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Factors shaping environmental awareness of young adults and its importance in market decision-making processes

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ABSTRACT

Objective: This study aims to present the results of the analysis of factors influencing the ecological awareness of young adults and their importance in market decision-making.

Research Design & Methods: The study utilized an online survey sheet that constituted the basis for the conclusions. The survey covered selected students of two universities in Krakow who completed 540 questionnaires. We applied cross-tabulation analysis in various cross-sections was applied using Pearson's chi-square statistics, contingency coefficient, and Cramer's V coefficient. We based the analysis on the declarations of young adults about their selected behaviours that significantly impact the state of the natural environment and, at the same time, require organisational and/or financial commitment from them.

Findings: We established that the surveyed young adults had a relatively high awareness of the importance of pro-environmental behaviour for the general climate situation in the world and the related well-being of humanity. At the level of description of the surrounding reality, the responses included both concern for the planet's future and fear of the deterioration of the climate situation. At the same time, the young adults were not ready to increase their involvement in pro-environmental activities. They declared a lack of interest in the possibility of financial support for broadly perceived ecological activities. Pro-environmental aspects are not crucial for them in purchasing or employment decisions. The basic forms of commitment to the environment are promotional campaigns which they occasionally join, such as collecting plastic bottle caps.

Implications & Recommendations: Similarly to the research results described as part of the literature review, the results show that to increase the involvement of young adults in pro-environmental activities, they need to be offered simple activities that do not require their financial involvement. A further increase in involvement will only be possible after the implementation of further educational campaigns.

Contribution & Value Added: Further research proposed a generalised linear model (GLZ) that helped describe the relationship between market decisions made by young adults and their demographic characteristics. We considered the variable containing answers to the question 'Are your purchasing decisions influenced by the environmental orientation of the producers of the goods you buy?' as the dependent variable. The obtained research and analysis results allowed for evaluating the answers to the question about the respondents' gender and form of studies to be dependent variables.

Article type:	research article
Keywords:	ecological awareness; young adults; the Polish market; the generalised linear model (GLZ); environmental behaviour; making decisions; ecological habits
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INTRODUCTION

The natural environment is now becoming an increasingly valuable asset for entire societies. It is becoming increasingly clear that caring for its safety requires knowledge, commitment, and large investments from all market participants (Akbar *et al.*, 2023). Therefore, scholars conduct more research on

the willingness of various social groups to engage in activities. The concept of a circular economy (CE) is becoming increasingly popular among scientists, but its implementation encounters many difficulties in practice. This is especially evident in countries such as Poland, where delays in the implementation of more ecological energy sources (other than fossil fuels) or lack of involvement in the sorting and management of industrial waste mean that the process of achieving a circular economy will probably spread over a long period (Malik & Janowska, 2019). Determining the level of awareness in society of the need to introduce pro-environmental solutions is especially important for the concept of process implementation. Knowledge on this subject will allow for clarifying information messages to support society in making purchasing decisions that benefit the environment (Prasad *et al.*, 2021).

The article aims to show the findings of analysing factors influencing the ecological awareness of young adults and its importance in the market decision-making process. The analysis is based on the declarations of young adults about their selected behaviours that significantly impact the state of the natural environment and, at the same time, require organisational and/or financial commitment from them. The indicated areas include the level of acceptance of incurring the costs of CO_2 production, willingness to engage in social campaigns for environmental protection (collecting bottle caps) and the approach to travelling in public space and using a private car for this purpose. The analysis of the attitudes mentioned above focused on searching for the demographic characteristics of young adults that influence them. The analysis covered mainly:

- place of residence (both in terms of the size of the place of origin and living with or without parents);
- gender;
- source of income;
- study mode.

Research conducted using an online survey sheet constituted the basis for the conclusions. The survey covered selected students of two universities in Krakow who completed 540 questionnaires. We applied cross-tabulation analysis in various cross-sections using Pearson's chi-square statistics, contingency coefficient, and Cramer's V coefficient.

Further research proposed a generalised linear model (GLZ) that helped describe the relationship between young adults' market decisions and their demographic parameters. We considered the variable containing answers to the question 'Are your purchasing decisions influenced by the environmental orientation of the producers of the goods you buy?' as the dependent variable. The answers to the question about the respondents' gender and form of studies were dependent variables.

LITERATURE REVIEW

Intuitively, 'awareness' refers to having knowledge or orientation in a specific topic. Polish encyclopaedia by PWN supplements this definition with the state of wakefulness, or a particular ability of the mind to reflect objective reality. Furthermore, scholars pay attention to social consciousness as a set of ideas, beliefs, and views typical for entire groups, classes, and societies and determined by their social existence. It includes both the attitudes and opinions of individuals, as well as established forms of spiritual life: ideology, law, morality, science, *etc*. (Encyklopedia Popularna PWN, 1982; Altaher, 2013; Bernaciak *et al.,* 2021).

Similarly, we may indicate that a responsible attitude towards the environment, resulting from knowledge and determination to preserve it in its original state, represents ecological awareness. However, this connection is not evident for some researchers. For example, Boztepe (2013) begins his considerations on ecological awareness with the question of whether and to what extent it is part of general social awareness. Environmental awareness is challenging to explain unambiguously. Therefore, there is generally no single interpretation of this concept. The normative definitions include the proposed optimal model of the ecological element of awareness, the implementation of which will allow for relatively conflict-free coexistence of man and the environment. Descriptive definitions indicate parts of individual or social awareness concerning the relationship between man/society and the environment.

In general, ecological awareness represents all recognised values, ideas, and opinions on the environment as a place of life and human development (society), shared by particular social groups in a specific historical period (Bernaciak *et al.*, 2021). Knowledge that can be acquired formally and informally is one of their essential elements. For Orea-Giner and Fusté-Forné (2023), human ecological awareness expresses their understanding of the environment and the ability to perceive phenomena, their interrelationships, causes and consequences, and their willingness to initiate actions to preserve the natural environment. Concluding, we can consider ecological awareness as the sum of knowing this field, the ability to assess and adopt a specific attitude towards the actual situation. It is something subjective, *i.e.,* one's assessment and one's thoughts about the surrounding environment. People can express it, for example, by saving electricity and water, using public transport instead of a car, or segregating waste (Mehdikhani & Valmohammadi, 2022). Wierzbiński *et al.* (2007) write on the role of environmental awareness in shaping pro-environmental behaviour. According to Lonc (2001), modern societies already know and accept ecological norms, patterns, and ideals, but they do not implement them in activities undertaken in the social sphere (as part of their professional role). Therefore, there is a need to take deliberate and integrated actions aimed at deepening and consolidating knowledge and building and strengthening society's ecological awareness.

Increasing ecological awareness should be apparent in limiting the negative impact of humans on the environment, among others, and understood as the knowledge and interest that Polish residents have in the field of the natural environment and its protection. We may consider all actions that anyone can undertake to have a positive impact on the environment (gov.pl). Every third Pole does not segregate waste, and only 15% can do it correctly. Moreover, 31% of respondents declare that they feel the impact of their buying processes on the natural environment. The data indicate that there is still much more to be achieved in terms of developing the ecological awareness of Poles (Lisowski *et al.*, 2022).

Contemporary market participants are increasingly reducing their water consumption (over 90%). They also choose other ecological solutions even if they have to incur additional costs (82%). Furthermore, 61% of respondents can choose a bicycle or public transport instead of using a car and 95% of Poles save energy most often by turning off the lights in unused rooms, using energy-saving light sources, or purchasing household energy-saving appliances. A third of respondents wanted to take further action to reduce energy bills. Usually, they planned to use renewable energy sources (Badania świadomości i zachowań ekologicznych mieszkańców Polski w 2020 r., 2020).

However, according to Kwiatek and Skiba (2017), most Poles are not ready to spend more of their income on pro-environmental solutions, *e.g.,* clean energy. Saving water or energy is driven more by economic considerations rather than by a conscious pro-ecological attitude.

Building ecological awareness also occurs during professional life, which is important in shaping the attitudes of adult recipients of all campaigns promoting environmentally friendly activities (Munaier *et al*., 2022). The increase in ecological awareness is necessary for making decisions by central and local authorities, but also society, to take effective actions to protect the environment (Boztepe, 2013).

From the point of view of this study, publications on students' ecological awareness are of special importance. For example, we can indicate the work of Bernaciak *et al.* (2022), which describes the cross-cultural importance of environmental problems, of which both Polish and Arab students are aware. The differences are visible primarily in the assessment of the environment's present state and in the declared readiness to make sacrifices for it. In turn, compared to students from Ukraine, Polish students of the researched fields of study at agricultural universities are characterised by a higher level of environmental awareness and readiness to undertake professional pro-ecological activities. Moreover, lecturers at these universities are aware of the need for environmental education in the teaching process. They are convinced that they should expand and deepen environmental knowledge and develop the ability to supplement the content of the course with this knowledge (Tezel & Giritli, 2019).

Research shows that students with appropriate ecological knowledge are ready to act and improve the state of the natural environment (Lonc *et al.*, 2007). Those who lack appropriate knowledge and understanding of ecological problems believe that all natural resources and nature are indestructible. This is also consistent with the slogan 'subdue the Earth,' which is an attitude that traditional Catholi-

cism popularises. Therefore, there is a need for effective ecological education among a significant part of the student community at Wrocław universities.

The vast majority of students declare that they take actions to protect the environment in their everyday lives and accept, if necessary, a possible reduction in the quality of their lives, but, for example, they are not willing to sign a clear declaration of readiness to limit tourist trips to one in five years, due to environmental protection. Depending on the field of study, they vary, among others, in the approach to assessing the level of contemporary environmental threats (Bernaciak *et al.*, 2021).

Insufficient education at the earlier stages of education may lead to low environmental awareness of students. Moreover, Kapsa and Trempała (2020) also write about ecological awareness among young people.

Research shows that students blame mainly local governments and industry for the state of the natural environment and few of them point to ordinary citizens (Koszarek-Cyra & Piśniak, 2017). The survey research by Altaher (2016) also emphasises the importance of ecological awareness based on the willingness to protect the natural environment. Unfortunately, students' knowledge is declarative rather than real. Ecological education that is too superficial and fragmentary should be enhanced, especially in technical fields, so that awareness of climate change will translate into a readiness to use ecological solutions.

The research by Orea-Giner and Fusté-Forné confirms the growing interest in ecological awareness (2023). Prasad and Mkumbachi (2021) indicate that although the student organisations participating in the study differ in their perception of climate change and environmental protection, they believe that they are occurring and pose a serious threat to Fiji as well as neighbouring Pacific islands.

The rapid consumption of new electronic devices has increased the amount of used electronics and therefore waste (e-waste) and created a potential threat to the environment. Research conducted on 327 students shows that the greater the awareness of the consequences, the greater the involvement in e-cycling (Gonul Kochan *et al.*, 2015). The effective role of social media in creating an aware environment in higher education is a topic that requires further analysis (Hamid *et al.*, 2017). However, online media can lead to greater awareness of environmental issues and better protection of the surrounding environment at local and global levels because of its reach and speed of information transfer (Misra, 2021).

Generally, the publications emphasise the need to build consumer awareness for circularity and a greening education system (Anwar Abdou *et al*., 2022; Byrd & Su, 2021). The World Bank (2023) publication presented it as one of the seven critical interventions to accelerate Poland's CE transition. The difficulty in assessing pro-environmental activities undertaken by all market participants is that they often contain deliberately misleading elements, which bear the hallmarks of greenwashing (De Freitas Netto *et al.*, 2020).

RESEARCH METHODOLOGY

Characteristics of the Research Process and the Studied Population

The research subject presented in this work is the purchasing behaviour of young adults. We considered the factors influencing buyers' ecological awareness and their role in making purchasing decisions to be a particularly interesting research area. We sought a relationship between the demographic profile of buyers and whether they consider information about the ecological approach of producers to the production process of the purchased goods in purchasing decisions. We conducted the research between December 15, 2021, and January 30, 2022 (online surveys; we sent a link to the questionnaire to respondents who filled it on their own).

When preparing the questionnaire, we prepared the results of previous research (including focus group interviews with selected groups of students) and available external reports and analyses. It helped to specify both the questions of the research questionnaire and clarify answers. Five hundred forty respondents participated in the study.

The research results presented here are a continuation of the research described in our earlier article (Lisowski *et al.*, 2022).

In the surveyed population (Table 1), women constituted 55.93% of the respondents. First-degree students were the majority of respondents. Engineering and bachelor's students amounted to 95.45% of respondents. Most of the respondents depended on their parents (70.93%). For others, their primary source of income was their work. Over half of the respondents (52.22%) were the residents of large cities (over 50 000 residents). The largest group lived in hired rooms or apartments (45.18%), a significant number of respondents lived with their parents (31.30%), considerably fewer people lived in dormitories (15.37%), and the smallest percentage lived in their flats (8.15%). More than three-quarters of respondents (76.11%) studied full-time.

Table 1. Characteristics of the sample population (young adults answering questions in research provided in 2020-2021)

Respondents' gender			
Woman		Man	
54.63%		45.37%	
Level of studies of the surveyed respondents			
First-cycle studies (bachelor's degree)	First-cycle studies (engineering)	Second-cycle studies (master's degree)	
51.30%	43.15%	5.55%	
Respondents' source of income			
Parents		Own gainful work	
70.93%		29.07%	
Place of residence (city/town)			
< 5000 residents	More than 5000 and less than 50 000 residents	> 50 000 residents	
29.26%	18.52%	52.22%	
Place of residence (form of ownership)			
Own flat	Living with parents	Dormitory	Rented flat (room)
8.15%	31.30%	15.37%	45.18
Mode of study			
Full-time program		Extramural program	
76.11%		23.89%	

Source: own study.

Statistical Analysis

We chose cross-tabulation analysis for different segments. Cross tabulation is the grouping of several contingency tables put together in the following way. Each table cell represents only one arrangement of the quantities of the variable being tabulated. In this way, the contingency tables allow for the analysis of frequencies associated with classes determined by the single variable above (see also Wolnowska & Kasyk, 2022).

Contingency tables allow for identifying the relationships between variables. We tested the significance of the recognised relationships with the performance of several tests. Thus, we can indicate the following (TIBCO, 2017):

Pearson's chi-square. The Pearson chi-square test is the base of the highest frequent test of implication (or autonomy) for qualitative variables. This test is built on the skill to calculate the anticipated frequencies in a contingency table (that is, the number we would suppose if there was no relationship connecting the variables). The chi-square test turns meaningful as the difference from this anticipated model rises. The value of the chi-square statistic and its connotation is determined by the entire number of observations and the number of cells in the table. The expression to evaluate χ^2 is as follows:

$$\chi^2 = \sum_{j=1}^{k} \frac{(O_j - E_j)^2}{E_j^2} \quad (1)$$

In which:

O_j - number detected for a specified group;

E_j - expected values of intervals;
k - amount of groups.

Thus, the values of degrees of freedom would be formed (df):

$$df = (p - 1)(r - 1) \quad (2)$$

In which:

r, p - category size for the first and second variables.

Once we calculated the χ2 and degrees of freedom, we read the critical value χ2 for the confirmed significance level p (p-value is usually considered to be 0.05) from the table of values. If the evaluated χ2 value was greater than the critical value, there was no basis for rejecting the null hypothesis of the neutrality of the variables under investigation; if the estimated value of χ2 was less than the critical value, the null hypothesis is rejected and the proxy hypothesis of the existence of a relationship between the variables is supported.

Cramér's V coefficient is a measure of dependence, a coefficient that determines the level of independence between two nominal variables, at least one of which has more than one value. The creator of this coefficient is the Swedish statistician Harald Cramér. The coefficient ranges from 0 to +1 (inclusive); the closer the result is to 0, the weaker the relationship between the characteristics under investigation, and the closer to 1, the stronger the relationship. However, the size of the contingency table affects this value, so one should not draw too far-reaching conclusions based on this result. Cramer's V formula is as follows:

$$V = \sqrt{\frac{\chi^2}{n \min(p-1, r-1)}} \quad (3)$$

In which:

r, p - category dimensions (contingency table sizes);
n - number of observations;
$\min(p - 1, r - 1)$ - minimum value between p and r.

Cramer's V is based on the chi-square value. Therefore, one can use it only if the chi-square indicates the existence of a significant relationship between the variables.

Test Power Analysis

To check whether the sample size was sufficient to identify the relationships under investigation, we performed tests from test groups that we generated based on χ2, in particular, goodness-of-fit tests against contingency tables. We chose a post hoc computational late-realised power test as a type of power analysis. This type of test requires a significance level α (assumed to be 0.05), sample size, degrees of freedom (df) and effect size (assumed to be *w* = 0.3), *i.e.* – for this type of test – a detectable level of association. We used the G*Power 3.1 program (Faul, 2007; 2009) for calculations.

On this basis, we set a threshold of degrees of freedom that allowed us to meet the above constraints, assuming that the test power (1-β) > 0.95. The quantity β corresponds to the probability of making an error of the second kind, *i.e.* an error that does not reject the false null hypothesis. On the other hand, according to Cohen (1992), the effect size is small when *w* varies around 0.1, medium when *w* varies around 0.3, and large when *w* varies above 0.5.

Table 2. Test power analysis (online research of young adults 2020-2021)

χ² tests – Goodness-of-fit tests: Contingency tables		
Analysis:	Post hoc: Compute achieved power	
Input:	Effect size	0.3
	α err prob.	0.05
	Total sample size	540
	Df	67
Output:	Noncentrality parameter λ	48.6
	Critical χ²	87.108
	Power (1-β err prob)	0.9515

Source: own study based on calculations in G*Power.

As Table 2 shows, test powers above 95% are reached to 67 degrees of freedom. None of the 14 contingency tables selected above for further analysis exceeded this limit.

RESULTS AND DISCUSSION

The data collected during the survey created 14 variables, including seven dependent variables and seven grouping variables.

Dependent variables (questions about the environment):

- What do you think about pro-environmental/pro-ecological behaviour?
- Are you financially involved in environmental protection measures?
- Should countries emitting too much CO_2 into the atmosphere pay extra for it?
- Do you have your own car (or plan to buy one in the next few years)?
- Are your purchasing decisions influenced by the environmental orientation of the producers of the goods you buy?
- When looking for a job, will you pay attention to whether a potential employer has an environmentally friendly image?
- Do you collect plastic bottle caps?

Grouping variables, *i.e.* gender, level of education, year of birth, place of residence (town of less than 5 000 residents, town of between 5 000 and 50 000 residents, city of over 50 000 residents), mode of study, place of residence (dormitory, with parents, rented apartment, own apartment), and source of income.

The total number of observations was 540. All variables were qualitative (nominal) variables.

Based on this, we created 72 (8x9) two-way contingency tables, 14 of which showed a significant relationship between the dependent variable and the grouping variable. Below, we present the most interesting of the observed relationships.

The research aimed to isolate factors (mainly elements of respondents' demographic characteristics) influencing the ecological awareness of young adults and to determine its importance for this generation's market decision-making processes.

Online surveys implementing this goal began with a semi-closed question about the respondents' opinions on pro-environmental behaviour. It was a multiple-choice question intended to determine the general attitude of the respondents to the issue of pro-environmental behaviour.

Table 3. Distribution of responses to the question: 'What is your opinion about pro-environmental/pro-ecological behaviour' (multiple choice question) (online research of young adults 2020-2021)

Opinion on pro-environmental behaviour	Number of indications	Percentage of indications
It is necessary in today's climate situation	341	63.15
It results from concern for the future of the climate and the future generations	302	55.93
It is the result of the need to have a positive impact on the environment	272	50.37
It results from fear of deterioration of nature and climate conditions	264	48.89
It is a tool for improving the image of people and enterprises	229	42.41
It is primarily fashion, increasingly popular and overused by some people	136	25.18
It is the effect of the activities of the industry lobby	48	8.89
It is only a consequence of the introduction of pro-ecological regulations	39	7.22
Sometimes it may be useful, but it is a marginal phenomenon, there is no point in being interested in it	15	2.77
It is unnecessary, irrelevant to the surrounding reality	6	1.11
Different opinion	7	1.30

Source: own study.

A direct analysis of the obtained responses presents that the respondents are well aware of the role and significance of the behaviours mentioned above and the inevitability of their promotion

(Table 3). At this declarative level, they clearly confirm that pro-environmental activities result from the personal needs of the people implementing them and are a manifestation of concern for the environment and the well-being of future generations. We recorded only a few negative opinions about these behaviours. Only about 1% of the population considered the above-mentioned activities to be unnecessary. Later in the study, respondents answered the questions about their selected pro-environmental attitudes and behaviours.

Table 4. Distribution of responses regarding pro-environmental attitudes and behaviour (online research of young adults 2020-2021)

Are you financially involved in environmental protection measures?							
No, I never contribute my money to such purposes.		I seldom donate, during direct collections into boxes.		Yes, from time to time, I financially support actions that I consider important.		Yes, I very often (even regularly) donate to pro-environmental campaigns and activities.	
371	**68.70%**	106	19.63%	60	11.11%	3	0.55%
Should countries emitting too much CO_2 into the atmosphere pay extra for it?							
They should not because it does not bother anyone.		They can if they can afford it.		They should pay high fees, because it is harmful to the environment.		There should be symbolic fees for this.	**There should be fees and absolute limits for CO_2 emissions.**
13	2.41%	122	22.59%	139	25.74%	91	16.85%	**75**	**32.41%**
Do you have your own car (or plan to buy one in the next few years)?							
I have a car and it is my main means of transport.		**I do not have a car, but I plan to buy one.**		I do not have one and I do not plan to have one because I cannot afford it.		I have a car but I only use it occasionally.		I do not have one and do not plan to buy one (I can perfectly manage without a car).	
95	17.59%	**140**	**25.93%**	77	14.26%	138	25.56%	90	16.67%
Do you collect plastic bottle caps?							
I have not heard that they can be collected and that something can be done with them.		I have heard about this action, but I do not want to collect them.		**I try to collect them instead of just throwing them away.**		This is how I collect all used plastic bottle caps.	
10	1.85%	77	14.26%	241	**44.63%**	212	39.26%
Would you accept the provision prohibiting entry to the city centre for private cars in your city?							
Never in my life will I accept this.		**It will be challenging for me, but somehow, I will accept it.**		Yes, I believe such a decision is necessary for the good of the residents.			
156	28.89%	**264**	**48.89%**	120	22.22%		
When looking for a job, will you pay attention to whether a potential employer has an environmentally friendly image?							
I'm not going to pay attention to it.		**I will pay attention to it, but I will not resign just because of the negative image of the employer.**		Yes, I do not want to work for a company that does not have a pro-environmental image.			
154	28.52%	**338**	**62.59%**	48	8.89%		
Are your purchasing decisions influenced by the environmental orientation of the producers of the goods you buy?							
I never pay attention to such information.		I notice such information and labels, but I do not care about them.		**I notice such information and I am pleased when I shop for 'organic' products, but it is not necessary.**		When buying food, because it directly influences my wellness.		Yes, I am always looking for such information and the lack of it makes me not make the purchase.	
88	16.30%	111	20.55%	218	**40.37%**	102	18.89%	21	3.89%

Note: Because of the table's size, we omitted some descriptions of the findings; the first numerical value provided for a given answer is the number of cases, and the second – the percentage of indications.
Source: own study.

In general, the respondents were not financially involved in pro-environmental activities. Nearly 70% of them never donated any money for such purposes. They accepted CO_2 emission limits and penalties for exceeding them. Over 30% of respondents stated that the penalties were necessary. A car was not a primary good for them, because a large group did not have one yet, but they planned to buy one. Those who had their own car most often used it occasionally. This behaviour is difficult to interpret in the context of pro-environmental behaviour, because we do not always have a form of transport that is an alternative to a car. Public transport is not fully available everywhere in Poland. The fact that the surveyed respondents collect used caps (over 80% of respondents often or always collect used caps) allowed us to assume that they notice pro-environmental initiatives in their surroundings and willingly join those that do not require too much involvement from them. They are moderately enthusiastic about restrictions on the use of private transport in the city centre. A negative ecological image of a potential employer will not prevent them from applying for employment in such a company. The fact that the product is 'organic' is an advantage, but not a necessary condition for wanting to buy it.

The next step of the analysis was relationships between variables. Below, we provide some examples of relationships that we considered significant for the topic.

Using the χ^2 test for multiple choice questions, we found a statistically significant relationship between the answer to the question of whether countries emitting too much CO_2 into the atmosphere should pay extra for it and the gender of the respondents (χ^2=10.59; p=0.03, V=0.14). Women were more radical in their assessments and they more often claimed that there should be fees and absolute limits on CO_2 emissions.

When analysing the respondents' attitude towards the decision to own a car, we found that there was a statistically significant relationship between this variable and the following variables:

- 'place of residence – city/town' (χ^2=23.50; p=0.00; V=0.15);
- 'gender' (χ^2=10.91; p=0.03; V=0.14);
- 'place of residence – form of ownership' (χ^2=100.69; p=0.00; V=0.25);
- 'source of income' (χ^2=33.45; p=0.00; V=0.25);
- 'mode of study' (χ^2=81.27; p=0.00; V=0.41).

Residents of large cities most often had cars, but they only used them occasionally. Residents of towns with populations of less than 5000 people were least likely to declare they have no plans to buy a car and can manage well without one. Women coped better without a car, and a larger group of men declared that they had a car which is their main means of transport. Most often, those who lived in rented apartments declared that they had no plans to buy a car, whereas for those who lived with their parents, it was the main means of transport. Respondents dependent on their parents usually had a car or planned to buy one, but they only used it occasionally (similarly to full-time students), while the largest group among self-dependent respondents were car owners, for whom it was the main means of transport (similarly to part-time students).

The analysis of the responses to the question whether they collect plastic caps showed a statistically significant relationship with the following variables: 'place of residence – city/town' (χ^2 = 24.96, df = 6; p = 0.00; V = 0.15), 'place of residence – form of ownership' (χ^2=19.53, df=9; p=0.02; V=0.11) and 'gender' (χ^2=45.05, df=6; p=0.00; V=0.20). Residents of small towns were most likely to collect caps (44.93% of them) and residents of large cities most often declared that they did not feel like doing it (20.57% of them). Dividing the respondents by the form of ownership of the place of residence, we noticed that respondents living with their parents were most likely to collect bottle caps (48.52% of them), and those who lived in a dormitory were the least likely to collect them (33.19%). Women were more willing to collect used caps; 44.90% declared that they always did it, while this group constituted 32.79% among men.

There was a statistically significant relationship between the variable containing answers to the question of whether they were guided by the ecological approach of producers to the production process when making purchasing decisions and the following variables: 'gender' (χ^2 = 40.76; p = 0.00; V = 0.27) and 'mode of study' (χ^2 = 18.31; p=0.00; V=0.18). Women most often declared that they 'notice such information and are pleased when shopping for 'organic' products, but it is not necessary' (49.65%). In contrast, men noticed such labels, but did not consider them when shopping (29.51%). Full-time students

enjoyed the 'organic' label, but it was not necessary (44.28%), whereas for part-time students, the ecological nature of the offer was most important when purchasing food products (27.91%).

Generalised Linear Model (glz) for Variables of Polynomial Distribution

The generalised linear model (GLZ) allows for the analysis of linear and nonlinear effects for any number and type of predictors and dependent variables, whether discrete or continuous. Patterns may include multi-degree-of-freedom systems for variables that are qualitative predictors, single degree-of-freedom systems for continuous predictors, or any combination of systems for qualitative or continuous predictors (TIBCO, 2017).

In a general linear model, the dependent variable Y is linearly related to the values of the variables in the set X through equality:

$$Y = b_0 + b_1X_1 + b_2X_2 + \cdots\ b_kX_k + e \tag{4}$$

in which e is the variation due to analyst unexplained errors and the expected value of e is assumed to be zero. However, in the generalised linear model, the relationship is expected to be as follows:

$$Y = g(b_0 + b_1X_1 + b_2X_2 + \cdots\ b_kX_k) + e \tag{5}$$

in which e represents the error and g(...) is a certain function. Correctly, g(...) is the opposite function of f(...) and f(...) is called the link function.

$$f(mi_y) = b_0 + b_1X_1 + b_2X_2 + \cdots\ b_kX_k \tag{6}$$

in which mi_y is the expected value of *y*.

Depending on the assumed distribution of the dependent variable, various link functions can be used (McCullagh & Nelder, 1989). For a variable with a polynomial distribution, the generalised logit is used as the link function:

$$f(z1/z2, \ldots, zc) = log((z1/z2, .., zc)) \tag{7}$$

in which the model has *c+1* categories.

'Odds ratio' (OR) can serve as a goodness-of-fit test for a model. For a polynomially distributed dependent variable, the odds ratio is calculated as the power-raised e of the 'score' that determines the models' significance. Therefore, the odds ratio reveals the change in the probability that the discriminant value of the dependent variable exists when the independent variable is increased by one unit. The other independent variables in the model are allowed to remain constant. We can also interpret the odds ratio as the percentage effect of an individual change in the quantity of the dependent variable on the odds ratio, which in the above case is calculated as the ratio of the probability of success to the probability of failure. Moskal *et al.* (2023) also used this model.

Moreover, OR=1 indicates that the probability of an event occurring in both groups (*e.g.* in the form of group membership) is comparable; OR<1, it means that in the studied group (dependent variable) compared to the reference group (independent variable) there is a lower chance of the event occurrence; and OR>1 means that the probability of an event occurring is higher in the group under study (compared to the reference group).

Therefore, the continuation of the analysis was an attempt to build a GLZ model. Due to the number of models that could be developed (we determined this by the number of variables and the number of response categories obtained during the survey), we selected two of several initial configurations for further analysis. We considered previously obtained results (significant two-way contingency table) and goodness of fit.

In the first selected configuration, we assumed that the dependent variable would be the answers to the question 'Are your purchasing decisions influenced by the environmental orientation of the producers of the goods you buy?' We selected gender and field of study as dependent variables. This type of analysis requires defining a reference category (one of the possible answers) for all nominal variables, both dependent and independent. In this specific example, we selected the most frequently occurring categories (responses) for each variable. The responses were as follows:

– 'I notice such information and I am pleased when I shop for 'organic' products, but it is not necessary' regarding the question 'Are your purchasing decisions influenced by the environmental orientation of the producers of the goods you buy?';
– Woman – question about gender;
– Full-time – question about the mode of study.

Since the variables are nominal polynomial variables, we chose the logit function as the link function (significant results for the first configuration – Table 5).

Table 5. Summary of model results (first configuration one) (online research of young adults 2020-2021)

Effect	*Level Effect*	*Level Response*	*Rating*	*Standard error*	*Wald Stat.*	*P*	*OR =exp (rating)*
Gender	man	When buying food, because it directly influences my wellness.	0.580	0.250	5.392	0.020	1.787
What is the mode of your study?	part-time	When buying food, because it directly influences my wellness.	1.048	0.278	14.189	0.000	2.854
Gender	man	I never pay attention to such information.	1.054	0.262	16.141	0.000	2.871
What is the mode of your study?	part-time	I never pay attention to such information.	0.666	0.309	4.633	0.031	1.947
Gender	man	I notice such information and labels, but I never take them into account.	1.375	0.248	30.599	0.000	3.955
What is the mode of your study?	part-time	I notice such information and labels, but I never take them into account.	0.808	0.287	7.904	0.004	2.245

Source: own study based on calculations in Statistica.

We selected six out of the eight possible models, for which the Wald statistic and confidence level ($p<0.05$) indicated significance. Table 5 shows that the answers to the question 'Are your purchasing decisions influenced by the environmental orientation of the producers of the goods you buy?' are significantly different depending on the adopted dependent variables. For example (line 2), men (in relation to women) chose the answer 'When buying food, because it directly influences my wellness ' (in relation to the answer 'I notice such information and I am pleased when I shop for 'organic' products,' but this is not necessary') significantly more often. The calculated OR in this case was approximately 1.8, which would mean that answering 'man' to the question about gender almost doubled the chance of answering 'When buying food, because it directly influences my wellness' to the question 'Are your purchasing decisions guided by the producers' ecological approach to the production process?'

We interpreted other models similarly. Noteworthy, the odds ratio (OR) was greater than 1 for all models.

Table 6 presents the measure of the goodness-of-fit of the models. We calculated it as the quotient of the relevant statistics and degrees of freedom of the model.

Table 6. Goodness-of-fit (online research of young adults 2020-2021)

Are your purchasing decisions influenced by the environmental orientation of the producers of the goods you buy? Measures of goodness of fit. Distribution: POLYNOMIAL Link function: LOGIT (Sample for analysis)			
Statistics	**Df**	**Stat.**	**Stat/Df**
Deviation	2140	1476.311	0.689
Pearson Chi^2	2140	2197.768	1.026

Source: own study based on calculations in *Statistica.*

Table 6 shows, that the model presents a good fit in terms of the Pearson chi^2 test (stat/df close to 1). In terms of deviation (statistics based on the logarithm of the maximum likelihood value for the

considered model and the logarithm of the likelihood value for the saturated model; Agresti, 1996), the fit was weaker. In any case, there was no over-dispersion (stat/df>>1).

In the second configuration, we changed the reference categories (responses) for the dependent variables:

- Man – question about gender;
- Part-time – question about the mode of study.

Table 7 presents the results relevant for the second configuration.

Table 7. Summary of model results (second configuration) (online research of young adults 2020-2021)

Effect	*Level Effect*	*Level Response*	*Rating*	*Standard error*	*Wald Stat.*	*P*	*OR =exp (rating)*
Gender	woman	When buying food, because it directly influences my wellness;	-0.580	0.250	5.392	0.020	0.560
What is the mode of your study?	full-time	When buying food, because it directly influences my wellness;	-1.048	0.278	14.189	0.000	0.350
Gender	woman	I never pay attention to such information;	-1.054	0.262	16.141	0.000	0.348
What is the mode of your study?	full-time	I never pay attention to such information;	-0.666	0.309	4.633	0.031	0.514
Gender	woman	I notice such information and labels, but I never take them into account;	-1.375	0.248	30.599	0.000	0.253
What is the mode of your study?	full-time	I notice such information and labels, but I never take them into account;	-0.808	0.287	7.904	0.004	0.445

Source: own study based on calculations in *Statistica*.

As before, we selected six out of eight possible models for which the Wald statistic and confidence level ($p<0.05$) indicated significance. Analysing line 2 of Table 7 similarly, we can conclude that women (in relation to men) chose the answer 'When buying food, because it directly influences my wellness' (in relation to the answer 'I notice such information and I am pleased when I shop for 'organic' products, but it is not necessary) significantly less often. The calculated OR in this case is 0.56, which would mean that answering 'woman' to the question about gender almost doubled the chance of answering 'When buying food, because it directly influences my wellness' to the question 'Are your purchasing decisions influenced by the environmental orientation of the producers of the goods you buy?'

We interpreted other models in a similar way. Noteworthy, for all models the odds ratio (OR) was less than 1.

Since the first and second configurations were complementary to each other and differed only in reference categories for dependent variables, the fit of the models created for the second combination was almost identical to that for models based on the first configuration.

Summing up the entire statistical analysis, we can state that it brought interesting results. In the context of producers' ecological approach to the production process, The respondents' purchasing decisions proved to be significantly diversified. Contingency tables showed that gender, mode of study, and field of study are differentiating factors. We developed the analysis in the form of GLZ models. We omitted the field of study, because this variable had a polynomial distribution with the number of possible answers equal to 8. Considering all possible answers in the analysis would result in an excessive extension of this study. Interpreting Table 6, we see that of the four possible answers to the question regarding purchasing decisions, three are significantly determined by the gender and respondents' mode of study. The odds ratio was highest for the answer 'I do not notice such labels and never take them into account ' if the respondents were men and were approximately 4 (line 6). Table 7 completes Table 6 as it shows that the lowest odds ratio belongs to the above-mentioned responses when women are the responders. The chance of obtaining the above-mentioned response is then approximately four times smaller.

As mentioned before, the above analysis is only an example. The collected data set contains a number of important information and further research based on it is possible.

CONCLUSIONS

As part of the ongoing research process, we established that the surveyed young adults had a relatively high awareness of the importance of pro-environmental behaviour for the general climate situation in the world and the related well-being of humanity. At the level of description of the surrounding reality, the responses included both concern for the future of the planet and fear of the deterioration of the climate situation. However, at the same time, they were not ready to increase their involvement in pro-environmental activities. They declared a lack of interest in the possibility of financial support for broadly perceived ecological activities. Pro-environmental aspects were not crucial for them either in purchasing decisions or in employment decisions. The basic forms of commitment to the environment were promotional campaigns which they occasionally joined, such as collecting plastic bottle caps.

Similarly to the research results described as part of the literature review, our research results allow us to conclude that to increase the involvement of young adults in pro-environmental activities, they need to be offered simple activities that do not require their financial involvement. A further increase in the involvement level will only be possible after the introduction of further educational campaigns.

In the process of developing the GLZ model, we determined that gender and mode of study of the respondents were the variables determining the answers to the question 'Are your purchasing decisions influenced by the environmental orientation of the producers of the goods you buy?'

Within the obtained GLZ models, we selected the most numerous categories (responses) for individual variables. They included the following answers: 'I notice such information and I am pleased when I shop for 'organic' products, but it is not necessary' to the question 'Are your purchasing decisions influenced by the environmental orientation of the producers of the goods you buy?,' woman (question about gender), full-time (question about the mode of study).

When analysing the impact of producers' environmental orientation on young adults' purchasing decisions, we found that it would be most important to female full-time students. Men pay less attention to this information. Even if they notice it, it does not influence the purchase decision.

An important limitation of the described research process is the purposive sampling and the selective (and relatively narrow) selection of manifestations of environmental awareness (discretionary selected areas of young adults' lives). The respondents were mainly students, which means that this research cannot be considered representative of the entire young adult population. However, the reason behind this sample selection was the assumption that management students would be characterised by a higher level of environmental awareness than the general population as a whole. Therefore, it was considered that the analysis of the importance of environmental awareness in the purchasing process should start with students. The next step will be to verify the results obtained in the study described above by surveying the entire young adult population.

At the same time, an important research direction will be to analyse the manifestations of environmental awareness in the areas of life that we did not analyse in our research.

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