

USING STRUCTURAL EQUATION MODELING TO EXPLORE THE INFLUENCE OF ENVIRONMENTAL CONCERN ON THE WILLINGNESS TO PAY FOR GREEN ENERGY AND GREEN PRODUCTS — THE CASE OF POLAND

ZASTOSOWANIE MODELOWANIA RÓWNAŃ STRUKTURALNYCH DO ANALIZY WPŁYWU ŚWIADOMOŚCI EKOLOGICZNEJ
NA GOTOWOŚĆ DO PŁACENIA ZA ZIELONĄ ENERGIĘ I PRODUKTY EKOLOGICZNE — PRZYKŁAD POLSKI

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ABSTRACT

Concern for the sustainability of the natural environment is garnering increasing interest across the globe. Environmental issues may significantly impact individuals and societies in various ways, such as by influencing behaviors aimed at adopting more sustainable lifestyles and making eco-friendly purchasing decisions. This study investigates the attitudes of Polish consumers towards pro-environmental behaviors, specifically focusing on environmental concern (EC), promoting pro-environmental behavior (PPB), the belief that Poland should move away from coal (MAFC), and willingness to pay (WTP). Data on these variables were collected in 2023 from a sample of 554 Polish respondents selected using a non-random sampling method. Results were analyzed using confirmatory factor analysis (CFA) and structural equation modelling (SEM). Findings revealed that environmental concern (EC) influences promoting pro-environmental behavior (PPB) and that both EC and PPB affect the belief that Poland should move away from coal (MAFC). Additionally, promoting pro-environmental behavior (PPB) and MAFC were found to influence willingness to pay (WTP). However, EC was not found to have a significant direct impact on WTP. The hypotheses were tested using a structural equation model, validated by such fit indices as $CMIN/df = 2.542 (<3.0)$, $RMSEA = 0.053 (<0.08)$ and $CFI = 0.985 (>0.90)$.

Key words: green consumption, environmentally friendly products, environmental concern (EC), willingness to pay (WTP), green energy, structural equation modeling (SEM)

ABSTRAKT

Troska o zrównoważony rozwój środowiska naturalnego jest obszarem rosnącego zainteresowania na całym świecie. Problemy środowiskowe mogą mieć różny wpływ na jednostki i społeczeństwo. Zachowania proekologiczne nie odnoszą się tylko do praktyk konsumenckich i motywacji do przyjęcia bardziej zrównoważonego stylu życia, ale mogą również obejmować konkretne decyzje zakupowe. Celem głównym artykułu jest określenie postaw Polaków wobec zachowań proekologicznych, w szczególności: troski o środowisko (KE), promowanie w swoim otoczeniu proekologicznych zachowań (PPB), przekonania, że Polska powinna zrezygnować z węgla (MAFC) oraz gotowości do ponoszenia dodatkowych kosztów (WTP). W artykule omówiono wyniki badania przeprowadzonego w 2023 roku na próbie 554 polskich respondentów. W doborze próby badawczej zastosowano metodę nielosowego doboru. W procesie analizy wyników wykorzystano confirmacyjną analizę czynnikową (CFA) oraz modelowanie równań strukturalnych (SEM). Wyniki wskazują, że na promowanie w swoim otoczeniu proekologicznych zachowań (PPB) wpływała troska o środowisko (EC). Ustalono, że na przekonanie, że Polska powinna zrezygnować z węgla (MAFC) wpływa troska o środowisko (EC) i promowanie w swoim otoczeniu proekologicznych zachowań (PPB). Dodatkowo na gotowość do ponoszenia dodatkowych kosztów (WTP) wpływało promowanie w swoim otoczeniu proekologicznych zachowań (PPB) oraz przekonanie, że Polska powinna zrezygnować z węgla (MAFC). Wyniki badania wskazują, że EC nie wpływa znacząco na WTP. Do weryfikacji hipotez wykorzystano model równań strukturalnych, którego rzetelność potwierdzono wskaźnikami dopasowania – m.in.: CMIN/df = 2.542 (<3.0), RMSEA = 0.053 (<0.08) i CFI = 0.985 (>0.90).

Słowa kluczowe: ekologiczna konsumpcja, produkty przyjazne środowisku, troska o środowisko, gotowość do płacenia, zielona energia, modelowanie równań strukturalnych (SEM)

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1. Introduction

In the past decade, serious global environmental issues such as climate change, global warming, depletion of natural resources, and air pollution have made customers more aware of their purchasing decisions and their impact on the environment. As environmental problems intensify, it is necessary to alter consumption patterns, lifestyles, and the ways products and services are extracted, distributed, and consumed. Consequently, understanding green purchasing behavior has become increasingly crucial. Numerous studies in recent decades have examined the environmentally friendly behavior of consumers in response to escalating environmental hazards.

Pro-environmental products – also known as environmentally friendly, green or sustainable products – are designed to minimize environmental impacts throughout their entire life-cycle by conserving resources, using renewable energy sources, reducing or eliminating packaging, and minimizing toxicity (Ritter et al. 2015; Durif, Boivin & Julien, 2017). These products benefit both society and the environment, being made from materials that are recyclable, biodegradable or easily reusable (Chen & Chai, 2010).

Green purchasing behavior involves buying pro-environmental products and reducing the purchasing and use of products that harm the environment (Seema et al., 2023; Mohammad et al., 2020; Jaiswal & Kant, 2018). Green consumption is a social phenomenon whereby consumers consider the impact of the products they purchase on present and future generations (Paul et al., 2016; Carman & Cheng, 2016; Mostafa, 2006; Yang et al, 2015). Pro-ecological behavior includes not only consumer practices and motivation to adopt a more sustainable lifestyle, such as separating waste and recycling, conserving resources like water or energy, and changing travel habits (switching from cars to walking or cycling), but can also include specific purchasing decisions, such as buying sustainable products (e.g. local food, organic food, ecological cleaning products, ecological cosmetics, or electric vehicles). Nowadays an increasing number of consumers are interested in pro-environmental products that pose fewer threats to the environment throughout their life-cycle, from production, to use and disposal (Lee & Haley, 2022).

Researchers have focused on a wide range of environmentally friendly products, including food products (Li et al., 2020; Woo & Kim, 2019, De Toni et al., 2018), skin care products (Chin et al., 2018; Hsu et al., 2017), apparel products (Saepudin et al., 2023; Moon & Lee, 2018; Jim Gam, 2011; Lee, 2011), and green electronic appliances (Zhang et al., 2022; Mansoor, Awan & Paracha, 2021).

The main objective of this article is to explore Poles' attitudes towards pro-environmental behaviors, specifically focusing on environmental concern (EC), promoting pro-environmental behavior (PPB), the belief that Poland should move away from coal (MAFC), and willingness to pay (WTP). Thereby it seeks to advance our knowledge regarding the pro-environmental behavior of Polish consumers.

2. Literature review

Various contexts of green purchasing behavior have for years been the subject of research around the world. It is extremely important to understand when, how, and why people consume and conserve resources, advocate for environmental causes, and engage in various pro-ecological behaviors. These behaviors have been studied in terms of a variety of factors that influence consumers' green purchasing decisions. The existing literature has identified a number of individual and social-level variables that affect consumers' pro-environmental behaviors. However, it remains remarkably difficult to predict responsible consumer behavior, due to the supporting and hindering factors that give rise to individual dilemmas (Dursun et al., 2016). A growing number of researchers agree that there is a clear inconsistency between consumers' attitudes and their actual sustainable consumption practices; this is known as the attitude–behavior gap (Quoquab et al., 2019; Sudbury-Riley & Kohlbacher, 2016; Carrington et al., 2010; Eckhardt, Belk and Devinney, 2010). The need for additional research to understand pro-environmental behaviors is often discussed.

Environmentally friendly purchasing behavior is a complex and multifaceted issue, influenced by many factors (Sheng et al., 2019). Among the most important factors shaping pro-environmental consumer behavior, researchers have distinguished the following: pro-environmental awareness (Wang, 2013; Liu et al., 2017; Eze, 2020), environmental knowledge (Vasiljevic-Shikaleska et al., 2018; Liu et al., 2014; Mei et al., 2016), environmental concern (Polonsky, 2014; Suki & Suki, 2015), green purchase intention (Polonsky, 2014; Mei et al., 2012; Ramayah et al., 2010), consumer values (Laroche et al., 2001), and consumer attitude (Paul et al., 2016).

Ecological awareness and knowledge in this area have a major impact on pro-ecological behavior. When consumers have a deeper understanding of the environment and pollution problems, they are more likely to adopt environmentally friendly green consumption. Research has demonstrated that consumers who have extensive knowledge of green consumption are more likely to adopt pro-environmental consumption behaviors (Liobikien et al., 2016). In addition, many studies have shown that consumers' sense of responsibility for the environment has a significant positive influence on their willingness to buy pro-environmental products (Sheng et al., 2019). Environmental responsibility is a sense of commitment that individuals have

when they are willing to make efforts to solve ecological and environmental problems, both at the individual and national levels.

Another factor that affects the degree of environmental concern is consumers' country of origin. Empirically, consumers from developed countries have been shown to be more concerned about the environment than those from developing countries. Nevertheless, further research is needed to understand the particular environmental purchasing behaviors of consumers in each country and how they differ from their counterparts around the world in terms of environmental concerns, beliefs, and attitudes (Singh & Gupta, 2013). This entails a need to conduct research in individual countries, as consumer behavior may vary significantly.

3. Hypothesis Development

The scope of our study includes examining the impact of four contextual variables: environmental concern (EC), promoting pro-environmental behavior (PPB), willingness to pay (WTP), and the belief that Poland should move away from coal (MAFC). In addition, the paper explores the interrelationships between these factors of pro-environmental behavior. We aim to verify not only whether people are concerned about environmental changes, but whether they are also active advocates for changes in consumer behavior and whether they are willing to bear the costs of transformation (regarding products and energy). Specifically, we want to determine if passive concern translates into an intention for action and readiness to make financial sacrifices.

Willingness to pay (WTP)

In this paper, willingness to pay (WTP) is understood as a readiness to share in the costs of transitioning from conventional or less sustainable practices to more environmentally friendly alternatives. The acceptance of environmentally friendly products is strongly influenced by price (Laroche et al., 2001). Consumers who feel an ethical responsibility toward society and the environment demonstrate this through their consumption behavior (Lee et al., 2015). Customers with a strong environmental consciousness and a desire to minimize their impact on the environment are more likely to invest in pro-environmental products, even if it comes at a higher cost.

Consumers who prioritize environmental sustainability are willing to pay more for their beliefs. Environmentally conscious consumers focus on long-term environmental benefits. They are willing to make an upfront investment for a more sustainable future. Findings from Arpad's (2018) study indicate that in five countries analyzed, a majority of citizens would prefer to increase funding for environmental protection even if doing so requires higher taxes.

Environmental concern (EC)

Environmental concern refers to a consumer's overall attitude towards protecting the environment (De Canio, 2023). This variable is considered the most important predictor of pro-environmental behavior because it can influence consumers to minimize the impact of human actions on the environment (Newton et al., 2015). The level of environmental concern can range from recycling to green purchasing (Mohammad, 2020). Previous studies have confirmed the positive relationship between environmental concern and pro-environmental consumer behavior (Scott & Vigar-Ellis, 2014), demonstrating that environmental concerns do significantly impact green purchase intentions (Yadav et al., 2022; De Canio et al., 2021; Akehurst et al., 2012; Hartmann & Apaolaza-Ibañez, 2012). Customers with a higher level of environmental concern try to protect the environment by purchasing green products. Geng et al.'s (2023) study found environmental awareness (concern) to be a significant predictor of willingness to pay a premium for living a green lifestyle (e.g., paying more for green products). Li et al. (2016), in turn, also confirmed that the more people are concerned about the negative impact of climate change, the more they are willing to pay more for energy-efficient and environmentally friendly products. Kim and Kim (2023) showed that environmentalism has a positive effect on willingness to pay for sanctioning instruments (e.g., imposing a carbon tax in response to climate change, increasing electricity rates). Dienes (2015) reported that people with higher climate concerns are more likely to pay for mitigating the effects of climate change. Irfan et al.'s (2020) study, on the other hand, found that environmental concern did not have a significant effect on WTP for renewable energy, whereas Liobikienė and Dagiliūtė (2021) reported that environmental concern negatively, albeit insignificantly, influenced the willingness to pay more for green energy. Lin and Syrgabayeva (2016) found that environmental concern has a positive and significant impact on attitudes toward renewable energy.

Based on this review of past research, we formulated the following hypotheses for the present study:

Hypothesis 1 (H1). Polish consumers' environmental concern (EC) positively influences promoting pro-environmental behavior (PPB).

Hypothesis 2 (H2). Polish consumers' environmental concern (EC) positively influences the belief that Poland should move away from coal (MAFC).

Hypothesis 3 (H3). Polish consumers' environmental concern (EC) positively influences willingness to pay (WTP).

Promoting pro-environmental behavior (PPB)

Individual consumers are encouraged to be more environmentally friendly not only by many initiatives, but also by friends or family members. Environmentally conscious individuals inspire others to act in accordance with shared values. Some environmentally concerned consumers actively advocate for environmental causes and engage in activism to raise awareness and promote change.

Socially engaged people tend to be more consistent in their pro-environmental behavior. A stronger sense of connection with others motivates people to strive to fulfil their social roles and to participate in actions that promote environmentally friendly purchasing behavior. Vanegas-Rico et al. (2022) argued that in social dilemma situations, the expectation by significant others for cooperation enhances an individual's chances to act pro-environmentally. Expectations regarding the environmental behavior of others have a positive effect on one's own pro-environmental behavior. Carrico (2021) observed that the norm of buying green products by peers and colleagues encourages individuals to purchase these environmentally friendly products themselves.

Based on this background, we formulated the following hypotheses for the present study:

Hypothesis 4 (H4). Promoting pro-environmental behavior (PPB) by Polish consumers positively influences their belief that Poland should move away from coal (MAFC).

Hypothesis 5 (H5). Promoting pro-environmental behavior (PPB) by Polish consumers positively influences their willingness to pay (WTP).

The belief that Poland should move away from coal (MAFC)

Poland was the world's ninth-largest producer of coal in 2022 (GlobalData, 2022). Compared to other EU countries, Poland has much larger reserves of hard coal and lignite, which are extensively harnessed for electricity generation. Poland's renewable energy capacity is increasing, but the country's electricity and heat generation is still dominated by coal and is the largest contributor to emissions. National energy consumption generates a significant proportion of global carbon emissions and damages the quality of the environment (Vivian et al., 2011). The introduction of pro-environmental solutions in the energy sector is associated with convergence costs, which in turn may result in incurring higher taxes and/or energy prices.

Based on previous research, we aimed to test whether positive attitudes toward greener energy solutions translates into a willingness to bear such additional costs. Lin and Qiao (2023) found that more than 80% of Chinese households are willing to pay extra for green electricity. Wang et. al. (2022) reported that the ecological environmental cognition significantly influenced rural residents' willingness to spend (WTS) on Biomass Briquette Fuel (BBF) to replace coal. Lin and Syrgabayeva (2016) showed that attitudes toward renewable energy have a positive and significant impact on willingness to spend more for renewable energy. Hojnik (et. al., 2021) also found that acceptance of green energy has a significant positive impact on WTP for green energy.

Based on these findings, we posited the following hypothesis:

Hypothesis 6 (H6). The belief that Poland should move away from coal (MAFC) positively influences willingness to pay (WTP).

The following conceptual research model is proposed (Figure 1):

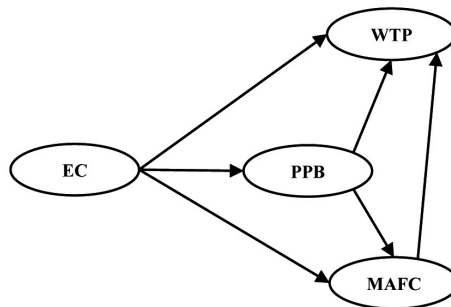


Figure 1. Conceptual research model.

4. Research Design

The data for this study was collected through an online research panel (Nationwide Research Panel Ariadna) in April 2023. The online survey included a total of 554 Polish respondents; all interviews were complete (with no missing data). A non-random sampling method was used; the sample structure matched the demographics of adult Poles in terms of gender, age, education level, and place of residence. The dataset was created with SPSS, version 28 (IBM). A confirmatory factor analysis (CFA) was performed and a structural equation model (SEM) was developed using IBM SPSS AMOS Graphics, version 25. A multi-item measurement scale was developed to measure the attitudes of Poles regarding environmental concern (EC) (adopted from Polonsky et al., 2014), promoting pro-environmental behavior (PPB), the belief that Poland should move away from coal (MAFC) and willingness to pay (WTP) (based on Laroche et. al., 2001). Each factor was measured by three items using a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). Since ordinal variables were used in the measurement process, before conducting further analyses, it was assumed that there were equal distances between the categories on the measurement scale. The selection of the research sample was carried out by the quota method (selection criteria: sex, age and place of residence). The structure of the research sample is presented in Table 1.

Table 1. Structure of the research sample

	Frequency	%
Sex		
male	265	47.8
female	286	51.7
other	3	0.5
Age		
18-24 years	76	13.7
25-34 years	113	20.4
35-44 years	88	15.9
45-54 years	101	18.2

55 years or more	176	31.8
Place of residence		
village	208	37.5
small city (up to 20 000 residents)	72	13.0
medium city (from 20 000 to 99 000 residents)	111	20.0
big city (from 100 000 to 500 000 residents)	105	19.0
very big city (above 500 000 residents)	58	10.5
monthly net (disposable) income of entire household		
below 1000 PLN	16	2.9
1001 – 2000 PLN	36	6.5
2001 – 3000 PLN	71	12.8
3001 – 4000 PLN	66	11.9
4001 – 5000 PLN	60	10.8
5001 – 7500 PLN	96	17.3
7501 – 10000 PLN	55	9.9
above 10 000 PLN	43	7.8
refusal to answer	111	20.0

5. Results

Measurement Model

Table 2 shows the results of the confirmatory factor analysis (CFA), including factor loadings and descriptive statistics. One of the four sets of variables was found to be characterized by a high average – environmental concern (EC) ($\text{mean}_{\text{EC}} = 3.92$). The remaining sets of variables were considered by the respondents as less important – the belief that Poland should move away from coal (MAFC) ($\text{mean}_{\text{MAFC}} = 3.26$), promoting pro-environmental behavior (PPB) ($\text{mean}_{\text{PPB}} = 3.17$) and, as the least important, willingness to pay (WTP) ($\text{mean}_{\text{WTP}} = 2.84$).

Table 2. Constructs and Items

Constructs	Items	Loadings	Mean	St. dev.	Cronbach's alpha
environmental concern (EC)	EC1 I am concerned about the condition of the natural environment.	0.89	3.92	0.88	0.869
	EC2. The condition of the natural environment is deteriorating year by year.	0.83			
	EC3 I am concerned about future shortages of natural resources.	0.77			
willingness to pay (WTP)	WTP1. I am willing to pay 10% more for my purchases to buy eco-friendly products.	0.89	2.84	1.15	0.919
	WTP2. I am willing to pay 10% more taxes if they were intended to prevent environmental pollution.	0.91			
	WTP3. I am willing to pay 10% more for electricity if these additional fees were spent on investing in renewable energy sources.	0.87			
the belief that Poland should move away from coal (MAFC)	MAFC1. Poland should abandon the use of energy generated from coal as quickly as possible.	0.95	3.26	1.18	0.890
	MAFC 2. Poland should accelerate the phase-out of domestic coal mines.	0.84			
	MAFC 3. Instead of investing in coal mining, Poland should allocate much more money from the state budget to investments in renewable energy sources.	0.79			
promoting pro-environmental behaviour (PPB)	PPB1. I provide my family/friends with information about environmentally friendly products.	0.90	3.17	1.03	0.914
	PPB2. I convince my family/friends to buy environmentally friendly products.	0.89			
	PPB3. I draw attention to my family/friends when I see that they consume products that are harmful to the environment.	0.86			

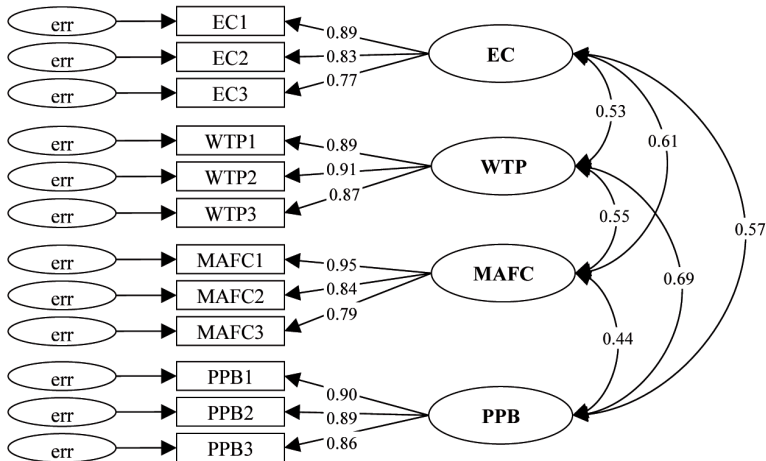
A structural equation model was used to test hypothetical relationships between observable and/or latent variables in experimental and non-experimental research (Konarski, 2009, p. 15). The structural equation model consists of two parts – the structural and the measurement parts. The structural part of the model describes the theoretical cause-and-effect or correlation between the studied phenomena, while the measurement part defines the variables which are not directly measurable (therefore they are represented in the constructed model by unobservable/latent variables). This means that before starting the estimation of the structural equation model, its measurement part should be determined and verified. One of the methods of verifying the measurement model is confirmatory factor analysis (Bedyńska, Książek, 2012, pp. 219–223). The reliability of measurement instrument was tested using Confirmatory Factor Analysis (CFA), where the results showed acceptable model fit indices.

Table 3. Fit indices of CFA model

Measure	Abbr.	Recommended threshold
Chi-square/df (CMIN/DF)	CMIN/DF	<3.0
Comparative Fit Index	CFI	>0.90
The Normed Fit Index	NFI	>0.90
Goodness of Fit	GFI	>0.90
Adjusted Goodness of Fit	AGFI	>0.80
Root Mean Square Residual	RMR	<0.08
Root Mean-Square Error of Approximation	RMSEA	<0.08

Source: Ode and Ayavoo (2020) and own research.

The overall measurement model and reliability and validity of the constructs were evaluated with a confirmatory factor analysis (CFA).



Constructs: EC – environmental concern; WTP – willingness to participate in conversion costs; MAFC – the belief that Poland should move away from coal; PPB – promoting pro-environmental behavior

Fit indices: CMIN/df = 2.542, RMSEA = 0.053, NFI = 0.976, CFI = 0.985, GFI = 0.965, AGFI = 0.943, RMR = 0.038

Figure 2. Measurement model

In the process of evaluating the measurement model, both discriminant and convergent validity were verified. Discriminant validity measures the extent to which the factors intended to measure a specific construct are actually unrelated (Wang & Wang, 2012). For this, Fornell and Larcker's (1981) approach was used, which states that the average variance extracted (AVE) for each research construct should be higher than the square of the correlation between that construct and other constructs (Ode & Ayavoo, 2020). The diagonal elements in Table 4 (shown in bold with asterisks) are the squares of multiple correlations between the research variables. The AVE values ranged from 0.69 to 0.91, while the diagonal values ranged from 0.83 to 0.89, indicating that all constructs have the appropriate discriminant validity. Table 4 shows that the measurement model has a satisfactory discriminant validity.

Table 4. Reliability and Validity Measures of the Measurement Model

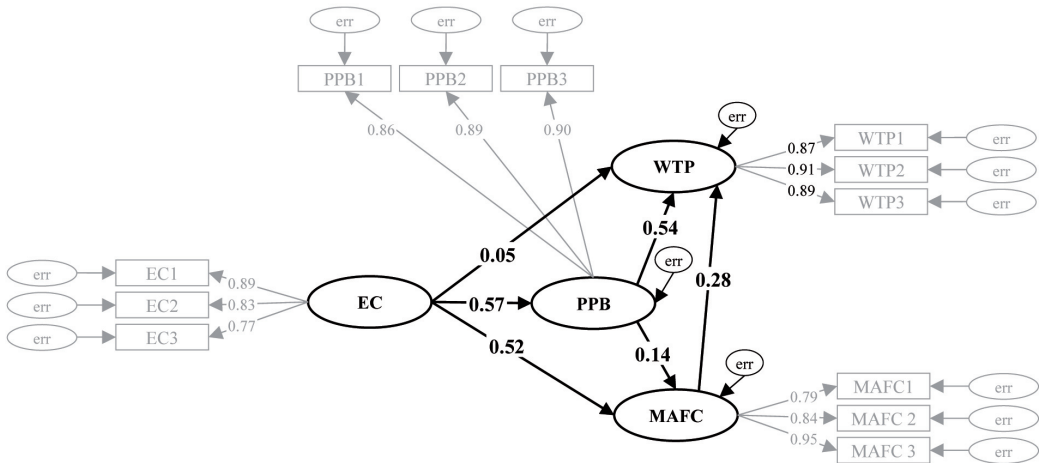
CR	AVE	MSV	MaxR(H)	Estimates	Construct	COAL	EC	WTP	ENG
0.895	0.740	0.366	0.925	<0.79, 0.95>	MAFC	0.860*			
0.870	0.691	0.366	0.882	<0.77, 0.89>	EC	0.605	0.831*		
0.920	0.792	0.482	0.922	<0.87, 0.91>	WTP	0.550	0.532	0.890*	
0.914	0.781	0.482	0.916	<0.86, 0.90>	PPB	0.442	0.575	0.694	0.883*

Notes:
CR – composite reliability; **AVE** – average variance extracted; **MSV** – maximum shared variance; **Estimates** – standardized factor loadings; **MaxR(H)** – maximum reliability;
Constructs: **EC** – environmental concern; **WTP** – willingness to participate in conversion costs; **MAFC** – the belief that Poland should move away from coal; **PPB** – promoting pro-environmental behavior.
* – squared multiple correlations between the research variables

Convergent validity, in turn, measures the degree to which the factors measuring single constructs are consistent with each other. Convergent validity was assessed using composite reliability (CR) and average variance extracted (AVE) – the minimum values adopted in the analysis were such that AVE should be greater than 0.5 (Fornell & Larcker, 1981), factor loadings should be greater than 0.6 and CR should be greater than 0.6 (Hair et al., 2009; Ahmed et al., 2020; Popa & Dabija, 2019; Szczepańska-Woszczyna, 2021). On the basis of the obtained results, all three minimum values were reached, which suggests that the reliability and validity of the model and the constructs used are acceptable.

Structural Model

Based on the literature review, the results of confirmatory factor analysis (CFA) and the adopted research hypotheses, a research model was developed and is graphically illustrated in Figure 3.



Constructs: EC – environmental concern; WTP – willingness to participate in conversion costs; MAFC – the belief that Poland should move away from coal; PPB – promoting pro-environmental behavior
 Fit indices: CMIN/df = 2.542, RMSEA = 0.053, NFI = 0.976, CFI = 0.985, GFI = 0.965,

Figure 3. Proposed theoretical model

The fit indices indicate that the structural equation model is appropriate for verifying the research hypotheses.

Testing Hypothesis

The hypothesis test results are shown in Table 5 below. The results indicate that promoting pro-environmental behavior (PPB) was influenced by environmental concern (EC) ($\beta = 0.575, p < 0.001$). We found that the belief that Poland should move away from coal (MAFC) was influenced by environmental concern (EC) ($\beta = 0.525, p < 0.001$) and promoting pro-environmental behavior (PPB) ($\beta = 0.140, p \leq 0.005$). Furthermore willingness to pay (WTP) was influenced by promoting pro-environmental behavior (PPB) ($\beta = 0.541, p < 0.001$) and the belief that Poland should move away from coal (MAFC) ($\beta = 0.279, p < 0.001$). The results obtained confirm the validity of hypotheses H1, H2, H4, H5 and H6, whereas hypothesis H3, which posited that environmental concern (EC) affects willingness to pay (WTP), was not supported.

Table 5. Effects of independent variables on the dependent variable

Relationship	Beta (β)	S.E	CR	<i>p</i> -Value	Hypothesis	Testing Results
EC → PPB	0.575	0.059	12.138	***	H1	Supported
EC → MAFC	0.525	0.071	9.330	***	H2	Supported
EC → WTP	0.052	0.071	1.015	0.310	H3	Not Supported
PPB → MAFC	0.140	0.050	2.835	0.005	H4	Supported
PPB → WTP	0.541	0.052	11.620	***	H5	Supported
MAFC → WTP	0.279	0.051	6.131	***	H6	Supported

Constructs: EC – environmental concern; WTP – willingness to participate in conversion costs; MAFC – the belief that Poland should move away from coal; PPB – promoting pro-environmental behavior
 ****p*-value is smaller than 0.001

Source: Own research

6. Discussion

The results of our study indicate that while environmental concern (EC) positively influences promoting pro-environmental behavior (PPB) and the belief that Poland should move away from coal (MAFC), it does not significantly influence willingness to share in the costs of conversion. Therefore, a certain dissonance was observed between concern for the environment and the willingness to make financial commitments to improve it, which may result from the rising costs of living in Poland, including energy costs. Our findings suggest that EC influences PPB. Taking on the role of an opinion leader and making efforts to ensure that people around oneself are also more pro-ecological, in turn, influences both attitudes towards changing energy sources to more environmentally friendly ones and the willingness to bear the associated costs. We found that the belief that Poland should move away from coal (MAFC) positively influences willingness to pay (WTP), indicating that opinions on the need to change to more pro-ecological ones are backed by declarations about the willingness to pay for them. Our research shows that environmental concern alone is not enough for some Poles to be willing to spend additional money on (more

expensive) pro-ecological products or support changing the energy mix to a more ecological one. The lack of a significant impact of CE on WTP shows that further research in this area is needed, as in the literature this relationship remains ambiguous. Perhaps it depends on the level of development and wealth of the citizens of a given country, hence comparative studies in other countries would be advisable. Our study partially fills this research gap on the influence of EC on WTP among Polish consumers.

Limitations and future research directions

The study has several limitations. Due to the sample size and the selected method of sampling, the results cannot be treated as representative for the general population of Polish consumers. Our research focused on four factors – environmental concern (EC), promoting pro-environmental behavior (PPB), the belief that Poland should move away from coal (MAFC), and willingness to pay (WTP) – so future research could widen the spectrum of factors in future research. While our results are relevant to Polish consumers, cultural differences may result in varying attitudes toward environmentally friendly behavior in other countries. Conducting transnational research in this area would be valuable.

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