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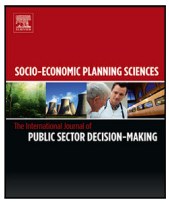

Environmental awareness and pro-environmental behavior impact on renewables investments: A moderating role of environmental concerns

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ABSTRACT

This study examines the impact of environmental awareness and pro-environmental behavior on renewable investment intentions and the moderating role of environmental concerns. Using a sample of 350 retail investors, we find that environmental awareness and pro-environmental behavior increase renewable investment intentions. Moreover, environmental concerns moderate the relationship between environmental awareness and renewable investment intentions. However, we find no significant moderating effect of environmental concern in the case of pro-environmental behavior. Overall, our research contributes to the emerging literature on renewable energy investments in contributing circular economy.

1. Introduction

The growing global climate crisis has prompted a growing interest in renewable energy [1–3]. It is increasingly becoming a priority for countries worldwide to move from fossil fuel dependency to cleaner, greener energy sources in the face of severe climate change [4]. Therefore, the move away from fossil fuels towards cleaner and more sustainable energy sources is a growing point of interest among governments [5–8], and stakeholders such as private companies, investors, and NGOs, drive the world toward renewable energy transformation. Their involvement in policy framing, partnership development, and ensuring scalability and economic viability of sustainable energy solutions across geographies is critical [9,10].

In this context, investments are crucial to achieving this transition [11–14], they provide the necessary finance for the development and deployment of renewable energy technologies on a large scale. Indeed, this transition can only be possible with increased investments from the public and private sectors to finance research and development, build infrastructure, and support the commercialization of new energy solutions in all their dimensions for the global transition toward a sustainable energy future. Although the renewable energy sector is growing, it is still largely dependent on public investment [15] and private [16–18] to finance new technologies and energy infrastructure. But what determines investment decisions in the sector? What drives investors to choose renewable energy projects among all other possible investments? Underlying this question is the pertinent issue of awareness and behavior [19,20].

For many investors, the interest in renewable energy stems not just from financial motives but also from an increasing concern for the environment [21]. As more people learn about the intrinsic benefits of renewable energy technologies, their willingness to invest grows. However, this interest is not limited to technical aspects of renewable energy; it also includes broader ideas like the circular economy, which aims for better resource use, sustainability, and less waste [22]. The increased awareness of environmental issues has pushed the general public and retail investors to consider sustainable investment options such as renewable energy projects, which align with their environment-friendly ideology [23,24]. Investors who are environmentally conscious in their everyday often perceive a strong ethical responsibility to support projects that align with their values. They may strongly acknowledge that their investment decisions can have significant environmental repercussions and prioritize non-economic benefits over economic ones. This pro-environmental behavior may be a long-standing commitment to sustainability, or it may develop over time as an individual develops a greater awareness of the environmental challenges of the contemporary world [25–27].

Given the fact the literature on environmental awareness (EA), pro-environmental behavior (PEB) is scarce ([19,28] and few studies have

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considered the moderating role of environmental concern [29–31]. The present study extends the literature [12,17,19,32,33] by exploring the impact of environmental awareness (EA) and pro-environmental behavior (PEB) on renewable investment intentions (RII) along with the moderating role of environmental concern using a sample of 350 Italian retail investors. Additionally, our findings contribute to a deeper understanding of how these factors interact within the context of the transitioning energy market, thereby offering valuable insights for policymakers and investors aiming to support and capitalize on sustainable investment trends.

The following sections of the article are organized as follows: Section 2 describes the literature review, Section 3 describes the data and methodology, Section 4 comments on the results, and Section 5 presents the conclusions, policy implications and limitations.

2. Literature review

2.1. Environmental awareness and renewable investment intentions

The current global scenario is characterized by challenges that are becoming increasingly urgent and relevant, aimed at promoting sustainable economic development [34–36]. This type of development should ensure equal and resilient economic growth [37–39], with the aim of safeguarding environmental ecosystems and avoiding irreversible transformations [40,41]. In the last decade, society has been facing major issues with climate change, which requires targeted and radical interventions on infrastructural and energy policies at many scales. Inevitably, addressing the challenges of climate change and developing economically sustainable models will require major changes in the global economy, particularly in the energy and transport sectors [42] and energy plays an important role in terms of decarbonization, the main sources of emissions are electricity and heat(31%).[1]

In this respect, moving to renewable sources of energy [43] is a basic answer to the challenges because it can help reduce atmospheric emissions and promote environmental sustainability [44,45]. Only the institutional framework, adequate policy measures, and main structural features are necessary, but also substantial and rapid investments are urgently needed to develop renewable energy sources quickly [46] in order for the transition to be ensured and facilitated [47–50].

A part of the literature has analyzed how the size and orientation of investments can be influenced by different factors, including awareness of renewable technologies and pro-environmental behavior, in addition to the degree of knowledge and awareness [19,51]. There are different dynamics that may exert a force on investments, and they are also partly linked to the geographical contexts that we examine [52]. Defining awareness, it is important to point out that it is not limited only and exclusively to simple technical knowledge, but also extends to broader concepts, such as the promotion of circular economy models, which by definition promote the most efficient use of resources and the reduction of waste [53,54]. Specifically, environmental awareness, and one of the factors that could determine an individual's intention to invest in renewable energy projects.

Esparcia et al. [19] demonstrate that green investments not only reduce the carbon footprint, but offer a different risk-return profile compared to brown ones. Individuals are becoming increasingly aware of the environmental challenges that the planet faces, such as climate change, pollution and resource depletion, thus motivating them to support solutions that can mitigate these problems. Examining specifically the benefits that could occur in the long term [55], which in a more complex and multidimensional perspective, would also allow in the energy scenario to promote energy security [56]. Based on the literature, we formulated the first research hypothesis:

H1: Environmental awareness positively influences renewable investment intentions

[1] https://www.c2es.org/content/international-emissions

2.2. Pro-environmental behavior and renewable investment intentions

Pro-environmental behavior, is another key aspect that can influence decisions [57]. In literature, the determining factors (of pro-environmental behavior) can generally be divided into two macro categories: internal and external factors, as highlighted by Li et al. [58], with psychological factors also playing a central role. Pro-environmental behavior includes actions performed by individuals that represent concern for the environment. For example, the use of environmentally friendly means of transportation [59], the choice to use renewable energy sources [60] instead of fossil fuels and, in general, the alignment of financial decisions with the values of nature are some examples of such behavior. This not only guides daily "conduct", but can also influence long-term investment decisions. However, in financial terms, an important role is also played by financial literacy, which if advanced can contribute to pro-environmental behavior, as highlighted by Han et al. [61]

To proceed with the explanation of this notion, it is appropriate to refer to the Theory of Planned Behavior [62] with the aim of drawing attention, for example, to the fact that investment intentions in green projects can be influenced by ecological attitudes [33]. Furthermore, there are empirical results that have shown that investors guided by pro-environmental behaviors invest in sustainable projects, even if the latter include greater economic risks than other available alternatives [63].

Another study in China has shown that pro-environmental behavior can have a positive impact on companies' ESG scores, thus generating greater concern for sustainability metrics for investments [64]. This means that greater environmental concern from investors would not only help in the transition to an environmentally sustainable model, but would also push companies to incorporate sustainable practices into their business strategy.

A study by Colombo et al. [65] suggests that greater regulation (top-down), could be associated with greater commitment to pro-environmental behaviors. State incentives, for example, and stricter controls and awareness campaigns can help investors in choosing environmentally friendly options. Attractive financial policies towards green investments, for example tax exemption or subsidy of renewable energy, are key to determining the ways of sustainable investments.

In addition, based on the literature, the availability of information and digitalization increasingly support the enabling of pro-environmental behaviors. Ethical investment platforms, more comprehensive ESG rating platforms and corporate disclosure allow investors to make more informed choices based on their environmental values. Therefore, pro-environmental behavior is not only transformed into daily and individual actions, but also into a driver of economic and financial transformation worldwide

H2: Pro-environmental behavior positively influences investor's renewable investment intentions.

2.3. Moderating role of environmental concern

Given that the literature on the topic is scarce. The literature suggests that environmental concern is also a major driver of investments, which refers to feeling worried about climate change, loss of biodiversity, environmental health concerns etc [66–68]. Few studies confirm a negative association between ecological footprint and economic development [69–71]. In reality, environmental problems emerge and make economic appraisal more difficult, as noted by Baumgärtner et al. [72].

Similarly, the theory of reasoned action proposed by Fishbein [73] essentially assumes that behavior is determined by intention [74]. Investors who have high environmental concerns are more likely to invest in environment friendly assets [75]. Moreover, Renneboog et al. [76] suggest that environmental concern can amplify or attenuate the influence of other factors on investment decisions. Limited empirical evidences have shown that environmental concern can moderate the

relationship between awareness of renewable energy and willingness to invest, as well as between pro-environmental behavior and the predisposition to finance sustainable solutions [19,20,77]. Based on the literature and our empirical model, the research hypotheses that we will test are the following:

H3: Environmental concern moderates the relationship between environmental awareness and renewable investment intentions.

H4: Environmental concern moderates the relationship between pro-environmental behavior and renewable investment intentions.

3. Methodology

3.1. Sample and questionnaire design

This study employed a cross-sectional research design to investigate the factors influencing investment in renewable energy projects in Italy. We collected the data from Italian retail investors in two phases between March and September 2024 using paper-based and e-questionnaires. Due to the inaccessibility of real-time data on retail investors who have either invested or are willing to in renewable energy projects, we adopted a non-probabilistic convenience sampling approach. Consequently, we determined our sample size based on non-probabilistic sampling techniques. We followed the guidelines proposed by Costello and Osborne [78] and Kline [79] who suggest that sample size should not be less than a item–sample ratio of 10:1 or 20:1. Considering our scale has 24 item, meaning our sample should be between the range of 240–480 responses. Thus, electronic questionnaires were distributed via social media platforms like Facebook and LinkedIn and messaging applications like WhatsApp. This mix of data collection techniques enhances the representativeness and reduces the sampling bias [80–82].

A total of 393 responses were collected, out of which we dropped 43 incomplete responses, making a final sample of 350 responses. A frequency analysis (Table 1) was conducted to describe the demographic and socio-economic characteristics of the sample. The gender distribution shows that 69.43% of respondents identified themselves as male, while 30.57% identified as female. The majority of respondents (45.71%) belonged to the 31 to 35 years age group, followed by respondents belonging to 26 to 30 years (26%) and 36–40 years (19.43%) and have Master's or Doctorate level education (66.57%).

Participants' employment and income dynamics show that most are either permanent employees (33.14%) or freelance professionals (24.00%) and have income less than €20,000. Furthermore, the geographical distribution reveals that most respondents belong to north Italian provinces and regions. Additionally, we performed frequency distribution across the gender (Table 1), which shows that the majority of male participants belong to the 31–35 years age group, who have master of doctorate level education and are mostly unemployed or work as freelancers and earns under 20,000 euros (see Table 2).

Table 1
Sample demographic features.

	Freq.	Percent	Cum.
Gender			
Female	107	30.57	30.57
Male	243	69.43	100
Age Groups			
18-25 years	3	0.86	0.86
26-30 years	91	26	26.86
31-35 years	160	45.71	72.57
36-40 years	68	19.43	92
41-45 years	9	2.57	94.57
46-50 years	13	3.71	98.29
51-55 years	5	1.43	99.71
56 year and above	1	0.29	100
Education Level			
No formal education	0	0	0
Primary and lower secondary school	4	1.14	1.14
Upper secondary school	0	0	0
Diploma (Technical or Professional Institute)	83	23.72	24.87
Bachelor's degree	30	8.57	33.43
Master's or Doctorate degree	233	66.57	100
Employment Status			
Employee with contract	1	0.29	0.29
Employee permanent	32	9.14	9.43
Freelance Professional	136	38.86	48.29
Unemployed	122	34.86	83.14
Retired and on pension	59	16.86	100
Income level per annum in Euros			
0–€9,999	163	46.57	46.57
€10,000–€19,999	126	36	82.57
€20,000–€29,999	51	14.57	97.14
€30,000–€39,999	9	2.57	99.71
€60,000 and above	1	0.29	100
Province			
Bari	34	9.71	9.71
Bologna	37	10.57	20.29
Catania	33	9.43	29.71
Chieti	12	3.43	33.14
Florence	38	10.86	44
Genoa	27	7.71	51.71
L'aquila	7	2	53.71
Milan	35	10	63.71
Naples	32	9.14	72.86
Palermo	25	7.14	80
Pescara	12	3.43	83.43
Rome	26	7.43	90.86
Turin	32	9.14	100
Total	350	100	
Region			
Abruzzo	31	8.86	8.86
Apulia	34	9.71	18.57
Campania	32	9.14	27.71
Emilia-Romagna	37	10.57	38.29
Lazio	26	7.43	45.71
Liguria	27	7.71	53.43
Lombardy	35	10	63.43
Piedmont	32	9.14	72.57
Sicily	58	16.57	89.14
Tuscany	38	10.86	100
Total	350	100	

3.2. Study variables

We use eight item scale of awareness developed by Ali et al. [23] and modified to capture environmental awareness which focuses on understanding of renewable energy sources such as wind and solar energy and the role of biogas plants and other sustainable technologies in mitigating environmental degradation. To measure pro-environmental behavior, we constructed an eight items scale. The scale measures investors environmentally conscious actions taken such as energy conservation recycling and the use of sustainable transportation methods. Additionally, we measure environmental concern using a three-item scale of Koenig-Lewis et al. [83] that reflects investors' worries about climate change and its potential social economic and environmental impacts. The scale was slightly modified to cover retail investors concern on environmental degradation and need of sustainable and renewable projects. Finally, to measure renewable investment intentions, we use a five-item by Bock et al. [84], Fagan et al. [85], Garg et al. [86] and Wee et al. [87] that assesses investors' willingness to support renewable energy initiatives and their perceived benefits, such as environmental protection and sustainable economic opportunities. A likert scale of five was use to measure these scales where 1 records strongly disagree and 5 strongly agree. The scale is available in Appendix A.1.

3.2.1. Measurement model assessment

The adequacy of the measurement model was evaluated using confirmatory factor analysis (CFA) [88]. To check reliability validity and

Table 2
Sample demographics feature across gender.

Category	Female (Freq.)	Female (%)	Male (Freq.)	Male (%)	Total (Freq.)	Total (%)
Age Groups						
18-25 years	1	0.286	2	0.571	3	0.86
26-30 years	30	8.571	61	17.429	91	26.00
31-35 years	47	13.429	113	32.286	160	45.71
36-40 years	24	6.857	44	12.571	68	19.43
41-45 years	1	0.286	8	2.286	9	2.57
46-50 years	2	0.571	11	3.143	13	3.71
51-55 years	1	0.286	4	1.143	5	1.43
56 years and above	1	0.286	0	0.000	1	0.29
Education Level						
Primary and lower secondary school	1	0.286	3	0.857	4	1.14
Diploma (Technical or Professional)	29	8.286	54	15.429	83	23.71
Bachelor's degree	16	4.571	14	4.000	30	8.57
Master's or Doctorate degree	61	17.429	172	49.143	233	66.57
Employment Status						
Employee with contract	1	0.286	0	0.000	1	0.29
Employee permanent	30	8.571	2	0.571	32	9.14
Freelance Professional	48	13.714	88	25.143	136	38.86
Unemployed	21	6.000	101	28.857	122	34.86
Retired and on pension	7	2.000	52	14.857	59	16.86
Income Level Per Annum						
€0–€9,999	53	15.143	110	31.429	163	46.57
€10,000–€19,999	45	12.857	81	23.143	126	36.00
€20,000–€29,999	9	2.571	42	12.000	51	14.57
€30,000–€39,999	0	0.000	9	2.571	9	2.57
€60,000 and above	0	0.000	1	0.286	1	0.29
Province						
Bari	10	2.857	24	6.857	34	9.71
Bologna	9	2.571	28	8.000	37	10.57
Catania	14	4.000	19	5.429	33	9.43
Chieti	2	0.571	10	2.857	12	3.43
Florence	10	2.857	28	8.000	38	10.86
Genoa	9	2.571	18	5.143	27	7.71
L'Aquila	2	0.571	5	1.429	7	2.00
Milan	7	2.000	28	8.000	35	10.00
Naples	15	4.286	17	4.857	32	9.14
Palermo	6	1.714	19	5.429	25	7.14
Pescara	5	1.429	7	2.000	12	3.43
Rome	6	1.714	20	5.714	26	7.43
Turin	12	3.429	20	5.714	32	9.14
Region						
Abruzzo	9	2.571	22	6.286	31	8.86
Apulia	10	2.857	24	6.857	34	9.71
Campania	15	4.286	17	4.857	32	9.14
Emilia-Romagna	9	2.571	28	8.000	37	10.57
Lazio	6	1.714	20	5.714	26	7.43
Liguria	9	2.571	18	5.143	27	7.71
Lombardy	7	2.000	28	8.000	35	10.00
Piedmont	12	3.429	20	5.714	32	9.14
Sicily	20	5.714	38	10.857	58	16.57
Tuscany	10	2.857	28	8.000	38	10.86

model fit reliability, we use Cronbach's alpha and composite reliability (CR) (Rho_A and Rho_C).[2]

(Table 3) highlights that all constructs have excellent reliability with Cronbach's alpha and CR exceeding the threshold 0.70 [80,89]. Specifically, Environmental awareness has a Cronbach's alpha of 0.938 Rho_A of 0.939 and Rho_C of 0.948, indicating that the scale is highly reliable. Similarly,pro-environmental behavior has Cronbach's alpha value of 0.926, Rho_A of 0.927 and Rho_C of 0.940, suggesting that the scale used by the authors is highly reliable.

For, environmental concerns the scale has Cronbach's alpha of 0.870 Rho_A of 0.874 and Rho_C of 0.920, which confirms the reliability of the instrument. Finally, we find that the renewable energy investments scale have the Cronbach's alpha of 0.924, Rho_A of 0.924 and Rho_C of 0.943 confirming the reliability of scale. Furthermore, we used Average variance extracted for to check for Convergent validity. Table 3 shows that AVE value for all constructs exceeded the threshold of 0.50 [80], suggesting the validity of variables. Finally, we use the Fornell and Larcker [80], and the correlations of all variables were under the square root of AVE, suggesting that all variable measures are valid and free from error [88] (see Table 4). Also, the VIF (See Appendix A.2) confirms that there is no multicollinearity among variables.

4. Results and discussion

After confirming the reliability and validity of instruments, we performed regression analysis as reported in Table 5 to test whether environmental awareness, pro-environmental behavior, and environmental concern drive renewable investments. Columns 1 and 3 present models with only these controls, where Column 1 excludes and Column 3 includes provincial and regional effects. Columns 2 and 4 test the effects of environmental awareness, pro-environmental behavior, and environmental concern on renewable investments alongside controls,

[2] To conduct measurement model assessment and regressions, we use SmartPls and STATA software.

Table 3
Constructs, items, and reliability statistics.

Constructs	Items	Factor loading	Cronbach's alpha	Composite reliability (ρ_a)	Composite reliability (ρ_c)	AVE
Environmental Awareness	EA1	0.838	0.938	0.939	0.948	0.696
	EA2	0.830				
	EA3	0.834				
	EA4	0.845				
	EA5	0.871				
	EA6	0.787				
	EA7	0.849				
	EA8	0.819				
Pro-environmental Behavior	PEB1	0.798	0.926	0.927	0.940	0.661
	PEB2	0.744				
	PEB3	0.851				
	PEB4	0.843				
	PEB5	0.828				
	PEB6	0.845				
	PEB7	0.826				
	PEB8	0.761				
Environmental Concern	ENVC1	0.877	0.870	0.874	0.920	0.794
	ENVC2	0.893				
	ENVC3	0.903				
Renewable Investment Intention	RII1	0.867	0.924	0.924	0.943	0.767
	RII2	0.878				
	RII3	0.880				
	RII4	0.881				
	RII5	0.874				

Table 4
Fornell–Larcker criteria.

	Environmental awareness	Pro-environmental behavior	Environmental concern	Renewable investment intention
Environmental Awareness	0.834			
Pro-environmental Behavior	0.790	0.813		
Environmental Concern	0.827	0.780	0.891	
Renewable Investment Intention	0.637	0.612	0.638	0.876

Table 5
Impact of variables on renewable investment intention.

	RII			
	(1)	(2)	(3)	(4)
Age	0.0273	0.0165	0.0397	0.0266
	(0.0323)	(0.0299)	(0.0344)	(0.0325)
Gender	0.125*	0.122	0.124*	0.225*
	(0.0727)	(0.0760)	(0.0727)	(0.127)
Education	0.0461**	0.0319*	0.0430**	0.0298
	(0.0206)	0.123*	(0.0215)	(0.0194)
Employment	0.382***	0.0568	0.388***	0.0660
	(0.0355)	(0.0490)	(0.0369)	(0.0499)
Income	0.0370	0.0133	0.0302	0.00695
	(0.0376)	(0.0343)	(0.0398)	(0.0366)
Environmental Awareness		0.197**		0.204**
		(0.0794)		(0.0809)
Pro-environmental Behavior		0.160**		0.157**
		(0.0649)		(0.0688)
Environmental Concern		0.180***		0.174***
		(0.0635)		(0.0658)
Constant	1.501***	0.981***	1.395***	0.897***
	(0.180)	(0.179)	(0.208)	(0.210)
Observations	350	350	350	350
R-squared	0.350	0.467	0.371	0.484
Region Effect	No	No	Yes	Yes
Province Effect	No	No	Yes	Yes

Note: The table presents regression results controlling for key demographic and socio-economic variables, including gender (male and female), age (categorized into groups ranging from 18–25 years to 56 years and above), education levels (ranging from no formal education to master's or doctoral degrees), employment status (contract employees, permanent employees, freelance professionals, unemployed individuals, and retirees), and income levels (grouped into annual brackets from less than €9,999 to €60,000 and above). Columns 1 and 2 present models with only these controls, without provincial and regional effects. Columns 3 and 4 include provincial and regional effects. Robust standard errors in parentheses. $p<0.01$, ** $p<0.05$, * $p<0.1$.

with Column 2 excluding and Column 4 including provincial and regional effects. This structure allows for a comprehensive analysis of demographic and environmental factors influencing renewable investment decisions. The results (Table 5) control variables such as gender, education, and employment to some extent influence renewable investment decisions. Environmental awareness positively impacts renewable investments ($\beta = 0.197, p < 0.05$), indicating that individuals who are aware of environmental issues aim to invest in renewables to mitigate environmental degradation. Thus, hypothesis 1 is supported. The literature suggests that investors' behavior is more likely to be impacted if there is any information related to climate or environmental degradation [32,90,91].

Similarly, we find that pro-environmental behavior also positively impacts renewable investments ($\beta = 0.160, p < 0.05$). This suggests that individuals who engage in environmentally conscious actions such as recycling or reducing energy use are more inclined to align their financial decisions with their environmental values. According, Shahid et al. [92], Wang et al. [93] Wang et al. (2019), individuals' pro-environmental attitudes significantly influence their proactive behavior towards the environment investments. Additionally, Testa et al. [94] suggests that responsible investors self-evaluate their actions and are more likely to prioritize environmental investments.

Finally, we also find that environmental concerns increase investors' renewable investment intention ($\beta = 0.180, p < 0.01$ effects of pollution, climate change, and environmental degradations are more likely to invest in renewable investments to mitigate the negative impact of climate change and to conserve the local environment. Moreover, environmental concern is often linked to the altruistic values of investors, reflecting their commitment to investing in socially responsible projects or firms while considering the broader implication of their actions [95,96]. This underscores the importance of altruism in driving investment decisions. Investors who prioritize environmental and social well-being tend to have a favorable perception of such projects or firms

Table 6
Moderating effect of environmental concern.

	RII	
	(1)	(2)
Age	0.0273	0.0209
	(0.0323)	(0.0294)
Education	0.0461**	0.0291
	(0.0206)	(0.124)
Gender	0.125*	0.122
	(0.0727)	(0.0760)
Income	0.0370	0.0175
	(0.0376)	(0.0327)
Employment	0.382***	0.0524
	(0.0355)	(0.0496)
Environmental Awareness		0.157***
		(0.0529)
Pro-environmental Behavior		0.116**
		(0.0481)
Environmental Concern		0.153***
		(0.0543)
Environmental Awareness x Environmental Concern		0.0730*
		(0.0432)
Pro-environmental Behavior x Environmental Concern		0.0362
		(0.0426)
Constant	1.501***	1.902***
	(0.180)	(0.173)
Observations	350	350
R-squared	0.350	0.466
Region Effect	Yes	Yes
Province Effect	Yes	Yes

Note: The table presents regression results controlling for key demographic and socio-economic variables, including gender (male and female), age (categorized into groups ranging from 18–25 years to 56 years and above), education levels (ranging from no formal education to master's or doctoral degrees), employment status (contract employees, permanent employees, freelance professionals, unemployed individuals, and retirees), and income levels (grouped into annual brackets from less than €9,999 to €60,000 and above). Columns 1 and 2 present models with only these controls, without provincial and regional effects. Columns 3 and 4 includes provincial and regional effects. Robust standard errors in parentheses $p<0.01$, ** $p<0.05$, * $p<0.1$.

due to growing awareness of the environmental issue and their desire to contribute to building a sustainable society for future generations [96]. These findings highlight the interplay of cognitive and affective factors in shaping sustainable financial behaviors.

Furthermore, we checked for the moderating effect of environmental concern on the relationship of environmental awareness and pro-environmental behavior with renewable investment intention. Table 6 indicates a significant moderating effect of environmental concern on the relationship between environmental awareness and renewable investment intention; this suggests that individuals with high environmental concern exhibit stronger renewable investment intention when they are more aware of environmental issues. This finding highlights the importance of targeting environmentally conscious individuals in awareness campaigns to maximize the impact on renewable investment behavior. In contrast, the interaction between pro-environmental behavior and environmental concern was not statistically significant, which suggests that the impact of pre-existing pro-environmental behavior on renewable investment intention is not controlled by environmental concern. This may be because while individuals may engage in pro-environmental behavior, these actions do not necessarily translate into increased intention to invest in renewable resources. It is possible that external factors, such as financial constraints or perceived risks, decrease the effect of environmental concern in moderating the relationship between pro-environmental behavior investment decisions.

5. Conclusions

Our findings reveal the significant effect of Environmental awareness and pro-environmental behavior on renewable investment intentions among Italian retail investors. This suggest that investors who engage in eco-conscious actions are more likely to align their financial decisions with environmental values. Additionally, our moderation analysis shows that environmental concerns only moderate the relationship of environmental awareness with renewable investment intentions, which suggests that individuals who have high environmental concerns exhibit stronger renewable investment intentions when they are more aware of environmental issues.

The lack of moderation effect in the case of pro-environmental behavior suggest that pre-existing pro-environmental actions do not necessarily translate into the individual intention to invest in renewables under the influence of environmental concerns. External factors, such as financial constraints or perceived risks, decrease or personal factors like personality may type the effect of environmental concern in moderating the relationship between pro-environmental behavior investment decision. Overall our findings extends the literature [11,17,19,32,33], on the topic.

5.1. Policy implications

From these results, some interesting policy implications arise that may favor investments in renewable energy. First, policies have to increase environmental awareness through focused educational campaigns, since with greater knowledge of environmental issues, the intention to invest in sustainable technologies would be higher [19]. In fact, as documented by [97] higher education is one of the most influential factors in reducing emissions and enhancing the use of renewable energy sources.

Additionally, policy incentives in an ecological direction, such as subsidies for switching to environmentally friendly practices, may help align everyday actions with green financial decisions [98]. The other pertinent issue is addressing investors' environmental concerns by implementing policies to directly appeal to the fears of these investors on climate change and energy security issues that drive investors towards greater investments. This also involves facilitating dialogue between the public and private sectors to minimize perceived risks by developing partnerships in support of renewable energy investments. Policies should facilitate access to information on green investments with a view to advising and making economic and environmental benefits more clear. Here, differentiated regional policies would be helpful by considering the sensitivities and behaviors in variation across areas.

Finally, by providing fiscal incentives for SRI and transitioning toward a green economy by promoting, with tax and dedicated finance facilitations, renewable energy investments, can be made easier and safer. In a nutshell, targeted policies that integrate education, incentives, and a defined regulatory framework could significantly fast-track the flow of capital to the renewable energy sector.

5.2. Limitations

Like all research studies, our studies contribute to body of knowledge but at the same time also has some limitation. First, the study relies on self-reported data collected through questionnaires, which may introduce biases such as the social desirability bias which may potentially affect the accuracy of our findings. Future studies could conduct experiments to explore actual investment behavior. Secondly, sample is geographically concentrated in northern Italian provinces which may limit the generalizability of result and does not address the cultural differences between both regions. Expanding the geographic scope of this study could provide a more comprehensive understanding of renewable investment behavior. Additionally, while study and identify the moderating role of environmental concern it does not extensively analyze external barriers such as financial constraint or perceived risk which may influence investment intentions. Future research should integrate these factors to present a more holistic analysis. Finally this study focuses on individual level factor while largely overlooking institutional or policy related driver of renewable investment or cultural factors which can be addressed in future studies.

Table A.1
Constructs details.

Variable	Item	Statement
Environmental Awareness	EA1	I am aware of wind as a renewable energy source
	EA2	I am aware that the sun is a renewable energy source
	EA3	I am aware that biomass is a renewable energy source
	EA4	I am aware that geothermal energy is a renewable energy source.
	EA5	I am aware that our habits influence climate change.
	EA6	I am aware of the pollution caused by factory farming.
	EA7	I am aware that biogas plants can be used to produce energy.
	EA8	I am aware that climate change will have an impact on my local area.
Pro-Environmental Behavior	PEB1	I am attentive to electricity consumption.
	PEB2	I am mindful of purchasing energy-efficient products (e.g., energy-saving light).
	PEB3	I take care to minimize wastewater.
	PEB4	I actively participate in waste separation and recycling.
	PEB5	I use electric vehicles regularly.
	PEB6	I prefer using a bicycle for short trips.
	PEB7	I am aware of the energy transition process.
	PEB8	I prioritize purchasing organic products.
Environmental Concern	ENVC1	I am concerned about the impact of climate change on future sustainability.
	ENVC2	I am concerned that power outages may increase without renewable energy investment.
	ENVC3	I am concerned about rising energy costs and their impact on affordability.
Renewable Investment Intention	RII1	I intend to invest investing in renewable energy as it will improve quality of life.
	RII2	I intent to invest in renewable energy because it will significantly protect the environment.
	RII3	I want to avoid investing in the companies which are involved in activities that can cause damage to the society, ethics and environment.
	RII4	I believe renewable energy investment will create new jobs and economic opportunity.
	RII5	I believe renewable investment will enhance energy independence and promote clean environment.

Table A.2
Variance Inflation Factor (VIF) analysis.

Variable	VIF
Environmental Concern	4.321
Environmental Awareness	3.987
Pro-Environmental Behavior	3.32
Employment	2.955
Gender	1.27
Income	1.269
Age	1.239
Education	1.084
Mean VIF	2.431

CRediT authorship contribution statement

Luca Esposito: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Raja Nabeel-Ud-Din Jalal:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization, Project administration.

Data statement

The dataset used in this study is not available due to the confidentiality and privacy of the participants.

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Appendix

See Tables A.1 and A.2.

Data availability

The data that has been used is confidential.

References

[1] Suman A. Role of renewable energy technologies in climate change adaptation and mitigation: A brief review from nepal. Renew Sustain Energy Rev 2021;151:111524.
[2] Phan TC. Impact of green investments, green economic growth and renewable energy consumption on environmental, social, and governance practices to achieve the sustainable development goals: A sectoral analysis in the ASEAN economies. Int J Eng Bus Manag 2024;16:18479790241231725.
[3] He X, Khan S, Ozturk I, Murshed M. The role of renewable energy investment in tackling climate change concerns: Environmental policies for achieving SDG-13. Sustain Dev 2023;31(3):1888–901.
[4] Marra A, Colantonio E. The path to renewable energy consumption in the European union through drivers and barriers: A panel vector autoregressive approach. Socio- Econ Plan Sci 2021;76:100958.
[5] Pollitt MG. The role of policy in energy transitions: Lessons from the energy liberalisation era. Energy Policy 2012;50:128–37.
[6] Aleluia J, Tharakan P, Chikkatur A, Shrimali G, Chen X. Accelerating a clean energy transition in southeast Asia: Role of governments and public policy. Renew Sustain Energy Rev 2022;159:112226.
[7] Su X, Tan J. Regional energy transition path and the role of government support and resource endowment in China. Renew Sustain Energy Rev 2023;174:113150.
[8] Song T, Li H, Feng Z. Policy and market mechanisms for promoting sustainable energy transition: role of government and private sector. Econ Chang Restruct 2024;57(4):153.
[9] Höfer T, Madlener R. A participatory stakeholder process for evaluating sustainable energy transition scenarios. Energy Policy 2020;139:111277.
[10] Marcon Nora GA, Alberton A, Ayala DHF. Stakeholder theory and actor-network theory: The stakeholder engagement in energy transitions. Bus Strat Environ 2023;32(1):673–85.
[11] Caetano RV, Marques AC, Afonso TL, Vieira I. A sectoral analysis of the role of foreign direct investment in pollution and energy transition in OECD countries. J Environ Manag 2022;302:114018.
[12] Caetano RV, Marques AC, Afonso TL. How can foreign direct investment trigger green growth? The mediating and moderating role of the energy transition. Economies 2022;10(8):199.
[13] McInerney C, Bunn DW. Expansion of the investor base for the energy transition. Energy Policy 2019;129:1240–4.
[14] Qi X, Guo Y, Guo P, Yao X, Liu X. Do subsidies and R&D investment boost energy transition performance? evidence from Chinese renewable energy firms. Energy Policy 2022;164:112909.
[15] Fleta-Asín J, Muñoz F. Renewable energy public–private partnerships in developing countries: Determinants of private investment. Sustain Dev 2021;29(4):653–70.
[16] Aguilar FX, Cai Z. Exploratory analysis of prospects for renewable energy private investment in the US. Energy Econ 2010;32(6):1245–52.
[17] Aslani A, Naaranoja M, Zakeri B. The prime criteria for private sector participation in renewable energy investment in the middle east (case study: Iran). Renew Sustain Energy Rev 2012;16(4):1977–87.
[18] Cárdenas Rodríguez M, Haščič I, Johnstone N, Silva J, Ferey A. Renewable energy policies and private sector investment: Evidence from financial microdata. Environ Resour Econ 2015;62:163–88.

[19] Esparcia C, Diaz A, Alonso D. How important is green awareness in energy investment decisions? An environmentally-based rebalancing portfolio study. Energy Econ 2023;128:107174.
[20] Szeberényi A, Rokicki T, Papp-Váry Á. Examining the relationship between renewable energy and environmental awareness. Energies 2022;15(19):7082.
[21] Christophers B. Environmental beta or how institutional investors think about climate change and fossil fuel risk. Ann Am Assoc Geogr 2019;109(3):754–74.
[22] Esposito L, Vecchio C, Cattaneo G, Gu Z, Scotto di Perta E. Addressing challenges and outcomes in the biogas sector: An analysis of efficiency, economic savings, and environmental impacts using an advanced SWOT model. Energies 2023;16(21):7413.
[23] Ali A, Esposito L, Gatto A. Energy transition and public behavior in Italy: A structural equation modeling. Resour Policy 2023;85:103945.
[24] Zyadin A, Puhakka A, Ahponen P, Cronberg T, Pelkonen P. School students' knowledge, perceptions, and attitudes toward renewable energy in Jordan. Renew Energy 2012;45:78–85.
[25] Zameer H, Yasmeen H. Green innovation and environmental awareness driven green purchase intentions. Mark Intell Plan 2022;40(5):624–38.
[26] Hamzah MI, Tanwir NS. Do pro-environmental factors lead to purchase intention of hybrid vehicles? The moderating effects of environmental knowledge. J Clean Prod 2021;279:123643.
[27] Moser AK. Thinking green, buying green? Drivers of pro-environmental purchasing behavior. J Consum Mark 2015;32(3):167–75.
[28] Liang H, Wu Z, Du S. Study on the impact of environmental awareness, health consciousness, and individual basic conditions on the consumption intention of green furniture. Sustain Futur 2024;8:100245.
[29] De Canio F, Martinelli E, Endrighi E. Enhancing consumers' pro-environmental purchase intentions: the moderating role of environmental concern. Int J Retail Distrib Manage 2021;49(9):1312–29.
[30] Zhou J, Jin S. Corporate environmental protection behavior and sustainable development: the moderating role of green investors and green executive cognition. Int J Environ Res Public Heal 2023;20(5):4179.
[31] Wang F, Liu J. Green bond and corporate environmental investment: The moderating effect of environmental concern. Financ Res Lett 2024;65:105607.
[32] Akhtar F. Big-five personality traits and pro-environmental investment specifics from an emerging economy. Glob Bus Rev 2022;23(2):354–71.
[33] Hemdan W, Zhang J. Investors' intention toward green investment: an extension of the theory of planned behavior. Int J Emerg Mark 2024.
[34] Pradhan RP, Arvin MB, Nair MS, Hall JH, Bennett SE. Sustainable economic development in India: The dynamics between financial inclusion, ICT development, and economic growth. Technol Forecast Soc Change 2021;169:120758.
[35] Afzal A, Rasoulinezhad E, Malik Z. Green finance and sustainable development in Europe. Econ Research- Èkon Istra v Zivanja 2022;35(1):5150–63.
[36] Maka AO, Alabid JM. Solar energy technology and its roles in sustainable development. Clean Energy 2022;6(3):476–83.
[37] Kennedy S, Linnenluecke MK. Circular economy and resilience: A research agenda. Bus Strat Environ 2022;31(6):2754–65.
[38] Wibowo A. Global economic challenges for Indonesia: Equitable development for sustainable prosperity. In: Prosiding seminar teknologi, akuntansi, bisnis, ekonomi, dan komunitas. 3, 2023, p. 23–40.
[39] Huang Z, Ren X. Impact of natural resources, resilient economic growth, and energy consumption on CO2 emissions. Resour Policy 2024;90:104714.
[40] Picazo-Tadeo AJ, Prior D. Environmental externalities and efficiency measurement. J Environ Manag 2009;90(11):3332–9.
[41] Zhu S, Zafar MW, Usman M, Kalugina OA, Khan I. Internalizing negative environmental externalities through environmental technologies: The contribution of renewable energy in OECD countries. Sustain Energy Technol Assessments 2024;64:103726.
[42] Unger N, Bond TC, Wang JS, Koch DM, Menon S, Shindell DT, Bauer S. Attribution of climate forcing to economic sectors. Proc Natl Acad Sci 2010;107(8):3382–7.
[43] Fu FY, Alharthi M, Bhatti Z, Sun L, Rasul F, Hanif I, Iqbal W. The dynamic role of energy security, energy equity and environmental sustainability in the dilemma of emission reduction and economic growth. J Environ Manag 2021;280:111828.
[44] Shahsavari A, Akbari M. Potential of solar energy in developing countries for reducing energy-related emissions. Renew Sustain Energy Rev 2018;90:275–91.
[45] Panwar N, Kaushik S, Kothari S. Role of renewable energy sources in environmental protection: A review. Renew Sustain Energy Rev 2011;15(3):1513–24.
[46] Kreider JF, Kreith F. Solar energy handbook. McGraw-Hill Book Company, New York, NY; 1981.
[47] Reuter WH, Szolgayová J, Fuss S, Obersteiner M. Renewable energy investment: Policy and market impacts. Appl Energy 2012;97:249–54.
[48] Wüstenhagen R, Menichetti E. Strategic choices for renewable energy investment: Conceptual framework and opportunities for further research. Energy Policy 2012;40:1–10.
[49] Wei X, Mohsin M, Zhang Q. Role of foreign direct investment and economic growth in renewable energy development. Renew Energy 2022;192:828–37.
[50] Li M, Hamawandy NM, Wahid F, Rjoub H, Bao Z. Renewable energy resources investment and green finance: Evidence from China. Resour Policy 2021;74:102402.
[51] Fahmy H. The rise in investors' awareness of climate risks after the Paris agreement and the clean energy-oil-technology prices nexus. Energy Econ 2022;106:105738.
[52] Kilinc-Ata N, Dolmatov IA. Which factors influence the decisions of renewable energy investors? empirical evidence from OECD and BRICS countries. Environ Sci Pollut Res 2023;30(1):1720–36.
[53] Mutezo G, Mulopo J. A review of africa's transition from fossil fuels to renewable energy using circular economy principles. Renew Sustain Energy Rev 2021;137:110609.
[54] Yildizbasi A. Blockchain and renewable energy: Integration challenges in circular economy era. Renew Energy 2021;176:183–97.
[55] Amin N, Shabbir MS, Song H, Abbass K. Renewable energy consumption and its impact on environmental quality: A pathway for achieving sustainable development goals in ASEAN countries. Energy & Environ 2024;35(2):644–62.
[56] Gökgöz F, Güvercin MT. Energy security and renewable energy efficiency in EU. Renew Sustain Energy Rev 2018;96:226–39.
[57] Qian S, You H, Wan D. From pro-environmental behavior to ESG fund investing: Evidence from account-level data in China. 2023, Available At SSRN.
[58] Li D, Zhao L, Ma S, Shao S, Zhang L. What influences an individual's pro-environmental behavior? A literature review. Resour Conserv Recycl 2019;146:28–34.
[59] Mikiki F, Papaioannou P. Investigating pro-environmental and active travel behaviour for successful sustainable travel promotion. Procedia- Soc Behav Sci 2012;48:1424–33.
[60] Deshuai M, Hui L, Ullah S. Pro-environmental behavior–renewable energy transitions nexus: exploring the role of higher education and information and communications technology diffusion. Front Psychol 2022;13:1010627.
[61] Han K, Tan J, Fan J, Lao Z. More "self-interested" or more "altruistic": the effect of financial literacy on pro-environmental behavior of rural households in China. Environ Dev Sustain 2025;1–28.
[62] Ajzen I. The theory of planned behavior. Organ Behav Hum Decis Process 1991.
[63] Panja S, Das AR. Exploring green investment on the dynamics of behavioural finance and stock performance. Business, Economics Sustainable Development 2020;120.
[64] Qian S, You H, Wan D. From pro-environmental behavior to ESG fund investing: Evidence from account-level data in China. Energy Econ 2025;108271.
[65] Colombo SL, Chiarella SG, Lefrançois C, Fradin J, Simione L, Raffone A. Probing pro-environmental behaviour: A systematic review on its relationship with executive functions and self-regulation processes. J Environ Psychol 2023;92:102153.
[66] Weigel R, Weigel J. Environmental concern: The development of a measure. Environ Behav 1978;10(1):3–15.
[67] Van Liere KD, Dunlap RE. Environmental concern: Does it make a difference how it's measured? Environ Behav 1981;13(6):651–76.
[68] Farooq U, Ahmed J, Tabash MI, Anagreh S, Subhani BH. Nexus between government green environmental concerns and corporate real investment: Empirical evidence from selected Asian economies. J Clean Prod 2021;314:128089.
[69] Priyan S. Effect of green investment to reduce carbon emissions in an imperfect production system. J Clim Financ 2023;2:100007.
[70] Pan R, Hu Y, Xu X, Yuan N, Zhou K. How government green investment affects the carbon emission reduction process: empirical evidence from prefecture-level cities in China. Front Environ Sci 2023;11:1202978.
[71] Usman M, Balsalobre-Lorente D. Environmental concern in the era of industrialization: can financial development, renewable energy and natural resources alleviate some load? Energy Policy 2022;162:112780.
[72] Baumgärtner S, Faber M, Proops J. How environmental concern influences the investment decision: an application of capital theory. Ecol Econom 2002;40(1):1–12.
[73] Fishbein M. Reasoned action, theory of. Int Encycl Commun 2008.
[74] Hale J. The theory of reasoned action. Persuas Handb: Dev Theory Practice/ Sage 2002.
[75] Siemroth C, Hornuf L. Why do retail investors pick green investments? A lab-in-the-field experiment with crowdfunders. J Econ Behav Organ 2023;209:74–90.
[76] Renneboog L, Ter Horst J, Zhang C. Socially responsible investments: Institutional aspects, performance, and investor behavior. J Bank Financ 2008;32(9):1723–42.
[77] Jia Y, Nadeem M, Hameed I, Waris I, Akram U. Towards sustainable consumption: Factors influencing energy-efficient appliance adoption in haze-affected environments. Energy Strat Rev 2024;53:101416.
[78] Costello AB, Osborne J. Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. Pr Assess Res Eval 2005;10(1).
[79] Kline RB. Principles and practice of structural equation modeling. Guilford publications; 2023.
[80] Fornell C, Larcker DF. Evaluating structural equation models with unobservable variables and measurement error. J Mark Res 1981;18(1):39–50.
[81] Jalal RN-U-D, Leonelli S. Does self-attribution impact on investor perception about cryptocurrency market efficiency? The mediating role of overconfidence. In: Exploring innovation in a digital world: cultural and organizational challenges. Springer; 2021, p. 137–50.

[82] Podsakoff PM, MacKenzie SB, Lee J-Y, Podsakoff NP. Common method biases in behavioral research: a critical review of the literature and recommended remedies.. J Appl Psychol 2003;88(5):879.
[83] Koenig-Lewis N, Palmer A, Dermody J, Urbye A. Consumers' evaluations of ecological packaging–rational and emotional approaches. J Environ Psychol 2014;37:94–105.
[84] Bock G-W, Zmud RW, Kim Y-G, Lee J-N. Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate. MIS Q 2005;87–111.
[85] Fagan MH, Neill S, Wooldridge BR. Exploring the intention to use computers: An empirical investigation of the role of intrinsic motivation, extrinsic motivation, and perceived ease of use. J Comput Inf Syst 2008;48(3):31–7.
[86] Garg A, Goel P, Sharma A, Rana NP. As you sow, so shall you reap: Assessing drivers of socially responsible investment attitude and intention. Technol Forecast Soc Change 2022;184:122030.
[87] Wee CS, Ariff MSBM, Zakuan N, Tajudin MNM, Ismail K, Ishak N. Consumers perception, purchase intention and actual purchase behavior of organic food products. Rev Integr Bus Econ Res 2014;3(2):378.
[88] Mom TJ, Van Den Bosch FA, Volberda HW. Investigating managers' exploration and exploitation activities: The influence of top-down, bottom-up, and horizontal knowledge inflows. J Manage Stud 2007;44(6):910–31.
[89] Nunnally JC, Bernstein IH. Validity. Psychom Theory 1994;3(1):99–132.
[90] Fransson N, Gärling T. Environmental concern: Conceptual definitions, measurement methods, and research findings. J Environ Psychol 1999;19(4):369–82.
[91] Yu T-Y, Yu T-K, Chao C-M. Understanding Taiwanese undergraduate students' pro-environmental behavioral intention towards green products in the fight against climate change. J Clean Prod 2017;161:390–402.
[92] Shahid AU, Nagarajan CD, Tufail HS, Imran M. Investors' pro-environmental attitude, spirituality and socially responsible investing: a mediating role of greenwashing practices. J Account Organ Chang 2024.
[93] Wang C, Zhang J, Cao J, Hu H, Yu P. The influence of environmental background on tourists' environmentally responsible behaviour. J Environ Manag 2019;231:804–10.
[94] Testa F, Miroshnychenko I, Barontini R, Frey M. Does it pay to be a greenwasher or a brownwasher? Bus Strat Environ 2018;27(7):1104–16.
[95] Ebreo A, Vining J, Cristancho S. Responsibility for environmental problems and the consequences of waste reduction: A test of the norm-activation model. J Environ Syst 2003;29(3).
[96] Singh M, Mittal M, Mehta P, Singla H. Personal values as drivers of socially responsible investments: a moderation analysis. Rev Behav Financ 2021;13(5):543–65.
[97] Özbay F, Duyar I. Exploring the role of education on environmental quality and renewable energy: Do education levels really matter? Curr Res Environ Sustain 2022;4:100185.
[98] Qadir SA, Al-Motairi H, Tahir F, Al-Fagih L. Incentives and strategies for financing the renewable energy transition: A review. Energy Rep 2021;7:3590–606.

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