Does product knowledge breed trust or scepticism? Evidence from energy-efficient appliance buyers in a mature labelling market

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Abstract

Purpose: This study examines whether green trust links householders' knowledge of energy-saving products to their intention to purchase energy-efficient appliances in a mature labelling market, where informed consumers might be expected to doubt efficiency claims.
Design/methodology/approach: Grounded in Commitment-Trust Theory and the knowledge-attitude-behaviour framework, four hypotheses were tested using online survey data from 300 householders in Victoria, Australia, involved in appliance purchases, analysed with PLS-SEM.
Findings: Environmental knowledge was positively associated with both green trust and purchase intention, and green trust showed the strongest association with intention. Green trust partially mediated the association between knowledge and intention, a direct association remained and the model showed predictive relevance beyond the estimation sample.
Implications: Because trust accounted for part of the association between knowledge and intention, efficiency programs and retailers should build the credibility of efficiency claims, not only awareness, for example by publishing verified savings from completed upgrades and explaining what star ratings mean for running costs.
Limitations and future research: Purposive online sampling in one Australian state, a cross-sectional design, self-assessed knowledge and an intention outcome limit generalization and causal inference. Longitudinal or experimental designs, objective knowledge tests and actual purchase records are recommended.
Originality/value: The study extends Commitment-Trust Theory to consumers' relationships with a credence product category, identifying trust as one channel linking knowledge to intention. It also shows that knowledge accompanied more, not less, trust in a market with mandatory energy labels and active greenwashing scrutiny.
Keywords: Green Trust; Product Knowledge; Energy-Efficient Appliances; Commitment-Trust Theory.

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Introduction

Victoria is encouraging households to pay to reduce their energy consumption. The Victorian Energy Upgrades (VEU) program has helped to upgrade appliance and equipment efficiency in over 2 million Victorian homes since 2009 (Department of Energy & Climate, 2024), and from 1 March 2027, the Victorian government will require rental providers to install efficient electric heating and hot water systems in their rental units if the heating and hot water systems are broken or leaky (Nguyen et al., 2025). Both policies rely on a purchase that consumers can only partially evaluate. Energy efficiency is a credence attribute because the energy savings cannot be assessed at the time of purchase and the buyer may never confirm the energy savings after

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the purchase (Darby & Karni, 1973). The decision therefore turns on whether households believe what labels, retailers, and program providers tell them, and Australian consumers have been given reasons for doubt. In 2023, the Australian Competition and Consumer Commission (ACCC) found 57% of 247 businesses examined in its internet sweep had made concerning environmental claims (Australian & Consumer, 2023) and in 2024, the Victorian Government introduced a ban on telemarketing and door knocking under the VEU program to prevent households from being targeted by high-pressure sales tactics (Department of Energy & Climate, 2024; Essential Services, 2024).

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In the past, policy has always viewed information as the solution to slow adoption. Labelling schemes, awareness raising and product explainers are based on the premise that if consumers are aware of energy efficient products, they will purchase them and a lack of knowledge is often cited as a barrier to the efficient purchase of appliances (Damigos et al., 2020). The argument for that assumption is weaker than its popularity implies. It is well known that knowledge is not a strong and consistent predictor of pro-environmental action (Kollmuss & Agyeman, 2002) and the gap between positive attitudes and green purchasing behaviour is one of the most well-established issues in the field of sustainable consumption (ElHaffar et al., 2020). A different stream of work explains this. Green trust, defined as the consumer's confidence that a product will meet its environmental claims, appears consistently as a predictor of green purchase intention in meta-analytic evidence (Chauhan & Goyal, 2024; Zhuang et al., 2021). It partially mediates the effect of green perceived value on purchase intention (Chen & Chang, 2012) and is reduced when consumers are faced with greenwashing (Chen & Chang, 2013). Efficient appliances studies in Pakistan, South Africa and Ghana also revealed that trust in products, labels and environmental claims were influential factors in consumers' response (Basiru et al., 2025; Issock Issock & Muposhi, 2023; Waris & Hameed, 2021).

Taken together, these streams suggest a mechanism which has not been tested directly that is knowledge could increase purchase intention primarily when knowledge also increases the confidence that energy-saving products will actually function as described. The closest test comes from Hossain et al. (2022) who found that green trust acts as a mediator between environmental knowledge and pro-environmental behaviour of energy efficient household appliances in Bangladesh. Their result was a general behavioural indicator, not intention-to-purchase and their environment is in an area where most evidence on efficient appliance purchase comes from emerging economies in Asia and where results often contradict (Nguyen et al., 2025). In most of these studies, knowledge along with trust are treated as concurrent determinants of intention or the trust is studied as a characteristic of labelling and not the product itself (Issock Issock & Muposhi, 2023; Waris & Hameed, 2021). The first step of the mechanism, from knowledge to trust, is therefore the least understood.

Whether this is the right move is debatable and especially in a developed market like Australia. Consumers with greater product knowledge have also been found to be more likely to identify a persuasion attempt and this awareness is generally correlated with scepticism of marketers' claims (Friestad & Wright, 1994). There is a strong link between green scepticism and environmental knowledge in the context of green purchasing (Goh & Balaji, 2016) and lack of confidence in energy rating labels is a well-documented green purchase barrier with respect to the purchase of energy efficient appliances (Joshi et al., 2019). However, persuasion knowledge can also increase the credibility of the tactic used when it is perceived as legitimate (Isaac & Grayson, 2017). Australia offers consumers two conditions: a credible, national, mandatory star-rating scheme under the Greenhouse and Energy Minimum Standards Act 2012("Greenhouse and Energy Minimum Standards Act 2012 (Cth)," 2012) and an active campaign against greenwashing. If knowledge in this setting feeds doubt rather than confidence, information campaigns attached to VEU discounts and the 2027 rental standards

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may raise awareness without moving purchases and policymakers currently lack the evidence to tell which outcome applies.

The study is based on two lenses. A framework that is often used in the study of efficient appliances is the knowledge-attitude-behavior framework (KAB) (Nguyen et al., 2025), which states that knowledge is the catalyst for a sequence of events that culminates with behaviour. Commitment-Trust Theory (Morgan & Hunt, 1994) provides the missing condition by making trust the primary focus of exchange relationships, as described below in Section 2.1. The study extends this relational logic from business partners to the consumer's relationship with a product category, whose primary benefit is a credence claim, and introduces green trust as the intervening state between the knowledge and the attitude-behaviour chain that is implicit.

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This study investigates the mediating effect of green trust between environmental knowledge (measured as knowledge about energy saving products) and purchase intention (measured as intention to purchase energy efficient appliances) for Victorian householders. The analysis is carried out based on two research questions.

RQ1: To what extent does knowledge of energy-saving products associated with green trust and purchase intention?

RQ2: Does green trust mediate the relationship between knowledge of energy-saving products and purchase intention?

The questions are answered with a cross-sectional online survey of 300 Victorian householders aged 18 years and over who are involved in the purchase decision for appliances, analysed using partial least squares structural equation modelling (PLS-SEM).

The study has three contributions. It estimates the direct effect of knowledge on intention, in addition to the indirect effect via trust, and it reports the strength of the relationship between knowledge and intention out-of-sample as well as in-sample. By doing so it builds on Commitment-Trust Theory, from interorganizational exchange to the consumer's judgments about credence products. Secondly, it puts the mechanism to the test under conditions that might be conducive to reversing it. A positive association between knowledge and trust in a mature labelling market in which greenwashing scrutiny is active would reinforce trust in the majority of the market, whilst a weak association between the two would set the limits of the market. Thirdly the findings directly relate to program design in Victoria. If trust carries a meaningful share of the knowledge effect, information attached to VEU discounts and the rental energy standards must establish the credibility of efficiency claims through verifiable savings and trusted messengers and not just by raising awareness.

The rest of the paper is organized as follows. The theoretical background and hypotheses are developed in Section 2, the methodology is explained in Section 3, the measurement and structural models are reported in Sections 4 and 5 respectively, the practical and theoretical implications are discussed in Section 6, the limitations and future research are discussed in Section 7 and the conclusion is provided in Section 8.

Literature Review and Hypothesis Development

This section builds on the problem and research questions outlined in Section 1 and provides a theoretical foundation for the model, situates the study in the context of Commitment-Trust Theory, defines the three constructs and formulates four hypotheses connecting them. It concludes with the research framework.



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Theoretical Background

Commitment-Trust Theory was developed in the context of relationship marketing where Morgan and Hunt (1994) proposed that the two essential mediating constructs for the success of exchange relationships are trust and relationship commitment. Trust is the confidence one party places in the reliability and integrity of an exchange partner and is similar to the general definition of trust as the willingness to trust the other party's reliability and integrity, based on positive expectations for their ability, benevolence, and integrity (Mayer et al., 1995). The theory defines what factors lead to trust (such as communication, shared values and no opportunistic behaviour) and what factors result from trust (such as cooperation, acquiescence and reduced uncertainty in decision making). The core mechanism is mediation: antecedents influence behaviours primarily by influencing trust.

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Later, this logic extended from interfirm exchange to the consumer market. Among customers who are high in relational orientation, Garbarino and Johnson (1999) demonstrated that trust and commitment factors, not overall satisfaction would predict future intentions and Sirdeshmukh et al. (2002) developed a model of consumers' trust based on the perception of the provider's competence and benevolence leading to the generation of value and loyalty. In the field of green marketing, Zhao et al. (2010) modified the construct to green trust which was specifically related to environmental performance.

The theory is appropriate for this study because the energy-saving products indicate the circumstances under which trust is most important. Benefits that cannot be observed by the buyer are uncertain and he/she must take on the word of the manufacturer, retailer and program providers. Knowledge of energy-saving products takes the place that communication occupies in the original model, supplying the information against which those claims are judged. Based on this, Commitment-Trust Theory includes the links between environmental knowledge and green trust (H_1), green trust and purchase intention (H_2) and the indirect link between them (H_4). The direct link between knowledge and intention (H_3) is based on the knowledge-attitude-behaviour model (Kollmuss & Agyeman, 2002), the first and most commonly used theory explaining pro-environmental behaviour which postulates that the relationship between knowledge and intention is direct with no intervening factor.

Theoretical Positioning

The Introduction identified the gap between knowledge and trust as the least understood in the relationship between what consumers know and what they will buy. To date, the use of Commitment-Trust Theory in green applications has focused on the outcome of trust relating this to satisfaction and loyalty with green brands (Martínez, 2015) and using trust in energy-efficiency labels as the bridge between product perception and intention (Issock Issock et al., 2020). Although context has been found to play a crucial role in green trust relationships based on meta-analytical evidence (Chauhan & Goyal, 2024), this side has been ignored. This study treats consumer knowledge as a communication-type antecedent of trust in a product category and examines whether trust carries the effect of that knowledge through to the intention to buy energy-efficient appliances.

Hypothesis Development

Environmental knowledge and green trust

Environmental knowledge is a householder's self-assessment of their knowledge of energy saving products and awareness of the environmental impacts of energy use as captured by the items adopted from Hossain et al. (2022). It is subjective knowledge which correlates with but

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differs from tested, objective knowledge (Carlson et al., 2009). Green trust refers to a willingness to rely on a product, because of its perceived environmental credibility, benevolence and capability (Zhao et al., 2010). Here it is aimed at energy-saving products as a whole and reflects the credibility and trust in this product group as opposed to similar products with regard to reliability, trustworthiness and environmental protection.

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Commitment-Trust Theory suggests that if one party can anticipate the other party's actions, it reduces uncertainty and increases trust (Morgan & Hunt, 1994). A householder who grasps the meaning of energy saving products and their application of a star rating can interpret energy saving claims as specific and verifiable signals and specific environmental claims are more likely to be trusted than general ones (Atkinson & Rosenthal, 2014). When this is not the case, consumers have a hard time understanding what certification and labelling systems are and they lack confidence in green products (Nuttavuthisit & Thøgersen, 2017). One study found that green product knowledge correlated with green trust in China's consumers (Wang et al., 2019), another study found that environmental knowledge was the predictor of green trust in Bangladesh for energy-efficient household products (Hossain et al., 2022). Based on the literature, following hypothesis is proposed.

H_1: Environmental knowledge has a positive effect on green trust.

Green trust and purchase intention

Purchase intention is defined as the householder's expressed intention to select an energy-efficient model when purchasing an appliance as well as making an effort to purchase energy-efficient appliances and to move away from conventional appliances (Ali et al., 2021). Efficient appliances tend to be more expensive at time of purchase and only become beneficial through savings which are realized later and cannot be verified at the counter, so the buyer takes a risk that is a good risk to bear. In the Commitment-Trust Theory, trust reduces uncertainty associated with the decision-making process and increases the willingness of individuals to invest into the trusted person. Green trust was found to increase green purchase intention, and perceived risk was observed to decrease it (Chen & Chang, 2012), while several dozen studies in the meta-analyses' studies supported the consistent positive correlation of green trust with green purchase intention (Chauhan & Goyal, 2024; Zhuang et al., 2021). The pattern is reflected in the case of energy-efficient appliances specifically: trust predicted intention to purchase efficient products among South African appliance users (Issock Issock et al., 2020), shaped purchase intention for efficient equipment in India (Shah et al., 2023) and influenced intention to buy efficient household appliances among urban residents in Ghana (Basiru et al., 2025). Because trust in a product category is a standing belief built from prior exposure, whereas intention concerns a future purchase, the direction from trust to intention is the more plausible one. Based on the literature, following hypothesis is proposed.

H_2: Green trust has a positive effect on purchase intention.

Environmental knowledge and purchase intention

Knowledge-attitude-behaviour (KAB) theory can be used to predict the likelihood that individuals who know about an environmental problem and its products will be more likely to act than those who don't, regardless of whether or not they have a favourable or unfavourable opinion of the sellers of the products (Kollmuss & Agyeman, 2002). Knowledge also works practically in the choice of appliances. One who knows the running costs can balance a high initial cost with lifetime savings and one who knows what makes efficient models can act without having to depend on a sales person. Subjective knowledge, especially, provides



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consumers with confidence in their own assessment in a product category and thus increases their willingness to act on their assessment (Flynn & Goldsmith, 1999). Evidence from the field is in agreement with a direct association. Environmental knowledge influenced green purchase behaviour among Egyptian consumers (Mostafa, 2007) was positively correlated with willingness of the households to purchase energy efficient appliances in Shanxi, China (Li et al., 2019) and knowledge of eco-labels was positively correlated with intention of the households to purchase energy efficient home appliances in Pakistan (Waris & Hameed, 2020). At the organizational level, a similar knowledge-to-action relationship has been reported where top managers' environmental awareness not only enhanced the returns of circular practices in the Iraqi oil and gas industry but also contributed to improving the performance of the circular economy (Abdulameer et al., 2025). The relationship is not uniform, however. Pothitou et al. (2016) found knowledge to be more strongly associated with energy-saving practices than to owning appliances, indicating that knowledge alone does not lead to buying. Based on this, the current study is expecting a direct association that will complement and not replace the indirect connection through trust. Based on the literature, following hypothesis is proposed.

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H_3: Environmental knowledge has a positive direct effect on purchase intention.

The mediating role of green trust

The mediation hypothesis is based upon the fundamental tenet of the Commitment-Trust Theory, that is, antecedents can influence behaviour primarily by shaping trust (Morgan & Hunt, 1994). Knowledge alone tells a householder what an efficient appliance should deliver; it does not guarantee that a particular claim will be honoured. Trust bridges that gap by turning a credible evaluation of the credibility into a willingness to invest funds in a good that is unquantifiable at the time of acquisition. The mechanism is strongest when the consumers' relation with a product lasts for a long time, which is the case with durable appliances that are used for a decade or more, and Garbarino and Johnson (1999) identified trust as the most important mediator for these relational customers. Evidence from green consumption supports each link of the chain. Chen and Chang (2012) showed that the effect of green perceived value on green purchase intention was partially mediated by green trust and Wang et al. (2019) found that green trust partially mediated the effect of green product knowledge on green purchase intention. Closest to the present context, Hossain et al. (2022) reported that the influence of environmental knowledge and eco-label knowledge on pro-environmental behaviour was mediated by green trust among the consumers of energy efficient household appliances in Bangladesh. Similarly, in appliance markets, trust has served as the link between judgements and purchase intention as it did when green trust mediated the effect of energy-efficiency labels on urban residents' purchase intention (Basiru et al., 2025) and trust in energy-efficiency labels mediated the relation between perceived price, perceived quality, attitude and satisfaction and intention to purchase energy-efficient products among South African consumers (Issock Issock et al., 2020). Based on the literature, following hypothesis is proposed.

H_4: Green trust mediates the relationship between environmental knowledge and purchase intention.

Research Framework

Figure 1 brings the four hypotheses together. Environmental knowledge is expected to relate positively to green trust (H_1) and to purchase intention (H_3) and green trust to purchase intention (H_2). The indirect path from knowledge through trust to intention (H_4) represents the

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Commitment-Trust mechanism while the direct path captures the knowledge-attitude-behavior route that operates alongside it.

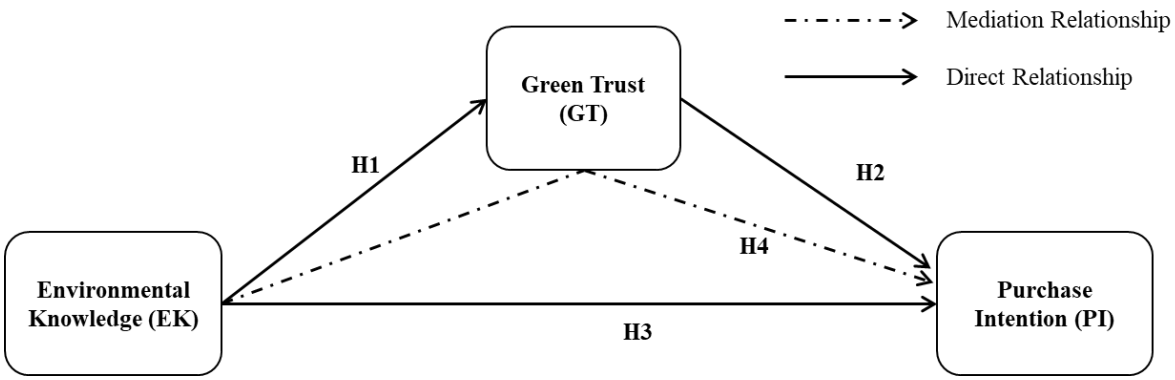

Figure 1. Research Framework

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Research Methodology

This section describes how the hypotheses were tested.

Population

Persons aged 18 and older residing in the household in Victoria, Australia who, in their own household, make or assist in making decisions about the purchase of household appliances. The individual (the respondent) is the unit of analysis because knowledge, trust and intention are individual perceptions but the screening criterion provides that each respondent participates in the decision under study. Victoria is a suitable location for the research question as is the natural setting in which its households build their knowledge about efficiency and trust in efficiency claims through a statewide efficiency support program for households and the national energy rating scheme. For 2021 Census, there were more than 2.3 million occupied private dwellings in the state (Australian Bureau of, 2022) and there is no register that identifies who is involved in appliance decision making within a household. The population was thus considered to be large, with an unknown exact number.

Sample Size and Sampling

The minimum sample size was determined using the inverse square root method where the minimum number of cases is based on the smallest path coefficient expected to be significant (Kock & Hadaya, 2018). To achieve a minimum path coefficient of 0.15 (with a 5% significance level and 80% statistical power), the method needs 275 cases and a target of 300 was used to allow for losses of cases through screening. The study adopted purposive non-probability sampling since there was no sampling frame of appliance decision makers. The sample was screened in the following way: two criteria were required, being living in Victoria and making appliance purchasing decisions.

Data Collection

The data were gathered by conducting an online, cross-sectional survey using online plateforms in July and August 2026. The link was sent out via community Facebook and

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WhatsApp groups. There were 317 responses. Eleven partial answers were excluded, as were six answers with a straight line or zig zag pattern which are associated with careless responses (Meade & Craig, 2012). This gave a total of 300 valid responses which is above the 275 minimum. Since the invitation was passed through the open social media group, the number of people who saw the invitation is unknown and a response rate cannot be estimated.

Table 1 presents the respondent profile. The sample consisted of 54.3% women and the largest age group was 35–44 years (23.7%). The most common highest qualification was a bachelor's (34.0%) followed by a certificate or diploma (29.7%). The largest tenure group were mortgage holders (39.3%), followed by those who rented privately (29.7%) and those who owned their home outright (28.3%). The predominant housing type for the majority of respondents was a separate house (71.7%) and the majority resided in metropolitan Melbourne (70.3%). Nearly two thirds (62.3%) had purchased an energy efficient appliance before and 37.3% had used a VEU discount.

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Table 1. Demographic profile of respondents (N = 300)

Demography	Category	Count	%
Gender	Female	163	54.3
	Male	132	44.0
	Non-binary / prefer not to say	5	1.7
Age (years)	18 to 24	19	6.3
	25 to 34	58	19.3
	35 to 44	71	23.7
	45 to 54	63	21.0
	55 to 64	51	17.0
	65 and above	38	12.7
Highest education	Secondary school or below	52	17.3
	Certificate or diploma	89	29.7
	Bachelor's degree	102	34.0
	Postgraduate degree	57	19.0
Annual household income (AUD)	Below 50,000	40	13.3
	50,000 to 99,999	85	28.3
	100,000 to 149,999	78	26.0
	150,000 to 199,999	46	15.3
	200,000 and above	28	9.3
	Prefer not to say	23	7.7
Housing tenure	Owned outright	85	28.3
	Owned with a mortgage	118	39.3
	Private renter	89	29.7
	Public or community housing	8	2.7
Dwelling type	Separate house	215	71.7
	Semi-detached or townhouse	48	16.0
	Apartment or unit	37	12.3
Location	Metropolitan Melbourne	211	70.3
	Regional Victoria	89	29.7

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Demography	Category	Count	%
Household size	1 person	62	20.7
	2 persons	103	34.3
	3 to 4 persons	108	36.0
	5 or more persons	27	9.0
Previously purchased an energy-efficient appliance	Yes	187	62.3
	No	113	37.7
Previously used a VEU discount	Yes	112	37.3
	No	131	43.7
	Not sure	57	19.0
Total		300	100.0

Note. Percentages may not sum to exactly 100 because of rounding.

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Measurement Instrument

Three first-order reflective constructs were measured using three items per construct all taken from published studies and adopted as it is (Table 2). Items of Hossain et al. (2022) were used to measure EK and GT while Ali et al. (2021) measured PI. A five-point Likert scale was used in this study. The survey was carried out in the English language and no translation was needed. The screening questions were followed by the construct items and then the demographic questions.

Table 2. Measurement items

Construct	Code	Item wording	Source
Environmental Knowledge (EK)	EK1	I am familiar with energy-saving products	Hossain et al. (2022)
	EK2	I am very knowledgeable about energy-saving products	Hossain et al. (2022)
	EK3	I am knowledgeable about energy and the environment	Hossain et al. (2022)
Green Trust (GT)	GT1	Energy-saving products are more reliable than other comparative products	Hossain et al. (2022)
	GT2	Energy-saving products are more trustworthy than other comparative products	Hossain et al. (2022)
	GT3	Energy-saving products are more secure and keep commitments for environmental protection than other comparative products	Hossain et al. (2022)
Purchase Intention (PI)	PI1	If I need to buy a household appliance, I intend to buy an energy efficient one.	Ali et al. (2021)
	PI2	I will make efforts to purchase energy efficient appliances.	Ali et al. (2021)
	PI3	I will shift from the use of traditional appliance to energy efficient appliances.	Ali et al. (2021)

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Data Analysis Technique

There were two stages in analysing the data, starting with testing the measurement model and then the structural model (Hair et al., 2019). The method is appropriate for this study because of the following: First, the study seeks to explain and predict purchase intention and PLS-SEM is a causal-based prediction model that allows for the assessment of the model out-of-sample by using PLSpredict (Shmueli et al., 2019). Second, the model has an indirect effect and the PLS-SEM method estimates the direct and indirect paths simultaneously and makes inferences based on bootstrapping so it does not require normally distributed data (Hair et al., 2019).

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Measurement Model

The measurement model was evaluated for internal consistency reliability, convergent validity, discriminant validity and then for common method bias as per the widely accepted guidelines of PLS-SEM (Hair et al., 2022). Figure 2 presents the estimated measurement model.

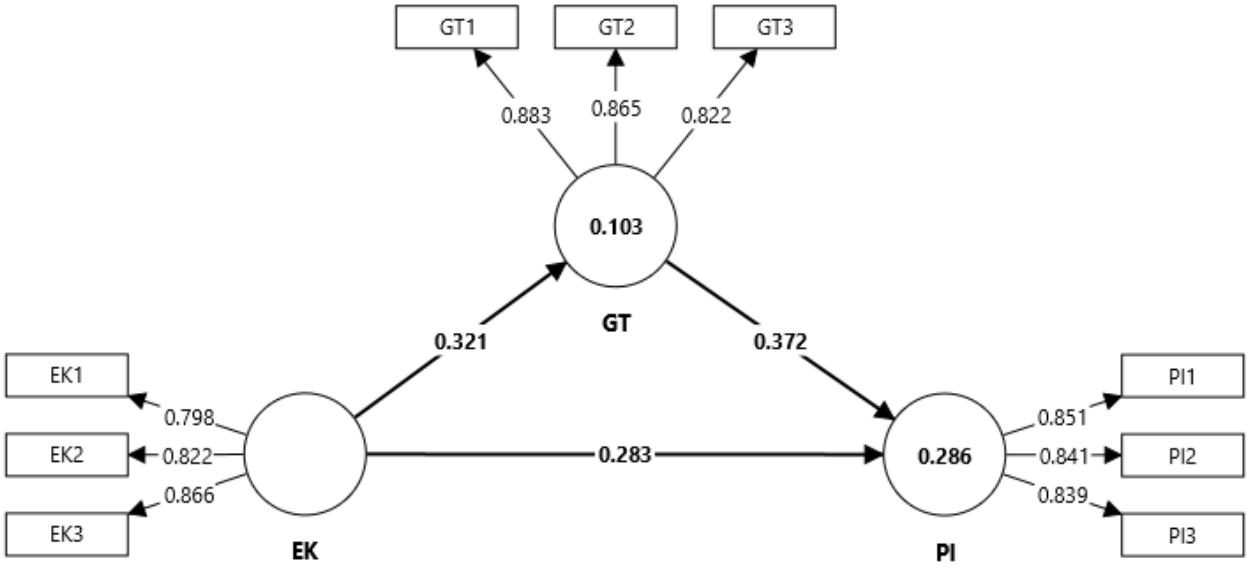

Figure 2

Measurement Model Showing Outer Loadings, Path Coefficients and R^2 Values

Note. Values on the arrows to indicators are bootstrapped t-values for the outer loadings; values on the paths between constructs are standardized path coefficients with p-values in parentheses (all $p < 0.001$); values inside the GT and PI circles are R^2 values. EK = environmental knowledge; GT = green trust; PI = purchase intention.

Reliability Analysis

Results are given in Table 3. The indicator loadings are higher than the recommended threshold of 0.708 (Hair et al., 2019) with ranges between 0.798 (EK1) and 0.883 (GT1) and thus the construct predicts more than half of the variance in each indicator. All Cronbach's alpha (CA) values were above the 0.70 threshold for internal consistency (Nunnally & Bernstein, 1994) with the values ranging from 0.774 (EK) to 0.822 (GT). Convergent validity was good with average variance extracted ranging from 0.687 for EK to 0.734 for GT, exceeding the criterion of 0.50 for convergent validity (Fornell & Larcker, 1981). The Variance Inflation Factors (VIFs) for the indicators ranged from 1.545 to 1.939, below the conservative value of 3 (Hair et al., 2022).

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Content validity is maintained as none of the indicators are reduced to below scale retention thresholds for each construct when maintaining all three items of its source scale.

Table 3. Reliability and convergent validity

Constructs / Items	Factor Loadings	CA	CR	AVE	VIF
Environmental Knowledge (EK)		**0.774**	**0.868**	**0.687**	
EK1	0.798				1.545
EK2	0.822				1.581
EK3	0.866				1.654
Green Trust (GT)		**0.822**	**0.892**	**0.734**	
GT1	0.883				1.894
GT2	0.865				1.777
GT3	0.822				1.882
Purchase Intention (PI)		**0.799**	**0.881**	**0.712**	
PI1	0.851				1.939
PI2	0.841				1.763
PI3	0.839				1.562

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Discriminant Validity

The heterotrait-monotrait ratio (HTMT) in Table 4 and Fornell-Larcker criterion were used to check discriminant validity. The HTMT values ranged from 0.383 (EK and GT) to 0.545 (GT and PI), all below the conservative 0.85 threshold (Henseler et al., 2015). The lower ratio between EK and GT shows that respondents perceived the same products differently, even though both relate to energy saving. The square roots of the AVE values (EK = 0.829, GT = 0.857 and PI = 0.844), shown on the diagonal of Table 5, were higher than the corresponding inter-construct correlations (Fornell & Larcker, 1981). The three constructs are empirically distinct as indicated by both criteria.

Table 4. Heterotrait-monotrait ratio (HTMT)

	EK	GT	PI
EK			
GT	0.383		
PI	0.508	0.545	

Table 5. Fornell-Larcker criterion

	EK	GT	PI
EK	**0.829**		
GT	0.321	**0.857**	
PI	0.403	0.463	**0.844**

Note. Diagonal values are the square roots of AVE; off-diagonal values are inter-construct correlations.

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Common Method Bias

Common method bias was a potential concern as all constructs were self-reported in a single survey (Podsakoff et al., 2003). It was assessed using the full collinearity test, which is more suitable for PLS-SEM than Harman's single-factor test because it measures both vertical and lateral collinearity among latent variables (Kock, 2015). All VIF values in Table 6 were below the 3.3 limit, indicating no evidence of common method bias or lateral collinearity (Kock, 2015; Kock & Lynn, 2012).

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Table 6. Full collinearity test

Construct	VIF
EK	1.219
GT	1.274
PI	1.376

Structural Model

With the measurement model established, the structural model was assessed for path significance, effect sizes, explanatory power and predictive relevance.

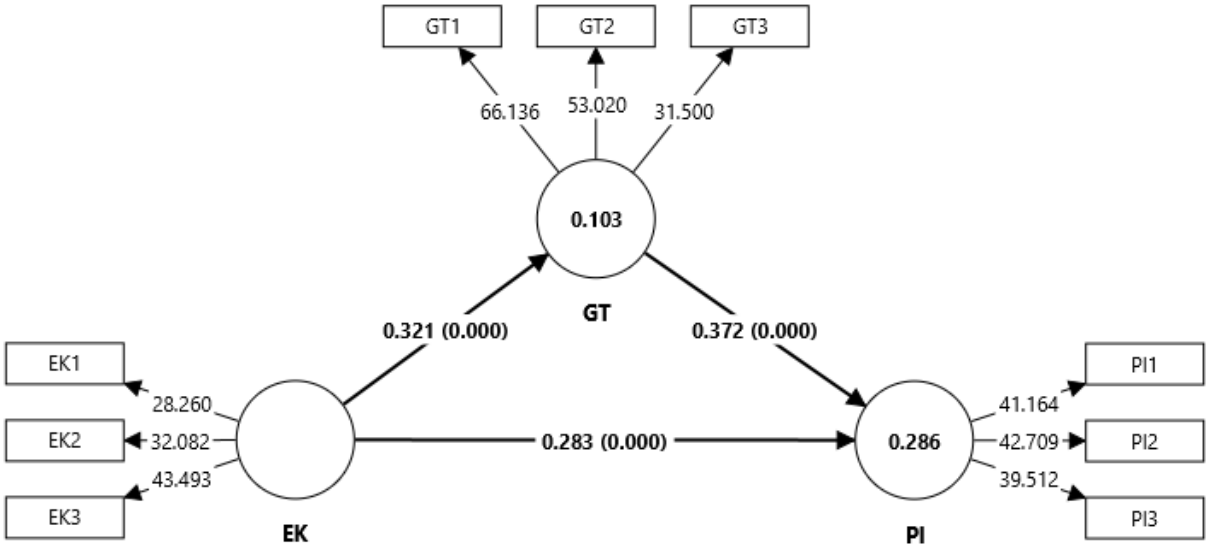

Figure 3. Structural Model Showing Bootstrapped Path Coefficients and Significance Levels

Hypothesis Testing Results

Direct and Mediation Effects

Because the data are cross-sectional, the path coefficients are interpreted as associations rather than causal effects. The results of the bias-corrected and accelerated (BCa) bootstrapping (Efron, 1987; Hair et al., 2022) were summarized in Table 7 and Figure 3. The p-values displayed as 0.000 in the SmartPLS output (Figure 3) are reported as $p < 0.001$ in Table 7. H_1 was supported by the positive association between environmental knowledge and green trust ($\beta = 0.321$, $t = 5.830$, $p < 0.001$). The strongest path in the model was positive between green trust and purchase intention ($\beta = 0.372$, $t = 8.037$, $p < 0.001$) supporting H_2.

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Environmental knowledge also retained a positive direct association with purchase intention when green trust was included (β = 0.283, t = 5.565, p < 0.001), supporting H_3.

Table 7. Hypothesis testing results (BCa bootstrap)

Hypotheses	Relationships	Beta	SD	*t* value	*p*-value	Decision
H1	EK -> GT	0.321	0.055	5.830	< 0.001	Supported
H2	GT -> PI	0.372	0.046	8.037	< 0.001	Supported
H3	EK -> PI	0.283	0.051	5.565	< 0.001	Supported
H4	EK -> GT -> PI	0.119	0.025	4.800	< 0.001	Supported

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To avoid distributional assumptions of the Sobel test, the indirect effect was bootstrapped for H_4 (Nitzl et al., 2016; Preacher & Hayes, 2008). The results of the indirect effect of environmental knowledge on purchase intention via green trust showed to be significant (β = 0.119, t = 4.800, p < 0.001), thus supporting H_4. Because the direct and indirect effects were both positive and significant, the mediation is complementary (Zhao et al., 2010). In other words, green trust carries part of the association between knowledge and intention, and a direct association also remains. All four hypotheses were thus supported and the direct relationship between knowledge and intention (0.283) was greater than the indirect effect of knowledge through trust (0.119).

Effect Sizes

The effect sizes (f^2) were explained using Cohen (1988)'s benchmarks of 0.02, 0.15 and 0.35 for small, medium and large effects. The results showed that green trust had medium effect on purchase intention (f^2 = 0.173), while environmental knowledge had small effect on green trust (f^2 = 0.115) and on purchase intention (f^2 = 0.101; Table 8). A medium value for green trust suggests that the omitting of it significantly decreases the variance explained in purchase intention (Hair et al., 2022).

Table 8. Effect sizes (f^2)

Path	Effect size	Interpretation
EK -> GT	0.115	Small
EK -> PI	0.101	Small
GT -> PI	0.173	Medium

Explained Variance (R^2) and Predictive Relevance (Q^2)

In terms of explained variance, the model accounted for 10.3% of the variance in green trust (R^2 = 0.103) and 28.6% of the variance in purchase intention (R^2 = 0.286). Following Chin (1998), R^2 values of 0.67, 0.33 and 0.19 are regarded as substantial, moderate and weak respectively. According to this benchmark, the explained variance in purchase intention is weak, while the explained variance in green trust is below the weak benchmark, which is consistent with a model developed to test only one mechanism and not to maximize explained variance. The values of $Q^2_{predict}$ were 0.092 for green trust and 0.153 for purchase intention for PLSpredict. Both are greater than zero, suggesting that the model performs better than a naive model

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based on the training-sample means (Shmueli et al., 2019). The RMSE and MAE values are shown in Table 9.

Table 9. Explanatory power and predictive relevance

Construct	R^2	Q^2predict	RMSE	MAE
GT	0.103	0.092	0.959	0.772
PI	0.286	0.153	0.927	0.747

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Discussion

The study examined whether householders' knowledge of energy-saving products is associated with their intention to buy energy-efficient appliances. The results align with the proposed model. There was a significant association between knowledge and trust and between purchase intent and trust and part of the association between knowledge and intention ran through trust.

The positive association between environmental knowledge and green trust (H_1) is consistent with the results of Bangladesh and China as consumers who have more knowledge about green or energy saving products also have had more trust in these products (Hossain et al., 2022; Wang et al., 2019). Its appearance in Victoria shed further light on this aspect. This extends the possibility raised in Section 1, based on persuasion knowledge research that informed consumers in a market such as Victoria's may become more sceptical than more trusting (Friestad & Wright, 1994). At the product category level, the data do not provide support for that concern. They fit better with the perspective that knowledge can increase credibility when the persuasive situation is perceived as legitimate (Isaac & Grayson, 2017). A regulated star-rating system could provide informed householders with a benchmark to check claims against, as there is evidence that specific and verifiable claims are more trusted than vague claims (Atkinson & Rosenthal, 2014). However, the small proportion of variance accounted for in green trust demonstrates that knowledge is just one of the sources of green trust. Direct experience is a plausible other that is nearly two thirds of respondents had already bought an energy-efficient appliance and that experience may relate to trust independently of what they know.

Green trust had the strongest association with purchase intention (H_2) and the only medium effect size in the model. This is consistent with the meta-analytic evidence which shows that trust is one of the most consistent correlates of green purchase intention (Zhuang et al., 2021) as well as appliance specific evidence from South Africa (Issock Issock et al., 2020). The outcome is consistent with Commitment-Trust Theory which suggests that trust reduces uncertainty in the decision-making process and increases willingness to invest resources into the trusted party (Morgan & Hunt, 1994). In the case of an appliance that does not generate savings immediately, intention was more related to confidence that the products meet their claims than to knowledge.

With trust holding constant, the direct relationship with environmental knowledge was still maintained with the purchase intention (H_3). It is consistent with the knowledge-attitude-behaviour premise that there are other paths and means from knowledge to behaviour, aside from trust (Kollmuss & Agyeman, 2002) and studies that found knowledge leading to willingness to purchase efficient appliances in China and Pakistan (Li et al., 2019; Waris & Hameed, 2020). It is somewhat counterintuitive to the results reported by Pothitou et al. (2016) who reported that knowledge was lowly related to appliance ownership. The difference may be

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because intention is more closely related to knowledge than is ownership, and because ownership is also dependent on income, tenure, and when the replacement occurs.

The fact that the indirect association through trust is significant (H_4) and the complementary association reported in Section 5 indicates that there is still a direct association between knowledge and intention. This pattern mirrors Wang et al. (2019), who found that green trust only partly mediated the link between product knowledge and intention and extends Hossain et al. (2022) whose mediated model predicted general pro-environmental behaviour rather than intention to buy appliances. Such mediation patterns are not consistent across sustainability settings. Among Nigerian agricultural SMEs, Ojeleye et al. (2026) found that green work engagement had no significant direct effect on sustainable performance and operated through green innovation instead, whereas the present data show a complementary pattern in which knowledge also retains a direct association with intention. The indirect effect is smaller than the direct effect and trust seem to be a significant although not primary pathway from knowledge to intention in this sample. The purchase intention is correlated with knowledge regardless of the increased confidence in energy-saving products and independently of this increased confidence and an effort that addresses only one of these routes would leave part of the relationship untouched.

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Taken together, the model accounts for just over a quarter of the variance in purchase intention. That is an acceptable model size for a model that was designed to test one mechanism, not to explain the maximum variance and allows space for the attitudinal, normative, and economic factors other appliance studies incorporate. The positive $Q^2_{predict}$ values show that the model also has predictive utility outside of the estimation sample and are important for programme administrators who may be interested in predicting the response of households to a programme based on the knowledge and trust measures.

Practical Implications

The results have three implications for the organizations that are promoting efficient appliances in Victoria. First, because green trust showed the strongest association with purchase intention, the DEECA which administers the VEU program could treat the credibility of efficiency claims as a program objective in its own right, for example by publishing verified savings achieved through completed upgrades so that households can check evidence rather than accept assertions. Second, knowledge was linked directly and indirectly to intention through trust, so information linked to VEU discounts and to the 2027 rental standards remains valuable but should tackle questions of how appliances are tested for the energy rating label and of what a star rating means in terms of running costs, the type of understanding that tied knowledge to trust. Third, the approved energy businesses and energy appliance stores are in a better position to foster trust at the time of sale because they are in direct contact with consumers at that time. Their staff can be instructed to provide information on star ratings in terms of running costs and stores could show verified running cost comparisons between efficient and conventional models making it easier to verify rather than assert efficiency claims.

Theoretical Implications

The results deliver the three contributions outlined in the Introduction. The study first demonstrates the nature of the relationship between knowledge and intention, rather than just its existence. Both direct and indirect pathways between knowledge of energy-saving products and purchase intention were found to be operating with green trust being a significant pathway. It extends Commitment-Trust Theory from the exchange relationship between organizations to

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the consumer-product relationship of a product category whose core benefit is not observable when buying the product with consumer knowledge acting as the counterpart of communication in the original model. It is supported by the positive Q^2predict values reported in Section 5.3. Second, the mechanism held where it was most likely to weaken. In a market with mandatory labelling and active scrutiny of green claims, knowledge was associated with more trust indicating that the knowledge-to-trust link is not confined to the emerging economies where it has mostly been examined. Third, the study provides a theoretical foundation for the design of information programs based on credibility as well as awareness as developed in section 6.1 by showing that trust carries part of the association between knowledge and intention.

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Limitations and Future Recommendations

The results are limited by a number of factors. Respondents were initially gathered using purposive non-probability sampling through community social media groups in the state of Victoria. The findings cannot then be generalized to other Australian states or to families not connected to online networks and cannot be generalized to countries that do not label the products in the same way as Australia. Second, the cross-sectional design only reflects associations at one time, and does not allow for the determination of causal direction or mediation as a causal process. Longitudinal panels, or experiments would offer more powerful insights. Third, knowledge was self-assessed, and self-assessed knowledge is not necessarily objective knowledge; future studies could include objective knowledge tests. Fourth, the outcome was intention not purchase and if the outcome were linked to the VEU uptake or purchase record, it would indicate whether intentions become purchases. Fifth, although the model was intended to test a single knowledge-trust-intention mechanism, the researchers also gathered data on demographic and experience factors such as prior purchase of an energy-efficient appliance, use of a VEU discount, household income, and housing tenure to describe the sample. This may account for some of the observed relationships, therefore. For instance, previous purchasers and homeowners might report higher knowledge and intentions. These variables can be used as controls or be compared using multigroup analysis in future studies. Lastly, knowledge accounted for a relatively small proportion of green trust and future models should incorporate other factors influencing trust including prior purchasing experience, trust in the energy rating label and perceived greenwashing.

Conclusion

The research focused on the survey results of 300 householders to determine whether green trust links Victorian householders' knowledge of energy-saving products with their intention to purchase energy efficient appliances. Regarding the first research question, the knowledge was positively related with both green trust and purchase intention. Regarding the second, green trust partially mediated the association, so that knowledge was related to intention both directly and indirectly through green trust, and green trust showed the strongest association with intention in the model. The key message is that knowledge is linked to stronger intention to buy efficient appliances partly through its association with confidence that energy-saving products perform as claimed and that this held in a market where informed consumers might be expected to be most sceptical. For those designing efficiency programmes, the lesson is that information about efficiency upgrades may be more closely tied to purchase intentions when it is paired with evidence that householders can trust.

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Declarations

Author Contributions (CRediT)

Qaiser Naveed and Akash Das: Conceptualization, Methodology, Writing – original draft, Formal analysis, Data curation, Visualization. Haroon Bhutta: Supervision, Validation, Writing – review & editing.

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Conflict of Interest

The authors declare that they have no competing interests.

Data Availability Statement

The data are not publicly available due to participant confidentiality and ethical restrictions.

Ethics Approval and Informed Consent

This study was approved by the Ethics Committee, Melbourne Institute of Technology (Approval No. 52-2025 Informed consent was obtained from all participants.

Declaration of Generative AI Use

The authors critically reviewed and verified all AI-assisted outputs and take full responsibility for the manuscript's accuracy and integrity.

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