakening the influence of attitudes. The findings advance the Theory of Planned Behavior (TPB) by incorporating environmental concern, underscoring psychological complexities influencing sustainable financial behavior. The study emphasizes policymakers' and financial institutions' roles in fostering adoption through awareness initiatives, financial incentives, and ecological narratives. This study pioneers TPB in Pakistan's green finance, revealing interactions among psychological, economic, and environmental factors shaping sustainable decisions.

JEL classification: G21, G28, Q01, Q56, M31
Keywords: Sustainable Finance, Green Finance, Theory of Planned Behavior, Adoption Intention

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Introduction

The term "Green finance" denotes financial products and instruments including green loans, green securities, green insurance, and subsidized financing schemes (Berrou et al., 2019). These financial instruments or products are intended to facilitate investments in environmentally friendly initiatives. Adopting green finance at household level indicates an environmentally rational decision for domestic users (Bethlendi et al., 2013). These choices promote the use of sustainable options e.g., solar systems, energy efficiency in the form of low voltage appliances, and other similar initiatives. Adopting such initiatives requires a critical adjustment of behavior as per TPB (Ajzen, 1991). This theory reflects that individual's intention to adopt something or use something is driven by their attitude, subjective norms, and perceived behavioral control. This theory offers a deep-rooted framework for understanding domestic behavioral decisions linked to practices in sustainable finance.

Pakistan is critically facing a number of energy related challenges such as power shortages, and incompetent infrastructure (Fazal et al., 2022). It has disrupted daily life and hampers economic productivity (Asif et al., 2025). Additionally, the country has long-term dependency on fossil fuels for running most of its production process, and transportation. For example, high energy dependence on biofuels and fossil fuels has further heightened environmental degradation in Pakistan (Bashir et al., 2025). Moreover, IEA (2024) approximates Pakistan carbon emission at 200.67 million metric tons in 2023, which is of serious concern for a developing country. These basic and operational level issues have strongly contributed towards climate change, environmental degradation, and the rising level of pollution in the country. Pakistan is ranked 5th among the countries that are exposed most to climate change (Ahmad et al., 2025; Aqib et al., 2024; Bashir et al., 2025). Additionally, the country endures environment, health-related and economic impacts. For example, the country is bearing a substantial cost on account of illness related to water, or air borne pollutions and more specifically due to smog (Nasir, 2024). Moreover, rising environmental pollution has severely impacted public health, and respiratory disease caused by smog, i.e., asthma and TB, has continued to rise annually in Pakistan (WHO, 2024). These are concerns calling for alternative energy use as well as green instruments of finance for raising sustainability as well as long-term socio-economic risk reduction.

As a response, the Government of Pakistan (GOP) has initiated a number of green financing schemes like solar energy installations, efficient energy appliances, environment-friendly housing initiatives and electric vehicles (Naqvi et al., 2023; Qamruzzaman & Karim, 2024). Additionally, the GOP has also initiated energy-efficient building design, subsidies on household solar panel installation, higher heat efficiency, and community water filtration centres (Rehman et al., 2024). However, adoption of such schemes and initiatives at household levels remains limited in Pakistan. The reasons might include the lack of awareness, affordability of upfront cost, and trust issues in using such technologies for the first time. For example, a green bank survey in Pakistan found only 18% household knowledge of subsidized solar finance, with less than 10% actual take-up (Yin et al., 2023). Low take-up stems from low awareness, uncertain perceived benefits, and further affordability concerns. Additionally, perceived benefits include savings, resource effectiveness, and environmental advantages (Nasir & Ahmed, 2024). Moreover, initial or upfront costs are out of reach for low- and middle-income households in Pakistan (Guta et al., 2022).

Existing literature has examined sustainable finance adoption. However, most of these emphasize institutional focus rather than domestic behaviour. For example, research has examined drivers of green banking or corporate-level adoption of financing mechanisms (Bashir-Ashraf et al., 2024; Guang-Wen & Siddik, 2023; Malik & Singh, 2022). Recently, Almrafee and Akaileh (2024) identified perceived benefits and affordability as critical drivers of individual adoption. However, Shukla (2019) highlighted the role of social norms and environmental awareness. Moreover, these findings are related largely from developed economies and have limited applicability to an undeveloped economy such as Pakistan. Therefore, a clear gap exists for a study to comprehensively examine the interaction between awareness, affordability, and perceived benefits with behavioural constructs in resource-constrained settings.

This study addresses this gap by considering one component of TPB which is attitude as a mediator and environmental concerns as a moderator. This theory provides an organized framework for examining intention adoption. These factors include attitude, subjective norms, and perceived behavioural control. For example, the 'attitude' as the primary factor captures how an individual evaluates the adoption of green finance initiatives (Chen et al., 2023). Similarly, the 'subjective norms' indicates the perception of social influences for such initiatives (Li et al., 2023). Finally, the 'perceived behavioural control' indicates the ability of individuals to perform their behaviour for such initiatives (Zolait, 2014). Moreover, a number of studies related to pro-environmental behaviour in financial decision making applies TPB as a primary framework (Correia et al., 2021; Yuriev et al., 2020). This theory is used for such studies because it accommodates the contextual as

well as the psychological determinants. Additionally, a number of alternative frameworks such as TAM or UTAUT also provides the behavioural explanations of similar studies. However, the scope of TPB explains a broader perspective due its evaluative, normative, and control factors for individual behaviours. Finally, this study specifically focuses on one component of TPB, e.g., attitude which evaluates the adoption intention. Furthermore, the study examines the influence of economic and informational determinants of household adoption of green finance initiatives which are also related with the attitude of individuals. Therefore, it uses attitude as the mediator derived from TPB. The subjective norms, and perceived behavioural control might add less explanatory power due to their normative pressure and weak control on their behavioural belief (Kashif et al., 2018). Consequently, the subjective norms, and perceived behavioural control were excluded as they might make the mediation structure more complicated. Therefore, this study adopts a selective approach for applying the TPB as coherence theory.

This research examines the economic, information, and behavioural factors that determine the domestic adoption of green finance initiatives in Pakistan. The specific research questions of the study are as follows:

1. What is the role of awareness, perceived benefits, and subsidized costs in shaping the domestic user's adoption intention for green initiatives in Pakistan?
2. How does attitude mediate the impact of these factors in shaping adoption intention for target participants in Pakistan?
3. Do environmental concerns significantly moderate the effect of these factors in shaping adoption intention?
4. Do environmental concerns significantly moderate the impact of attitude in shaping adoption intention?

This research provides the following three significant contributions. Firstly, it extends existing literature by applying the TPB to green finance initiatives rather than the adoption of technology. It provides boundary conditions by incorporating conceptual clarity and environmental concerns. Secondly, this study provides empirical insights from Pakistan as a most climate-exposed country. Here the domestic participation of green initiative is still very low as compared to most other countries from climate-exposed settings. Thirdly, the findings highlight empirical evidence to guide the design of initiatives for enhancing awareness, simplifying financing needs, and improving incentives. These measures can increase household adoption and support national sustainability goals and Sustainable Development Goals 7 and 13.

Literature review

The TPB as proposed by Ajzen (1991), focuses on predicting and explaining human behaviour. It is particularly relevant when individuals lack full volitional control over their actions. TPB posits that behaviour is primarily determined by attitude. It is further stated that intention is shaped primarily by attitude while "subjective norms, and perceived behavioural control" plays a secondary role. It shapes the individual's behavioral intention, which is the immediate precursor to the behavior itself. Moreover, this theory underwent major development as researchers adapted it to varied contexts and questions. Initial use emphasized overall behaviour, with health behaviour such as smoking cessation and physical exercise and consumer behaviour (Fisher et al., 2011). Researchers later integrated factors such as formation of habit and concern for the environment (Bashir et al., 2024; Lavuri, 2022). Furthermore, TPB has also been integrated with models such as the TAM (Bashir et al., 2023; Bashir et al., 2025; Venkatesh et al., 2003). It offers more knowledge of technology adoption, including green technologies (Almrafee & Akaileh, 2024). Lastly, TPB became an influential model associated with sustainability and green finance. It explains intention toward behaviour that is pro-environmental, such as the use of green technologies, reuse and sustainable consumption (Pamidimukkala et al., 2025). Contemporary scholarship suggests the moderating function of concern for the environment, with attitudes toward sustainability potentially directly affecting behavioural intention (Wang et al., 2024).

This study considered "attitude" as the mediator from TPB. The reason for selecting these components from TPB is justified from a number of perspectives. Firstly, the determining factors (e.g., awareness, perceived benefits, and subsidized costs) primarily impact the emulative judgements, which are reflected in attitude. Secondly, the other components of TPB such as behavioural control and subjective norms indicates weak explanatory value in the case of low awareness and early adoption contexts (Kashif et al., 2018). Thirdly, prior studies provide evidence of using partial models of TPB (Li et al., 2023; Yin et al., 2023). These studies analyse how economic and informational factors shape such intentions using a core emotional mechanism. Finally, considering alle three components of TPB as mediator would complicate the analysis unnecessarily. It would result in adding no clarity theoretically. However, considering one component like 'attitude' is not only conceptually justified but also simplified the mediation analysis and theoretical clarity. In line with the above arguments, the study considered the 'attitude' as the mediator for this study.

Awareness of green finance significantly shapes behavioral intentions by increasing the likelihood of adopting sustainable practices. Empirical research shows that individuals with greater awareness of environmental challenges express stronger intentions to adopt eco-friendly solutions (Ghouse et al., 2024; Kim

& Lee, 2023; Zhang & Liu, 2022). Moreover, a study confirmed a positive relationship between awareness and green financing adoption (Sharma et al., 2024). Likewise, Gong et al. (2019) found that awareness develops the green practices adoption in supply chain management. This evidence reinforces the broader role of knowledge in sustainable decision-making. Extending these findings to financial products, Xing et al. (2021) observed a positive link between awareness of green loans and adoption intentions. Such a link was even more evident in the Chinese context. Furthermore, Chandel et al. (2022) found that promotional activities for solar financing enhanced adoption considerably in India. Overall, such studies prove the importance of awareness, thereby making plausible the following hypothesis:

H_1: Awareness about green financing initiatives increases their adoption.

Perceived benefits are a prime motivator in stimulating individuals towards adoption of green finance initiatives. Prior research confirms adoption likelihood is heightened when environmental, financial, as well as social benefits are sharply perceived (Tanveer et al., 2021). Indeed, environmental motives such as reducing carbon footprints and furthering broader sustainability objectives buttress adoption intentions (Ning et al., 2023). Similarly, perceived benefits were identified as a prime adoption driver (Shukla, 2019). However, he stated that the applicability of perceived benefits is self-evident in diverse settings. Energy and cost savings appliances alongside longer-term energy bill reductions were identified as prime reinforcement for adoption behaviors (Bianco & Sonvilla, 2021). These findings appear universal in several settings. However, a huge proportion of research remains specific in setting, commonly within organizational or institutional perspectives within developing countries (Ogiemwonyi, 2022). Broadly speaking, there is an accumulating establishment in the evidence for perceived benefits as a prime determinant. Therefore, it is necessary to test the following hypothesis:

H_2: Increasing the Perceived Benefits of green financing initiatives increases their adoption.

Cost is a major shaper of intentions for adopting environmentally sustainable behavior. Higher upfront costs for green technologies such as solar panels or energy-saving appliances reduce adoption considerably (Niemeyer, 2010). Cost barriers in developing countries frequently surpass environmental and social benefits, further discouraging use of sustainable choices (Sudhakara-Reddy, 2013). However, subsidies and support in these countries reduce cost barriers, promoting adoption of green action (Curtin et al., 2017). Such interventions are patchily administered or notably absent in developing environments. Even in Pakistan, monetary policies for green finance remain in an early phase (Yin et al., 2023). Access controls for affordable credit or instalment purchasing raises household affordability dilemmas (Khan et al., 2024). Such contextual realities make cost a major driver justifying our hypothesis:

H_3: Subsidizing the cost of green initiatives increases the adoption of these initiatives.

Awareness, perceived benefits, and cost are fundamental determinants for attitudes towards green finance applications. Prior research substantiates how knowledge about environmental issues generates favorable attitudes towards sustainability (Patzelt & Shepherd, 2011). Individuals with knowledge about green finance's environmental-positive characteristics demonstrate favorable adoption attitudes (Soni et al., 2022). Perceived financial and environmental benefits generate favorable green adoption attitudes as substantiated in prior research (Hageman et al., 2024). Perceived high costs boost negative attitudes hindering intentions for adoption (Zeng et al., 2022) Long-term benefits or external impulses may change negative perceptions into favorable attitudes (Zhang et al., 2023). Accordingly, awareness, benefits, and subsidization of costs are determining antecedents for attitudinal construction. From such a finding, it is hypothesized as follows:

H_4: Awareness, perceived benefits, and subsidized costs of green initiatives positively impacts attitude.

Attitude is a central component of TPB and a primary predictor of behavioral intention. Literature evidence shows that knowledge about environmental action boosts positive attitudes which in turn modify intention towards adopting sustainable behaviors (Shahzad et al., 2023). There is proof that people's positive attitudes towards green solutions make them more solid in their willingness towards such behaviors (Soni et al., 2022). Positive appraisals concerning green finance action directly improve adoption intentions at both organizational and household levels (Pamidimukkala et al., 2025). There is also additional evidence which shows that positive attitudes reinforce behavioral commitments by transforming abstract perceptions into actual adoption behaviors (Tunji-Olayeni et al., 2024). Generally speaking, such evidence validates attitude's mediator role in linking cognition and behavior. Consequently, attitude is a predictor in its own right. As such, this paper hypothesizes:

H_5: Positive attitude towards green initiatives increases the adoption intention.

Environmental concern is a core factor determining pro-environmental behavior. Concern for sustainability further enriches how individuals form intentions in embracing greener solutions like green finance schemes (Gifford & Nilsson, 2014). Evidence substantiates that high environmental concern improves the likelihood of

undertaking actions based on awareness of sustainable practice (Mills et al., 2017). However, in a state where there is awareness but low concern, intention in adopting is significantly reduced (Mngumi et al., 2022). In situations where environmental concern is high, awareness in green finance alternatives significantly contributes value in adoption intentions. People concerned about ecological problems regard such schemes as necessary responses in environmental emergencies (Nasir & Ahmed, 2024). It means environmental concern is not only an influential factor but a significant determinant in adoption behavior. Therefore, this research hypothesizes:

H_6: Higher environmental concerns increase intention to adopt Green Finance initiatives.

Attitudes are also commonly found acting as mediators between behavioral intention and cognition. Positive attitudes for sustainability are generated by awareness, which in turn guide behavioral outcomes (Soni et al., 2022). Similarly, perceived benefits promote green practice attitudes by describing environmental, financial, and social advantages (Wang et al., 2024). Moreover, a positive attitude toward subsidized costs for green products at a high-level result in positive adoption intention (Zeng et al., 2022). Similarly, when costs are framed in longer-term benefits, positive dispositions still result (Zhang et al., 2023). Thus, attitude serves as a critical mediator through which awareness, benefits, and subsidized costs are converted into intentions for adoption. Such a mediator function is even more significant in a context such as Pakistan, where direct adoption is hindered by resource scarcity. Accordingly, it is in such a context hypothesized by this study:

H_7: Positive attitude for green initiatives mediates the positive impact of awareness, perceived benefits, and subsidized cost for green finance adoption.

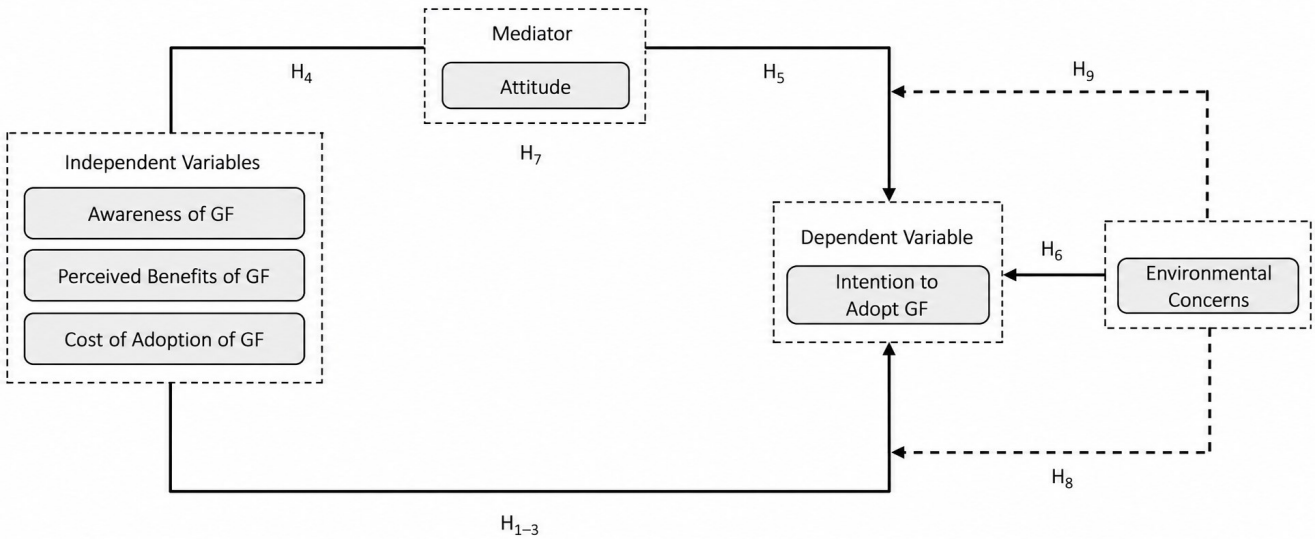
Environmental concern moderates people's responses towards sustainability awareness, perceived benefit and subsidized cost, and green finance attitude. According to literature, increased concern enhances responsiveness towards sustainability awareness thereby enhancing adoption intentions (Mills et al., 2017). Concern enhances perceived benefit thus valuing environmental saving and minimizing pollution (Ekins & Zenghelis, 2021; Hasan et al., 2022). Yet low concern reduces such benefit (Agrawal et al., 2024; Guang-Wen & Siddik, 2023). Correspondingly, people with high ecological concern are prepared for costs towards future gains (Banga, 2019; O'Mahony, 2021). Environmental concern may hinder attitude's predictive ability since people with high concern are inclined towards making intentions regardless of attitudinal judgment (Du et al., 2024). Yet low concern maximizes reliance on attitude (Banga, 2019; O'Mahony, 2021). As a result, this study hypothesizes as follows:

H_8: Increasing environmental concern strengthens the positive effects of awareness, benefits, and subsidized cost for green finance adoption.

H_9: Higher environmental concern weakens the positive effect of attitude on green finance adoption.

The researcher established the following research model in Figure 1 by considering the objectives of this study, TPB, and existing literature. The conceptual model considered "attitude" as mediator, and "environmental concerns" as the moderator of this study.

Figure 1: Research Model



Source: Author's own work.

Research methodology

This research implements a quantitative design and deductive reasoning, grounded in a positivist view of the world. Positivism is about quantitative measurement and experimentation for establishing cause-and-effect relationships (Bryman, 2016). Deductive reasoning permits testing of pre-existing theories and hypotheses based on pre-existing knowledge (Creswell & Creswell, 2017). Adopting a quantitative research design guarantees that hypotheses are tested in a structured framework with results that are both reliable and generalizable (Saunders et al., 2023). The target population of this study is domestic consumers in Pakistan as possible adopters of green finance initiatives. Such a population is extremely crucial for advocating for sustainable developmental aspirations in emerging economies where environmental expertise is low (Iqbal et al., 2024).

Convenience sampling was employed since it is effective when resources and time are not available (Creswell & Creswell, 2017). Online questioning combined with offline approaches were employed for data collection. Online approaches for data collection made it possible for participation across geographical divides. However, offline approaches were employed for individuals with low internet connectivity access, thereby promoting inclusivity. Such combinations enhance diversity while improving representation even though in a non-probability means (Creswell & Creswell, 2017). Data was collected within 6 months during (March-August 2025). Despite convenience sampling reducing generalizability, it is appropriate for research on associations rather than population-wide inferences (Bryman, 2016). According to Hair et al. (2017), power analysis is recommended for finalizing a sample size. The final sample exceeds the threshold level for justifying the use of PLS based SEM as per provided guidelines (Hair et al., 2017). They further stated that the power analysis ensures the necessary statistical power required for moderation or mediation analysis. Moreover, the target sample of this study may indicate biases such as owner occupier and urban due to the demographic landscape of Pakistan. Existing studies indicates that such biases are common in green finance initiatives and their adoption (Steuer & Tröger, 2022). The researchers acknowledged these limitations and interpreted their findings as per the sampled sub-population context.

A close-ended structured questionnaire divided into four sections was used for response collection in this study. Demographic details in six items made up the first part consisting of gender, age, residence, marital status, household size, and owning a house. Part two to four were about awareness, perceived benefits, subsidized-cost, attitude, intention to adopt, and environmental concerns in green finance initiatives. All concepts in this research are measured using established multi-item scales. Awareness of green finance initiatives is assessed with 7 items from (Almrafee & Akaileh, 2024). Additionally, perceived benefits of green finance are measured through 6 items proposed by (Ogiemwonyi, 2022). Moreover, subsidized-cost of green finance initiatives is captured with 5 items adapted from (Almrafee & Akaileh, 2024). Likewise, attitude toward green finance is measured using 9 items from (Almrafee & Akaileh, 2024). Furthermore, environmental concerns are evaluated with 8 items adapted from (Lavuri, 2022). Finally, intention to adopt green finance initiatives is measured by 8 items adapted from (Hassan et al., 2025).

In order to validate the questionnaire items, the researchers adopted best practices in terms of expert review and pilot testing before actual collection of data. A number of academicians and practitioners (or professionals) and experts from sustainability, green finance, and behavioral finance domains have given their expert views to ensure content validity. The researcher made minor adjustments in the wordings of these items to reduce ambiguity and improve readability. After making such adjustments in questionnaire items, the researcher initially collected 30 responses for pilot testing. The initial analysis revealed the items' reliability, comprehension, and clarity.

In order to ensure the transparency of this research, informed consent was obtained from all the respondents before starting data collection. The respondents were informed that their participation is voluntary, and that they can withdraw at any time without any responsibility. They were also informed about maintaining the confidentiality and anonymity of their collected information. Ethical approval was not required from any institution for data collection purposes for conducting this research.

The data of this study is cross-sectional by nature, and the responses are self-reported. Therefore, there were high chances of common method variance (CMV). The researchers have adopted a number of procedural and statistical remedies to control and minimize possible CMV in this study. The procural remedies include placing the exogenous and endogenous variables in different sections. It also includes variations in the wording of items for avoiding similar patterns of responses. Furthermore, a bias of social desirability was reduced using emphasis on anonymity. The statistical remedies include Harman's single factor test for assessing CMV (Fuller et al., 2016). Moreover, another diagnostic technique named the 'marker' variable was used as per suggestions of existing research (Simmering et al., 2014). All of these approaches resolved the concerns related to CMV from this study.

SEM is employed to examine complex relationships between observed measures and latent theoretical constructs. SEM enables simultaneous estimation of multiple relationship magnitudes and assessment of both direct, indirect, and moderating effects (Hair et al., 2017). This analysis confirms proposed relations, mediation, and moderation within TPB. Smart-PLS 4 is used, as it suits studies with complex models with smaller samples, and non-normal data (Henseler et al., 2015). The final PLS-SEM analysis includes a two-step approach. At first, it considers measurement model assessment including construct validity and reliability. Secondly, it considers structural model assessment in the form of hypotheses testing, mediation and moderation analysis, etc.

Data analysis

Table 1 reports the summary of study participants' attributes and their categories (N = 439). The sample comprised more males (59.7%) than females (40.3%). Similarly, the higher number of participants belongs to the age category of 21- 30 years (41.7%). This was followed by the age category of 31 - 40 years (32.3%). In addition, 21.0% were aged 41 years or older. Only 5.0% were aged 20 years or younger. Regarding marital status, a majority were married (57.2%). In contrast, 41.0% were single or engaged, and a small proportion (1.8%) were divorced or separated. Household size was relatively evenly distributed. Specifically, 41.0% reported households of four or fewer members. Another 29.4% lived in households with five to six members, while 29.6% reported more than six members. Most participants (82.0%) reported owning their homes. In comparison, 18.0% lived in rented houses. The majority resided in urban areas (78.6%). By contrast, 15.0% lived in rural areas, and 6.4% resided in semi-urban locations. It indicates a bias of urban and owner-occupation. This study acknowledged this bias as a limitation for generalizing its findings for a broader population.

Table 1: Participant summary

Attributes	Categories	N	%
Gender	Male	262	59.7
	Female	177	40.3
Age (in years)	≤ 20	22	5.0
	21-30	183	41.7
	31-40	142	32.3
	≥ 41	92	21.0
Marital Status	Single/Engaged	180	41.0
	Married	251	57.2
	Divorced/Separated	8	1.8
Household Size (Based on number of persons living in a house)	≤ 4	180	41.0
	5-6	129	29.4
	> 6	130	29.6
Home Ownership	Rented House	79	18.0
	Own House	360	82.0
Location (Residence)	Urban	345	78.6
	Semi Urban	28	6.4
	Rural	66	15.0

Source: Author's own work.

Table 2 reports the descriptive statistics for the study constructs. The results indicate that participants generally scored high across all measures. Mean values ranged from 5.61 to 6.30 on a 7-point Likert scale. The highest mean was observed for PBG as 6.30. This was followed closely by a mean value of ENC as 6.19. ATT also scored highly with the mean value as 6.11. Moreover, AGF demonstrated a similarly elevated average of 6.05. Additionally, IAG indicates a mean value as 5.96 6and CAG a mean value as 5.61. These values still reflected positive orientations. The same table indicates the standard deviations (SD) ranging from 0.19 to 0.37. It also indicated that all the constructs show negative skewness values. It reflects a cluster of responses at the scale's upper end. It shows a strong positive orientation. It also reflects a restricted range of responses including ceiling effects.

Table 2: Descriptive Statistics

Constructs	Min	Max	Mean	Std. Dev	Skew	Kurt
AGF	1.00	7.00	6.0469	0.37056	-1.892	2.005
PBG	1.00	7.00	6.2961	0.19402	-1.493	1.361
CAG	1.00	7.00	5.6087	0.32851	-1.160	1.354
ATT	1.00	7.00	6.1088	0.21058	-1.305	1.852
IAG	1.00	7.00	5.9570	0.20627	-1.914	4.689
ENC	1.00	7.00	6.1888	0.25629	-1.333	1.575

AGF = Awareness of Green Finance Initiatives, PBG = Perceived Benefits of Green Finance Initiatives, CAG = Cost (subsidized) of Adopting Green Finance Initiatives, ATT = Attitude toward Green Finance Initiatives, IAG = Intentions to Adopt Green Finance Initiatives, ENC = Environmental Concerns

Source: Author's own work.

Table 3 presents diagnostic statistics for model assumptions. Normality tests, including the Kolmogorov-Smirnov and Shapiro-Wilk, were significant (p-value < 0.05). This indicated non-normal residuals. Such a result validates the use of PLS SEM, which is robust to deviations from normality (Hair et al., 2017). VIFs revealed some collinearity concerns, with attitude exceeding 7.5. Some regression texts classify VIF values between 5 and 10 as moderate to high (Hair et al., 2017). The DW statistic (1.91) confirmed the independence of errors.

Table 3: Diagnostic statistics

Diagnostic	Test	Statistic	Decision
Normality	Kolmogorov-Smirnov	0.194 (p-value < 0.05)	Normality in Residuals was not found
	Shapiro-Wilk	0.793 (p-value < 0.05)	
Multicollinearity	**Tolerance**	**VIF**	**Decision**
AGF	0.270	3.707	Low or Mild Multicollinearity found
PBG	0.178	5.611	
CAG	0.342	2.923	
ATT	0.133	7.537	
ENC	0.286	3.496	
Error independency	DW	1.911	Independence of Error is found

VIF = Variance Inflation Factor, DW = Durbin-Watson

Source: Author's own work.

Table 4 reports the results of reliability and validity assessments for the study constructs. All FLs exceeded the recommended threshold of 0.70, thereby supporting indicator reliability (Hair et al., 2017). CA and CR values for each construct were well above the 0.70 benchmark. CA ranged from 0.858 for CAG to 0.974 for ENC, confirming strong internal consistency. The AVE values were also above the 0.50 criterion, ranging from 0.640 to 0.830. This result established convergent validity (Hair et al., 2017). Specifically, AGF (AVE = 0.802), ATT (AVE = 0.775), PBG (AVE = 0.817), and ENC (AVE = 0.830) demonstrated particularly high convergent validity. IAG and CAG also met validity requirements, although their AVEs were comparatively lower. Taken together, the evidence establishes that the constructs possess adequate psychometric properties for rigorous structural modelling. Figure 2 indicates the measurement model reflecting the factor loading values, R^2 and path coefficients.

Table 4: Discriminant validity and reliability

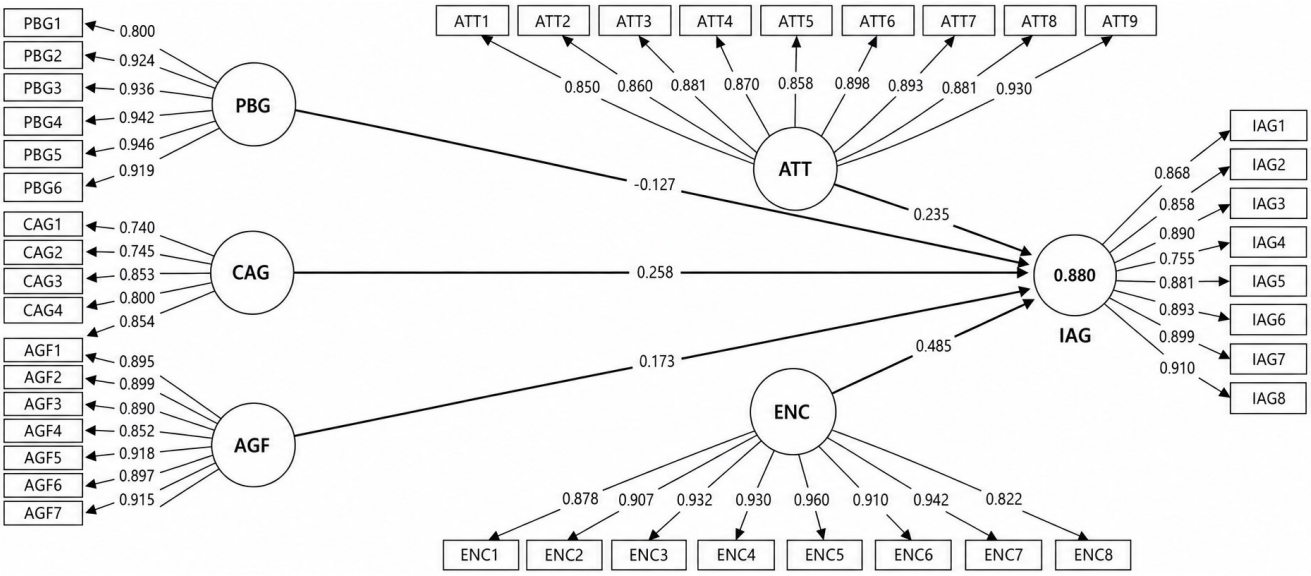
	FL	CA	CR	AVE		FL	CA	CR	AVE
Awareness		0.959	0.963	0.802	Environmental Concerns		0.970	0.974	0.830
AGF1	0.895				ENC1	0.878			
AGF2	0.899				ENC2	0.907			
AGF3	0.890				ENC3	0.932			
AGF4	0.852				ENC4	0.930			
AGF5	0.918				ENC5	0.960			
AGF6	0.897				ENC6	0.910			

	FL	CA	CR	AVE		FL	CA	CR	AVE
AGF7	0.915				ENC7	0.942			
Attitude		0.964	0.966	0.775	ENC8	0.822			
ATT1	0.850				Intention to Adopt GF		0.954	0.956	0.758
ATT2	0.860				IAG1	0.868			
ATT3	0.881				IAG2	0.858			
ATT4	0.870				IAG3	0.890			
ATT5	0.858				IAG4	0.755			
ATT6	0.898				IAG5	0.881			
ATT7	0.893				IAG6	0.893			
ATT8	0.881				IAG7	0.899			
ATT9	0.930				IAG8	0.910			
Cost (subsidized)		0.858	0.866	0.640	Perceived Benefits		0.955	0.956	0.817
CAG1	0.740				PBG1	0.800			
CAG2	0.745				PBG2	0.924			
CAG3	0.853				PBG3	0.936			
CAG4	0.800				PBG4	0.942			
CAG5	0.854				PBG5	0.896			
-	-				PBG6	0.919			

FL = Factor Loadings, CA = Cronbach Alpha, CR = Composite Reliability, AVE = Average Variance Extracted

Source: Author's own work.

Figure 2: Measurement model



Source: Author's own work.

Table 5 reports the discriminant validity and reliability using two approaches; 'the HTMT ratio and the Fornell-Larcker criterion'. All estimated HTMT values are less than conservative cutoff of 0.85, meeting the criteria for reliability and validity (Henseler et al., 2015). The ratios ranged from 0.665 to 0.795, thereby indicating satisfactory discriminant validity among constructs. As AVE for each construct (shown on the diagonal) exceeded its correlations with other constructs, the criterion meets its requirements for reliability and validity (Hair et al., 2017). For example, AGF (AVE = 0.895) exceeded its correlations with ATT (AVE = 0.814) and PBG (AVE = 0.799). Likewise, ENC (AVE = 0.911) was higher than its correlation with CAG (AVE = 0.650). These results confirm that each construct is empirically distinct from the others. Collectively, the evidence establishes that the study's constructs fulfil the requirements for discriminant validity. Therefore, it supports the adequacy of the measurement model and enabling rigorous structural model testing.

Table 5: Convergent validity and reliability

	HTMT Ratios						Fornell Larcker Criterion					
	AGF	ATT	CAG	ENC	IAG	PBG	AGF	ATT	CAG	ENC	IAG	PBG
AGF							0.895					
ATT	0.744						0.814	0.880				
CAG	0.745	0.795					0.683	0.823	0.800			
ENC	0.730	0.729	0.699				0.807	0.809	0.650	0.911		
IAG	0.764	0.701	0.665	0.713			0.832	0.868	0.789	0.884	0.871	
PBG	0.733	0.734	0.736	0.709	0.737		0.799	0.795	0.761	0.782	0.798	0.904

HTMT = Heterotrait-Monotrait

Source: Author's own work.

Table 6 reports the model fit for the data analysis of this study. The SRMR = 0.071 was below the recommended 0.08 threshold, which indicated good fit (Hair et al., 2017). Both d ULS (1.271) and d G (2.034) were close to zero, thereby supporting acceptable fit. The chi square value was non-significant, further confirming adequacy. Finally, the NFI = 0.905 exceeded the 0.90 threshold, which confirmed an acceptable model fit (Hair et al., 2017). Collectively, the evidence demonstrates that the model exhibits adequate global fit, thereby validating its suitability for structural model interpretation.

Table 6: Indices of model fit

Fit Indices	Saturated model	Estimated model	Threshold	Decision
SRMR	0.071	0.071	SRMR ≤ 0.08 indicates a good fit	Good Fit
d_ULS	1.271	1.271	Close to zero is Acceptable	Acceptable
d_G	2.034	2.034		
Chi^2	209.008	209.008	Non-significant is Acceptable	Acceptable
NFI	0.905	0.905	NFI ≥ 0.90 = acceptable fit	Acceptable

SRMR = Standardized root mean squared residual, d-ULS = Squared Euclidean Distance, d_G = Geodesic Distance, Chi2 = Chi-Square, NFI = Normed Fit Index

Source: Author's own work.

Table 7 reports the model's exploratory power using f^2, R^2, and Q^2. IAG was strongly explained, with R^2 = 0.888 and Q^2 = 0.859. These values indicated substantial explanatory and predictive accuracy (Hair et al., 2017). ATT was also highly explained (R^2 = 0.867, Q^2 = 0.867), thereby underscoring its role as a key mediator. Effect sizes revealed that ENC (f^2 = 0.543) exerted a large effect. CAG (f^2 = 0.177) showed a medium effect, while AGF (f^2 = 0.066) exerted a small to medium effect. In contrast, PBG (f^2 = 0.024) reflected only a small effect (Hair et al., 2017). Collectively, the results indicate that the model demonstrates strong explanatory power. Moreover, ENC emerged as the most influential predictor of IAG.

Table 7: Exploratory power

Constructs	f^2	R^2	Q^2
IAG	IAG	0.888	0.859
ATT	0.058	0.867	0.867
AFG	0.066	-	-
CAG	0.177	-	-
ENC	0.543	-	-
PBG	0.024	-	-

f^2 = effect size, R^2 = coefficient of determination, Q^2 = predictive relevance

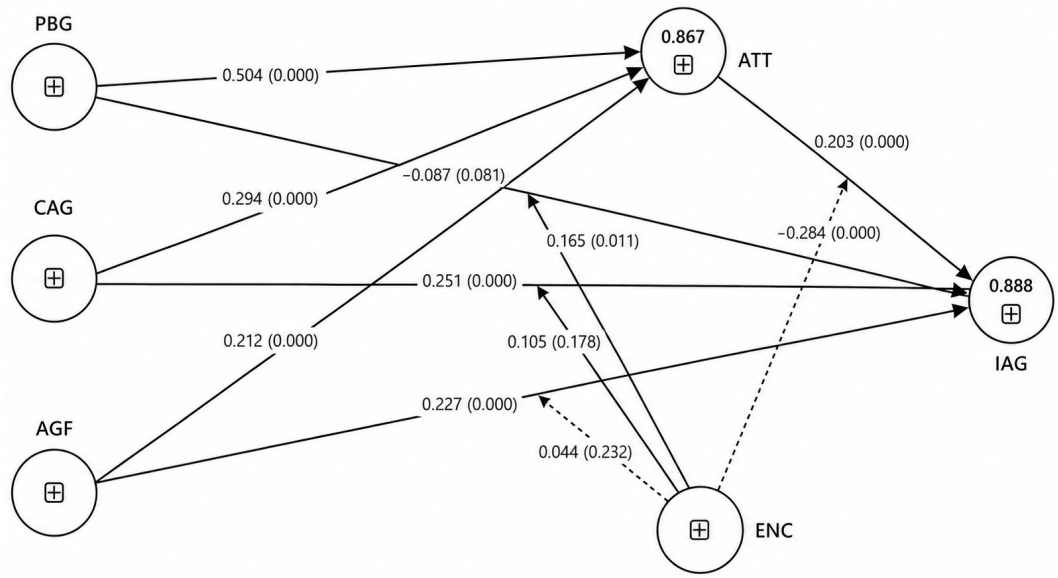
Source: Author's own work.

Table 8 reports the direct effects, indirect and moderation effects among the constructs. AGF significantly predicted IAG (β_1= 0.227, and p-value < 0.001). This finding strongly supported H_1. CAG also exerted a positive and significant impact on IAG (β_3= 0.251, p-value < 0.001), thereby confirming H_3. However, PBG did not significantly predict IAG (β_2 = –0.087, p-value = 0.081). As a result, H_2 was not supported. Regarding predictors of ATT, AGF (β_{4a} = 0.212, p-value < 0.001), PBG (β_{ab} = 0.504, p-value < 0.001), and CAG (β_{4c} = 0.294, p-value < 0.001) all showed significant positive effects. These outcomes confirmed H_4 and its sub hypotheses. ATT itself significantly predicted IAG (β_5 = 0.203, p-value < 0.001), which supported H_5. Finally, ENC exerted the strongest direct effect on IAG (β_6 = 0.431, p-value < 0.001), thereby supporting H_6.

Mediation analysis confirmed a significant indirect impact of ATT on the relationships between AGF, PBG, and CAG with IAG. Specifically, the indirect path AGF → ATT → IAG was significant (β_{7a} = 0.043, p-value < 0.001). This finding supported H7a and indicated partial mediation, as AGF also directly predicted intentions. Similarly, the indirect path CAG → ATT → IAG significant (β_{7c} = 0.060, p-value < 0.001). This supported H_{7c} and reflected partial mediation, since CAG maintained a significant direct effect. By contrast, the path PBG → ATT → IAG was significant (β_{7b} = 0.103, p-value < 0.001). Because the direct effect of PBG on intentions was not supported with H_2, this result indicated full mediation supporting H_{7b}.

Moderation results provided mixed support for ENC as a moderator. The interaction of ENC with AGF on intentions was positive (β_{8a} = 0.044) but nonsignificant (p-value = 0.232), thereby suggesting no meaningful moderation (H_{8a}). Similarly, the interaction of ENC with CAG was nonsignificant (β_{8c} = 0.105, p-value = 0.178), indicating no robust moderating effect (H_{8c}). In contrast, ENC significantly strengthened the effect of PBG on intentions (β_{8b} = 0.165, p-value = 0.011), thereby supporting H_{8b} and demonstrating that ENC enhance the influence of PBG on IAG. Interestingly, the interaction between ENC and ATT was negative and significant (β_9 = –0.284, p-value < 0.001). This finding confirmed H_9, indicating that higher ENC weakened the effect of ATT on IAG.

Figure 3: Structural model



Source: Author's own work.

Table 8: Hypotheses testing

Hypotheses	Direct Effects	Coefficients	P-values	Decision
H_1 (+)	AGF -> IAG	0.227	0.000	Strongly Supported
H_2 (+)	PBG -> IAG	-0.087	0.081	Unsupported
H_3 (+)	CAG -> IAG	0.251	0.000	Strongly Supported
H_{4a} (+)	AGF -> ATT	0.212	0.000	Strongly Supported
H_{4b} (+)	PBG -> ATT	0.504	0.000	Strongly Supported
H_{4c} (+)	CAG -> ATT	0.294	0.000	Strongly Supported
H_5 (+)	ATT -> IAG	0.203	0.000	Strongly Supported
H_6 (+)	ENC -> IAG	0.431	0.000	Strongly Supported

Hypotheses	Mediations	Coefficients	P-values	Decision
H_{7a} (+)	AGF -> ATT -> IAG	0.043	0.000	Strongly Supported with partial Mediation
H_{7b} (+)	PBG -> ATT -> IAG	0.103	0.000	Strongly Supported with Full Mediation
H_{7c} (+)	CAG -> ATT -> IAG	0.060	0.000	Strongly Supported with partial Mediation
Hypotheses	**Moderations**	**Coefficients**	**P-values**	**Decision**
H_{8a} (+)	ENC x AGF -> IAG	0.044	0.232	Insignificantly Strengthen
H_{8b} (+)	ENC x PBG -> IAG	0.165	0.011	Significantly Strengthen
H_{8c} (+)	ENC x CAG -> IAG	-0.105	0.178	Insignificantly Strengthen
H_9 (-)	ENC x ATT -> IAG	-0.284	0.000	Significantly Weakens

Source: Author's own work.

Discussion

This study investigated how awareness, perceived benefits, and adoption costs (subsidized) influence intentions to adopt green finance initiatives in Pakistan. It further incorporated the mediating role of attitude and the moderating role of environmental concern. Results indicated awareness, and subsidized costs were strong predictors for intention to adopt green finance initiatives while perceived benefits were not a direct predictor. These results are consistent with prior literature in developing settings where awareness is found as an adoption behavioral motivator (Chandel et al., 2022; Xing et al., 2021). In a similar line, Curtin et al. (2017) observed behavioral intentions were significantly predicted by subsidized adoption costs where institutional support is minimal. These studies confirm that affordability, and information availability are the critical determinants of sustainable behavior at household level. In a country like Pakistan, the domestic users of green financing initiatives often face limited awareness of such initiatives and resource constraints to avail such facilities. Therefore, subsidized cost can decrease this financial barrier for them and make them ready to adopt such initiatives.

However, the inability for perceived benefits to reach significance is contrary to prior literature which emphasize benefits as a core determinant of sustainable behaviors at domestic levels (Shukla, 2019). This disagreement from an existing study may indicate a unique contextual reality from Pakistan. For example, the household users in Pakistan acknowledge the financial and environmental benefits of sustainable initiatives (Nizam et al., 2020). However, it might be possible that these benefits alone may not be sufficient to enhance their adoption intention. Furthermore, additional attitudinal evaluations and cognitive processing are sometimes necessary to trigger such intentions to adopt sustainable behaviors (Rakib et al., 2022). These findings also highlight that perceived benefits may remain immaterial for Pakistani domestic users for such initiatives. The importance of such benefits may be sought when transformed through their attitudes.

The results further indicate that awareness, perceived benefits, and subsidized costs for adoption significantly predicted attitude formation of domestic users in Pakistan. Attitude in turn exerted strong influence on influence intentions to adopt green finance initiatives. Consistent with TPB (Ajzen, 1991), it positions attitude at a key psychological linkage between cognition and behavioral intention. It connected the cognitive factors with behavioral intentions.

Prior research substantiates how awareness yields support for sustainability-positive attitudes (Soni et al., 2022). There is an addition of such evidence in green finance here which reveals perceived benefits influence attitudes such that an intermediate role is played by these for intention towards influencing the adoption of green finance initiatives rather than direct prediction. Such a result is consistent with Wang et al. (2024) and Hageman et al. (2024). Both indicated people may perceive benefits at a conceptual level but are subject to attitudinal judgment for behavioral translation. Attitude thus emerges as an indispensable bridging variable such that TPB's explanatory power remains robust. Collectively, these results emphasize the evaluative path of TPB. It indicates that economic perceptions and cognitive factors explain the adoption intention using attitudinal decisions of domestic users.

Mediation analysis reveals attitude's significance, with partial mediation for awareness and subsidized costs, and complete mediation for perceived benefits. Such a dichotomy adds valuable theoretical contributions. It reflects that positive attitudes explain the impact of the perceived benefits on adoption. It also highlights the direct and indirect role of awareness and subsidized cost in shaping intention. Moreover, complete mediation means perceived green finance benefits alone are insufficient in triggering adoption intentions in the absence of favorable attitudes. Such a finding is in line with (Zeng et al., 2022), which posited that cost and benefit perceptions rarely initiate behavior in the absence of attitudinal judgment. On the contrary, awareness costs and subsidized-adoption costs had a direct and indirect effect on intention, acting as both cognitive precursors and attitudinal antecedents. Prior research offers similar observations from Pakistan and other contexts from the developing world. For example, Zhang and Liu (2022) indicated that cost perceptions are influencing both attitudinal evaluation and direct decision-making outcomes. Therefore, these mediation findings indicate a diffracted role of evaluative, economic, and cognitive factors in shaping the adoption of such financial initiatives.

Moderation analysis for environmental concerns revealed a mixed pattern. Despite its highest direct influence on intentions to adopt green finance initiatives, its moderating influence was mixed. Precisely, environmental concerns amplified the association between perceived benefits and intentions to adopt green finance initiatives, simultaneously inhibiting attitude's contribution. Such dual effect is consistent with Du et al. (2024), which hypothesizes strong environmental concern as a motivation for direct action in suppressing reliance on evaluative attitudes. As in Hasan et al. (2022), strong environmental concern is observed to augment perceived benefits because individuals sensitive to ecological issues are interested in environmental benefits in green finance. Conversely, environmental concern with nonsignificant moderation claims awareness and subsidized adoption costs operate independently, which further establishes their stability as consistent predictors. It reflects that more environmentally-concerned individuals may be more responsive to its benefits. Moreover, a strong negative moderation impact between attitude and intention reflects the formation of strong concerns for the environment as an independent evaluation of attitude. It is consistent with a similar argument which states that increasing the environmental concerns can enhance responsible behavior towards the environment (Du et al., 2024). However, in the case of decreasing environmental concerns this strongly depends upon the attitude of domestic users as per a number of studies (Banga, 2019; O'Mahony, 2021).

Conclusion

This study analyzed determinants of domestic user's intention towards adopting green finance initiatives in Pakistan using TPB. Findings showed awareness and adoption costs (subsidized) had direct prediction value on adoption intentions whereas perceived benefits had an indirect influence on intentions via attitude. Attitude emerged as a strong mediator thus substantiating its saliency in the TPB model. Environmental concern exerted its maximum direct influence on adoption intentions but manifested a mixed moderating role. Specifically, it strengthened perceived benefits effect whereas it had a damping explanatory power for attitude. By finding evidence in Pakistan, the research adds knowledge on sustainable finance adoption for domestic users in emerging economies. Finally, the results fine-tune as well as extend TPB's predictive validity in fresh settings indicated environmental, economic, and cognitive factors shaping behavioral intention to adopt green financing initiatives.

Theoretical implications

The study provides a number of implications theoretically. Firstly, it emphasizes that attitude is psychologically a critical mechanism to position the TPB. It connects the beliefs towards behavioral intention of individuals. It further clarifies the translation of conceptual assessment of values into behavioral intentions of adoptions. Secondly, it also emphasizes the role of TPB's constructs in operating under limitations of resources. For example, these factors can serve dual roles in the form of awareness and subsidized cost impacts both on attitude as well as intentions. Therefore, these can perform as cognitive and independent factors for making decisions under low awareness and resource constraint settings. Thirdly, the selective moderating influence of environmental concern reveals TPB variables operate differently between contextual factors. Increased environmental concern significantly weakens the attitude-intention association, implying ecological urgency might act directly on intention rather than involving an evaluation route.

Practical implications

The findings offer practical implications for policymakers, financial institutions, and green finance promoters in Pakistan. For example, awareness emerged as a strong predictor in support of intention and attitude. It reflected the importance of delivering mass information over media, workshop settings, and institutional outreach about green finance initiatives. These are effective tools in raising familiarity and enhancing confidence in green finance tools. Additionally, subsidized costs had a strong bearing on intentions in support of subsidies, low-interest credit initiatives, and instalment schemes in cutting affordability deterrents. It impacts both attitude and intention strongly. It reflected that household decisions should be affordable. Therefore, the policies related to reduction in upfront cost of sustainable initiatives should be made to enhance their adoption. This may include partial subsidies, flexible installment plans, and concessional schemes of loans. These policies may encourage the adoption of such initiatives by the middle and lower class of Pakistan. Moreover, mediation of perceived advantages by attitude suggests a need for more than promoting green finance advantages. Interventions require actively engendering positive appraisals by linking benefits with values at both individual and societal levels. Finally, environmental concern as a mediator signifies ecological storylines as a strong candidate for extremely concerned groups. The differential moderating impact of environmental concerns highlights the importance of individuals having similar ecological concerns for environmental issues. Finally, these practical implications offer actionable guidelines for making more context specific interventions that enhance the adoption of green finance initiatives in Pakistan.

Limitations and suggestions for future research

The study contains some limitations that need to be highlighted. For example, it used cross-sectional survey data. This data limits causal inferences and ignores temporal shifts in perceptions. Therefore, future studies must include longitudinal design to capture behavioral processes more adequately. Secondly, it addresses the domestic users from Pakistan. It restricts generalizability across varied cultural and other contexts. Therefore, comparative analysis is needed for other economies. It would enhance the contextual understanding of green finance adoption and its impacts. Thirdly, this study is dependent on self-reported measures. It might introduce social desirability bias. Therefore, future research could integrate behavioral inventions to address such limitations. Consequently, this study considered awareness, perceived benefits, subsidized costs, and environmental concern. However, future research should expand the model with underexamined constructs. These may include institutional trust, perceived risks, or policy support for fuller adoption behavioral insights from underexplored contexts.

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