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Selected aspects of household consumer behavior in the context of environmental and technological changes

PhD dissertation

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Prague, 2024

Acknowledgements

I would like to express my appreciation and thanks to my supervisors for their guidance and cooperation during my studies and all the support I received in my teaching, our joint research and publication activities.

I would also like to thank all my other colleagues from the faculty and the university for their support over the years and the knowledge and experience they have passed on.

Abstract

With increased societal awareness of the negative externalities associated with production of goods and services there is a growing need to investigate the factors that influence households' purchasing decisions for products associate with higher sustainability standards (both general and sector specific).

The idea of this paper is to investigate in both areas (*general and sector specific*) about consumer awareness and how factors linked to eco-friendly consumption and reaction to new emerging technologies can influence their consumer preferences and behaviour. It is done by combining research in three areas: 1) the consumers´ choice purchasing eco-friendly and sustainable products (*green purchasing*), 2) consumers reactions related to novel sector specific technologies with potential to address sustainability of multiple negative externalities and 2) the consumers‘ source-of-energy choice related to acceptance of new technologies (*public acceptance of small nuclear reactors*).

Factors impacting ***green consumption*** studied in the literature include (1) economic incentives and possibilities, (2) socio-demographic segmentation, (3) values, emotions and personal responsibilities, (4) information including education and mass media, (5) factors related to the locality of the respondents and the lifestyles. While the effects of environmental concerns and perceptions of climate change or green purchasing are well established, the impacts of preferences for EU integration and media exposure are less clear. This paper examines the effects of environmental concerns, perceptions of climate change, trust in EU policies, and media exposition on green purchasing employing a representative sample of 904 respondents (aged 15–95 years, M ± SD: 47,74 ± 17,66; 51.40% women, 19,40% with higher education) in the Czech Republic. Methodologically we rely on principal component analysis, correlations, and a set of ordinal regression analyses. The results suggest that (1) the public perceives the agendas of environment protection and climate change as two different agendas. (2) environment protection attitudes and climate concerns, the acceptance of EU integration positively predict green consumption. (3) the impact of the media exposition proved controversial: printed media and online discussion forums and blogs positively predicted green purchasing, while exposition to online social networks negatively impacted purchasing of organic food; (4) the frequency of watching TV negatively predicted purchasing of environmentally friendly products. We suggest that the advertisements emphasizing low prices

may reduce willingness to pay a price premium for green products. It implies that more efforts need to be made on TV and social networks to increase public awareness of green consumption.

The public perspective on ***genetically modified foods*** (GMFs) has been intensely debated and scrutinized. Often, discussions surrounding GMF tend to revolve solely around the potential health risks associated with their consumption. However, it is essential to acknowledge that public perceptions of genetically modified foods are multifaceted, encompassing environmental concerns, ethical considerations, and economic implications. This paper studies the factors predicting the attitudes to GMF employing the representative sample of Czech population (N=884 , aged 18–90 years, M ± SD: 48,17 ± 17,72; 53,40% women, 18,04% with higher education). The research is guided by the Behavioral Change Model and the Health Belief Model. We employ hierarchical ordinal regressions to study the effects of information, environmental concerns, perceived health risks, food habits, purchasing habits, and socio-demographics on indicators of GMF acceptance. The results suggest that the (un)willingness to purchase GMF is primarily driven by the health risks - the environmental concerns were largely unimportant. The impact of information provision on GMF acceptance proved positive, suggesting information and education to be the main channel of creating public acceptance. The inferent interest in GMF information negatively affected the perception that GMF is moral. The valuation of the benefits the GMF can provide proved unrelated to the GMF acceptance indicating the gap in the information campaign. The research provides valuable insights for policymakers, public health professionals, and market researchers to communicate GMF agenda to the general public effectively.

Small Nuclear Reactors (SNR) can provide climate-neutral, stable electricity and heating if located in people's neighborhoods close to people's dwellings. The extensive use of SNR would reduce capacity requirements for energy transmission systems and increase the overall stability of energy grids. However, the public fear location of SNR close to their homes. This paper hypothesizes that the public acceptance of SNR in the neighborhood is contingent upon knowledge of technology, fear of nuclear energy (NE), trust in the government, the expected increase of future electricity needs and the expected ability of renewables to cover these needs, environmental and climate concerns, and media exposure. We rely upon representative survey data from the Czech Republic (N=1013, 51,2% female, aged 18-91, M±SD: 47,7±17,6; 19,6% with higher education). Methodologically we conduct exploratory Principal Component Analysis and a series of ordinal regressions. The results suggest that the knowledge of

technology, trust in the government, the preference for NE expansion, and media exposure increased the acceptance of SNR, while fear of NE decreased SNR acceptance. The perceived replaceability of conventional energy sources with renewables decreased acceptance of SNR in most cases. Surprisingly, worries about climate change reduced the support for SNR. Women accept fewer SNRs located close to their residence compared to men. More educational effort is needed in the specifics of SNR technology and the environmental effects of SNR. Media proved to be an excellent way to start.

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1. Introduction

With increased societal awareness of the negative externalities associated mainly with the impact of climate change, the effects of pollution and the depletion of non-renewable resources, there is a growing need to investigate the factors that influence households' decision-making to prefer and choose products that they consider to be made according to better product sustainability standards.

These standards have evolved in our territories area over the past decades, mainly by incorporating internationally agreed standards into general and sectoral regulations at EU level. In the context of the Czech Republic, they were then partially adopted during the EU accession process and later by participating in their further development in the post-accession period. The development of these standards and their incorporation into EU and, consequently, national legislation took place and keeps taking place mainly at three levels:

Firstly, as a set of *general standards* which regulate and charge for the use of natural resources, the level of pollution by hazardous chemicals, the level of air pollution by greenhouse gases and waste management. In terms of the goods and services purchased by consumers, the main concern is the available form of energy and the associated externalities with the production of this energy. This part is related to Small nuclear reactors.

Secondly, as a set of *sector specific standards* that further regulate and specify additional conditions and rules in the production of each product category to be followed in order to meet the minimum required level of sustainability. This part is related to Green Purchasing.

Thirdly, as a set of sector specific measures incentivizing the development, scale up, marketing and use of innovative technologies that are at qualitatively superior level and therefore in a position to: 1) significantly reduce or eliminate the born of sector specific externalities and 2) overcome the need of externality specific regulation. This part is related to GM Foods.

In all these cases, they represent public interventions aimed at:

1) limiting the impact of negative externalities on the supply side and

2) incentivizing the transformation of supply side business models

These public interventions are transposed and reflected in the characteristics of products and services that should be perceived, at demand side, by consumers and, consequently, taken into account in their purchasing decisions.

The research is therefore based on three papers:

1) *Examining green purchasing. The role of environmental concerns, perceptions on climate change, preferences for EU integration, and media exposure;*
2) *The moderating role of perceived health risks on the acceptance of Genetically Modified Food.*
3) *Nuclear reactor at home? Public acceptance of Small Nuclear Reactors in the neighbourhood.*

Understanding how the adopted standards are actually reflected in social awareness and public perception and consequently influence or do not influence their preferences is a valuable resource for future reference to those who propose and decide on these standards and seek their implementation and uptake. It would also serve a valuable source of inspiration to inform for what appropriate regulatory and communication tools to choose towards Czech citizens in order to accelerate their adoption of sustainable consumer behaviours.

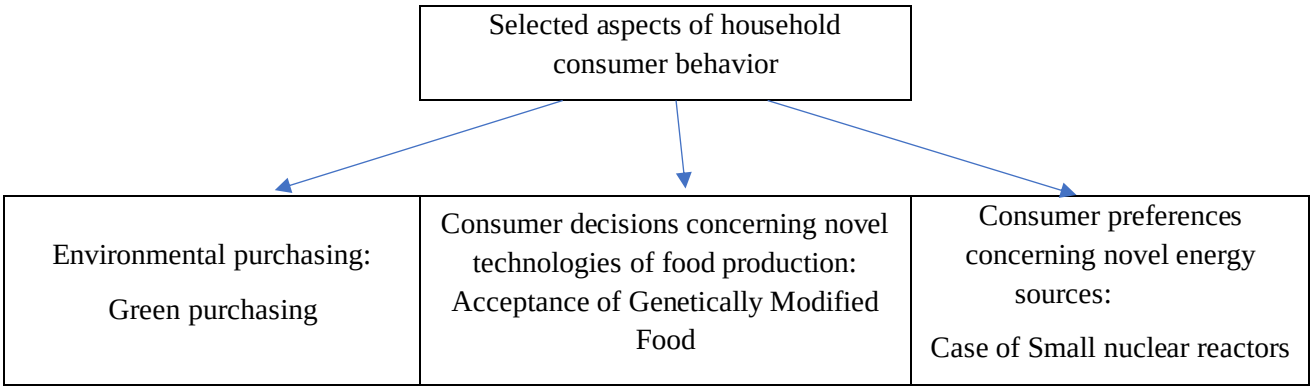
Considering that the author of this dissertation has been involved in the development of both general and sector-specific standards at EU level for two decades and remembers with which assumptions and expectations these decisions were approved, the partial results of this research also represent potential future inputs for further detailed research in this domain.

2. Objectives

With growing concerns about climate change, pollution and resource constraints, households are becoming increasingly aware of their impact on the environment. This awareness influences their consumption, such as the choice of environmentally friendly and sustainable products. Climate-neutral energy sources are another indispensable part of environmentally conscious consumption. Technological innovations provide consumers with new, climate-neutral energy sources. However, their use is conditional on public acceptance. The aim of this paper is to investigate the main factors that contribute to environmentally friendly consumer decision making in the area of green consumption and energy innovations. In particular, the thesis will focus on green consumption at the stage of consumer choice of environmentally friendly food and non-food products and consumer choice of energy source, using the example of the acceptance of small nuclear reactors as a climate-neutral alternative for fossil fuel energy production.

The idea of this paper is to investigate in both areas (*general and sector specific*) of consumer awareness and how factors linked to eco-friendly consumption influence their consumer preferences and behaviour. It is done by combining research in three areas: 1) the consumers´ choice purchasing eco-friendly and sustainable products (*green purchasing*); 2) the consumers reactions to introduction of innovative technologies *(acceptance of GM Food);* 3) the consumers‘ source-of-energy choice related to acceptance of new technologies (*public acceptance of small nuclear reactors*).

Figure 1. Selected aspects of household consumer behavior in the context of environmental and technological changes. The topics.



Green purchasing

Green purchasing is an important part of environmental sustainability and responsible resource management. It involves purchasing goods and services that are environmentally friendly and reduce the negative impacts of production, use and disposal. Green purchasing can help reduce pollution, conserve natural resources, reduce energy and water consumption, reduce waste and reduce environmental costs of production, transport and disposal.

The aim is to examine the role of environmental attitudes, perceptions of climate change, attitudes towards the EU and media influence in predicting environmentally responsible consumption in the Czech Republic. We distinguish three types of "green" commodities: organic food, local food and environmentally friendly products.

The main objectives of the research are se follows to:

1. examine the effect of environmental concerns and attitudes on green purchasing

The literature suggests that environmental concerns and attitudes can increase green purchasing. However, this effect does not always manifest itself, as economic and normative factors may play a larger role. For example, green products may be considered luxuriously expensive and the norm is not to buy them.

2. *to study (1) whether the concerns about climate change are disconnected from environmental concerns in the minds of the representative sample (via factor analysis) or*

belong to the same factor. (2) The paper aims to test the relation between the concerns with climate change and green purchasing.

One of the most recent environmental issues relates to climate change. Although it is generally a subset of environmental change, it is often referred to as a separate category.

3. test whether the acceptance of EU integration positively predicts green purchasing.

Increasing green consumption is one of the priorities of the European Union, which is reflected in several legislative documents and overall communication. However, the green agenda has generated some controversy, especially in coal regions, and may not always be perceived positively.

4. test whether the exposition to mass media (TV, printed media, online news social networks, online discussions and blogs, social networks, and offline discussions) is related to green purchasing and if yes, whether this is a positive or negative association.

Mass media is one of the important factors influencing the level of information, but also group norms and attitudes. Ideally, we assume that mass media positively influence green consumption.

Consumer preferences for Genetically modified food (GMF)

Hunger, malnutrition, and population growth are some of the world's most pressing challenges today (Verma et al.,2022). To date, over 820 million people are food-insecure – in 2018, one in nine individuals on the planet suffered from malnutrition. Genetically modified crops are a potential solution to the lack of food as they are more resistant to pests and diseases (Talakayala, 2020; Yali, 2022), can be engineered to produce higher yields and promise improved nutritional profile including, e.g., higher protein share (Gbashi, 2021; Vega et al., 2022), have lower production costs (Azadi and Ho, 2010; Ekici and Sancak, 2012), are more adaptable to climate change (Zaidi et al., 2019; Garland, 2021), provide the opportunity to reduce food waste as they have a longer shelf life (Kamthan et al.,2016; Islam et al., 2020; Asrey et al., 2021). Moreover, they may be more delicious and better textured (Kamthan et al.,2016; Islam et al., 2020; Asrey et al., 2021).

Yet, the public and governments are reluctant to adopt genetically modified foods (GMF). The reasons include health risks (Zhang et al., 2016), the possible harm to the environment and

biodiversity (Tsatsakis et al., 2017), ethical, moral, and religious aspects (Knight, 2009; Kumar and Yadav, 2021; Green, 2023). This reluctance continues despite unanimous conclusions from some risk assessment research that GMFs are as safe as conventional crops regarding human and animal health (Smyth et al., 2021). The media provide a blurred picture of GMF safety, where the campaigns against GMFs often follow campaigns for GMFs.

The main objectives of the research are as follows to:

5. to study the factors predicting public acceptance of GMOs, specifically exploring the impact of perceived health risks, environmental concerns an available information on the willingness of Czech population to buy, taste and ethically accept GMOs.

Consumer preferences for small nuclear reactors (SNRs)

Small nuclear reactors (SNRs) may represent climate-neutral, stable electricity and heating if they are located in the vicinity of human dwellings. The widespread use of SNRs would reduce the capacity requirements of power transmission systems and increase the overall stability of power grids. However, the public is concerned about locating SNRs near their homes.

The literature on public perception of nuclear power is extensive and wide-ranging. In general, it suggests that public opinion is influenced by perceived benefits, costs, risks, and the perceived ability of governments to mitigate these risks (Stoutenborough et al., 2013). However, the perceived benefits, costs, and risks examined in the literature to date have been primarily related to conventional nuclear power plants.

The main objectives of the research are as follows to:

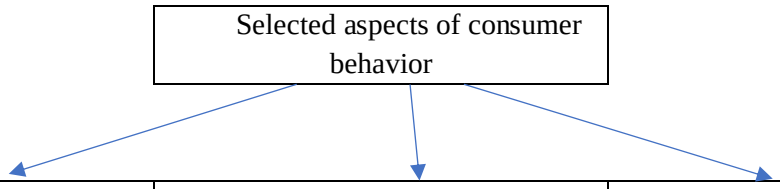
6. study the factors predicting public acceptance of SNR in locations closer than 10 km from residence, more than 50 km from residence, in urban areas, in current nuclear power plants, and beyond.

There is still a lack of available literature on the factors affecting public perceptions of SNR. We hypothesize that the acceptability of SNR in various locations is affected by the knowledge of technology (both of nuclear energy and SNR), attitude to nuclear energy (fear, the trust in the government in NE), environmental concerns, the perception of electricity needs in the future (increase, can be replaced by renewables), sources of information (mass media, other), and socio-demographic characteristics including age, gender, and education.

3. Methodology and models

The study relies on econometric analysis of cross-sectional survey data based on a representative sample of households in the Czech Republic. The principal component analysis will be used to reduce the dimensionality of the affecting factors and/or the indicators of consumer choices. Ordinal regression analyses will help to identify the contributing factors impacting consumer choices. The model for econometric analyses will be composed based on existing theories, empirical results, and policy-relevant ideas summarized in the literature review.

Figure 2. Selected aspects of household consumer behavior in the context of environmental and technological changes. The methodologies

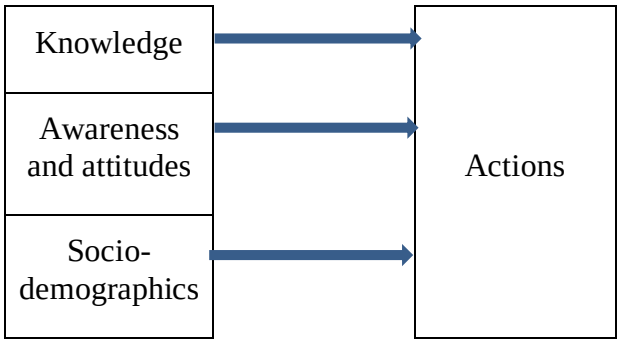


Environmental purchasing: Green purchasing	Consumer decisions concerning novel technologies of food production: Acceptance of Genetically Modified Food	Consumer preferences concerning novel energy sources: Case of Small nuclear reactors
Factors affecting green purchasing decisions	Factors affecting Genetically Modified consumption and purchasing decisions	Factors affecting acceptance of small nuclear reactors in the neighborhood
Behavioral change model Ordinal regression analysis	Behavioral Change Model and the Health Belief Model. Hierarchical ordinal regression analysis. Moderation effects	Ordinal regression analysis The Principal Component Analysis
Chapter 5	Chapters6	Chapter 7
Hlaváček, M., Čábelková, I., Brož, D., Smutka, L., & Prochazka, P. (2023). Examining green purchasing. The role of environmental concerns, perceptions on climate change, preferences for EU integration, and media exposure. Frontiers in Environmental Science, 11, 1130533.	Cabelkova, I., Sanova, P., Hlavacek, M., Broz, D., Smutka, L., & Prochazka, P. The moderating role of perceived health risks on the acceptance of Genetically Modified Food. Frontiers in Public Health, 11, 1275287.	Hlavacek, M., Cabelkova, I., Pawlak, K., & Smutka, L. (2023). Nuclear reactor at home? Public acceptance of Small Nuclear Reactors in the neighborhood. Frontiers in Energy Research, 11, 1211434.

3.1. Green purchasing model

The model is built according to the principles of the general behavioral change model (Boudreau, 2010; Hungerford and Volk, 1990) applied to environmentally responsible behavior (Figure 3).

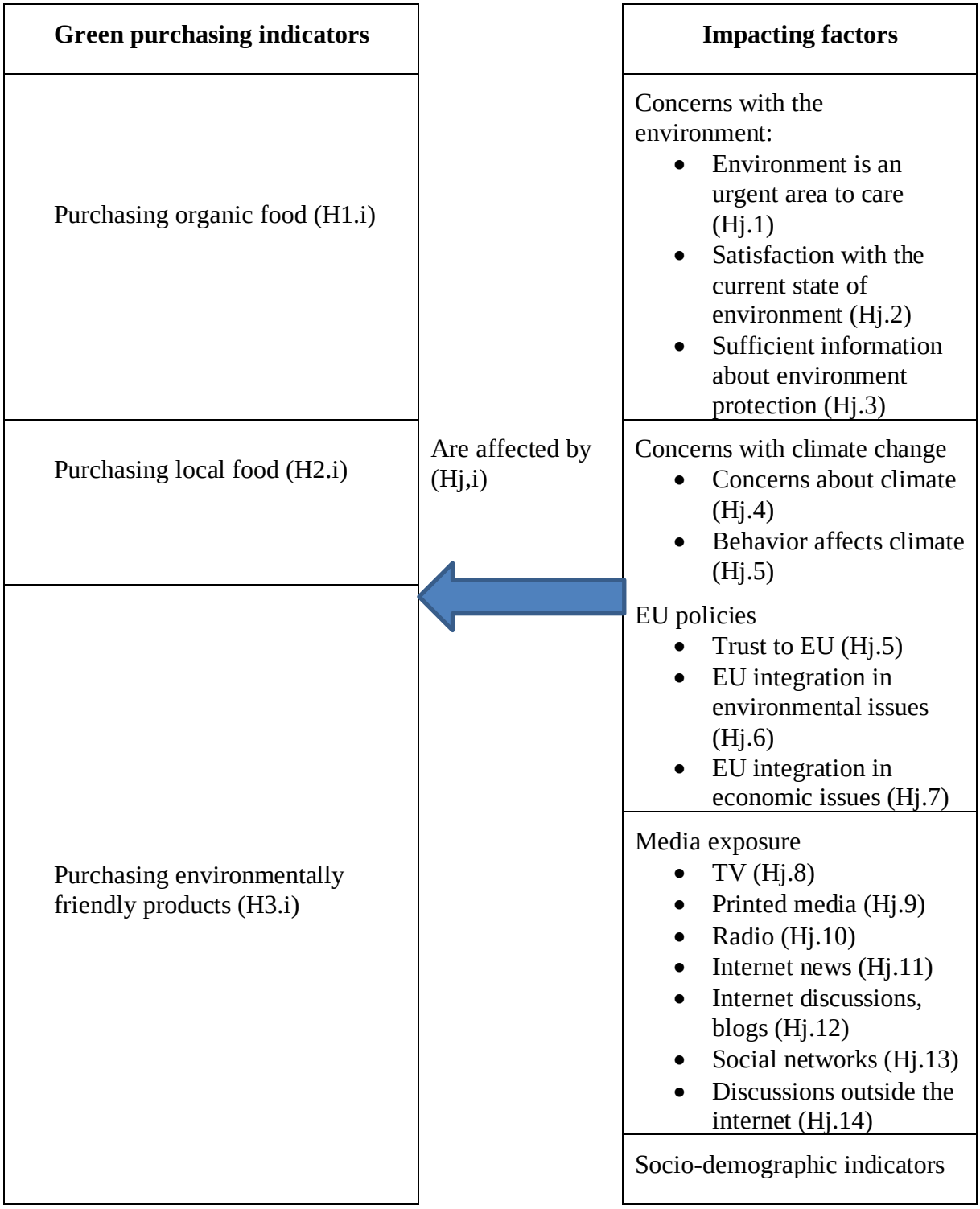
Figure 3. Behavioural change model



Source: modified from Boudreau, 2010; Hungerford and Volk, 1990

The knowledge part is impacted by the education level and the sources of information about the social life. Awareness and attitudes are then represented by the awareness and concerns with the environment and climate change, satisfaction with the current state, and sufficient information about environmental protection. As environmental protection was one of the topics that proliferated on the level of EU policies, we include the indicators of trust and attitude to EU policies. Finally, we also control for socio-demographic variables. The resulting model and hypotheses are presented in Figure 4.

Figure 4. The model and hypotheses (Hj.i)



Scholars have highlighted that lack of information might prevent consumers from buying sustainable products as it impacts individuals at multiple psychological levels (Cerri et al., 2018; Testa et al., 2015).

3.1.1. Formula

Methodologically we rely on Principal component analysis to study the structure of attitudes to environmental protection and climate change. Namely, we are interested in whether the agendas of environmental protection and climate change represent one or two different agendas in the minds of the representative sample of the population in the Czech Republic. In theory, the agenda of climate change represents a subset of the agenda of environmental protection. However, the literature review suggested that according to the media presentation and the non-availability of personal experience, they may present two different agendas.

Second, we conduct ordinal regression analyses to test the factors associated with environmentally conscious behavior according to the scheme presented in Table 24 (Appendix) and Equation (1).

Equation 1

$$Behavior_i = logit(a_0 + a_{1-3}Environment + a_{4,5}Climate + a_{6-8}EU + a_{9-15}Info + a_{16}Standart + a_{17}Gender + a_{18}Age + a_{19}Political\ orientation + a_{20-22}Education + a_{23-27}Town\ size + e \quad (1)$$

Where:

Behavior$_i$ – stands for the frequency of conducting environmentally conscious activities consequently (buy organic food, buy locally produced food, when buying products you are guided by whether they are environmentally friendly, hand in, sort your hazardous waste, sort your regular waste, limit car journeys to protect the environment, save energy and water to protect the environment, for the distribution of the respondents see Table 1.1)

Environment – three variables capturing environment protection attitudes, namely: 1) the extent the environment protection is urgent, 2) the level of satisfaction with the environment in the locality of the respondent, 3) the extent the respondent has sufficient information about how to behave in an environmentally friendly way (for the distribution of the respondents see table 1.2)

Climate – stands for two variables reflecting concerns about the effects of climate change and whether the respondents believe that people's behavior can change climate change *((for the distribution of the respondents, see table 1.2)*

EU – stands for the three variables reflecting the attitude to EU policies: whether European integration in the fields of economy and environment is beneficial or harmful, and the extent to which the respondents trust the EU.

Info – stands for the six variables reflecting the frequency the respondents follow social life in the following media: TV, printed newspapers and magazines, radio, online news serves, social networks, and offline discussions (for the distribution of the respondents, see table 1.3).

Standard – subjective standard of living of the respondents (very good to very bad, five-point scale)

Gender and Age – stands for the gender and age of the respondents

Political orientation – political orientation (left-right, eleven-point scale)

Education – education dummies (primary, secondary w/o state exam, secondary with state exam, higher; higher education is reference variable)

Town size – dummies for subjective town size (big city, suburb of big city, average town, small town, big village, small village)

The bivariate correlations between the variables above are presented in Appendix 1.

3.1.2. Formula

We apply hierarchical ordinal regression analysis to test the hypotheses presented in Graph 3.

The hierarchical part of ordinal regression analysis included two steps. First, we tested the model with all the explanatory variables according to formula 2.

Equation 2

$$GMF\ Attitudes = Logit\ (a_0 + a_{1\text{-}3}\ Information + a_{4\text{-}8}\ Health + a_{9\text{-}12}\ Environment + a_{13\text{-}17}\ Food\ Purchasing + a_{18\text{-}20}\ Food\ habits + a_{21\text{-}27}\ Socio\text{-}demographics + e) \quad (2)$$

On the second stage we excluded the group of variables related to health effects and computed ordinal regression according to the following formula (3):

Equation 3

$$GMF\ Attitudes = Logit\ (a_0 + a_{1\text{-}3}\ Information + a_{9\text{-}12}\ Environment + a_{13\text{-}17}\ Food\ Purchasing + a_{18\text{-}20}\ Food\ habits + a_{21\text{-}27}\ Socio\text{-}demographics + e) \quad (3)$$

Where

GMF Attitudes - Would buy food with a GM ingredient, Would taste approved GMF, Genetically modifying crops are morally unacceptable

Information - Have heard about genetically modified crops, Interested in GMF, Have enough information about GMF.

Health - Own state of health, Consuming GMF is safe, The health effects of GMP are sufficiently researched, Consuming GMP can change human DNA, GMF can endanger human health

Environment - the importance of the impact of food production on the environment, reduces waste, saves resources to protect the environment, recycles.

Food Purchasing – the importance of origin, package material, price, ingredients, and package size.

Food habits - Food consumption is important, Frequency of food purchasing, Number of meals per day

Socio-demographics – Gender, Age, Education, Town size, Household standard of living, Life satisfaction, Belief in God

The description of the variables above is presented in the section Indicators.

We compared the pseudo-R-square of both models and inferred the moderation effects of the excluded variables.

3.2. Small Nuclear reactors. The model

The model to study public acceptance of SNRs represents the interplay of factors influencing their acceptance. It integrates inputs like knowledge of nuclear technology, attitudes towards nuclear energy, environmental concerns and socio-demographic characteristics. These factors are examined for their impact on public acceptance of SNRs in various locations and was built using Principal Component Analysis and a set of ordinal logit analysis.

3.2.1. Formula

We rely on a set of ordinal regression analyses in the following form (formula 4):

Equation 4

$$SNR\ acceptability_i = logit(a_0 + a_{1-2}Technology + a_{3-5}Attitude + a_{6-7}Electricity + a_{8-9}Environment + a_{9-10}Info + a_{11}Age + a_{12}Gender + a_{13-15}Education + a_{16}Economic\ activity + a_{17-21}Municipality + a_{22}Political\ orientation + a_{23}Life\ Satisfaction + e_ \quad (4)$$

Where

SNR acceptability – five indicators of acceptability subsequently (SNR up to 10 km, SNR further than 50 km, SNR in the area of current NPS, SNR out of the area of current NPS, SNR directly in the city, Table 2.3).

Technology – two indicators of Knowledge of Nuclear technology (knowledge of principles of NE, knowledge of technology for SNR, see section Indicators for knowledge of technology)

Attitude – three indicators mapping Attitude to Nuclear Energy (Fear of NE, trust to the government in NE, the belief that share of NE should increase, see section Attitude to NE)

Electricity – two indicators on the perception of electricity needs in the future (the belief that electricity consumption will increase in the future, the perception on whether conventional electricity replacement is possible (see section Electricity needs in the future)

Environment – two indicators for environmental concerns (satisfaction with the environment in the Czech Republic, fear of climate change, see section Environmental concerns)

Info – two indicators for sources of information (new media, old media, see section Sources of information)

Age, Gender, and *Education* – age, gender, and education (basic, secondary w/o state exam, secondary with state exam, higher)

Economic activity – active / non-active

Municipality – the subjective size of a municipality (large city, a suburb of a large city, medium-sized city, small town, a large village, small village, solitude

Political orientation – political orientation on 11-point scale

Life satisfaction – subjective life satisfaction.

4. Development of externality based policymaking on the example of EU Common Agricultural Policy

4.1. The context of the reform changes from the perspective of CAP instrumental policy

The establishment of the Common Agricultural Policy (CAP) was particularly significant in terms of the integration process and the establishment of the Common Market.[1] The European Economic Community (EEC) was established in 1957 by the Treaty of Rome, which also established some common policies of the EEC member countries, including the Common Commercial Policy and the Common Agricultural Policy[2] .

The Common Agricultural Policy is thus one of the oldest and, in terms of common public expenditure, one of the most robust policies of the European Union. However, this is a relative view, since its real share of European gross value added compared to the total public expenditure of other (less harmonized) policies has never exceeded 0.67% of GDP over the last 40 years and since 1993 its share as a proportion of GDP has steadily declined to its current level of 0.35% of GDP. Given the fact that one of the main attributes of the 'common policy' is almost exclusive funding through the EU budget, with very limited scope for national funding by Member States (limited solely by *the rules on national co-financing of the CAP* and the *rules on the functioning of the internal market* in the area of *public aid* and *competition*), comparisons of the CAP with other policies in less harmonized areas cannot objectively be made through the limited lens of EU budget expenditure.

Although the financing and implementation of the CAP has been the subject of criticism and substantial debate since its inception, it is remarkable that this debate has never resulted in a modification of the legislative objectives of the CAP itself. As they were originally defined in Article 33 of the EC Treaty[3] - i.e. with the emphasis on 1) increasing agricultural productivity, 2) ensuring an adequate standard of living for farmers, 3) stabilizing markets and 4) ensuring a continuous supply of the population at 5) affordable prices - they persist today in the form of Article 39 TFEU. At the same time, the main focus of the recent debates on the revision of the

[1] GARZON, I. Reforming the Common Agricultural Policy. 2006, p. 21

[2] EUROPEAN ECONOMIC COMMUNITY. Traité instituant la Communauté Économique Européenne. 1957. [online]. https://eur-lex.europa.eu/legal-content/CS/TXT/HTML/?uri=LEGISSUM:xy0023&from=CS

[3] EUROPEAN UNION. Treaty on the Functioning of the European Union. 2012. [online]. https://eur-lex.europa.eu/legal-content/CS/TXT/PDF/?uri=CELEX:12012E/TXT&from=CS

Treaties, which eventually led to the Treaty of Lisbon as it is applied today, took place during a period of major international and domestic criticism of the CAP, a period of major structural changes to the CAP, as well as a period of implementation of international trade commitments (the Uruguay Round of the GATT and the WTO Hong Kong MC6).

In terms of the instrumental policy structure, the Common Agricultural Policy was built in 1962 around the European Agricultural Guidance and Guarantee Fund (EAGGF), which was split two years later into a Guarantee Section, mainly aimed at financing expenditure related to market and price policy, and an Indicative Section, aimed at rural development policy[4] , although expenditure in the latter area was very limited.

Other non-productive functions were not given much emphasis in the original CAP instruments, apart from the development of agricultural production potential (investment). CAP instruments were primarily aimed at supporting farmers and boosting productivity. Moreover, in 1962 an agreement was reached on the regulation of markets for certain agricultural commodities, including cereals, and a year later the measures were extended to beef and rice[5] .

Modifications of instrumental policy in the 1960s and 1970s tended to focus more on partial parametric changes to the original main CAP instruments - 1) guaranteed prices, 2) intervention instruments and 3) tariff protection - and were driven by efforts to strengthen their functionality, efficiency and also to correct negative market effects.

Other non-productive functions - the *broader notion of rural development* and *environmental functions* - only became more important during the later reform processes and fundamentally influenced the structure of CAP policy instruments.

4.2. Projecting reform processes into the EU's instrumental policy architecture and comparing the different stages

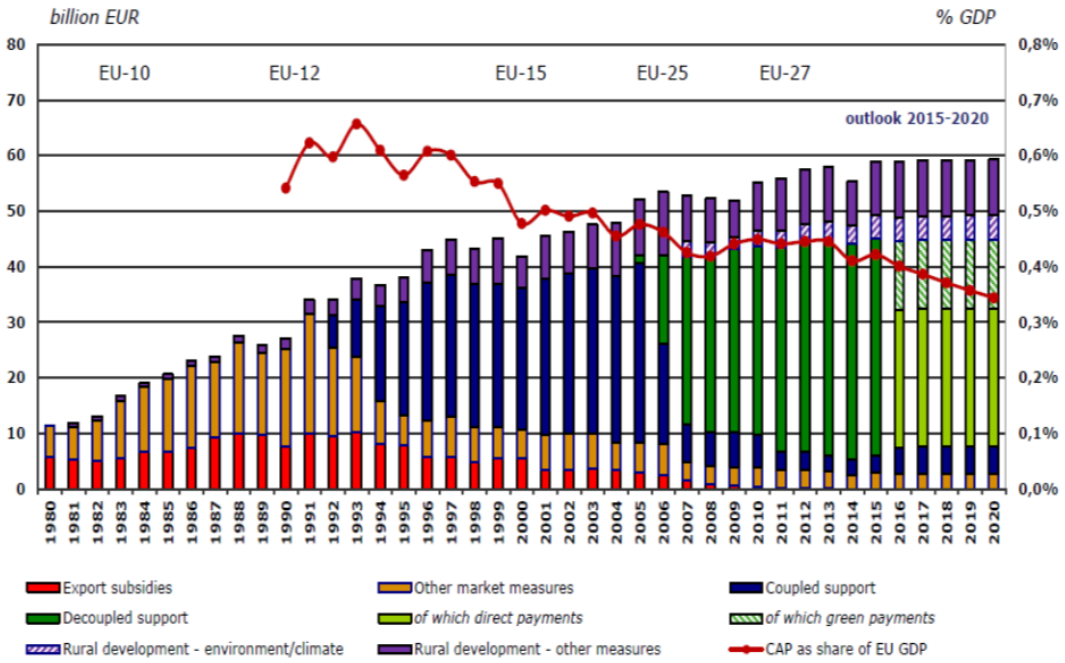
For the purposes of comparison, the above reform decisions, and their implementation, which are reflected in the level and structure of CAP funding, should be divided into the following stages. The individual phases do not appear to coincide with the reform decisions in terms of

[4] EUROPEAN PARLIAMENT. Facts & Figures on the European Union - Financing the Common Agricultural Policy. 2020. [online]. https://www.europarl.europa.eu/factsheets/cs/sheet/106/financovani-spolecne-zemedelske-politiky.

[5] GARZON, I. Reforming the Common Agricultural Policy. 2006, p. 23

time, as the timing of the reform changes (*phasing-out* or *phasing-in of* old or newly introduced measures) must be considered. This principle of phasing-in of major reform changes is one of the traditional attributes of the introduction of specific CAP measures to minimize negative impacts on stakeholders and market shocks within the CMO.

Figure 5. Overview of the evolution of the instrumental policy structure in terms of the build-up of reform changes over time



Source: DG AGRI, European Commission[6]

[6] DG AGRI. Adapted from CHATELLIER, V., GUYOMARD, H. PAC, soutiens et revenus: réflexions sur certaines tendances a l´oeuvre. 2019 [online].

Stage 1 for the period up to 1993 is characterized by efforts to manage the market with the aim of increasing the productivity of the agricultural sector. It is implemented mainly through market measures in the form of guaranteed prices, intervention instruments and trade support mainly in the form of a combination of tariffs, import quotas and export aids. Expenditure to support non-productive functions through the rural development programme plays an essentially negligible role.

Stage 2 for the period 1993-2005 is characterised by a shift towards income support in the form of aid linked to the unit of crop and livestock production and an attempt to administratively stabilise market imbalances through the use of a combination of intervention and trade support measures, with a predominance of export aid, while still maintaining a relatively high level of external protection of the European agricultural market. At the same time, support for non-productive functions is being strengthened by supporting productive investment through the rural development programme.

Stage 3 for the period 2006-2015 is characterised by a fundamental shift away from income support in the form of coupled support per unit of production towards decoupled support in the form of area payments (i.e. for the basic factor of production in agriculture - land) and the introduction of conditionality (with an impact on the cost-effectiveness of production). In the context of the implementation of the commitments made by the EU, coupled support is limited to a maximum under the WTO Bluebox of no more than 15% of total CAP Pillar I expenditure. For the first time, there is more substantial support for non-productive functions with a focus on environmental support through Pillar II with targeted programming of expenditure under the Rural Development Programme. The main measures take the form of LFA (Less Favoured Areas), AEO (Agri-environmental measures) and EZ (Organic Farming) payments.

Stage 4 for the period 2016-2020 is characterised by a substantial strengthening of support for non-productive functions in the field of environment and, more recently, climate protection, for the first time with targeted programming of minimum expenditure levels for CAP Pillar I and Pillar II of at least 20% and 30% respectively. In terms of the form of support, it remains an area payment per hectare of agricultural land, but with additional compliance with greening conditions and reinforced conditionality. Voluntary coupled support, as allowed under WTO rules, remains at a maximum of 15%, but its use is applied differently by Member States, both in terms of coverage of individual livestock sectors and in terms of the level of support. There is a concentration of voluntary coupled aid mainly in the livestock sector, with a predominance

of aid to cattle, specifically beef and milk production, with allocations of 42% and 20% of the envelope respectively. A more detailed overview of the current use of coupled support from Member States and individual sectors is conveniently provided in Table 5. The main Pillar II measures take the form of area payments (LFA, EZ) or area payments with multiannual commitments (AEO), with targeted programming of environmental and climate support expenditure. In this period, in addition to AEO and EZ payments, LFA payments are also fully counted towards the environment and climate spending targets, which is the subject of significant criticism of the application of the so-called *Rio marker* criteria[7] for these purposes by the European Commission.

The four main time stages of the CAP, their main objectives and predominant instruments

	Stage 1	**Stage 2**	**Stage 3**	**Stage 4**
Period	Until 1993	1993 - 2005	2006 - 2015	2016 - 2020
Main objectives	Price support Market stabilisation Productivity growth	Income support Market stabilisation Rural development (productivity)	Conditional income support Market liberalisation RVe - Environment	20% greening of direct payments 30 % RVe - environment and climate
Prevailing instruments	Guaranteed prices Market intervention Customs protection (tariffs, quotas) Export support	Bound support Market intervention Export support RVe - AEO payment RVe - LFA payment RVe - Investments	Uncommitted contingent aid Maximum 15 % of the aid committed RVe - AEO payment RVe - LFA payment RVe - EZ payment RVe - Investments	Untied conditional aid with greening Maximum 15 % of aid committed - different uses RVe - LFA payment RVe - Investments RVe - AEO, LFA, EZ payment

[7] https://www.oecd.org/dac/financing-sustainable-development/

4.3. Comparison of the different stages in the development of instrumental policy and the impact of the main forms of measures used from the perspective of economic theory

Comparison of the different stages of instrumental policy development

	Stage 1	Stage 2	Stage 3	Stage 4
Period	Until 1993	1993 - 2005	2006 - 2015	2016 - 2020
Nature of the measures	Internally - market management measures Externally - trade barriers	Internally - production support measures Externally - trade barriers	Internally - support for the use of the production factor	Internally - support for the use of the production factor Internally - support for additional costs of externalities
Forms of action	1. Administrative price 2. Intervention buying and selling 3. Import duty 4. Export subsidies	5. Payment linked to the unit of production	6. Payment linked to a unit of the factor of production	7. A payment linked to the payment of part of the extra costs associated with the sustainable use of a unit of a factor of production

In relation to the above, it can be concluded that in purely economic terms, subsidies and protectionist policies make no sense, especially in the long term. The losses associated with the application of these policies are not offset by adequate benefits in economic terms, or in purely monetary terms. On a purely economic level, it can be agreed that public interventions linked to the implementation of economic processes or protectionism lead to a number of negative or controversial effects[8] :

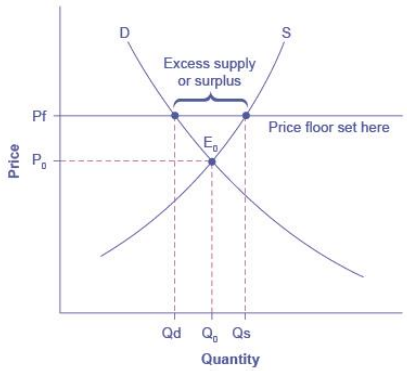
1) Welfare loss effect
2) The conservation effect
3) Consumer effect
4) Business effect
5) Tax effect
6) Redistributive effect
7) Price effect
8) Terms of Trade effect
9) Balance of payments effect
10) Pension effect

[8] SVATOŠ, M. et al. Economics of the agrarian sector. 2015.

11) Competitive effect
12) Quality effect
13) The effect of strengthening and changing protectionism
14) Criminogenic effect

A number of these effects are simplified and expressed graphically in standard market equilibrium models, which correspond to the selected 7 forms of the main CAP measures applied during the period of the reform processes.

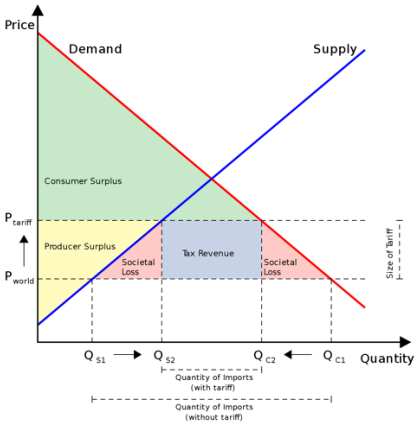
1) Administrative price



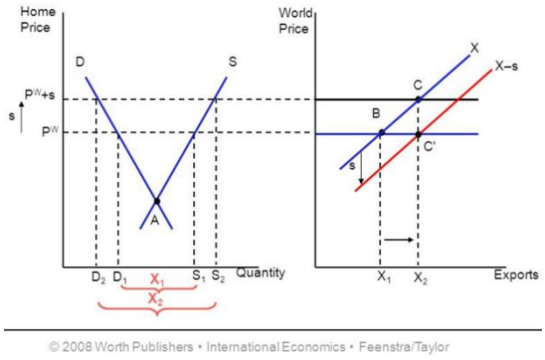
Source: Principles of Microeconomics[9] .

2) Market intervention

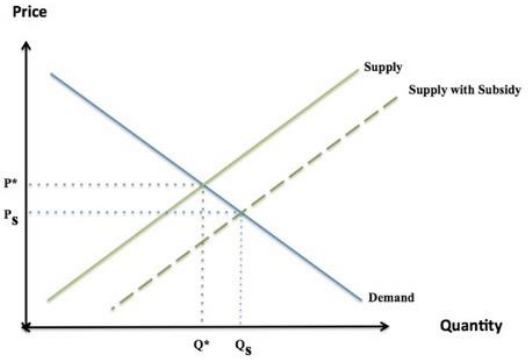
3) Import duty



4) Export subsidies

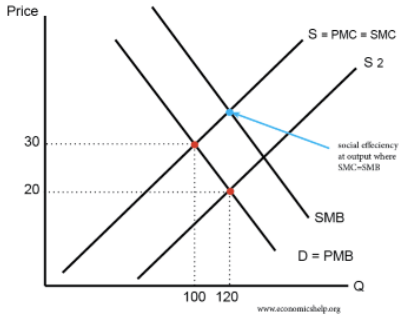


5) Payment linked to the unit of



Source: Introduction to the Agricultural Economics.[10]

6) Payment linked to a unit of the factor of production and payment linked to the payment of part of the extra costs associated with the sustainable use of a unit of the factor of production



[9] GAMEZ, C., et al. Principles of Microeconomics. 2017, updated 2021.

[10] BOUNDLESS ECONOMICS. Introduction to the Agricultural Economics. Year not specified. [online]. https://courses.lumenlearning.com/boundless-economics/chapter/introduction-to-the-agriculture-economics/

From the point of view of their own character, these are effects which, if they are the result of long-term applied interventionism, have a clearly negative impact on the formation of balanced economic relations that should be optimal and sustainable in the long term. However, it must be stressed that we do not live in an optimal economic world and that the generally declared prosperity of all stakeholders may not in fact be a reflection of the interests of all relevant interest groups. These interest groups naturally and indirectly, through political choices, pursue society-wide decisions aimed at achieving non-optimal economic goals. These objectives are very diverse in their orientation. In relation to the above, the issue of interventionism and protectionism must be seen in a completely different light.

Externality plays a key role in the area of policies aimed at protecting the market or supporting certain entities, which can be very different in nature and character, and therefore from the perspective of the relevant stakeholders. It is important to note that policies based on different forms of intervention are relevant precisely to the context of broader, for example, social, cultural, environmental, security and other needs. The nature of interventions is then largely determined by the mix of societal needs and possibly socially acceptable trade-offs that are associated with externalities (primarily of a non-economic nature) in a range of aspects. Among these aspects, the following arguments (which are by no means exhaustive) can be made in relation to the agri-food sector in particular:

1) Food Security
2) Food Safety
3) Environmental and climate protection
4) Biodiversity conservation
5) Soil conservation
6) Water management in the landscape
7) Fighting greenhouse gas emissions
8) Preservation of the cultural landscape
9) Stability and development of rural areas
10) Social aspects
11) Political aspects at local level
12) Political interests at the strategic level, especially in terms of the broader geopolitical context and events.

It is precisely in the case of the above that subsidy and protectionist policies can take on a defensible meaning.

It is the very wide range of objectives, which have not only an economic dimension but also a number of other aspects and priorities in the societal reality, that forces the stakeholders involved to pursue a number of interests, the fulfilment of which may appear ineffective in purely economic terms, but in terms of broader societal needs, interventions in the economy can be justified (see, for example, food aid, crisis aid, sanctions, states of war, political tensions, social stability, environmental protection, etc.).

6. Examining green purchasing. The role of environmental concerns, perceptions on climate change,

6.1. Introduction

Green purchasing is an important part of environmental sustainability and responsible stewardship of resources. It involves the acquisition of goods and services that are environmentally friendly and reduces the negative impacts of production, use and disposal. Green purchasing can help reduce environmental pollution, conserve natural resources, reduce energy and water use, reduce waste and reduce the environmental costs of production, transportation, and disposal.

Factors affecting green consumption have been a long subject of research. The early literature on green consumption presented the term in the context of "societal marketing," which addressed environmental questions (Fisk, 1974; Henion and Kinnear, 1976) and studied economic incentives and socio-demographic segmentation. Later on, individual values, emotions and attitudes proved to be more important. Environmental attitudes, knowledge and personal responsibilities showed to have positive effects on green consumption in some cases but not in others. Dominant social paradigms (e.g., consumerism), individual and collective norms, and habits, such as the perception that green products are luxuriously expensive and insufficient or incorrect information, may reduce green consumption.

All these factors are affected by the agenda presented in the mass media and discussion platforms, which may, if effective, create group norms and affect intentions and actual behavior (Moore and Moschis, 1983; Willnat and Weaver, 2018; Chen et al., 2019).

In Europe, green consumption is a subject of a number of political initiatives on the level of the EU and single countries. The EU is considered a global leader in environmental and climate change politics (Fischer and Geden, 2015; Skovgaard, 2014); green procurement is an essential part of public and private consumption policies (Calabro, 2007). These initiatives are not always accepted positively by the local population, which may affect the willingness to purchase green products. In the Czech Republic, environmentally charged EU policies traditionally evoke controversy, as they negatively affect coal-producing regions, limit the supply of cheap but environmentally damaging products, and incorporate environmental externalities into the product prices. The EU Environmental policies damaged the economies

of the poor coal-producing regions and created an aversion in part of the population to EU integration (Cabelkova et al., 2020, 2022)

Environment protection requires relevant knowledge transferred to the general public through school education or various types of mass media (traditional, online, social). In this field, research on the media's role in different sustainable actions is still largely missing (Chen et al., 2019)

This paper aims to study the role of environmental attitudes, perceptions on climate change, attitudes to the EU, and media exposure in predicting environmentally responsible consumption in the Czech Republic. We distinguish three types of "green" commodities: organic food, local food, and environmentally friendly products. Methodologically we rely on Principal Component Analysis (PCA), correlation, and ordinal regression analyses applied to a representative sample of 904 respondents (aged 15–95 years, M ± SD: 47,74 ± 17,66; 51.40% women, 19,40% with higher education) in the Czech Republic to reach the following research objectives:

1. The literature suggests that environmental concerns and attitudes may increase green purchases. However, the effect does not always manifest itself as economic and normative factors may play a bigger role. For example, green products may be considered luxuriously expensive, and the norm is not to buy them. The paper aims statistically examine the effect of environmental concerns and attitudes on green purchasing.
2. One of the more recent environmental concerns relates to climate change. While in general, it presents a sub-set of environmental changes, it is often communicated as a separate category. This paper aims to study (1) whether the concerns about climate change are disconnected from environmental concerns in the minds of the representative sample (via factor analysis) or belong to the same factor. (2) The paper aims to test the relation between the concerns with climate change and green purchasing.
3. Enhancing green consumption is one of the priorities of the European Union, manifested in several legislative documents and overall communication. However, the green agenda produces certain controversies, especially in the coal-producing regions, and may not always be viewed positively. This paper aims to test whether the acceptance of EU integration positively predicts green purchasing.

4. Mass media is one of the important factors affecting the level of information, but also the group norms and attitudes. Ideally, we suggest that mass media positively affect green consumption. This paper aims to test whether the exposition to mass media (TV, printed media, online news social networks, online discussions and blogs, social networks, and offline discussions) is related to green purchasing and if yes, whether this is a positive or negative association.

Green purchasing (GP) refers to (1) purchasing environmentally friendly products, which are usually recycled and bring benefits to the environment, and (2) avoiding products that harm the environment (Chan, 2001; Mostafa, 2007; Steg and Vlek, 2009). In this regard, GP should be distinguished from sustainable purchasing, which, besides environmental sustainability, accounts for economic, social, health, and other sustainability aspects (Miemczyk et al., 2012).

While the definition of green products is relatively simple in practice, there is still a certain controversy about which products can be classified as green (Huijbregts et al., 2008; Mancini et al., 2016; Hanafiah et al., 2012) since many environmental externalities cannot be directly measured. Nevertheless, green marketing utilizes the green phenomenon to propagate some products as "green" via various "green" certificates and labels (Boström and Klintman, 2008; Schwartz et al., 2020). Besides the products themselves, a number of certificates and labels are employed to indicate the use of eco-friendly or recycled materials in production or packaging, sustainable agrarian practices, or responsible animal handling (eco-labeling, Dhir et al., 2021; Anuar et al., 2020).

Though green- and eco-labeling and environmental concerns are on the rise, the actual purchase of green products still falls behind (Wojnarowska et al., 2021; Rizqiyana and Wahyono, 2020). The intention to purchase green often is not followed by the action. Hughner et al. (2007) showed that though 67% of consumers reported a positive attitude to organic food products, only 4% purchased those products. The discrepancy between the positive attitude and actual green purchases is widely reported in the literature as ('green purchasing inconsistency' or 'green attitude-behavior gap (Witek, 2019; Wang et al., 2019; Joshi and Rahman, 2015). The following section presents the factors affecting green consumption and green purchasing per se.

6.2. The factors affecting green purchasing

Green purchasing belongs to a more general category of green consumption. The concept of green consumption first emerged in the 1970s in the United States, alongside the development of "societal marketing," which addressed environmental questions. Fisk's Theory of Responsible Consumption (Fisk, 1974), Henion and Kinnear's Ecological Marketing (Henion and Kinnear, 1976), and Kardash's Ecologically Concerned Consumer (Kardash, 1974) all contributed to categorizing green consumption. Initially, research focused on energy use, pollution connected to the automobile, oil, and chemical industries, as well as consumer reactions to advertising and labeling (Kilbourne and Beckmann, 1998; Henion and Kinnear, 1976; Peattie, 2010). Later, the studies concentrated more on green purchases of food products and environmentally friendly products.

The literature on factors affecting green consumption aimed at defining factors that might help to increase green consumption. Obviously, the factors in question reflected the dominant social and economic paradigms of a particular period and social context. The early literature concentrated on economic incentives and financial possibilities of households, socio-demographic characteristics, and environmental knowledge (Peattie, 2010). The proponents of economic rationality viewed green consumption as primarily affected by economic factors and suggested that government policy must provide primarily economic incentives (Jackson, 2005; Eriksson, 2004; Bartelings and Sterner, 1999; Shen and Wang, 2022; Wang et al., 2021). This approach is still used, for example, in waste management, where the households are incentivized to sort communal waste by making the disposal of sorted waste free of change. The economic literature also suggests that more affluent households produce a larger environmental footprint but can afford to purchase "greener" goods (Lenzen and Murray, 2003; Cymru, 2002; Huang, et al. 2022). Thus, income rise may increase green consumption.

Socio-demographic aspects as predictors of green consumption were originally important primarily from the point of view of market segmentation according to sex, age, presence and number of children, educational level, and socioeconomic class (Laroche, et al., (2001), Robinson and Smith (2002), Jenkins, et al. (2003). Yet, they are still frequently included in empirical analyses, often as control variables (Walia et al, 2020)

The impact of environmental knowledge in supporting green consumption is not uniform. The straightforward conclusion that providing more information about the environment increases green consumption was supported by some studies (Bartkus et al., 1999) but not the others

(Davies, et. al., 2002; Pedersen and Neergaard, 2006; Rustam, et al., 2020). Besides price ("green" goods are still more expensive, making them difficult to afford), the green attitude-behavior gap seems to play a role here (Witek, 2019; Wang et al., 2019; Joshi and Rahman, 2015).

While the early studies studied primarily economic, demographic, or knowledge factors, the later research proved that attitudes and values are often more important predictors of green consumption than rational choices. (Carrus et al, 2008; Han, et al., 2007; Wang, et al, 2019; Peattie, 2010). The values are a broad category. One stream of research concentrated on the existing models of values. For example, Schwartz's value model or altruist values were shown to be related to pro-environmental behavior. However, other studies report the opposite - pro-environmental values increase product reuse and waste-minimization intentions and behaviors but not recycling (Barr, 2007), or pro-environmental values increase the intention to recycle and conserve water but not to buy organic food or avoid leaving appliances on standby (Lyndhurst, 2004). The other studies report that environmental attitudes, environmental knowledge, subjective norms, perceived behavioral control, conditional value, and emotional value have a positive effect on green purchase intentions (Nekmahmud, et al., 2022a)

The lower expected effect of pro-environmental values on pro-environmental behavior was explained by the particularities playing more important role (Barr, 2007) or by the impact of economic incentives (Jackson 2005; Eriksson, 2004; Bartelings and Sterner, 1999; Shen and Wang, 2022; Wang et al. 2021) and the green attitude-behavior gap (Witek, 2019; Wang et al., 2019; Joshi and Rahman, 2015). The dominant social paradigm (DSP) and cultural/ethnic group norms may reduce the role of the value factors above (Kilbourne, et al., 2002; Johnson, 2004; Halder, et al., 2020; Fischer, et al., 2021). For example, consumerism reduces willingness to engage in green consumption (Kilbourne and Polonsky, 2005; Fischer, et al., 2021). Consumption is then viewed as a social process in social, political, and historical contexts, and conditions of lives and lifestyles bear immense importance. All these factors affect green consumption (Moisander, 2007; Connolly and Prothero, 2003; Fischer, et al., 2021; Beatson, et al., 2020). The (pro)environmental behavior may also belong to social norms. For example, recycling may be adopted because it is perceived as normal, Barr (2007), or the existing prices may represent the norm, and greener products represent an expensive luxury (Krystallis and Chryssohoidis, 2005). Similarly, pro-social behavior is showed to influence pro-environmental behavior (Ramkissoon, 2023).

Values can be effective in the case the consumer feels that a change in his behavior can produce a significant change in the environmental outcome, or, oppositely, the current state of the environment is partly caused by his behavior. Understanding personal responsibilities for both causing and solving environmental problems and believing that the action they take can have a meaningful impact was shown to be a significant predictor of pro-environmental behavior (Gupta and Ogden 2009; Yue et al (2020).

The spatial dimension (local, urban/rural, regional, and national) is the next dimension of factors affecting pro-environmental behavior (Peattie, 2010). The urban and rural differ in waste infrastructure (Munksgaard, et al., 2000), style of housing, agricultural systems, and specific mix of energy sources (Hines and Peattie, 2006), and people's behavior (Tang, et al., 2022). We can expect different economic incentives in pro-environmental behavior, different local culture and style of life and habits (Leiserowitz, et al., 2010; Empacher and Götz, 2004; ElHaffar, et al., 2020; Vita, et al., 2019; Samkange et al., 2021)

All the perceptions, values and knowledge can be impacted by the mass-media and education. The impact of mass media on pro-environmental values and pro-environmental behavior was shown to be a significant one (Haron, 2005; Jain, et al, 2020; Wagdi, et al, 2022). Especially video content that is largely based on emotions has a particular influence on pro-environmental attitudes (Ramkissoon, and Smith, 2014). Social media, as a special case of the mass media, were shown to have a significant positive effect on green consumption intentions promoting attitude, subjective norms, and green thinking via social media marketing (Nekmahmud, et al, 2022b). However, the media is such a complex phenomenon that much of the research on the media's role in different sustainable actions is still largely missing (Chen et al., 2019).

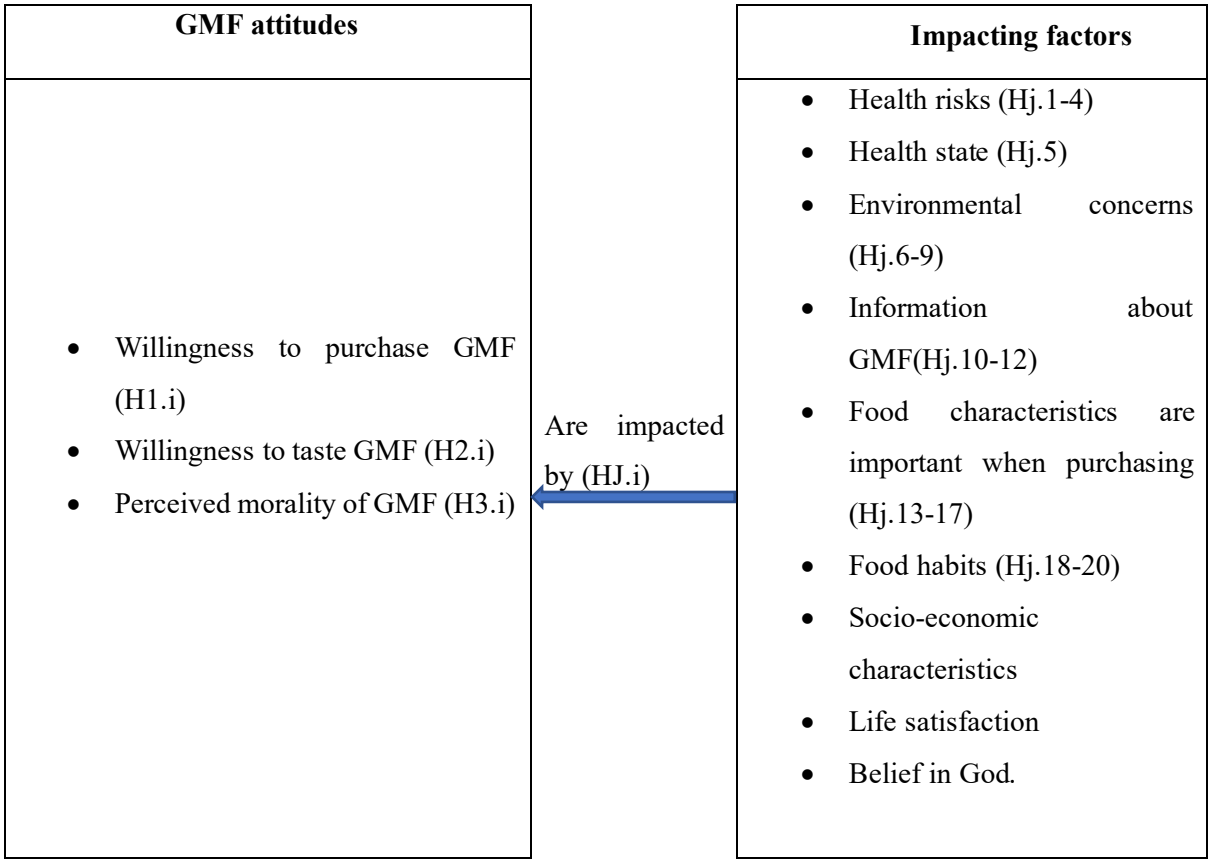
This paper contributes to the research on the factors affecting green consumption by studying the effect of values and attitudes related to climate change, environment protection, personal possibility to affect environmental outcomes such as climate change, and the sufficiency of information about environmental protection. We add political attitudes such as trust in the European Union and the perceived reasonability of EU integration. In addition, we add more comprehensive research on the effect of media exposure (TV, printed media, radio, internet news, discussions and blogs, social networks, and offline discussions), socio-demographic indicators including sex, gender, education, the standard of living, and town size. The following sections will describe more closely relevant agendas and the existing literature.

6.3. Green purchasing – hypotheses development

6.4. Consumer preferences concerning Genetically Modified Food. The model.

The model is constructed employing the principles of the Health Belief Model and Behavioral Change Model.

Figure 6. The model and hypotheses (Hj.i)



Source: authors, based on the principles of the Health Belief Model and Behavioral Change Model

6.4.1. The agenda of climate change

The climate change agenda is largely related to global warming production, among other extreme weather events. However, personal experience with extreme weather phenomena such as hurricanes and storms is rare, and overall observable temperature increase is not always associated with global warming. Thus, the information about climate change largely depends on the mass-media presentation (Anderson, 2011; Ryghaug et al., 2011), though the scope and frequency of presentation of climate-related agenda in different countries fluctuate (Schmidt et al., 2013). In the extreme case, public opinion can be understood as just a simple reflection of

the extent and prominence of media coverage (the agenda-setting hypothesis, McCombs and Valenzuela, 2020; Dumitrescu and Mughan, 2010; the quantity coverage theory, Mazur, 2009).

The agenda of climate change, as presented in media, suffered considerable changes with the change of the media itself. The diminishing role of specialist reporters and the emergence of online news media and niche sites specializing in climate journalism accompanied by the shift of roles of journalism from "gatekeeping" to "curating" roles plus the change of journalist sources from elite scientists to a broader range of stakeholders led to a strong and rising influence of the interests of stakeholders to climate journalism (Schäfer and Painter, 2021). The engagement of stakeholders presenting their interests in the media led to overrepresentation of climate change issues compared to the general agenda of environment protection (Legagneux et al., 2018).

The media agenda formation is shown to produce significant polarization of the climate-related agenda (Matakos, et al., 2017; Li, et al, 2013; Gubanov and Petrov, 2019). Facing perceived scientific uncertainty about climate change, the media norms eventually helped the climate-skeptic opinions to become a relevant part of the climate discourse. The internet-based social networks can exacerbate the effect of opinion polarization. The pre-defined computer algorithms are likely to diminish the exposure frequency of the content, presenting alternative ideas (Pearce et al., 2019).

Social networks, open forums, and internet-based discussion platforms are the other frequent source of climate change attitudes (Williams et al., 2015; Pearce et al., 2019), where all kinds of influencers and celebrities can shape public opinion (ibid., Anderson, 2011).

In the Czech Republic, the discussion on climate change in mass media is rather scarce in most cases, presented according to the mainstream viewpoint as global warming of anthropogenic origin (Navrátilová, 2021; Trunečková, 2015; Cabelkova et al., 2022). The appeal to fight climate change via the adoption of climate-conscious behavioral patterns was also dominant (ibid.). On the other hand, in the context of economically important areas (such as coal mining), the climate effects of fossil fuels were effectively missing (Lehotský et al., 2019; Černý and Ocelík, 2020; Cabelkova et al., 2022).

In any case, the methods to fight climate change are presented primarily as the reduction of greenhouse gas emissions via green consumption, green housing, and green travel (Alfredsson, 2004).

From the discussion above and in line with literature survey two hypotheses can be made:

H1 Concerns with climate change positively predict green consumption.

H2 The impact of the media on green consumption may vary according to the type of the media as some types produce significant polarization of opinions.

6.4.2. The agenda of environmental protection

Though measures combatting climate change is one of the forms of environmental protection, the media presentations of the two substantially differ. While the dangers of climate change are often distant and not primarily visible in the Czech Republic, environmental degradation is more often experienced already (Hůnová, 2020). The health effects of contaminated food, smog, frequently appearing in the cities, and changes in biodiversity in ecosystems are experienced directly. In the Czech Republic, the agenda and environmental effects of coal mining and processing are directly visible to the general public in exposed regions (Lehotský and Černík, 2019).

So, contrary to climate change agenda, general environment protection attitudes are more related to personal experience (positive or negative) and less affected by the media. If fact, the agenda of environment protection might be perceived as a completely different agenda from the agenda of climate change. Thus we can formulate the following research question:

Q1. Values related to climate change and environment protection represent two separate sets of values belonging to two factors.

We do not formulate this as hypotheses since it is not directly testable, though we will apply exploratory factor analysis to research it.

H3. The concerns with environment protection positively predict green consumption.

6.4.3. The role of preferences for EU integration. The specifics of the Czech Republic.

The EU policies that are relevant to consumers' sustainable choices can be divided into two categories: product legislation and waste legislation. Product legislation includes

environmental product requirements, information and labeling requirements, rules on product guarantees, and climate legislation (Sajn, 2020). Waste legislation makes it easier to waste recycling. Though in general, these policies are beneficial for the environment, in the Czech Republic they aroused certain controversy, as they affected the economic choices of coal-producing regions, limited the supply of cheap but environmentally damaging products, and in general, incorporated the environmental externalities into the product prices (Cabelkova et al., 2020, 2022). Thus, the trust in the EU and the public attitudes to environmental and economic EU policies were compromised in affected regions.

Being as it is, we hypothesize, that:

H4. Positive attitudes to European integration and policies with respect to environment and economic development positively predict green consumption.

6.4.4. The role of the media

Media play an essential role in disseminating information, thus influencing people's knowledge, awareness, attitudes, and socioeconomic choices (Jalan & Somanathan, 2008; Madajewicz et al., 2007). Media usage and browsing significantly affect sustainable purchasing (Zafar, et al., 2021). The impact of the media on environmentally responsible attitudes and behaviors varies according to the type of media and the agenda the media presents (Cabelkova et al., 2020; 2022).

We hypothesize that:

H5. Exposition to the mass media predicts green consumption. The type of the association depends on the media.

6.5. Materials and method

6.5.1. The model

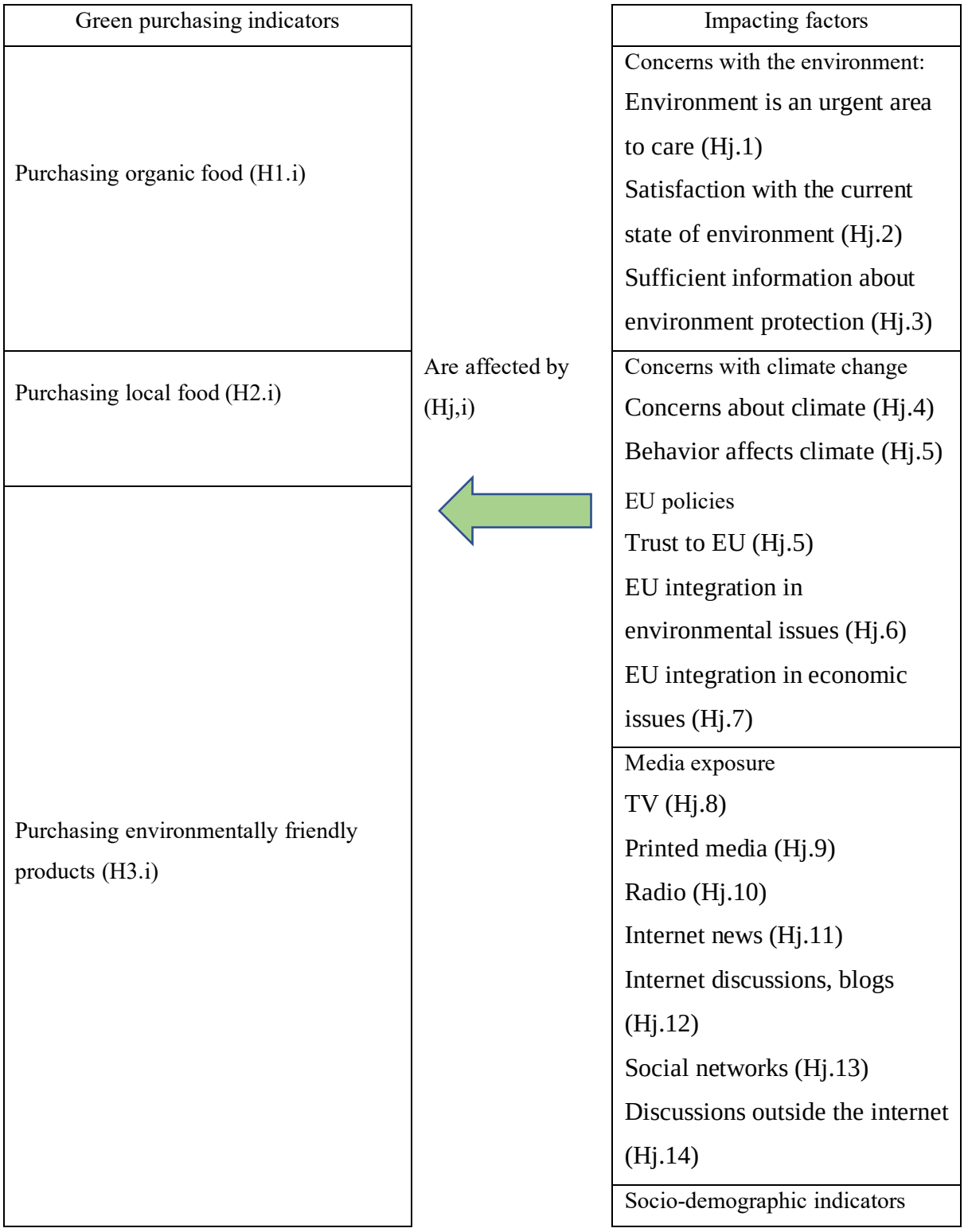
The model is built according to the principles of the general behavioral change model (Boudreau, 2010; Hungerford and Volk, 1990) applied to environmentally responsible behavior (Figure 7).

Figure 7. Behavioral change model

Source: modified from Boudreau, 2010; Hungerford and Volk, 1990

The knowledge part is impacted by the education level and the sources of information about the social life. Awareness and attitudes are then represented by the awareness and concerns with the environment and climate change, satisfaction with the current state, and sufficient information about environmental protection. As environmental protection was one of the topics that proliferated on the level of EU policies, we include the indicators of trust and attitude to EU policies. Finally, we also control for socio-demographic variables. The resulting model and hypotheses are presented in Figure 8.

Figure 8. The model and hypotheses (Hj.i)



Scholars have highlighted that lack of information might prevent consumers from buying sustainable products as it impacts individuals at multiple psychological levels (Cerri et al., 2018; Testa et al., 2015).

6.5.2. The data

The data were collected in July 2021 via a survey entitled Our society (Naše společnost) conducted by the Czech Institute of Sociology. A total of 904 respondents (aged 15–95 years, M ± SD: 47,74 ± 17,66; 51.40% women, 19,40% with higher education) answered the questions in the questionnaire voluntarily and anonymously under the supervision of 139 experienced interviewers. Methodologically the method of interviewing can be classified as structured interviews. As the quality of the filled-out questionnaires was considered very good, all the questionnaires were included in the data sample. All participants were Czech native speakers living in the Czech Republic. The method of sampling relied on representative sampling with quotes. The quotes included the geographical position, age, gender, and education of the respondents. According to quotes, the data sample is representative of the Czech Republic. The data were kindly provided by the Czech Social Science Data Archive (Sociologický ústav. Akademie věd ČR. 2021).

6.5.3. The indicators

6.5.3.1. Green purchasing.

The indicators of green purchasing include the frequency of purchasing organic food, local food, and environmentally friendly products. The exact wording of the questions and the distribution of the respondents are presented in Table 1.

Table 1. Environmental consumption indicators. The exact wording of the questions and the distribution of the respondents (%)

As far as your household is concerned, you ...	always	often	rarely	never	N/A
Purchasing decisions					
- buy organic food	3,10	19,20	45,00	28,40	4,30
- buy locally-produced food	8,10	50,10	30,10	7,50	4,20
- when buying products, you are guided by whether they are environmentally friendly	7,00	23,80	32,20	26,80	10,20

Source: own computations based on representative raw data from Sociologický ústav. Akademie věd ČR. (2021)

The least frequent green purchasing is reported in the cases of buying organic food (22,30% report buying it always or often, and 28,40% of the respondents report never buying them). On the other side, the Czech population showed to be environmentally conscious in purchasing

locally produced food, where 58,20% of the respondents reported buying it always or often (Table 1).

6.5.3.2. Perceptions on the environment, climate change, attitude to EU policies.

The exact wording of the questions and the distribution of the respondents are presented in Table 2.

Table 2. Perceptions on the environment, climate change, EU. The distribution of the respondents (%)

How urgent do you think it is to address the following areas in the Czech Republic this year: Environment protection				
Not urgent at all	Rather urgent	Very urgent	N/A	
19,8	48,8	29,5	1,9	
How satisfied are you with the environment in the place where you live?				
Very satisfied	Rather satisfied	Rather dissatisfied	Very dissatisfied	N/A
19,7	56,2	18,8	4,6	0,7
Do you have enough information about how to be environmentally friendly?				
Definitely enough	Rather enough	Rather not enough	Definitely not enough	N/A
15,3	52,2	22,9	4,0	5,6
How worried are you about the impacts of climate change?				
Very worried	Rather worried	Rather not worried	Not worried at all	N/A
13,2	40,7	26,2	9,2	10,7
Do you think that if people changed their current behavior, they could change the current climate change?				
Could stop it completely	Could slow it down	Could not affect the climate change	N/A	
5,9	63,3	15,0	15,8	
In your opinion, is European integration beneficial or harmful in these areas: economy				
Definitely beneficial	Rather beneficial	Rather harmful	Definitely harmful	N/A
11,7	44,0	26,2	7,6	10,5
In your opinion, is European integration beneficial or harmful in these areas: environment				
Definitely beneficial	Rather beneficial	Rather harmful	Definitely harmful	N/A
12,2	46,2	20,0	6,4	15,2
Please tell me, how much do you trust the European Union				
Definitely trust	Rather trust	Rather distrust	Definitely distrust	N/A
5,2	45,5	27,2	15,4	6,7

Source: own computations based on representative raw data from Sociologický ústav. Akademie věd ČR. (2021)

The majority of the respondents perceive environmental protection as urgent or rather urgent (78,3%), although most of the respondents are very or rather satisfied with the state of the environment in their neighborhood (75,9%, table 2). Approximately half of the respondents are worried or rather worried about climate change (53,9%), and are rather optimistic about the ability of people to affect climate change if they change their current behavior (69.2%, table 2).

However, society is polarized regarding the environmental and economic effects of European integration and trust in the European Union. Approximately a third of the respondents (33,8% in economic policies and 26,4% in environmental policies) believe that EU integration is harmful to the Czech Republic. 42,6% of the respondent reported some level of distrust to the EU.

6.5.3.3. Media exposure

The distribution of the respondents on media exposure and the exact wording of the questions are presented in Table 3

Table 3. Media exposure. The distribution of the respondents (%)

How often do you follow social life on	At least 1x a day, %	Several times a week, %	1x a week, %	Less than 1x a week, %	Never, %	N/A, %
TV	42,1	33,8	10,3	7,3	5,9	0,6
Printed newspapers, magazines	7,2	18,3	23,0	24,2	26,7	0,6
Radio	19,1	28,4	16,7	14,3	20,6	0,9
Online news servers	19,6	29,1	15,8	12,9	22,0	0,6
Social networks	14,2	18,7	11,0	14,2	40,9	1,0
Offline discussion	7,1	24,8	21,8	20,9	24,1	1,3

Source: own computations based on representative raw data from Sociologický ústav. Akademie věd ČR. (2021)

Most TV is still frequently used media, while the second place is occupied by radio and online news. Printed newspapers and magazines and offline discussions are relatively rarely used sources of information (table 3). Social networks are very respondent-specific and rarely used 40,9% of the respondents never use them.

6.5.3.4. Socio-demographic characteristics

We control for the standard of living (very good 8,8%, rather good 45,7%, neither good nor bad 35,2%, rather bad 8,6%, very bad 1,2%), gender (51,4% women), age (aged 15–95 years, M ± SD: 47,74 ± 17,66) education (19,40% with higher education), political orientation (1 left

- 11 right, M ± SD: 6,56 ± 2,27), subjective town size (21,5% big city, 3,4% suburb of big city, 26,7% average town, 24,7% small town, 8,9% big village, 14,3% small village).

6.6. The method

Methodologically we rely on Principal component analysis to study the structure of attitudes to environmental protection and climate change. Namely, we are interested in whether the agendas of environmental protection and climate change represent one or two different agendas in the minds of the representative sample of the population in the Czech Republic. In theory, the agenda of climate change represents a subset of the agenda of environmental protection. However, the literature review suggested that according to the media presentation and the non-availability of personal experience, they may present two different agendas.

Second, we conduct ordinal regression analyses to test the factors associated with environmentally conscious behavior according to the scheme presented in Table 23 and formula (1).

$$Behavior_i = logit(a_0 + a_{1-3}Environment + a_{4,5}Climate + a_{6-8}EU + a_{9-15}Info + a_{16}Standart + a_{17}Gender + a_{18}Age + a_{19}Political\ orientation + a_{20-22}Education + a_{23-27}Town\ size + e \quad (1)$$

Where

Behavior$_i$ – stands for the frequency of conducting environmentally conscious activities consequently (buy organic food, buy locally produced food, when buying products you are guided by whether they are environmentally friendly, hand in, sort your hazardous waste, sort your regular waste, limit car journeys to protect the environment, save energy and water to protect the environment, for the distribution of the respondents see Table 3)

Environment – three variables capturing environment protection attitudes, namely: 1) the extent the environment protection is urgent, 2) the level of satisfaction with the environment in the locality of the respondent, 3) the extent the respondent has sufficient information about how to behave in an environmentally friendly way (for the distribution of the respondents see table 2)

Climate – stands for two variables reflecting concerns about the effects of climate change and whether the respondents believe that people's behavior can change climate change *((for the distribution of the respondents, see table 2)*

EU – stands for the three variables reflecting the attitude to EU policies: whether European integration in the fields of economy and environment is beneficial or harmful, and the extent to which the respondents trust the EU.

Info – stands for the six variables reflecting the frequency the respondents follow social life in the following media: TV, printed newspapers and magazines, radio, online news serves, social networks, and offline discussions (for the distribution of the respondents, see table 3).

Standard – subjective standard of living of the respondents (very good to very bad, five-point scale)

Gender and Age – stands for the gender and age of the respondents

Political orientation – political orientation (left-right, eleven-point scale)

Education – education dummies (primary, secondary w/o state exam, secondary with state exam, higher; higher education is reference variable)

Town size – dummies for subjective town size (big city, suburb of big city, average town, small town, big village, small village)

The bivariate correlations between the variables above are presented in Appendix 1.

6.7. Results and discussion

6.7.1. Results

Before conducting ordinal regression, we run principal components analysis for the indicators of concerns with the environment and climate to study the internal structure represented by components.

6.7.1.1. Concerns with the environment and climate change. The principal component analysis

As environmental protection and climate change largely represent different agendas in the media, we conducted correlation analysis and Principal component analysis for the indicators of environmental concerns and the concerns with climate change.

The Principal Component Analysis of climate change indicators and environmental concerns are presented in tables 4 and 5. An Eigenvalue of 1 or higher determined the number of factors extracted. The Bartlett test of sphericity with a Chi-Square value 163,50 ($p < 0,001$) and Kaiser-Meyer-Olkin Measure of sampling adequacy was equal to 0,550 (>0,5), suggests that that the data are suitable to identify factor dimensions.

Table 4 The Principal Component Analysis of concerns with the environment and climate change. Rotated component matrix

	Component	
	1	**2**
Behavior affects climate	**0,786**	-0,006
Concerns about climate change	**0,743**	-0,221
Satisfaction with the environment in locality of residence	-0,105	**0,780**
Urgent areas - environment	-0,215	**0,608**
Enough info about environment	0,372	**0,487**

Table 5 The Principal Component Analysis of concerns with the environment and climate change. Total variance explained

Component	Rotation Sums of Squared Loadings		
	Total	% of variance	Cumulative %
1	1,365	27,3	27,3
2	1,264	25,278	52,579

Extraction Method: Principal Component Analysis.

The results suggest that perceptions of climate change and environmental concerns present two largely independent categories (slight correlation was reported only in the case of concerns about climate change on the one hand and satisfaction with the environment of the respondent in the locality where he lives and perception that environment is an urgent issue, see appendix 2)

The correlation matrix of environmentally conscious behavior and concerns about the environment and climate change is presented in Appendix 2.

The results of ordinal regression (logit) according to formula 1 are presented in Table 6.

Table 6 Environmentally conscious purchasing as predicted by environment protection, concerns about climate change, EU policies, exposition to media, and socio-demographics. Results of ordinal regression analysis

	Buys organic food		**Buys local food**		**Buys environmentally friendly products**	
	Estimate	Sig.	Estimate	Sig.	Estimate	Sig.
Threshold=1	0,631	0,483	-0,209	0,821	-0,75	0,387
Threshold=2	**3,1*** **	**<,001**	**3,262** **	**<,001**	1,349	0,117
Threshold=3	**5,654*** **	**<,001**	**5,787** **	**<,001**	**3,168*** **	**<,001**
Environment protection						
Urgent areas - environment	-0,005	0,960	**-0,235***	**0,031**	**-0,243***	**0,011**
Satisfaction with the environment	-0,131	0,303	**0,383** **	**0,004**	0,209	0,098
Enough info about environment	-0,034	0,784	**0,261***	**0,046**	**0,269***	**0,030**
Concerns about climate change						
Behaviour affects climate	0,056	0,770	**0,449***	**0,023**	0,063	0,738
Concerns about climate	**0,467*** **	**<,001**	0,076	0,532	**0,516*** **	**<,001**
EU policies						
EU integration, environment	**0,298***	**0,024**	0,019	0,891	**0,283***	**0,031**
EU integration, economy	0,031	0,815	-0,016	0,910	-0,122	0,356
Trust to EU	0,137	0,292	0,026	0,849	-0,087	0,490
Political orientation (left-right)	**-0,143*** **	**<,001**	**-0,149*** **	**<,001**	**-0,112** **	**0,005**
Exposition to media						
TV	-0,182	0,052	-0,118	0,229	**-0,244** **	**0,008**
Printed media	**0,226** **	**0,005**	0,067	0,416	0,120	0,130
Radio	-0,004	0,958	0,056	0,441	-0,022	0,754
Online news	0,018	0,826	0,108	0,202	-0,054	0,502
Online discussions, blogs	**0,209***	**0,014**	0,052	0,565	**0,252** **	**0,003**
Social networks	**-0,166***	**0,036**	**0,005***	**0,951**	-0,042	0,587
Offline discussions	0,106	0,169	-0,018	0,820	0,055	0,468
Socio-demographics						
Standard of living	0,034	0,770	0,127	0,293	0,036	0,749
Gender (men)	**0,371***	**0,038**	**0,381***	**0,041**	**0,479** **	**0,007**
Age	**0,022*** **	**<,001**	0,001	0,846	-0,004	0,586

Table 6, continued. Environmentally conscious purchasing as predicted by environment protection, concerns about climate change, EU policies, exposition to media, and socio-demographics. Results of ordinal regression analysis

	Buys organic food		Buys local food		Buys environmentally friendly products	
	Estimate	Sig.	Estimate	Sig.	Estimate	Sig.
Education						
Basic	**0,779***	**0,027**	**0,821***	**0,023**	-0,024	0,944
Secondary w/o state exam	**0,733****	**0,004**	**0,687***	**0,011**	0,048	0,847
Secondary with state exam	**0,567***	**0,016**	0,393	0,120	0,139	0,547
Subjective town size						
Large City	**0,919****	**0,003**	**0,712***	**0,027**	0,061	0,841
Large city suburb	0,495	0,347	**-1,450****	**0,008**	-0,842	0,107
Average town	**0,672***	**0,022**	-0,273	0,374	-0,258	0,369
Small town	**0,571***	**0,049**	-0,401	0,192	-0,214	0,454
Big village	0,612	0,100	-0,275	0,484	-0,095	0,799
N	531		531		505	
Sig		<,001		<,001		<,001
Pseudo R-Square						
Cox and Snell	0,232		0,176		0,161	
Nagelkerke	0,257		0,201		0,175	
McFadden	0,113		0,093		0,069	

*Link function: Logit., reference variables: women, higher education, small village. *** significant at the 0.001 level (2-tailed). ** significant at the 0.01 level (2-tailed). * significant at the 0.05 level (2-tailed). Source: own computations based on data (Sociologický ústav. Akademie věd ČR. 2021)*

Table 7 summarizes the results presented in table 6.

Table 7 Predicting environmentally conscious consumption. Results of ordinal regression analyses. Statistically significant associations on conventional levels (5%, 1%, 0,1%). Brief summary.

	Frequency of purchasing of		
	Organic food	Local food	Environmentally friendly products
Environment protection			
Urgent areas - environment		+	+
Satisfaction with the environment		+	
Enough info about environment		+	+
Concerns about climate change			
Behavior affects climate		+	
Concerns about climate	+		+
EU policies and political orientation			
EU integration, environment	+		+
EU integration, economy			
Trust to EU			
Political orientation (left-right)	+ (right)	+ (right)	+ (right)
Exposition to media			
TV			-
Printed media	+		
Radio			
Online news			
Online discussions, blogs	+		+
Social networks	-	+	
Offline discussions			
Socio-demographics			
Standard of living			
Gender (women)	+	+	+
Age	-		
Education			
Basic	-	-	
Secondary w/o state exam	-	-	
Secondary with state exam	-		
Town size			
Large City	-	-	
Large city suburb		+	
Average town	-		
Small town	-		

Note: + denotes positive association, - denotes negative association. The signs of the associations might be different from the signs of coefficients presented in tables 6 and 7 as they reflect the encoding of the variables. Reference variables: men, higher education, small village. The exact wording of the associations depicted in the table is presented in Appendix 3.

Environment protection attitudes predicted a higher frequency of purchasing local products and environmentally friendly products (Table 7). However, environmental protection indicators were not associated with purchasing of organic food. Concerns about climate change predicted higher purchasing of organic food and environmentally friendly products but were unrelated to purchasing local food. On the other hand, the perception that behavior can affect climate predicted higher purchasing of local food (Table 7).

The positive attitude to EU integration predicted higher purchasing of organic food and environmentally friendly products but was unrelated to local food purchasing. Right-wing political orientation predicted higher values in all three indicators of green consumption.

The impact of the exposition to the media provided a controversial picture as printed media and online discussion forums and blogs predicted higher purchasing of organic food and environmentally friendly products. In contrast, exposure to social media negatively impacted organic food purchasing. However, the frequent use of social networks positively predicted purchasing of local food. Surprisingly, frequent exposition to TV negatively predicted purchasing of environmentally friendly products.

Age, gender, and education were also associated with green purchasing. Women engaged more in environmentally conscious purchasing than men. Higher-educated respondents purchased more organic and local food. Age was related to lower organic food purchasing. People living in small villages purchase more organic food than those living in other settlements.

6.7.1.2. Discussion

The literature suggested six major factors impacting environmentally conscious consumption – (1) economic incentives and possibilities, (2) socio-demographic segmentation, (3) values emotions and personal responsibilities, (4) sources and sufficiency of information, including education and mass media, (5) factors related to locality of the respondents including lifestyles (Peattie, 2010). Empirical studies report that some of the factors contradict each other, making the effects unpredictable. This study researched the effects of the environment- and climate-related values, political preferences, economic position (measured by the standard of living), information (whether the respondent has enough information about the environment, education, exposition to mass-media), and socio-demographic values.

The results of the principal component analysis suggest that the population considers the agendas of climate change and environmental protection as two different agendas. While environmental degradation is evident to the public, the disadvantages of climate change are less direct. Moreover, the presentation of climate change in the media results in polarization of opinions both on the existence and long-lasting nature of climate change and on the negative effects of climate change (Matakos, et al., 2017; Li, et al, 2013; Gubanov and Petrov, 2019). Some people believe climate change presents more advantages than disadvantages in the Czech Republic as temperature increase may reduce the necessity to heat houses in winter and possibly allow to collect two harvests per year (Cabelkova et al., 2022).

In general, the interest of Czech respondents in climate change issues is rather low. Only 20% of the respondents reported that they were interested or rather interested (ibid.). Despite the little interest, 86% of the respondents believe the change is happening (the climate has changed during the last 100 years, ibid.)

The difference in environmental protection and climate change agendas was most reflected in the frequency of buying organic food. Surprisingly, the propensity to purchase organic food was predicted by concerns with climate change but was unrelated to all three indicators of environmental protection. The organically managed farms were previously shown to mitigate climate change through the reduction of N2O emissions from soils (the potential was reported to be about 20% of emissions, Scialabba and Müller-Lindenlauf, 2010) and carbon sequestration (the potential is about 40–72% of the world's current annual agricultural greenhouse gas (GHG) emissions, ibid.). On the other hand, the yields from organic farming proved to be lower, and if the whole cycle of production is taken into account, the benefits of organic farming from the reduction of GHG emissions are not that certain.

The lack of association between indicators of environmental protection and the frequency of purchasing organic food is intriguing, as, previously, the association was rather supported by the literature (Janssen, 2018; for the review, see Suciu et al., 2019). We can hypothesize that previous authors included climate change in the definition of environmental concerns.

The perception of EU integration positively predicted purchasing organic food and environmentally friendly products. The EU organic certificates and Ecolabelling may play a large role. However, local food purchasing was not associated with EU policies, possibly reflecting the lack of visibility of EU policies.

The role of mass media in environmentally conscious purchasing proved to be very controversial. Larger exposure to printed media, online discussions, and blogs positively predicted purchasing organic food and environmentally friendly products. The exposure to social networks reduced buying organic food, and surprisingly, exposure to TV reduced purchasing environmentally friendly products.

The role of social networks needs more attention as exposure to this media negatively affected buying organic food and sorting common waste, though it positively predicted purchasing local food. The propensity of social networks to form information bubbles may create these phenomena, which need to be studied.

The negative effect of TV on purchasing environmentally friendly products needs to be studied from the traditional journalistic point of view. The presentation of the environmental agenda is subject to numerous biases starting from the topic, through the way of presentation, and ending with conclusions and socially desirable outcomes. From this point of view, it is even more alarming that the media negatively affect environmentally conscious behavior. We can hypothesize that there might be certain self-selection. In many cases, people most exposed to TV have it as a background to other activities rather than actively watching. Thus, the sole fact of exposition might define the group as people working with the information differently, which may also correlate with a lack of environmental concern. TV exposure as a factor of self-selection needs to be analyzed. We also suggest that TV advertisements often emphasize low price rather than environmental benefits, making consumers more price sensitive and less willing to pay a premium for green products.

The positive effect of right-wing political orientation on environmentally conscious purchasing, similar to the attitude to EU integration, presents the political aspect of the environmental efforts.

6.8. Conclusion

Green purchases are indispensable for environmental protection and combatting climate change. The relevant information is, in most cases, distributed to the general public via education, mass media, green marketing, certification, and labeling. In Europe, the EU plays a major role in determining environmental policies and the provision of relevant certificates.

The existing literature established that attitudes to environmental protection and climate change, among other factors such as values, beliefs, lifestyles, and orientations, significantly affect the propensity of the population for green purchasing (Wijekoon and Sabri, 2021), though certain green attitude-behavior gap, (Witek, 2019; Wang, et al., 2019) limits the applicability of these findings. On the other hand, the intention to purchase and the purchase itself are shown to be driven by the same determinants (Janssen, 2018). In this field, research on the media's role in green purchases is still largely missing (Chen et al., 2019).

This paper studied the effects of attitudes to environmental protection, climate change concerns, and EU integration, and mass media (traditional and new ones) on the reported frequency of green purchases of households. Predictably, environmental attitudes and climate concerns positively predicted green purchases. The EU integration was the most important in the sense of environmental integration.

However, the most problematic effects were shown on the side of mass media as the exposure to TV and social networks diminished green purchasing. We suggest that information bubbles that polarize opinions (most frequent in social networks) cause this unfortunate outcome (see also Pearce et al., 2019). Besides the content, the negative effect of TV might be caused by significant self-selection or inappropriate advertisement that primarily emphasize the price Both of these effects need to be studied. In any case, more efforts must be made by the TV and social networks to increase the population's awareness on green products.

The impact of the paper is twofold. First, the paper contributes to the empirical literature on green consumption by analyzing value, information, and media factors affecting green consumption. Second, the paper poses significant problems to policymakers and media experts. As exposition to TV and social networks was shown to diminish green consumption, policymakers and journalists need to concentrate on these two media channels to reverse the unfavorable trends. Especially video-content, so vital for green consumption intentions

(Ramkissoon and Smith, 2014), should be analyzed and modified accordingly in these two media outlets.

Limitations and suggestions for further research

The biggest limitation of this research is the discrepancy between the positive attitude and actual green purchases ('green purchasing inconsistency' or 'green attitude-behavior gap, Witek, 2019; Wang et al., 2019; Joshi and Rahman, 2015). However, this problem is partially reduced by the fact that the questions in the questionnaire were formulated as the frequency of actual purchasing rather than the intention to purchase. Moreover, the intention to purchase and the purchase itself are shown to be driven by the same determinants (Janssen, 2018).

The impact of the mass media (online and offline) on environmentally conscious consumption showed the biggest controversy, which needs to be studied further. TV and Social networks proved to reduce several indicators of environmentally conscious consumption. We suggest that the nature of these effects is twofold and may not necessarily be related to the content. First, the frequent use of both media implies certain self-selection. Second, especially in the case of social networks, the role of information bubbles and polarizations needs to be studied. In the case of TV, we can hypothesize that many of the respondents, who report watching TV on a daily basis, use TV programs as a background to their daily activities. The emotional need of this background may define the group.

On the other hand, there might be a considerable percentage of people watching TV news on a daily basis. Given the existence of alternative news sources, this group also may share certain characteristics that distinguish them from others and define the negative association between the frequency of watching and environmentally conscious behavior.

The other avenue for further research may lie in the area of political preferences. The role of political orientation and the perception of EU integration proved to be significant factors for purchasing decisions but not for saving resources or waste management. These effects need to be explained

Citation:

Hlaváček, M., Čábelková, I., Brož, D., Smutka, L., & Prochazka, P. (2023). Examining green purchasing. The role of environmental concerns, perceptions on climate change, preferences for EU integration, and media exposure. *Frontiers in Environmental Science*, *11*, 1130533.

7. The moderating role of perceived health risks on the acceptance of Genetically Modified Food..

7.1. Introduction

Hunger, malnutrition, and population growth are some of the world's most pressing challenges today (Verma et al.,2022). To date, over 820 million people are food-insecure – in 2018, one in nine individuals on the planet suffered from malnutrition. Genetically modified crops are a potential solution to the lack of food as they are more resistant to pests and diseases (Talakayala, 2020; Yali, 2022), can be engineered to produce higher yields and promise improved nutritional profile including, e.g., higher protein share (Gbashi, 2021; Vega et al., 2022), have lower production costs (Azadi and Ho, 2010; Ekici and Sancak, 2012), are more adaptable to climate change (Zaidi et al., 2019; Garland, 2021), provide the opportunity to reduce food waste as they have a longer shelf life (Kamthan et al.,2016; Islam et al., 2020; Asrey et al., 2021). Moreover, they may be more delicious and better textured (Kamthan et al.,2016; Islam et al., 2020; Asrey et al., 2021).

Yet, the public and governments are reluctant to adopt genetically modified foods (GMF). The reasons include health risks (Zhang et al., 2016), the possible harm to the environment and biodiversity (Tsatsakis et al., 2017), ethical, moral, and religious aspects (Knight, 2009; Kumar and Yadav, 2021; Green, 2023). This reluctance continues despite unanimous conclusions from some risk assessment research that GMFs are as safe as conventional crops regarding human and animal health (Smyth et al., 2021). The media provide a blurred picture of GMF safety, where the campaigns against GMFs often follow campaigns for GMFs.

This paper aims to assess the power of environmental concerns, health risks, and information in predicting public acceptance of GMF, employing the representative sample of the Czech population (N=884). The statistical model is constructed according to the principles of the Behavioral Change Model and the Health Belief Model. Methodologically we rely on hierarchical ordinal regression analysis to assess predictors of willingness to buy GMF, taste

GMF, and the perceived morality of GMF. We also perform principal component analysis to reduce the dimensionality of the indicators of environmental concern.

The paper is structured as follows. The first sections discuss the main points of public discussion on GMF. The brief description of the principles o Behavioral Change and Health Belief models helps build the statistical model. Then, we describe the data, methods, and results. The final section provides the discussion and concludes.

7.2. The public discourse on GMF

Public discussions on genetically modified foods (GMFs) have been characterized by diverse and often conflicting opinions. While some individuals and interest groups embrace GMFs as a potential solution to address global food security challenges, others express concerns about their possible health and environmental risks. Ethical considerations, corporate control of the food system, labeling requirements, and potential economic implications have also been central themes in public discussions on GMFs.

7.2.1. The Health risks

Health risks have been addressed since GMFs first entered the market (Ozkok, 2015; Gizaw, 2019; Krimsky, 2019). Three primary health risks potentially associated with GM foods are most commonly cited: toxicity and allergenicity (Zhang et al., 2016). For example, shortly after the introduction of transgenic corn to the market, there followed several consumer reports of food allergy symptoms (headaches, diarrhea, nausea, and vomiting) that were thought to occur specifically after consuming products containing GM corn (Bernstein et al., 2003; Dona and Arvanitoyannis, 2009).

The other major concern is that if GM food alters our diet sufficiently, it may also change our human DNA - either through inserting foreign genes into the human genome or through cumulative changes in our metabolic processes resulting from altered dietary intakes. However, there is no clear evidence that GM food alters human genetics at this point in time (Nawaz et al, 2019). Despite the wide consumption of GM food over two decades, there has been no confirmed case of gene insertion into humans related to GM food intake (ibid).

7.2.2. Effects on environment

GMOs can have a range of potential effects on the environment. These include reduced biodiversity, contamination of non-genetically modified plants and animals with genetically modified organisms, disruption of natural ecosystems by the widespread introduction of GMOs, and reduced effectiveness of certain pest deterrents. Additionally, risks may be associated with the unintended transfer of genes between species that could lead to unpredictable effects on the environment and food webs (Tsatsakis et al., 2017). On the other hand, the positive effects of GM crops include the decreased use of herbicides, pesticides, and other chemicals for food production.

7.2.3. The ethical and moral aspects of GMF

Other criticisms of GMF include moral and ethical issues (Knight, 2009; Kumar and Yadav, 2021; Green, 2023). Many people feel that genetically modified food is immoral because it goes against the natural order of food production. Genetically modified food (GMO) usually involves the alteration of a food's DNA in order to make it more nutritious or resistant to certain diseases, pests, or environmental stressors. Many see this manipulation of the natural process of food production as a violation of the principles of nature. Furthermore, there are concerns about potential long-term health risks associated with consuming genetically modified foods and cross-pollination that can result in unintended environmental consequences. For these reasons, many people consider genetically modified food immoral. Thus, the problem of positive acceptance of GM foods is caused not only by ethical principles but also by concerns of a biological nature related to the complexity of the processes involved (Kosicka-Gębska and Gębski, 2009; Ekici and Sancak, 2012).

For some cultures, religion plays a strong role in determining what is acceptable for human consumption. In these cultures, genetically modified foods may conflict with religious beliefs, making them less likely to be accepted by the general population (Streiffer and Hedemann, 2005; Chen and Li, 2007). Many people who believe in God also express concern about GMOs because they often require to interfere with natural processes and upset the balance of nature. Some worry that these technologies are beyond human control, as genetic manipulation can never be fully foreseeable or accounted for, while others view it as a form of "playing God" by usurping a role that should belong only to the divine. Even those who do not oppose genetically modified foods out of religious conviction may reject them out of respect for nature or fear

about possible unknown dangers posed by their consumption. As GMOs continue to increase commercial use, discussions surrounding ethics and belief will undoubtedly become more closely entwined - informing decisions that affect public policy and consumer choice.

7.2.4. The effects of information

Although some research suggests that growing and producing modified products results in lower production costs (Azadi and Ho, 2010; Ekici and Sancak, 2012), many consumers prefer the more expensive non-GM options on principle rather than for functional reasons. Consistent with the previously reported low public acceptance of GM foods, consumers with much subjective and little objective knowledge are most willing to pay for non-GMO foods (Rihn et al., 2021).

Many people lack knowledge of the scientific evidence supporting or rejecting GM technologies. The conflicting views of proponents and opponents of GM expressed in media debates and deliberate actions against GMF led by NGOs have contributed to widespread public confusion (Sikora and Rzymski, 2021). Social networks transmit information about the negative effects of GMFs that are not always scientifically based, adding to the confusion (Jiang and Fang, 2019). Despite knowing little about GMOs, parents shape their children's perceptions of GMOs (Shtulman et al., 2020). Several studies (Moon and Balasubramanian, 2004; Moerbeek and Casimir, 2005; Vilella-Vila et al., 2005) have empirically demonstrated a direct link between knowledge and attitudes, revealing that there is a direct and positive relationship between increasing knowledge of GM technologies and increasing support for GM applications (Costa-Font et al., 2008). For this reason, awareness campaigns can create an informed public and a more objective view of the risks and benefits associated with these products. However, it should be noted that the influence of knowledge is moderated by perceptions of the immorality of genetic modification rather than political or religious views (Hasell and Stroud, 2020).

Some studies have questioned the direct link between scientific knowledge and attitudes, showing that the correlation between science-based information on GMF and adequate public perceptions remains weak and, in some cases, non-existent (Diamond et al., 2020). Government regulatory policies and laws regarding the cultivation and sale of genetically modified products will also affect public acceptance, as consumers who disagree with government policies could protest against these products even if they are not directly involved.

7.2.5. The role of the state

The above risks perceived by consumers can be partially mitigated by trust in regulatory institutions, scientists, and industry, as well as public trust in government and corporations (Frewer et al., 2004; Lindberg et al., 2023; Pechar et al., 2018). However, many people distrust the large corporations that control much of the production of genetically modified foods, seeing them as motivated by profit rather than safety or health benefits. The specific actor most often cited is Monsanto (Mintz, 2017). Monsanto has overshadowed other biotechnology companies in mentions and has often been referred to as an icon of all the supposed ills of the industry (Haspel, 2013; Mintz, 2017). This situation can lead to skepticism about whether genetically modified foods are safe for consumption. Therefore, a common concern among consumers is the change in food quality, unfair competition from GMO and non-GMO suppliers, biopiracy, etc. (Ozkok, 2015).

7.3. The aim of the paper and hypotheses

Following the public discussion above, this paper aims to assess the role of health risks, environmental concerns, and information in predicting the public acceptance of GMF. Central hypotheses are formulated as follows:

H1: GMF acceptance is predicted by environmental concerns

H2: GMF acceptance is negatively predicted by perceived health risks

H3: GMF acceptance is predicted by the availability of relevant information and interest in the subject.

7.4. Materials and methods

7.4.1. The model

The model is constructed employing the principles of the Health Belief Model and Behavioral Change Model.

7.4.1.1. The Health Belief Model and Behavioral Change Model

The Health Belief Model presents four major constructs that govern people's behavior related to health outcomes: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers (Champion and Skinner, 2008). The impact of these constructs on health-

related action is then modified by socio-economic conditions (such as age, gender, education, personality, and standard of living) and knowledge of the subject. In our case, the perceived susceptibility and severity are approximated by the current state of heals and the beliefs on the impact of GMF on health. The benefits are related to the importance of various aspects of food purchasing and consumption, such as price, ingredients, frequency of food purchasing, the importance of self-catering, etc. (see the indicators presented in the next sections). We suggest that the introduction of GMF lowers the price (Bouis, 2013), and properties of GMF may make food consumption easier (for example, through longer shelf life and easier storage, which will lower the need for frequent food purchasing, Shetty et al. 2018). The effects of information are then controlled by the indicators of information on GMF. Socio-economic and personality effects are approximated by age, gender, education, town size, standard of living, life satisfaction, and belief in God.

The behavioral change model presents a more general idea of the factors impacting behavioral outcomes. Here the behavior is predicted by knowledge, awareness and attitudes, and socio-demographics (Boudreau, 2010; Hungerford and Volk, 1990). In our case, the possible environmental outcomes of GMF production and environmental concerns. We combine both approaches to construct the following model:

Figure 8. The model and hypotheses (Hj.i)

GMF attitudes		Impacting factors
• Willingness to purchase GMF (H1.i) • Willingness to taste GMF (H2.i) • Perceived morality of GMF (H3.i)	Are impacted by (HJ.i) ⇐	• Health risks (Hj.1-4) • Health state (Hj.5) • Environmental concerns (Hj.6-9) • Information about GMF(Hj.10-12) • Food characteristics are important when purchasing (Hj.13-17) • Food habits (Hj.18-20) • Socio-economic characteristics • Life satisfaction • Belief in God.

Source: authors, based on the principles of the Health Belief Model and Behavioral Change Model

7.4.1.2. The model

We apply hierarchical ordinal regression analysis to test the hypotheses presented in Graph 6.

The hierarchical part of ordinal regression analysis included two steps. First, we tested the model with all the explanatory variables according to formula 2.

$$GMF\ Attitudes = Logit\ (a_0 + a_{1\text{-}3}\ Information + a_{4\text{-}8}\ Health + a_{9\text{-}12}\ Environment + a_{13\text{-}17}\ Food\ Purchasing + a_{18\text{-}20}\ Food\ habits + a_{21\text{-}27}\ Socio\text{-}demographics + e) \quad (2)$$

On the second stage we excluded the group of variables related to health effects and computed ordinal regression according to the following formula (3):

$$GMF\ Attitudes = Logit\ (a_0 + a_{1\text{-}3}\ Information + a_{9\text{-}12}\ Environment + a_{13\text{-}17}\ Food\ Purchasing + a_{18\text{-}20}\ Food\ habits + a_{21\text{-}27}\ Socio\text{-}demographics + e) \quad (3)$$

Where

GMF Attitudes - Would buy food with a GM ingredient, Would taste approved GMF, Genetically modifying crops are morally unacceptable

Information - Have heard about genetically modified crops, Interested in GMF, Have enough information about GMF.

Health - Own state of health, Consuming GMF is safe, The health effects of GMP are sufficiently researched, Consuming GMP can change human DNA, GMF can endanger human health

Environment - *the* importance of the impact of food production on the environment, reduces waste, saves resources to protect the environment, recycles.

Food Purchasing – the importance of origin, package material, price, ingredients, and package size.

Food habits - Food consumption is important, Frequency of food purchasing, Number of meals per day

Socio-demographics – Gender, Age, Education, Town size, Household standard of living, Life satisfaction, Belief in God

The description of the variables above is presented in the section Indicators.

We compared the pseudo-R-square of both models and inferred the moderation effects of the excluded variables.

7.4.2. The data

The data were collected in July 2021 in a survey entitled Food 2021 (Potraviny 2021) conducted by the Czech Institute of Sociology. A total of 884 respondents representing the population of the Czech Republic (aged 18–90 years, M ± SD: 48,17 ± 17,72; 53,40% women, 18,04% with higher education) answered the questions in the questionnaire voluntarily and anonymously under the supervision of 139 experienced interviewers (combination of PAPI (68%) and CAPI (32%) interviews). As the quality of the filled-out questionnaires was considered very good, all the questionnaires were included in the data sample. All participants were Czech native speakers living in the Czech Republic. Respondents were selected by quota sampling. Quota features were Region (NUTS 3), size of place of residence, gender, age, and education. The data sample is representative of the Czech Republic. The data were kindly provided by the Czech Social Science Data Archive (Sociologický ústav. Akademie věd ČR. 2021).

7.4.2.1. Indicators

7.4.2.1.1. GMF attitudes

The GMF attitudes are studied in three aspects – the willingness to purchase GMF, the willingness to try GMF, and the moral acceptability of GMF. The relevant questions in the questionnaire were formulated as follows:

"To what extent do you agree or disagree with the following statements?

- *If you discovered that you had a food item in your shopping cart containing an ingredient from genetically modified crops, you would still buy it.*
- *Genetically modifying crops is morally unacceptable.*
- *If you had the chance, would you taste an approved and verified food from genetically modified crops?" (Sociologicky ustav, 2021)*

Table 8 Indicators of attitudes for GMF. The distribution of the respondents (%)

Question	definitely agree	rather agree	undecided	rather disagree	definitely disagree	no opinion
Would buy food with a GM ingredient	8,3	27,1	21,3	16,1	10,7	16,6
Would taste approved GMF	definitely yes	rather yes	rather no	definitely no	no opinion	
GMFs are morally unacceptable	10,9	13,5	30,4	15,4	7,5	22,3
	3,1	10,9	25,7	60,4		

Note: Given the relatively high number of people with no opinion about the perception questions, we added these people to the group of people "undecided" where possible (this is category 3 on the 5-point Likert scale)

Table 8 shows that the fear of the population of GMF is rather mild – 62% of the respondents are willing to taste GMF. However, the willingness to buy is rather small - only 35% of the respondent would buy GMF. The biggest ambiguity concerned the perceived moral acceptance of the GMF – 52% of the respondents did not have an opinion, or were undecided.

7.4.2.1.2. Information about GMF

Information is essential for opinion creation. In this study, we employ indicators for the availability and sufficiency of this information, and we also control for the level of interest in the topics. The indicators, the scales, and the distribution of the respondents are presented in Table 2.

Table 9. Indicators of GMF information. The distribution of the respondents (%)

Have heard about GMF	No	Yes, but does not know what it refers to	yes, and roughly knows what it involves	yes, and knows well what it involves	
	27,7	31,9	33,4	6,8	
Interested in GMF	definitely yes	rather yes	rather no	no	does not know
	3,3	12,7	32,9	48,4	2,6
Have enough information about GMF	definitely enough	rather enough	rather not enough	definitely not enough	does not know
	3,1	14,1	32,5	40,8	9,4

The respondents who answered "do not know" were excluded from further analysis.

7.4.2.1.3. Perceived GMF effects on health

The literature suggests that the perceived effects on health are one of the most important informational problems affecting legislation and public use of GMF. Table 10 summarises the indicators used in this paper.

Table 10 Indicators of perceived GMF effects on health. The distribution of the respondents (%)

own state of health, assessment	very good	good	average	bad	very bad	
	20,00	42,30	29,30	7,50	0,90	
Consuming GMF is safe.	definitely agree	rather agree	undecided	rather disagree	definitely disagree	No opinion
	4,30	18,40	26,80	16,20	8,90	25,10
The health effects of GMP are sufficiently researched.	definitely agree	rather agree	undecided	rather disagree	definitely disagree	No opinion
	5,90	22,50	21,60	15,50	7,90	26,50
	definitely yes	rather yes	rather no	definitely no	no opinion	
Consuming GMP can change human DNA	5,40	15,70	21,20	21,40	36,20	
GMF can endanger human health	definitely yes	rather yes	rather no	definitely no	no opinion	
	10,30	24,70	24,40	7,00	33,60	

Note: The respondents with no opinion were joined with the group Undecided for further analysis

7.4.2.1.4. Environmental concerns

The first indicator of environmental concerns studied the subjective level of importance of the impact of food production on the environment (definitely important, 11,10% of the respondents; rather important, 37,30%; rather unimportant, 30,10%; definitely unimportant, 11,00%; and no opinion 3,70%)

Next, we mapped environmental concerns by the frequency of engaging in environmentally-friendly behavior (Table 11).

Table 11 Indicators of environmental concerns. The distribution of the respondents (%)

How often does the respondent	Never	Rarely	Sometimes	Often	Always	No opinion
use own reusable shopping bag	5,50	8,00	16,20	24,20	44,60	1,40
use reusable bags for purchasing fruits and vegetables	41,30	13,90	17,30	12,90	10,70	3,70
use reusable bottles for drinks	33,30	11,80	22,90	17,80	13,10	1,10
use environmentally friendly detergents	17,90	18,60	28,70	17,90	6,20	10,60
prefer purchasing Czech-made foods	7,70	11,80	31,40	32,80	13,10	3,10
pack the food into reusable boxes	28,80	17,20	21,00	20,20	10,40	2,10
avoid single-use plastic products	13,70	15,40	23,80	25,10	19,70	2,30
limit car trips to protect the environment	40,20	23,40	17,80	9,60	4,20	4,50
save energy and water to protect the environment	17,40	19,00	27,80	22,40	11,80	1,50
sort waste	4,60	6,80	15,80	30,90	41,10	0,70
compost	45,10	6,40	13,10	14,90	18,70	1,60

Note. N=727. The respondents with No opinion were excluded from further analysis.

To reduce the dimensionality of the model, we applied the Principal Component Analysis (PCA) to the indicators presented in table 4 and used the regression-based factor scores in further analysis. The results of PCA are reported in the Data transformation section. Three components were extracted: the tendency to reduce and sort waste, save resources, and for recycling.

7.4.2.1.5. The importance of food characteristics when purchasing

Consumers consider a number of characteristics when purchasing their food to various extents. They take into account the ingredients, package material and size, origin, and, obviously, the price (table 12). We hypothesize that these factors are also important predictors of attitudes to GMF.

Table 12. Indicators of the importance of food characteristics when purchasing

	Mean	Std. Deviation
origin	3,1	1,479
package material	4,89	1,298
price	2,22	1,438
ingredients	2,78	1,412
package size	3,48	1,472

N=799, Min=1 (very important), Max=6 (least important)

7.4.2.1.6. The importance of food and food habits

The indicators of the subjective importance of food and food habits are presented in table 13.

Table 13 Indicators of the importance of food and food habits. The distribution of the respondents (%)

Food consumption important	definitely important	rather important	rather unimportant	definitely unimportant		
	43,30	43,00	9,80	3,40		
Frequency of food purchasing	daily	several times a week	1x a week	1x per 14 days	less than 1x per 14 days	No answer
	9,80	50,80	23,50	5,50	3,50	6,70
Number of meals per day	one meal	two meals	three meals	four meals	five meals	more than five
	0,10	8,50	39,90	30,70	16,40	4,10

7.4.2.1.7. Socio-economic characteristics of the respondents and other

We control for gender, age, and education (age 18–90 years, M ± SD: 48,17 ± 17,72; 53,40% women, 18,04% with higher education), subjective town size (from a big city to small village), the household standard of living (very good, 13,l2%; rather good, 45,5%; neither good nor bad, 33,9%; rather bad, 6,4%; very bad, 0,9%), life satisfaction (very satisfied 20,8%; rather satisfied, 50%; neither satisfied nor dissatisfied, 21,3%; rather dissatisfied, 5,7%; very dissatisfied 1,2%), and belief in God (69,9% non-believers).

7.4.3. Data transformations and treatment of missing values

As the level of information on GMF is still low, some questions exhibited high numbers of respondents with no opinions. As stated in the previous chapters, we joined the respondents with No opinion with the group Undecided. This data transformation forms one of the limitations of the study. In case there was no option "undecided," the respondents with No opinion were excluded from further analysis.

7.4.3.1. Data transformations. Environmental concern. The principal component analysis

In order to reduce the dimensionality of the model, we applied the Principal Component analysis to the set of variables representing the respondents' actions to protect the environment

(Indicators of environmental concerns, Table 10). An Eigenvalue of 1 or higher determined factor extraction and all variables were extracted as expected. The Bartlett test of sphericity with a Chi-Square value of 1716,968 ($p < 0,001$) and Kaiser-Meyer-Olkin Measure of sampling adequacy was equal to 0,852 (>0,8), suggests that the data are suitable to identify factor dimensions. The two factors extracted cumulatively explain 54,095 % of the total variance. The rotated component matrix is presented in Table 14.

Table 14. The rotated component matrix for components describing indicators of environmental concern

	Question:	Component		
	How often does the respondent	1	2	3
Reduce waste	sort waste	0,765	0,059	0,179
	use own reusable shopping bag	0,623	0,138	0,055
	prefer purchasing Czech-made foods	0,614	0,326	0,125
Saving resources to protect the environment	limit car trips to protect the environment	-0,062	0,842	0,113
	save energy and water to protect the environment	0,394	0,637	0,136
	avoid single-use plastic products	0,457	0,545	0,101
	use environmentally friendly detergents	0,410	0,523	0,227
Recycling	use own reusable bottle for drinks	0,018	0,127	0,796
	pack the food into reusable boxes	0,177	0,155	0,760
	compost	0,421	-0,078	0,500
	use reusable bags for purchasing fruits and vegetables	0,105	0,367	0,495
% of variance explained		34,25	10,593	9,252

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

The regression-based factor scores for all three components were saved as variables and used for further analysis.

7.5. Results

The results of the first stage of hierarchical ordinal regression analyses are presented in Table 15 below (formula 2), and the second stage in Table 16 (formula 3)

Table 15 Factors predicting GMF consumption. Results of ordinal regression analysis (formula 2)

	Purchase GMF		**Try GMF**		GMF immoral	
	Estimate	Sig.	Estimate	Sig.	Estimate	Sig.
Threshold=1	-1,925	0,201	1,488	0,337	-0,732	0,633
Threshold=2	1,05	0,483	4,371*	0,005	0,673	0,66
Threshold=3	3,268*	0,03	5,820***	<,001	3,785*	0,014
Threshold=4	5,198***	<,001			5,589***	<,001
Information about GMF						
Heard of GMF	**-0,249***	**0,031**	-0,199	0,097	**0,266***	**0,025**
Interested in GMF	-0,206	0,095	0,081	0,523	**0,284***	**0,024**
Enough Info about GMF	0,038	0,643	0,099	0,24	0,033	0,691
GMF effects on health						
State of own Health	-0,135	0,272	-0,143	0,268	-0,047	0,708
GMF is safe	**1,078*** **	**<,001**	**0,778*** **	**<,001**	**-0,753*** **	**<,001**
the effects of GMP on health are scientifically investigated	**0,610*** **	**<,001**	0,17	0,124	-0,233*	0,033
Consuming GMP can change DNA	**-0,254****	**0,001**	-0,154	0,055	**0,346*** **	**<,001**
GMP can endanger his health	**-0,457*** **	**<,001**	**-0,316*** **	**<,001**	**0,563*** **	**<,001**
Environmental concerns						
Effect of food production on environment important	-0,202	0,083	**-0,260***	**0,033**	0,099	0,405
Reduce Waste (component1)	0,038	0,695	**-0,293****	**0,005**	-0,133	0,182
Save Resourse (component 2)	-0,035	0,691	0,06	0,525	-0,048	0,598
Recycling (component 3)	0,084	0,337	0,072	0,424	0,055	0,532
Aspects of food important when purchasing						
Origin	0,028	0,724	0,036	0,664	0,087	0,29
Packaging	-0,137	0,067	-0,089	0,253	**0,173***	**0,024**
Price	-0,024	0,746	0,06	0,43	0,052	0,487
Ingredients	0,075	0,379	0,028	0,751	0,121	0,166
Package size	0,095	0,208	0,071	0,361	0,012	0,874
Food habits						
Number of meals per day	-0,023	0,784	0,103	0,245	-0,1	0,245
Importance of self-catering	0,042	0,727	0,189	0,136	-0,134	0,27
Frequency of food purchasing	0,107	0,269	-0,084	0,414	0,097	0,323
Socio-demographics						

Gender	0,304	0,071	0,05	0,779	-0,01	0,955
Age	0,008	0,133	0,006	0,3	-0,002	0,785
Education	0,133	0,161	0,036	0,71	-0,04	0,676
Town size	0,002	0,97	**0,187****	**0,001**	-0,044	0,432
Household standard of living	-0,056	0,65	0,047	0,714	0,09	0,473
Life satisfation	-0,064	0,617	**0,274***	**0,044**	-0,18	0,171
Non believer in God	0,063	0,733	0,322	0,102	-0,179	0,345
Model Fitting Information, Sig.						
Sig.		<,001		<,001		<,001
N	625		586		622	
Pseudo R-Square						
Cox and Snell	0,51		0,323		0,394	
Nagelkerke	0,538		0,352		0,422	
McFadden	0,242		0,156		0,185	

Note: Link function: Logit. ***-significant on 0,1% level. ** - significant on 1% level, * - significant on 5% level. Components 1, 2, 3 denote the three components of PCA presented in Table 7.

The bulleted results of Table 15 are presented in (Appendix A1). Here we will summarize the findings.

Table 15 suggests that the health risks significantly impact GMF attitudes. The indicators of perceived health risks negatively predicted the willingness to try and purchase GMF and the perceived morality of GMF. The indicators of health risk showed unrelated to checking GMO content at the purchase stage.

Environmental concerns and practices showed unrelated to the willingness to try or purchase GMF, the knowledge of real GMO content in the food he eats, and the perceived morality of GMF (see Appendix A1).

The role of information showed positive - the level of personal knowledge of GMF and the persuasion that GMF is sufficiently investigated positively predicted willingness to purchase GMF; the level of personal knowledge of GMF was associated with higher moral acceptability of GMF. On the other hand, the interest in GMF negatively predicted the perceived morality of GMF.

Contrary to the idea that the respondents might appreciate the benefits of GMF in terms of high price or higher shelf life (the latter enabling them to shop less often), these variables did not appear significant in the abovementioned analysis. Surprisingly, the results suggest that the more important the packaging, the more he considers GM food immoral.

Socio-demographic, economic, psychological, and religious characteristics were not significantly related to GMF attitudes, with two exceptions: town size and life satisfaction are positively related to the willingness to try GMF.

In order to test the predictive (and moderating) power of the perceived health effects of GMF as opposed to other variables, we conducted the second stage of the ordinal regression analyses, where all the variables representing the health effects were excluded from the analysis. The results are presented in table 16.

Table 16. Factors predicting attitudes to GMF. Results of ordinal regression analysis without health risks (Formula 3)

	Purchase GMF		**Try GMF**		**GMF immoral**	
	Estimate	Sig.	Estimate	Sig.	Estimate	Sig.
Threshold=1	-2,515	0,059	0,335	0,811	-1,012	0,489
Threshold=2	-0,492	0,711	2,665	0,059	0,327	0,823
Threshold=3	0,984	0,459	3,841**	0,007	2,191	0,135
Threshold=4	2,223	0,095			3,376*	0,023
Information about GMF						
Heard of GMF	-0,082	0,443	-0,106	0,354	**-0,637*** **	**<,001**
Interested in GMF	-0,029	0,801	0,158	0,19	-0,116	0,361
Enough Info about GMF	0,053	0,483	0,088	0,278	-0,001	0,99
Environmental concerns						
Effect on environment important	-0,071	0,516	-0,214	0,065	-0,061	0,608
Reduce Waste (component 1)	-0,031	0,731	**-0,305****	**0,002**	**-0,515*** **	**<,001**
Save Resources (component 2)	0,012	0,885	0,056	0,531	0,175	0,055
Recycling (component 3)	0,121	0,133	0,081	0,344	**0,209***	**0,021**
Importance when purchasing						
Origin	-0,081	0,283	-0,036	0,653	**0,183***	**0,027**
Packaging	-0,09	0,203	-0,086	0,254	-0,118	0,122
Price	-0,014	0,837	0,067	0,356	-0,131	0,096
Ingredients	0,028	0,725	0,019	0,824	0,034	0,702
Package size	0,025	0,722	0,047	0,529	0,152	0,053
Food habits						
Number of meals per day	0,022	0,78	0,099	0,247	-0,012	0,889
Importance of self catering	0,026	0,814	0,121	0,318	0,043	0,726
Frequency of food purcbhasing	0,159	0,08	-0,02	0,838	-0,056	0,574
Socio-demographics						
Gender (men)	-0,059	0,709	-0,186	0,273	-0,033	0,849
Age	0,01	0,059	0,007	0,195	**0,012***	**0,036**
Education	0,143	0,108	0,053	0,571	0,042	0,669
Town size	0,002	0,969	**0,176****	**0,002**	-0,001	0,981
Household standard of living	-0,028	0,81	-0,002	0,986	-0,078	0,544
State of own Health	-0,066	0,566	-0,068	0,581	0,088	0,488
Life satisfaction	0,012	0,919	-0,143	0,438	-0,154	0,254
Non believer in God	-0,401	0,02	**0,291***	**0,025**	0,375	0,054
Model Fitting Information						
Sig.		0,222		<,001		<,001
N	624		588		626	
Pseudo R-Square						

Cox and Snell	0,043		0,09		0,192	
Nagelkerke	0,046		0,098		0,212	
McFadden	0,015		0,038		0,091	

Note: Link function: Logit. ***-significant on 0,1% level. ** - significant on 1% level, * - significant on 5% level. . Components 1, 2, 3 denote the three components of PCA presented in Table 7.

The results suggest that excluding the variables representing the health effects of the GMF led to significant changes in the predictive power of the models for willingness to purchase GMF. While the original Pseudo R2 ranged from 24% to 51% (depending on the indicator of pseudo R2) and the original models were statistically significant at 0,1% level, the exclusion of health variables led to a reduction of Pseudo R2 to the level of 1-5% and to the loss of statistical significance of the whole model in the case of willingness to purchase. Thus, the results indicate that health effects can be considered the most powerful predictors of the willingness to purchase GMF.

The effect of the exclusion of health variables on the other two regressions was less pronounced as the regressions stayed statistically significant on 0,1% level. However, the variability explained by the model as measured by Pseudo R2 decreased considerably.

The moderating effect of the health risks manifested itself only in the case of one information variable (heard of GMF) when the association before exclusion was positive (more information about GMF positively predicted the perception that GMF is immoral) while after the same association proved to be negative. In addition, some environmental concerns got statistical significance after the exclusion of health effects.

Discussion

The results above pose several essential points. First, the absence of statistical significance regarding the impact of price and food habits on the one hand and attitudes towards genetically modified foods (GMF) on the other may indicate a lack of consumer awareness of the potential positive effects of GMF and an inability to translate this awareness into their daily behavior . It suggests that consumers may not yet fully understand the benefits associated with genetically modified foods and are therefore unable to incorporate them into their daily choices. This knowledge gap can be attributed to the complex nature of the regulatory frameworks governing GMF in many countries. Strict regulations may prevent consumers from directly assessing lower prices or other potential benefits associated with genetically modified products, creating a mismatch between their attitudes and actual purchasing behavior.

Second, the observed lack of statistical significance underscores the need for increased efforts in public education and awareness campaigns regarding genetically modified foods. Governments and relevant authorities should consider initiatives to inform consumers about the potential positive effects of GMF,

emphasizing factors such as affordability and improved food production. Bridging the knowledge gap will allow consumers to make more informed choices and align their attitudes with the real benefits of genetically modified foods. In addition, it calls for a review of existing regulatory frameworks to ensure that they facilitate transparent communication and enable consumers to access and understand relevant information related to genetically modified products.While the public discourse largely relates to the ability of GMF to feed the planet even in less developed countries, GMF's individual contributions to improving consumers' lifestyles in developed countries are less pronounced.

The effect of information on the willingness to try and purchase GMF proved positive, suggesting the information efforts to be the main channel to increase the public acceptance of GMF. The importance of reliable, scientifically supported communication and education from credible sources cannot be overestimated (Herman, et al., 2019) and need to be taken into account when forming strategic approaches to public education (Woźniak-Gientka, et al., 2022). These communication and education strategies will need to consider the group of people, largely interested in the GMF, that consider the GMF immoral (the association between interest in GMF and perceived immorality of GMF proved to be positive). The role of opinion polarization present on social networks needs to be investigated in this respect, as it is possible that the interest in the subject leads these people to discussion groups that consider GMF immoral.

Interestingly, health concerns proved more important for purchasing GMF rather than trying GMF. While the perceived non-safety of GMF and assumed health danger produced by GMF negatively affected both the willingness to purchase and the willingness to try, the idea that consuming GMF can change people's DNA and the perceived lack of scientific knowledge on GMF negatively impacted the willingness to purchase but not the willingness to try. The sole fact that one-fifth of the sample believes that consuming GNF can change human DNA is alarming. If we add the respondents with no opinion, the number will rise to 56%. These people form a receptive substrate to any kind of misinformation produced by social and traditional media sources. Similarly, the perception that the health effects of GMF are not sufficiently researched is speculative and, most likely, promoted in the mass media (Clancy and Clancy, 2016).

The moral and ethical side of GMF is often discussed from the point of view of religion. However, in our case, the perceived morality was not associated with the belief in God.

7.6. Conclusion and discussion

GMF is one of the chances to feed the increasing number of people on our planet. On the other hand, GMF's environmental and health effects still pose several questions to research. The governments and the public are still reluctant to adopt GMF on a large scale, thus limiting the ability to utilize all the positive effects of GMF.

This paper studied the impacts of perceived health risks of GMF, environmental concerns, and information about GMF on the GMF acceptance represented three indicators: willingness to try and taste GMF and the perceived morality of GMF. We also studied the importance of possible positive effects of the GMF as lower price or larger shelf life. The research was guided by the Behavioral Change Model (BCM) and the Health Belief Model (HBM) to understand the factors that shape acceptance of GMF. We employed the representative data of the Czech population (N=884, aged 18–90 years, M ± SD: 48,17 ± 17,72; 53,40% women, 18,04% with higher education) to test the model and hypotheses. Expectedly, the health risks proved to be the most important predictor of the willingness to purchase GMF. The impact of health risks on willingness to try was less pronounced. The environmental risks of GMF, as related to the environmental concerns and actions of the population, were largely unimportant.

The impact of information proved positive, suggesting information and education to be the main channel of creating public acceptance. The information campaign needs to explain not only the benefits of GMF on a worldwide scale but also the benefits to the particular consumer in terms of lower prices. According to the Health Belief Model, this may partially compensate for the GMF risks. The opinion polarization present primarily (but not only) on social networks also needs to be considered, as our results suggest, that the interest in GMF predicts the perceived immorality of GMF. We suggest that interested individuals might share these opinions in the online and offline discussion forums.

These findings highlight the importance of considering health risks when evaluating individuals' acceptance of GMF, indicating the need for targeted communication strategies to address health concerns. The research provides valuable insights for policymakers, public health professionals, and market researchers to effectively communicate the benefits of GMF and alleviate health-related concerns to enhance its acceptance among consumers.

Citation:

Cabelkova, I., Sanova, P., Hlavacek, M., Broz, D., Smutka, L., & Prochazka, P. The moderating role of perceived health risks on the acceptance of Genetically Modified Food. Frontiers in Public Health, 11, 1275287.

8. Nuclear reactor at home? Public acceptance of Small Nuclear Reactors in the neighbourhood.

8.1. Introduction

The evident energy crisis of 2020th, suppression of non-renewable, and instability of renewable energy sources reopened the issue of producing energy from nuclear power (Chakraborty and Bhattacharya, 2021; McWilliams et al., 2022; Singh, 2021; IEA, 2022). Nuclear power plants seem to offer the ways to produce stable, low-carbon energy in sufficient quantities (Muellner et al., 2021; Siqueira et al., 2019; Makhijani and Ramana, 2021). Contrary to traditional power plants, Small Nuclear Reactors (SNR) provide a number of benefits such as lower initial investments, fewer requirements for site selection and preparation, standardized design and construction, lower capacities of transmission systems and energy grids, the ability to be tuned to local needs, lower need of expertise in operation, ability to produce heat as a side product of electricity production (Ingersoll, 2009; Carter, 2016; Carlsson et al., 2012; Lokhov et al., 2013; Shropshire, 2011; OECD, 2021). These benefits can be utilized most if SNRs are located close to people's residences. However, the accidents in power plants (Three Mile Island, Chornobyl, and Fukushima) and the adverse health effects of radioactivity made people fear the Nuclear Power Plants located near their homes (Guo and Ren, 2017; Bird et al. 2014). For example, people in China were willing to pay up to US$ 116,6 per year to avoid building a nuclear power plant in the neighborhood (Sun and Zhu, 2014). This paper aims to study the factors that can reduce this fear and increase the support of SNRs located near people's dwellings.

The literature on public perceptions of nuclear power is vast and comprehensive. It generally suggests that public opinion is affected by the perceived benefits, costs, risks, and the perceived ability of governments to reduce these risks (Stoutenborough et al., 2013). In the case of nuclear energy, the benefits include the stable, climate-neutral energy source for a reasonable price (Bird et al., 2014), while the risks encompass all the fears of radiation and other effects coming from nuclear accidents (Guo and Ren, 2017; Bird et al., 2014).

However, the perceived benefits, costs, and risks studied in the literature primarily concerned traditional power stations. This paper argues that the benefits and risks of Small Power Stations are somewhat different. Moreover, the technology on SNR is still on the stage of the prototype; thus, the requested public support for the placement of SNR is still hypothetical, with no existing evidence of the reactors already in place. Yet, public support is indispensable for the

future location of SNR close to the people's homes. To our knowledge, the literature on the factors affecting public perceptions of SNR is lacking.

The perceived benefits, costs, and risks of new technologies are impacted by knowledge about the subject, cognitive abilities, and education (Soares, 2009; Hande et al., 2022; Čábelková et al., 2021). In addition, public attitude is often affected by values, which are heavily influenced by the mass media, such as traditional (TV, Radio, Printed newspapers, and magazines) and new (social networks, online news sources, online and off-line discussions; Mulder, 2012; Kim and Kim, 2014; Koerner, 2014).

This paper studies the factors predicting the public acceptance of SNR in locations closer than 10 km from residence, more than 50 km from residence, in the city, in and out of the current nuclear power stations. We hypothesize that the acceptability of SNR in various locations is affected by the knowledge of technology (both of nuclear energy and SNR), attitude to nuclear energy (fear, the trust in the government in NE), environmental concerns, the perception of electricity needs in the future (increase, can be replaced by renewables), sources of information (mass media, other), and socio-demographic characteristics including age, gender, and education. Methodologically we rely on a Principal component analysis and a set of ordinal logit analyses performed on representative survey data in the Czech Republic (N=1013, 51,2% female, aged 15-91, M±SD: 47,7±17,6; 19,6% with higher education).

8.2. Small Nuclear Reactors (SNR) as an alternative to conventional reactors

Historically, nuclear power in advanced economies was responsible for around 50% of all low-carbon electricity, i.e., over ten times more than the combined contribution of wind and solar power (1971-2018, IEA, 2019). In EU countries, nuclear power contributed around 25% of total energy generation, with shares less than 5% in the Netherlands up to more than 50% in the countries implementing policies to support nuclear power like the Czech Republic or Hungary (ibid). Besides effective energy production, the nuclear power stations are considered to be Green House Gasses neutral, thus reducing the speed of Global warming (Pata and Kartal, 2022; Coleman et al., 2012; Lenzen and Schaeffer, 2012; Kharecha and Hansen, 2013;).

The major challenges to the widespread use of nuclear power reactors are relatively large investment costs, inflexible electricity provision, and extensive requirements for safety and security (Budnitz, 2016). The first two limitations can be largely avoided by Very Small (under about 15 MWe) to Small (under 300 MWe) Nuclear Reactors (SNR) located close to people's

residences. These reactors can provide stable electricity sources close to the customers, thus making it independent from large electricity grid systems, eliminating transmission of electric energy to long distances, and reducing capital costs. Besides electricity, they could also provide a heat source for heating systems of homes and enterprises. The power of small or very small reactors could be tuned to the particular needs of consumers, be it industrial enterprises, cities, or particular families. (World Nuclear Association, 2022).

The idea of Small Nuclear Reactors (under 300 MWe, International Atomic Energy Agency) goes back to the times after World War II. Though the first reactors were relatively small, the development prioritized large Nuclear Power Stations (NPS, Ingersoll, 2009). The revival of small modular technologies for power stations occurred at the beginning of the 21st century. Nowadays, various technologies exist, and several reactors are already operating (see Table 17). Many other reactors are planned, licensed, or built (World Nuclear Association, 2022).

Table 17 Small Nuclear Reactors operating

Name	Capacity	Type	Developer
CNP-300	300 MWe	PWR	SNERDI/CNNC, Pakistan & China
PHWR-220	220 MWe	PHWR	NPCIL, India
EGP-6	11 MWe	LWGR	at Bilibino, Siberia (cogen, soon to retire)
KLT-40S	35 MWe	PWR	OKBM, Russia
RITM-200	50 MWe	Integral PWR, civil marine	OKBM, Russia

Source: World Nuclear Association (2022)

The operating cost effectiveness, low carbon generation, simpler design, and job creation make SNRs one of the alternatives for the future (Carlsson et al., 2012; Lokhov et al., 2013; Shropshire, 2011; OECD 2021). The enormous potential of SMRs rests on the factors sumarized can be seen in Table 18.

Table 18 Benefits of Small Nuclear Reactors (SNR) as compared to Large Nuclear Power Stations (LNPS)

Group	Large Nuclear Power Stations (LNPS)	Small nuclear reactors (SNR)
Initial investments	The LNPS requires considerable initial investments. However, once constructed, their electricity is relatively cheap and stable (Gu, 2018; Wu et al., 2019; Haas, et al., 2019; Rothwell, 2018).	The initial investments are relatively low, especially if the reactors are standardized and economies of scale are explored (Ingersoll, 2009).
Site selection and preparation	The site choice, preparation, initial infrastructure, and all permissions are complicated and generally long-term (Baskurt and Aydin, 2018).	Given the size and the modular structure, the requirements for the locality are less demanding. The decreased amount of radioactive particles present in the center of a reactor, which might be released into the environment, renders them suitable for use near residential sites and allows their heat output to be harnessed for heating. (Ingersoll, 2009).
Design and construction	The design and construction are largely complicated, requiring considerable expertise and a large set of sub-contractors, and must be tailored to a particular locality. This produced considerable delays in the construction of new reactors and increased construction costs time fold. Under the condition of everchanging legislation, these projects became rather risky (Gu, 2018; Wu et al., 2019; Matsuo and Nei, 2019; Portugal-Pereira et al., 2018; IEA, 2019).	The design and construction can be standardized, enabling economies of scale and reducing the number of sub-contractors, construction risks, and costs. The reactors can be built in a controlled factory setting and installed in chosen locality module by module (Carter, 2016, Carlsson et al., 2012; Lokhov et al., 2013; Shropshire, 2011; OECD, 2021).
Transmission systems and energy grids	Large investments in the transmission systems are required, as, given the size, the reactors are located far away from consumers (Gu, 2018; Wu et al., 2019).	The transmission of electricity over long distances is largely eliminated, thus reducing capital costs and pressure on energy grids (World Nuclear Association, 2022).

Safety	The additional safety requirements enacted after each nuclear accident made it difficult to design safe, easy-to-operate, cost-efficient, and reliable nuclear reactors (Gu, 2018; Wu et al., 2019).	The safety requirements, though equally binding, could be met in a standardized setting by exploiting economies of scale. Moreover as (Ingersoll, 2009).
Time flexibility of energy production	Low flexibility of the reactor in energy production related to the time schedule of energy needs, though good practices for increasing this flexibility exist (Cany et al., 2018; Morilhat et al., 2019).	Low flexibility of the reactor in energy production for related to the time schedule of energy needs. However, this flexibility can be increased if combined with an energy storage system (Nian and Zhong, 2020).
Ability to be tuned to locality needs	Low ability to tune the reactor changing energy needs of a particular locality	The reactors can provide a stable energy source tuned to particular customers' needs independently of large electricity grids (World Nuclear Association, 2022).
Need of expertise in operation	The operation of a power station requires considerable expertise in Nuclear processes and energy systems	The expertise requirements are less strict. The SNRs are a viable alternative for localities with small grids and less experience with NE due to their small size and passive safety features (World Nuclear Association, 2022).

Source: own compilation of literature sources

The operating cost effectiveness, low carbon generation, simpler design, and job creation make SNRs one of the viable alternatives for the future (Carlsson et al., 2012; Lokhov et al., 2013; Shropshire, 2011; OECD, 2021).

Despite all benefits of SNRs, the adverse health effects of radioactivity and the accidents on powerplants (Three Mile Island, Chornobyl, and Fukushima) made people fear the Nuclear Power Plants and made them unacceptable close to their place of residence (Emanuel, 2021; Wu and Huang, 2021).

8.3. The factors affecting public acceptance of nuclear technologies – hypotheses

Public perceptions of new technologies are generally affected by perceived benefits, costs, risks, and the perceived ability of governments to reduce these risks (Stoutenborough et al., 2013). All these are influenced by knowledge about the subject, cognitive abilities, and education (Soares, 2009; Hande et al., 2022). Public perceptions are, in most cases, heavily influenced by the mass media, either traditional (TV, Radio, Printed newspapers, and magazines) or new ones (social networks, online news sources, online and off-line discussions; Mulder, 2012; Kim and Kim, 2014; Koerner, 2014).

8.3.1. Knowledge of technology

In Korea, despite numerous scientific analyses and all the efforts taken to promote nuclear power as an environmentally friendly energy source, nuclear power is in jeopardy. According to Lee and Roh (2022), this can result from the Korean public's insufficient knowledge of nuclear power.

However, important factors for decreasing public concerns about nuclear power include comprehensive knowledge and improving the transparency of nuclear power regulations Guo and Ren (2017) also noticed that the local acceptance of nuclear power plants in China depends on perceived benefits and risks. However, contrary to the findings by Sun and Zhu (2014) or evidence from the US delivered by Stoutenborough et al. (2013), Guo and Ren (2017) pointed out that the public's perception of nuclear power is influenced by emotional identification and social trust rather than knowledge.

Huang et al. (2018), just like Sun and Zhu (2014), found a positive relationship between knowledge and nuclear risk acceptance. An analogous relationship was also observed between trust and risk acceptance. The latter relationship has been previously proved by Liu et al. (2008). In turn, Kim et al. (2014), based on their analysis of 19 countries, indicated that knowledge of nuclear inspection is a more effective factor than trust in inspection authorities in enhancing the public's acceptance of nuclear power in countries with relatively strong opposition to nuclear power. Huang et al. (2018) showed that before the Fukushima accident, perceived benefits had a stronger impact on nuclear power acceptance than perceived risks, while after the nuclear accident, the importance of benefits decreased, and risks were more and more decisive to the public's acceptance.

Thus, we hypothesize that:

H1 the public acceptability of Small Nuclear Reactors is impacted by the knowledge of technology (both the technology of NE and SNR; H1.1, H1.2)

8.3.2. Attitude to nuclear energy. The role of nuclear accidents

The public's perception of nuclear power is affected by nuclear accidents, including the Fukushima disaster (Guo and Ren, 2017). The Australian public's acceptance of nuclear power in relation to climate change and the Fukushima disaster has been assessed, e.g., by Bird et al. (2014). As results from their study, in 2010 (before the Fukushima accident), 42% of Australians were willing to accept nuclear power if it would help combat climate change, while in 2012 (after the Fukushima disaster) the public support for building nuclear power plants has decreased (34.4% of Australians supported that idea). In 2012 an increased proportion of respondents believed that the risks associated with nuclear power outweighed the possible benefits related to the extensive use of cleaner and more efficient source of energy than coal (Bird et al., 2014).

Similarly, to Bird et al. (2014) as well as Ho and Chuah (2021), who focused on five Southeast Asian countries including Indonesia, Malaysia, Singapore, Thailand, and Vietnam, Huang et al. (2013, 2018) identified a decreasing public acceptance of nuclear power after the Fukushima accident. Risk acceptance declined most among women, people over the age of 35, respondents not in public service, those with lower income or higher level of education, and living near nuclear power plants (Huang et al., 2013).

Those results concur with the Switzerland study by Visschers and Siegrist (2013) and Siegrist et al. (2014). However, in China, perceived risks have become a stronger predictor of acceptance than benefits (Huang et al., 2018). Due to the greater awareness of the risks of nuclear power before the nuclear accident, this was not the case in Switzerland (Visschers and Siegrist, 2013). In that country, economic benefit perception has remained a more important driver for nuclear power acceptance than risk perception (Visschers et al., 2011). Perceived benefits were also of key importance in determining the public's acceptance of nuclear power plants in Korea (Jang and Park, 2020).

Thus, we hypothesize that:

H2 The public acceptability of Small Nuclear Reactors is impacted by the attitude to nuclear energy – fear of NE, trust in the government in dealing with NE, and perception that the share of NE should increase (H2.1, H2.2, H2.3)

8.3.3. Climate change and environmental concerns

However, a more recent study by Uji et al. (2021) showed that climate change concerns do not drive the acceptance of nuclear power, possibly because the benefits of climate mitigation are not clearly visible and immediate. Nonetheless, climate change mitigation appears to be a significant factor boosting nuclear power acceptance in the United Kingdom, Finland, and France (Bickerstaff et al., 2008; Pidgeon et al., 2008; Teräväinen et al., 2011), i.e., in countries that have experienced nuclear power generation. At the same time, Lee and Roh (2022) revealed the negative relationship between greenhouse gas concerns and nuclear power acceptance in South Korea. Hence, it can be concluded that empirical evidence is ambiguous in the case of those impacts.)

Thus, we hypothesize that:

H3 The public acceptability of Small Nuclear Reactors is impacted by the concerns about the environment – both the current environment and climate change (H3.1, H3.3)

8.3.4. Future electricity needs and the possibility of replacing conventional energy sources with renewables

The future electricity needs of the world are predicted to increase significantly due to population and economic growth, urbanization, and the increased electrification of transport and heating. According to the International Energy Agency (IEA), global electricity demand is set to double by 2050 (IEA, 2022). This increase in demand will be driven by rising incomes, population growth, and the electrification of transport and heating, as well as the need to decarbonize electricity generation to meet climate change targets (ibid.).

Renewable sources of energy were sought to have the potential to accommodate these new electricity needs and to replace traditional energy sources due to their abundance, sustainability, and environmental friendliness. However, the instability of energy production and the excess pressure on electricity grids in the peaks of production cast certain doubts on the ability to replace the traditional energy sources. Some authors suggest that renewables should be used together with the conventional sources of energy (Bekirsky, et al., 2022).

Thus, we hypothesize that:

H4 The public acceptability of Small Nuclear Reactors is impacted by the perception of electricity needs in the future (increase/decrease, H4.1) and the possibility of replacing conventional energy sources with renewables (H.4.2)

8.3.5. The effect of distance from the plant

On the other hand, Guo and Ren (2017) found that the public perception of nuclear power plants is affected by the distance to the plant sites. People who live closer to them are usually less willing to accept it than those who live further. On the one hand, this is consistent with the observations by Huang et al. (2013), but on the other hand, this has not been confirmed by Uji et al. (2021) when evaluating the public support for nuclear power in Japan.

We do not formulate the hypothesis on the distance from the plant; however, we take it into account in the formulation of the dependent variable.

8.3.6. The effect of income, gender and education

Many analyses on the acceptance of nuclear power plants in the post-Fukushima period offer evidence from China. Sun and Zhu (2014) focused on nuclear power plants at the preliminary planning stage and showed that people in China are willing to pay up to US$ 116.6 per year to avoid building a nuclear power plant in the neighborhood. It was also indicated that the higher the annual income, the higher amount of willingness to pay.

Stehlik (2010) found that older Australians are more likely to support nuclear power than younger people. The same applies to men compared to women, who are usually more concerned about climate change (McCright, 2010) and perceive risks to be higher (Leiserowitz, 2006). Stronger support for nuclear power from men than women was also found by Arikawa et al. (2014), who examined Japanese attitudes toward nuclear power after the Fukushima accident. Unlike in Australia, the older Japanese showed less support for nuclear power. Opponents of nuclear power were also identified as those who use electronic devices less intensively and reveal energy-saving behavior to a greater extent than nuclear power advocates.

8.3.7. Hypotheses summary

The public acceptability of Small Nuclear Reactors is related to:

1. Knowledge of technology (both the technology of NE and SNR; H1.1, H1.2)
2. Attitude to Nuclear Energy – fear of NE, trust in the government in NE, and perception that the share of NE should increase (H2.1, H2.2, H2.3)
3. Concerns about the environment – both the current environment and climate change (H3.1, H3.3)
4. The perception of electricity needs in the future (increase/decrease, H4.1) and the possibility of replacing conventional energy sources with renewables (H.4.2)

8.3.8. The data

The data were collected by the Czech Institute of Sociology in the project Our society (Nase spolecnost, Sociologický ústav, 2020). One thousand thirteen persons representing the population of the Czech Republic aged 15 and over were interviewed voluntarily and anonymously (N=1013, 51,2% female, aged 15-91, *M*±*SD:* 47,7±17,6; 19,6% with higher education). The representativeness of the collection was ensured by quotas derived from the real distribution of the required characteristics in the population of the Czech Republic. The monitored quotas were that of gender, age (6 categories), and education (4 categories) of the respondent. Other monitored quota features were also the region (14 categories), size of place of residence (5 categories), economic status (6 categories), and internet use (3 categories, ibid.). The data are available for non-commercial use upon signing up the corresponding contracts with the depositor of the data. The data should not be used for commercial purposes or transmitted to third parties.

8.3.9. The indicators

8.3.9.1. Indicators for public acceptability of Small Nuclear Reactors

One of the main benefits of small nuclear reactors is the ability to be close to the electricity consumers, thus avoiding much of the financial, environmental, and land-related costs of long electricity transmission networks. However, the direct proximity of Small Nuclear Reactors (SNR) to the customers might be unacceptable to many of them. Thus, the indicators of public support study the acceptance of SNR in direct proximity to the public. The answers to the following questions were employed:

1. *"How acceptable or unacceptable would the construction of a small nuclear reactor be for you?" Tell me your opinion on these options:*
   a) a small nuclear reactor would be built closer than 10 kilometers from your home
   b) a small nuclear reactor would be built more than 50 kilometers from your home
   c) a small nuclear reactor would be built on the site of some of the existing nuclear power plants in the Czech Republic
   d) a small nuclear reactor would be built outside the existing nuclear power plants in the Czech Republic.
2. *Unlike large nuclear reactors, which are being built outside the city, the possibility of building a small nuclear reactor directly in the city and using it as a heating plant supplying heat is being considered. Would you agree with a small nuclear reactor built in the city and serving as a heating plant?"* (Sociologický ústav, 2020)

The distributions of the respondents are presented in Table 19.

Table 19 The acceptability of Small Nuclear Reactors. The distribution of the respondents (%)

	definitely unacceptable	**rather unacceptable**	**rather acceptable**	**definitely acceptable**	**No opinion**
SNR up to 10 km, (%).	28,2	26,7	22	5,4	17,7
SNR further than 50 km, (%).	13,9	19,4	35,5	15,9	15,2
SNR in the area of current NPS, (%).	6,5	10,5	39,6	26	17,5
SNR out of the area of current NPS, (%).	11,5	19,4	33,8	12,6	22,7
SNR directly in the city, (%).	25,2	25,7	23,2	5,4	20,5

Note: SNR – Small Nuclear Reactor; NPS – Nuclear Power Station. The respondents with no opinion were excluded from further analysis

From Table 2.3 follows that for a little over 50% of the respondents, the construction of the SNR directly in their city or up to 10 km from their home is (definitely or rather) unacceptable. The location of SNR in the area of the current NPS is much more acceptable – for 65% of respondents, it is definitely or rather acceptable. However, in this case, the main benefit of SNR - the possibility of locating close to the customers – is difficult to achieve. On the other hand, it is possible to use the existing electricity distribution system if the capacity is sufficient.

The acceptability of SNR further than 50km from the respondents' home and out of the area of current NPS is approximately similar – approximately a third of the respondents find these two options unacceptable (definitely or rather), and 45-50% of the respondents agree or rather agree with this option. A significant share of the respondents (15-20%) did not have an opinion on the acceptability of SNR.

8.3.9.2. Indicators for knowledge of technology

The knowledge of technology firstly implies the knowledge of Nuclear Energy (NE) principles, and secondly, some knowledge of the technological principles of Small Nuclear Reactors (SNR). Two indicators were employed to study these aspects according to the answers to the following questions:

1. *"At your own discretion, try to say what is the level of your knowledge in the field of physical and technical principles of nuclear power plant operation:*" no or almost no knowledge (37,4%), basic knowledge (45.7%), advanced knowledge (9.7%), knowledge almost or completely at the level of an expert (1.4%), no opinion (5,8%). (Sociologický ústav, 2020)
2. *"The possibility of using the technology of so-called small nuclear or modular reactors to produce energy from nuclear power is currently being investigated. Have you ever heard of small nuclear or modular reactor technology?"* Yes (18.1%), No (72.3%), Do not know (9.6%) (ibid.)

The distribution of the respondents above presents a very bleak picture of the knowledge of the population of Nuclear principles and technologies. Almost 40% of the respondents reported no knowledge of nuclear energy principles, which is surprising as these principles should be explained in secondary schools. Despite that, only 45% of the respondents acknowledged at least basic knowledge. Similarly, only 18% of the respondents acknowledged that they had heard about Small Nuclear Reactors (SNR). The overall level of knowledge thus seems to be very low.

8.3.9.3. Attitude to nuclear energy

Though not many respondents revealed some level of knowledge on principles of NE, we expected that there is some emotional attitude to NE, possibly formed by the last Nuclear incidents, discussion on the expansion of Temelin or Dukovany Power Stations, and the recent

Energy policy of EU and Czech Government. Three indicators were used to study these attitudes:

1. *"Do you yourself feel concerned about the use of nuclear energy in our country?"* Major concern (8.3%), medium concerns (22.1%), small concerns (38.3%), no concerns (27.0%), No opinion (4.2%), (Sociologický ústav, 2020)
2. *"Do you trust the government of the Czech Republic to make the right decisions about the development of nuclear energy in our country?"* Definitely yes (8.7%), rather yes (43.2%), rather not (25.1%), definitely not (10.5%), no opinion (12.5%). (ibid.)
3. *"Do you think that the share of nuclear energy in the production of electricity in our country should increase in the future, remain at the current level, or should decrease? "* Should definitely increase (8.8%), rather should increase (23.6%), should remain at the current level of (36.7%), should rather decrease (16.1%), should definitely decrease (4.0%), no opinion (10.8%) (ibid)

Understandably, in light of the Nuclear Incidents in Chornobyl and Fukushima, almost 70% of the respondents had some (small or big) concerns about the use of nuclear energy in the Czech Republic. However, a little above 50% trust the government in the decisions about nuclear energy. But the most surprising was the support for Nuclear energy. Almost a third of the respondents believe that the share of nuclear energy in electricity production in the Czech Republic should increase. Another third of the respondents (36,7%) stated that the share of energy should remain the same.

8.3.9.4. Electricity needs in the future

Electric usage is likely to go up in the near future. The replacement of gasoline-powered vehicles with electric equivalents will result in a surge of electricity demand, and this energy must be generated without harming the environment; yet there are still doubts that this can be done. The next indicators reveal public opinions:

1. *"Do you think that our electricity consumption will increase, remain at its current level, or decrease in the future?"* It will definitely increase (30.3%), will rather increase (43.6%), will remain at the current level (16.8%), will rather decrease (4.0%), will definitely decrease (0.4%), no opinion (4.8%), (Sociologický ústav, 2020)
2. *"Do you think that it is possible to replace the production of electricity from conventional sources (such as thermal power plants burning coal or gas, nuclear power plants, or large dam hydropower plants) with the production of electricity from wind,*

solar radiation, and biomass combustion?" It can definitely be replaced (8.7%), rather it is possible to replace (35.5%), rather it is not possible to replace (33.2%), certainly cannot be replaced (12.2%), no opinion (10.4%), (ibid)

Above 70% of the respondents believe that in the future, electricity consumption will (definitely or rather) increase in the Czech Republic, while 45% of the respondents believe that it is not possible to replace the production of electricity from conventional sources with the production from renewable sources. Thus, it seems that nuclear power will still have its place.

8.3.9.5. Environmental concerns

The production of electricity, including the production from Nuclear energy, has some impact on the environment. In this paper, we monitor two indicators – the level of satisfaction with the current state of the environment in the Czech Republic and the fear of climate change:

1. *"How satisfied or dissatisfied are you with the environment in our republic?"* Very satisfied, (5.1%), rather satisfied (50.5%), rather dissatisfied (36.1%), very dissatisfied (4.7%), no opinion (3.7%), (Sociologický ústav, 2020)
2. *"How much are you worried about the effects of climate change?"* Very worried (17.2%), more worried (48.6%), rather not worried (24.1%), definitely not worried (6.5%), no opinion (3.6%), (ibid)

8.3.9.6. Sources of information

We considered seven possible sources of information: TV, printed magazines and newspapers, radio, news servers on the internet, discussion and blogs on the internet, social networks, and discussions outside the internet. The distribution of the respondents is presented in Table 20

Table 20 Indicators - exposition to Mass Media and social discussion platforms concerning following social life. Frequency table (%)

How often do you follow social life via:	at least once a day, %	several times a week, %	once a week, %	less than once a week, %	never, %
TV	50,2	29,7	8,1	7,3	4,4
Printed newspapers and magazines	12,4	22,3	21,1	22,5	21,3
Radio	23,5	29,9	14,4	13,2	18,6
News webs on internet	25,2	29,8	14,3	10,6	19,7
Internet discussions and blogs	7,8	14,7	15,1	17,7	44,1

Social networks (for example Facebook, Twitter, or Instagram)	13,2	15,4	11,7	14,2	45
Discussions outside of internet	6,5	24,3	24,6	21,4	21,5

Source: Data from (Sociologický ústav, 2020), own processing

The indicators of sources of information were then transformed into two categories - Traditional media and New media, as presented in the section Data transformation.

8.3.9.7. Socio-demographic characteristics

We consider the following socio-demographic and other characteristics of the respondents: age In years), gender (as self-reported by the respondent, male=1), education (basic=1, secondary w/o state exam=2, secondary with state exam=3, higher=4 included into further analysis as factor variable), economic activity (active=1/non-active=0), subjective size of the municipality the respondent lives in (large city, suburb of a large city, medium-sized city, small town, large village, small village, solitude), political orientation (left-right, 11 point scale), life satisfaction (definitely satisfied =1, rather satisfied =2, neither satisfied nor dissatisfied = 3, rather dissatisfied =4, definitely dissatisfied =5, 5 point scale).

8.3.9.8. Data transformations

In order to reduce the dimensionality of the model we applied the Principle Componenta Analysis (with VARIMAX rotation and Kaiser Normalization) to six variables representing the sources of information (Table 21). Two components were extracted, which can be tentatively named as old media and new media. The regression-based factor scores were saved for all the observations. These scores served as indicators for sources of information (New media and Traditional media) in the further analysis.

Table 21 Rotated Component Matrix and Total Variance Explained

		Component factor loadings		**Rotation Sums of Squared Loadings**		
Factors		**I**	**II**	**1**	**2**	**3**
New media	Internet-based blogs, discussions	0,857	-0,063	2,384	34,054	34,054
	Social networks	0,83	-0,145			
	Online news servers	0,79	0,028			
	Discussions outside internet	0,568	0,27			

Traditional media	Printed newspapers, magazines	0,068	0,82	1,931	27,58	61,634
	Radio	0,025	0,792			
	TV	-0,062	0,73			

Note: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. 1- Total; 2 - % of Variance, 3 - Cumulative %

The two extracted components explained 61% of the variability of the original variables.

All the respondents who had chosen "no opinion" in any of the questions were excluded from the further analysis.

8.4. The model

SNR acceptance indicators		Impacting factors
SNR up to 10 km		1. Knowledge of technology (both the technology of NE and SNR; H1.1, H1.2)
SNR further than 50 km	Are affected by (Hj,i)	2. Attitude to Nuclear Energy – fear of NE, trust in the government in NE, and perception that the share of NE should increase (H2.1, H2.2, H2.3)
SNR in the area of current NPS		3. Concerns about the environment – both the current environment and climate change (H3.1, H3.3)
SNR out of the area of current NPS		4. The perception of electricity needs in the future (increase/decrease, H4.1) and the possibility of replacing conventional energy sources with renewables (H.4.2)
SNR located in the municipality		

We rely on a set of ordinal regression analyses in the following form (formula 4):

$$SNR\ acceptability_i = logit(a_0 + a_{1-2}Technology + a_{3-5}Attitude + a_{6-7}Electricity + a_{8-9}Environment + a_{9-10}Info + a_{11}Age + a_{12}Gender + a_{13-15}Education + a_{16}Economic\ activity + a_{17-21}Municipality + a_{22}Political\ orientation + a_{23}Life\ Satisfaction + e_ \quad (4)$$

Where

SNR acceptability – five indicators of acceptability subsequently (SNR up to 10 km, SNR further than 50 km, SNR in the area of current NPS, SNR out of the area of current NPS, SNR directly in the city).

Technology – two indicators of Knowledge of Nuclear technology (knowledge of principles of NE, knowledge of technology for SNR, see section Indicators for knowledge of technology)

Attitude – three indicators mapping Attitude to Nuclear Energy (Fear of NE, trust to the government in NE, the belief that share of NE should increase, see section Attitude to NE)

Electricity – two indicators on the perception of electricity needs in the future (the belief that electricity consumption will increase in the future, the perception on whether conventional electricity replacement is possible (see section Electricity needs in the future)

Environment – two indicators for environmental concerns (satisfaction with the environment in the Czech Republic, fear of climate change, see section Environmental concerns)

Info – two indicators for sources of information (new media, old media, see section Sources of information)

Age, *Gender*, and *Education* – age, gender, and education (basic, secondary w/o state exam, secondary with state exam, higher)

Economic activity – active / non-active

Municipality – the subjective size of a municipality (large city, a suburb of a large city, medium-sized city, small town, a large village, small village, solitude

Political orientation – political orientation on 11-point scale

Life satisfaction – subjective life satisfaction

8.5. Results and interpretation

The results of ordinal regression analyses (formula 4) are presented in Tables 22 and 23.

Table 22. Predicting the acceptance of Small Nuclear Reactors. The results of original regression analyses I.

	SNR up to 10 km		**SNR further than 50 km**		**SNR in the area of current NPS**	
	Estimate	Sig.	Estimate	Sig.	Estimate	Sig.
Threshold=1	-0,921	0,371	-0,309	0,760	-2,540*	0,014
Threshold=2	0,912	0,376	1,358	0,181	-1,21	0,24
Threshold=3	3,485**	0,001	3,772***	0,000	1,197	0,245
Knowledge of technology						
Knowledge of principles of NE	0,535***	0,000	0,304*	0,036	-0,022	0,881
Knowledge of SNR technology	-0,524*	0,017	-0,293	0,183	-0,505*	0,023
Attitude to NE						
Fear of NE	0,718***	0,000	0,763***	0,000	0,438***	0,000
Trust to the government in NE	-0,299*	0,027	-0,476***	0,000	-0,394**	0,003
Share of NE should increase	-0,404***	0,000	-0,278**	0,006	-0,079	0,447
Electricity needs in the future						
Electricity consumption increase	0,315**	0,006	-0,057	0,607	-0,305**	0,008
Conventional electricity replacement possible	0,283*	0,010	0,513***	0,000	0,432***	0,000
Environment concerns						
Environment satisfaction	-0,327*	0,023	-0,055	0,682	-0,160	0,241
Fear of climate change	0,126	0,291	0,400**	0,001	0,387**	0,001
Sources of information						
New media	-0,274*	0,010	-0,190	0,070	0,010	0,924
Old media	-0,216*	0,032	-0,224*	0,022	-0,197	0,053
Socio-demographic variables						
Age	-0,014*	0,036	-0,005	0,430	-0,004	0,508
Gender	0,532**	0,005	0,111	0,546	0,111	0,550
Education - basic	0,146	0,695	0,381	0,284	0,169	0,644
Education - secondary w/o exam	0,272	0,291	0,435	0,083	0,389	0,125
Education - secondary with exam	0,273	0,250	0,433	0,061	0,230	0,325

Economic activity - non-active	0,312	0,118	0,238	0,221	0,042	0,829
Subjective size of municipality						
large city	-0,128	0,734	0,285	0,44	0,557	0,128
suburb of a large city	-1,060	0,106	-0,643	0,312	0,280	0,672
medium-sized city	-0,681	0,065	-0,774*	0,031	-0,131	0,714
small town	-0,049	0,889	-0,114	0,741	0,260	0,449
large village	0,406	0,382	-0,138	0,763	0,591	0,219
Political orientation	-0,057	0,197	-0,016	0,714	0,022	0,606
Life satisfaction	-0,119	0,301	-0,051	0,633	-0,079	0,464
Model Fitting Information (Sig.)		0,000		0,000		0,ooo
Pseudo R-Square						
Cox and Snell	0,391		0,385		0,241	
Nagelkerke	0,423		0,415		0,265	
McFadden	0,191		0,184		0,116	
N	514		534		523	

Notes: SNR - Small Nuclear Reactors, NE - Nuclear Energy, Reference variables: gender - women, education - higher, economic activity - active, size of settlement - small village, settlement, solitude. Link function: Logit.
****-significant on 0,1% level. ** - significant on 1% level, * - significant on 5% level. Thresholds indicate the cutoffs between categories on an ordered scale. Thresholds are determined by finding the point at which the probability of belonging to a particular category (e.g., high-moderate-low) changes.*

Table 23 Predicting the acceptance of Small Nuclear Reactors. The results of original regression analyses II.

	SNR out of the area of current NPS		SNR directly in the city	
	Estimate	Sig.	Estimate	Sig.
Threshold=1	-0,693	0,499	-1,185	0,238
Threshold=2	0,982	0,338	0,483	0,63
Threshold=3	3,425**	0,001	2,763**	0,006
Knowledge of technology				
Knowledge of principles of NE	0,455**	0,002	0,303*	0,034
Knowledge of SNR technology	-0,041	0,849	-0,530*	0,013
Attitude to NE				
Fear of NE	0,573***	0,000	0,503***	0,000
Trust to the government in NE	-0,358**	0,006	0,006	0,963
Share of NE should increase	-0,258*	0,013	-0,328**	0,001
Electricity needs in the future				
Electricity consumption increase	-0,128	0,260	0,220*	0,048
Conventional electricity replacement possible	0,254*	0,021	0,080	0,450
Environment concerns				
Environment satisfaction	-0,241	0,080	-0,260	0,053
Fear of climate change	0,288*	0,016	0,130	0,252
Sources of information				
New media	0,029	0,783	-0,066	0,519
Old media	-0,309**	0,003	-0,155	0,112
Sociodemographic				
Age	-0,011	0,089	-0,015*	0,017
Gender	0,200	0,282	0,500**	0,006
Education - basic	0,089	0,811	0,572	0,121
Education - secondary w/o exam	0,431	0,087	0,120	0,627
Education - secondary with exam	0,315	0,173	0,157	0,489
Economic activity - non-active	0,248	0,208	0,207	0,289
Subjective size of municipality				
large city	0,829*	0,030	-0,081	0,825
suburb of large city	-0,113	0,861	0,016	0,982
medium-sized city	-0,095	0,799	-0,125	0,727
small town	0,391	0,275	0,065	0,853
Large village	0,409	0,400	0,225	0,624
Political orientation	-0,010	0,817	-0,028	0,513

Life satisfaction	-0,015	0,887	-0,089	0,407
Model Fitting Information (Sig.)		0,000		0,000
Pseudo R-Square				
Cox and Snell	0,280		0,231	
Nagelkerke	0,303		0,250	
McFadden	0,127		0,102	
N	499		509	

*Notes: SNR - Small Nuclear Reactors, NE - Nuclear Energy. Reference variables: gender - women, education - higher, economic activity - active, size of settlement - small village, settlement, solitude. Link function: Logit. *** - significant on 0,1% level. ** - significant on 1% level, * - significant on 5% level. Thresholds indicate the cutoffs between categories on an ordered scale. Thresholds are determined by finding the point at which the probability of belonging to a particular category (e.g., high-moderate-low) changes.*

8.5.1. Knowledge of technologies (H1.1, H1.2)

From Tables 2.6 and 2.7 follow that knowledge of principles of NE is statistically significant predictor of SNR acceptability in four out of five indicators (SNR up to 10 km, SNR further than 50 km, SNR out of the area of current NPS, SNR directly in the city). The more knowledge of NE technology the respondent reports, the more acceptable SNR is up to 10 km from his residence, SNR further than 50 km from his residence, SNR out of the area of current NPS, and SNR directly in the city. The indicator of SNR in the area of current NPS was not statistically related to the subjective level of knowledge of NE. This may be because SNR's location in the current NPS area does not significantly change the perceived threat of nuclear energy.

In addition, the perceived knowledge of SNR technology increases the acceptability of SNR according to the following indicators: SNR up to 10 km, SNR in the area of current NPS, and SNR directly in the city.

8.5.2. Attitude to NE (H2.1, H2.2, H2.3)

Attitude to NE also proved to be highly related to public acceptability. The more the respondent is concerned about the use of NE in the Czech Republic, the less acceptable is the use of NE in all the five indicators (SNR up to 10 km, SNR further than 50 km, SNR out of the area of current NPS, SNR in the area of current NPS, SNR directly in the city). The more respondents trust the government about NE in the country, the more acceptable SNR are according to the four (out of five) following indicators: SNR up to 10 km, SNR further than 50 km, SNR in the area of current NPS, SNR out of the area of current NPS). The more respondents believe that

the share of NE in the production of electricity in the Czech Republic should increase, the more he accepts SNR up to 10 km from their residence, further than 50 km from their residence, out of the area of current NPS, and directly in the city.

8.5.3. Future electricity needs and the possibility of replacing traditional energy sources with renewables (H3.1, H3.2)

A greater belief that the electricity needs in the future will increase was associated with less acceptance of SNR up to 10 km from the residence and directly in the city and more acceptance of SNR in the area of currents NPS.

The belief that it is possible to replace conventional electricity sources with renewables was associated with less acceptance of SNR in four out of five cases - up to 10 km for residence, further than 50 km from the residence, in and out of the area of current NPS.

8.5.4. Environmental concerns (H4.1, H4.2)

The more the respondents are satisfied with the environment in the Czech Republic, the more they accept SNR up to 10 km from their residence.

The more the respondents are worried about climate change, the less acceptable for them is SNR further than 50 km from their residence, in and out of the area of current NPS.

8.5.5. Sources of Information

The role of the mass media, both old (printed newspapers, magazines, radio, TV) and new (internet-based blogs, discussions, social networks, internet news, discussions outside the internet), was generally positive. The more respondent exposes himself to new and old media, the more he accepts SNR up to 10 km from the residence. Old media also support the acceptance of SNR further than 50 km and out of the area of current NPS.

8.5.6. Socio-demographic variables

Except for the modular technology, the main advantage of SNR is the ability to locate this reactor close to consumers, as it can also serve as a heating plant. Thus, it seemed reasonable to assume that the size of the city would be a significant predictor of the acceptability of SNR would be dependent on the size of the city of the respondent. However, the statistical significance of relevant indicators was low. Respondents living in medium-sized towns accept less SNR further than 50 km. People living in large cities are more accepting of SNRs out of the area of current NPS.

Older respondents and women accept less SNR located close to their residence (SNR up to 10 km from residence and directly in the city).

8.5.7. Conclusion and discussion

The use of SNR presents several interrelated and controversial contexts in the population's minds. First, there is a widespread belief that future electricity needs will increase (70% of the respondents). These needs can be satisfied by conventional sources and renewables. However, the population presents high distrust for renewables' ability even to replace the production of energy from conventional sources (45% of the respondents), not to mention the potential of renewables to increase overall energy production. Apart from renewables, and in light of high environmental concerns (almost 70% of the respondents are worried about the effects of climate change), nuclear energy presents one of the viable emission-free alternatives. Despite the nuclear accidents, the majority (65%) of the respondent have only small or no concerns about the use of nuclear energy in the Czech Republic, which presents a large opportunity to utilize NE for energy production in the future. Almost 70% of the sample believe that the future use of nuclear power for electricity production should stay the same or even increase.

In this respect, SNRs present an auspicious direction for energy production compared to Large Nuclear power Plants (table 2.2). One of the biggest advantages of SNR is that if located close to a place of residence, they can produce both the electricity (tuned to the local electricity needs and largely independently from global electricity grids) and heat for the heating systems. However, the respondents showed little acceptance of SNR close to their residence (above 50% of the respondents perceived SNR unacceptable up to 10 from their homes or directly in the city). SNRs are more acceptable further than 50 km from the residence (above 50% of the respondents), and ideally, they should be located in the area of current nuclear power plants (almost 70% acceptance). Interestingly, almost one quarter of the respondents (15-22%) could not define their level of acceptance of SNR in various locations.

This fact is linked with the relatively low education in nuclear energy principles (85% report no or just basic knowledge of NE principles) and little information about SNR (18% of respondents only report some knowledge about SNR).

We hypothesized that the public acceptance of SNR is contingent upon knowledge of technology, attitude to NE in general, a perceived increase of future electricity needs, perceived substitutability of traditional energy sources with renewables, the attitudes to the environment,

and we controlled for the sources of information and socio-demographic characteristics. Except for socio-demographic characteristics, all the other factors proved to be statistically significant.

The results suggest that knowledge of technology (both the NE in general and SNR in particular) increases the acceptance of SNR (H1.1 and H1.2. was supported in most cases, similar to Huang et al. 2018; and Sun and Zhu, 2014). Fear of NE expectedly decreases the acceptability of SNR (similar to Bird et al., 2014; and Ho and Chuah, 2021), while trust in the government (similar to Stoutenborough et al., 2013) and the perception that the share of NE should increase in the future makes the SNR more acceptable (H2.1, H2.2, H2.3 was supported in most cases). The expected future increase of electricity needs was ambivalent to the overall support of SNR - it decreased the acceptance of SNR located up to 10 km from residence and increased support for SNR in the area of current NPS (H3.1 was supported partly). In most cases, the perceived replaceability of conventional energy sources with renewables decreased acceptance of SNR (H3.2 was supported partly).

Environmental attitudes proved to be related to the support of SNR. The concern of climate change led to less acceptance of SNR in 3 out of 5 cases (H4.1 was supported partly), though the literature suggests that nuclear power is one of the ways to mitigate climate change (Muellner et al., 2021; Siqueira et al., 2019; Makhijani, and Ramana, 2021). The level of satisfaction with the environment proved to be unrelated to SNR acceptance in 4 out of 5 indicators (H4.2 was not supported in most cases). In the fifth one, satisfaction with the environment supported the acceptance of SNR located up to 10 km from their residence.

In general, the factors affecting the acceptance of SNR showed to be similar to those affecting public acceptance of Nuclear Energy, though the location of SRN close to the homes showed to be problematic. The media apparently does a good job presenting SNR (people more exposed to the media present more acceptance), though it does a bad job in propagating SNR (18% of respondents only report some knowledge about SNR).

Hlavacek, M., Cabelkova, I., Pawlak, K., & Smutka, L. (2023). Nuclear reactor at home? Public acceptance of Small Nuclear Reactors in the neighborhood. *Frontiers in Energy Research,* 11, 1211434.

9. Summary conclusions and discussion

Green shopping, often referred to as green shopping, represents an important aspect of consumer behavior as individuals increasingly prefer environmentally sustainable products. This trend extends beyond consumer goods to various industries, including the food and energy industries. In the context of food production technologies, the adoption of genetically modified foods (GMFs) is emerging as an important consumer decision. Consumer attitudes towards GMF are influenced by factors such as environmental, health and ethical concerns. The intersection between green shopping and consumer decisions about new technologies in food production is crucial, as consumers go through choices that not only match their personal preferences, but also contribute to sustainable and environmentally friendly practices.

Another dimension of consumer preferences regarding new technologies is evident in the field of energy sources. An example is the consideration of small nuclear reactors as an alternative energy source. Consumer attitudes toward these emerging energy technologies play a key role in shaping the energy landscape. The acceptance or rejection of small nuclear reactors is not only based on technological considerations, but is also linked to environmental awareness and preferences for sustainable energy options. The link between consumer preferences for energy sources and environmental impact underscores the complex relationship between individual choices and broader environmental concerns and highlights the need for energy solutions that are consistent with technological progress and environmental sustainability.

Essentially, the common thread that runs through this consumer dynamic is the complex interplay between individual choices, environmental considerations, and technological advancements. Whether it's green shopping for various consumer goods, acceptance of genetically modified foods or preferences for new energy sources such as small nuclear reactors, consumers are increasingly aware of and influenced by the environmental impact of their decisions. This convergence of environmental awareness and technology acceptance highlights the need for businesses and policymakers to align innovation with sustainable practices, recognizing that consumer decisions can shape the industry's trajectory toward a greener and more technologically advanced future.

Green consumption research delves into the influence of environmental attitudes, climate change concerns, European Union (EU) integration, and the role of mass media (both traditional and new) on the reported frequency of environmentally friendly household purchases. As expected, the study found that positive environmental attitudes and increased

concern about climate change were key predictors of increased green purchases. In particular, EU integration proved to be the most influential factor in promoting environmental integration in consumer behavior. The study sheds light on the multifaceted relationship between individual values, information dissemination, and media exposure in shaping green consumption patterns and provides valuable insights into the dynamics of environmentally conscious decision-making.

The significance of this paper goes beyond its empirical contributions to the existing literature on green consumption. First, it enriches the empirical landscape by dissecting the impact of values, information sources, and media platforms on the frequency of household green purchases. By identifying and quantifying these influences, this paper deepens our understanding of the complex factors that drive the behavior of environmentally conscious consumers. Second, the findings of this research pose significant challenges for policymakers and media practitioners alike. The implications call for rethinking strategies to promote environmentally sustainable practices and recognizing the influential role of values and media in shaping consumer choices. Policy makers and media professionals are faced with the task of developing more effective communication and information strategies that align with the values and interests of the population and facilitate a wider transition to greener consumption patterns.

Essentially, the dual impact of this paper lies in its scholarly contribution to the field of green consumption studies and its practical implications for those involved in policy formulation and media communication. By unpacking the complex web of factors influencing green shopping, the research not only advances academic knowledge, but also stimulates real-world considerations to promote sustainable practices and shape public discourse on environmental issues.

Research on genetically modified foods (GMFs) has examined the influence of perceived health risks, environmental concerns, and availability of information on GMF acceptance, as measured by indicators such as willingness to try and taste GMFs and perceived morality of GMFs. In addition, the study investigated the importance of potential positive effects associated with GMF, such as lower prices and extended shelf life. In particular, perceived health risks emerged as the most critical factor predicting willingness to purchase GMF, while their impact on willingness to try was less pronounced. Surprisingly, the environmental risks of GMF associated with the environmental concerns and activities of the population were found to be largely insignificant. The study highlighted the positive impact of information and

underlined the role of education in shaping public acceptance. According to the findings, the information campaign should emphasize not only global benefits, but also focus on individual consumer benefits, especially in terms of cost savings. Addressing these aspects could partially balance the perceived risks associated with GMF, in line with the health belief model. The study further highlighted the need to consider opinion polarization, particularly on social media, as interest in GMFs was found to predict perceptions of product morality.

The results highlight the complexity of introducing a new category of consumer innovation, which requires a different approach. The study suggests that individuals interested in GMF find platforms such as online and offline discussion forums suitable for sharing their views and fostering dialogue. This approach recognizes the importance of engaging stakeholders in discussions that can contribute to shaping perceptions and acceptance of GMF. By recognizing the various factors influencing consumer attitudes, the research advocates tailored communication strategies that not only address health and environmental issues, but also highlight the tangible benefits of GMF to individual consumers.

In summary, the study provides insight into the multifaceted dynamics of GMF adoption and highlights the varying importance of factors such as health risks, environmental concerns, and information availability. The research highlights the need for a nuanced communication strategy that takes into account individual contributions and considers the impact of opinion polarization, especially in the area of social networks, in order to effectively navigate the complexities associated with introducing innovative products to consumers.

Findings from the Small Nuclear Reactor (SNR) paper suggest that technological knowledge, particularly regarding nuclear power (NE) in general and SNR in particular, plays a key role in shaping public acceptance. This is consistent with previous research by Huang et al. (2018) and Sun and Zhu (2014), highlighting the positive correlation between technology awareness and SNR acceptance. Conversely, the fear associated with nuclear power reduces the acceptability of SNR, which is consistent with studies by Bird et al. (2014) and Ho and Chuah (2021). Trust in government, similar to the findings of Stoutenborough et al. (2013) and the notion that the share of nuclear power should increase in the future contributes to greater acceptability of SNR.

Expectations of future increases in electricity demand have an ambivalent effect on overall SNR support. While reducing the acceptance of SNR located within 10 km of residences, it increases support for SNR in areas where existing nuclear power plants (NPS) are located. Perceived substitutability of conventional energy sources with renewable sources generally reduces the acceptance of SNR. Environmental attitudes also play a role, with concerns about climate change being correlated with reduced acceptance in three out of five cases. This finding contrasts with literature that suggests nuclear power as a means of mitigating climate change (Muellner et al., 2021; Siqueira et al., 2019; Makhijani and Ramana, 2021). Moreover, environmental satisfaction appears to be unrelated to SNR adoption in four of the five indicators.

The factors influencing the acceptance of SNRs essentially closely mirror those influencing the public acceptance of nuclear power, except for the challenging aspect of the proximity of SNRs to homes. The media appears to inform and inhibit public opinion about SNR. Media-exposed individuals show higher levels of acceptance, yet only a modest 18% of respondents report having some knowledge of SNR. This indicates the dual role of the media in presenting and disseminating information about SNR, suggesting a potential need for enhanced public education and awareness campaigns in this area. In summary, the thesis highlights the importance of information sources, potential health problems, and pro-environmental tendencies in predicting behavior. It means the need for greater government focus on effectively communicating new technologies and environmental strategies to the public. Furthermore, recognizing the importance of communication channels, further analysis is needed to understand how communication undergoes transformations within these channels. This dissertation thesis contribute to the literature about consumer behavior, media research, adoption of new technologies and government interventions and communication.

10. Limitations, suggestions for further research and policy recommendations

These three research papers give us the opportunity to look in combination at how the decisions made in the three areas of supply-side regulation mentioned above, i.e. 1) regulation to reduce negative externalities within the existing production model, 2) regulation to incentivize the transformation to new types of production models, and 3) the availability of innovative but controversial technologies in combination with the chosen communication strategy of the public and private spheres, influence supply-side attitudes and behavior.

All the three papers rely on the methodology of questionnaire survey. All the limitations applying to questionnaire studies apply also here.

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having some knowledge of SNR. This suggests a dual role for the media in presenting and disseminating information about SNR, suggesting a potential need for enhanced public education and awareness campaigns in this area. There are several limitations associated with questionnaire-based studies. One primary limitation is the reliance on self-reporting, where participants may provide responses influenced by social need or a desire to present themselves in a favorable light. This can lead to response bias, which can impact the accuracy and reliability of the data collected. Another limitation concerns the possibility of respondents misunderstanding or misinterpreting questionnaire items, leading to inaccuracies in their responses. Lack of direct interaction with researchers in questionnaire studies may result in a reduced ability to clarify uncertainties or explore respondents' perspectives more deeply.

In addition, questionnaire studies may suffer from selection bias because the participants who choose to respond may not be representative of the wider population. This bias may affect the generalizability of the findings. In addition, the questionnaire format may limit the range of possible responses, limiting the richness of qualitative insights that can be obtained through open-ended interviews or focus groups. The fixed-choice nature of questionnaires can oversimplify complex attitudes or experiences and potentially miss the nuances of participants' perspectives.

There is also the risk of response fatigue or survey fatigue, where participants may disengage or provide less thoughtful responses as they progress through a lengthy questionnaire. This can compromise the quality of the data collected, especially towards the end of the survey. Finally, the cross-sectional nature of many questionnaire studies may hinder the ability to establish causality or examine changes in attitudes over time. These limitations underscore the importance of recognizing and carefully considering the limitations associated with questionnaire-based research designs.

As the results show, some fundamental data limitations on the input side of the model do not allow for a more detailed examination of perceptions of sub-product characteristics that may be different. A typical example is the difference in perceptions between qualitative product categories that are objectively supported by a robust legislative, control and labelling framework (e.g. organic products) and the more subjective category of environmentally friendly products (legal framework and labelling not yet established). Similarly, preferences to buy local products can be perceived very subjectively in terms of location definition and correlation with better environmental impacts. In this context, it seems to be a good

recommendation for future data collection by the Institute of Sociology of the Academy of Sciences that their questionnaire surveys in the future should take more account of current and future developments in both definitions and categories related to the very dynamic development of the EU legislative framework for production and labelling of products - e.g. to clearly reflect the category of organic food, PDO (denomination of origin), PGI (geographical indicaton), the definition of short supply chains, the definition of Green Claims legislation related to agricultural and non-agricultural products. A more detailed structure of data from future questionnaire surveys would allow a better analysis not only of the motivations on the consumer side, but also of the impact of these categories in contrast to the original intentions of the decision makers.

Second important area is the aspect of communication about "green" attributes of products and services. The results show that exposition to some extensively used communication outlets, i.e. TV and social networks may diminish green consumption. Policymakers and journalists, perhaps contrary to their original expectations, need to concentrate on these two media channels to reverse their unintended impact. As especially video-content, is considered so vital for green consumption intentions (Ramkissoon and Smith, 2014), it should be be further studied how different TV and social network formats and styles could be adapted and modified accordingly in these two media outlets as well as how formation of different information bubbles could polarize opinions (most frequent in social networks) and cause this unfortunate outcome (see also Pearce et al., 2019). Besides, the negative effect of TV might be further analyzed in terms of whether inappropriate advertisement that primarily emphasize the price does not jeopardize communication aspects of green attributes. This would be an essential recommendation for public communication campaigns associated with the adoption of new legislation and its subsequent implementation at both EU and national level. Given that significant amounts of EU and national budget money are spent on these (e.g. the campaign to promote PDO and PGI, organic food etc.), a better understanding of the problem identified in our research would allow taxpayers' money to be better spent.

Regarding the implementation in practice of innovative technologies, our second paper shows the limitations of communication, especially on social media. This area is generally considered to be an environment dominated by interested players and especially dedicated activists. From this perspective, it would be useful to further explore how the composition of social bubbles and the influence of activist influencers on social media can be used to better communicate and promote these technologies. In particular, the findings highlight the key communication role of

health professionals and scientists who are unfortunately alien to these forms of simplified activist-type communication as our findings highlight the importance of considering health risks when evaluating individuals' acceptance of GMF, indicating the need for targeted communication strategies to address health concerns.

Our third paper on SNR adds additional dimension to our findings as it helps to understand how the proximity of real physical existence of innovative technology, with often controversial overtone, to consumers could interact with other factors explaining their preferences and behavior. Despite historical controversies (nuclear accidents etc.) consumers have only small or no concerns about the use of nuclear energy in the Czech Republic, which presents a large opportunity to utilize NE for energy production in the future. Almost 70% of the sample believe that the future use of nuclear power for electricity production should stay the same or even increase. However, they show little acceptance of SNR close to their residence (above 50% of the respondents perceived SNR unacceptable up to 10 from their homes or directly in the city). SNRs are more acceptable further than 50 km from the residence (above 50% of the respondents), and ideally, they should be located in the area of current nuclear power plants (almost 70% acceptance). This finding would require much deeper study as the very nature of the SNR technology and its benefit is related to de-centralization of power production and its displacement to the proximity of energy needs, which would inevitably lead to decisions related to the location of the SNRs at new sites.

The interesting future domain of research might come from the combination of the results presented in the three empirical parts. For example, it would be interesting to study the effects of proximity of the nuclear power station on the willingness to purchase the food products grown up and eventually processed in the region. One might assume, that the fear of nuclear power, and, possible but not probable radioactivity will limit the willingness of the population to purchase the goods produces in its proximity.

To sum it up, in all the paper the sources of information, possible health concerns and the propensity for the environment protection proved to predict behavior. One might suggest, that the government need to pay more attention to the communication of the new technologies and environmental strategies to the general population. Moreover, given that the communication channels proved important, more analysis need to be performed on the ways the communication is transformed within the communication channels.

11. References

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12. Appendices

12.1. Appendix 1. The results in bulleted form

Health risks

- The subjective assessment of own health condition proved unrelated to GM attitudes and actions.
- The more the respondents believe that GMF is safe, (1) the more they would purchase foods with GM ingredients and (2) the less they consider GMF immoral; (3) the more likely they would try GMF.
- The more the respondents believe that GMF can change their DNA, (1) the less likely they would buy food with a GM ingredient, (2) the more they consider GMF immoral.
- The more the respondents believe that GMF can endanger their health, (1) the less likely they would buy food with a GM ingredient, (2) the more they consider GMF immoral; (3) the less likely they are to try food with GM ingredients.

Environmental concerns

- The more important the effect of food production on the environment, the less likely they would try GMF.
- The more the respondent engage in waste management, the more likely they are to try GMF.

Information and interest

- The more the respondent is informed about GMF, (1) the more likely he would buy food with a GM ingredient, (2) the less he believes that GMF is morally unacceptable.
- Interest in GMF positively predicts (1) GMF considered immoral: the more the respondents are interested in GMF, the more they consider GMF immoral;
- The more the respondents believe that the effects of GM are scientifically investigated, (1) the more likely they would buy food with a GM ingredient.

Socio-demographics and other controls

- The bigger the city, the more people are willing to try GMF
- The more the respondent is satisfied in his life, the more he is willing to try GMF

12.2. Appendix 2. Pearson correlation of independent variables in the ordinal regression

Table 24 Pearson correlation of independent variables in the ordinal regression model (formula 1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Urgent areas-environment (1)	1	,161**	0,024	-,078*	-0,062	-0,004	-0,025	-0,061	0,01	0,041	-0,001	-0,041	-0,007	-0,036	0,049	0,015	-0,065	-,095**	0,045
Sig. (2-tailed)		<,001	0,489	0,032	0,078	0,905	0,449	0,085	0,757	0,217	0,984	0,216	0,846	0,284	0,142	0,659	0,074	0,007	0,181
Satisfaction with the environment (2)	,161**	1	,079*	,077*	,101**	,113**	-0,063	-0,058	,079*	0,043	,080*	-0,03	-,075*	-0,045	-0,004	,098**	-0,071	-,177**	-0,014
Sig. (2-tailed)	<,001		0,021	0,033	0,004	<,001	0,06	0,102	0,018	0,195	0,017	0,364	0,025	0,178	0,909	0,003	0,051	<,001	0,672
Enough info about environment (3)	0,024	,079*	1	,132**	0,062	,124**	0,005	0,017	-0,042	-0,039	0,02	,165**	,080*	0,066	,072*	,149**	0,035	0,027	-,145**
Sig. (2-tailed)	0,489	0,021		<,001	0,085	<,001	0,889	0,646	0,219	0,26	0,57	<,001	0,02	0,055	0,036	<,001	0,346	0,454	<,001
EU integration, environment (4)	-,078*	,077*	,132**	1	,505**	,460**	0,065	-0,051	0,07	0,013	0,032	0,043	0,005	0,049	0,014	,125**	,114**	,151**	-,078*
Sig. (2-tailed)	0,032	0,033	<,001		<,001	<,001	0,071	0,176	0,052	0,719	0,384	0,238	0,896	0,175	0,69	<,001	0,003	<,001	0,032
EU integration, economy (5)	-0,062	,101**	0,062	,505**	1	,517**	,111**	-0,066	,074*	,109**	,078*	,097**	0,019	,090*	0,014	,149**	,086*	0,024	-0,063
Sig. (2-tailed)	0,078	0,004	0,085	<,001		<,001	0,002	0,077	0,036	0,002	0,028	0,006	0,584	0,011	0,684	<,001	0,023	0,524	0,074
Trust in EU (6)	-0,004	,113**	,124**	,460**	,517**	1	,149**	-,127**	0,019	,085*	,073*	,085*	0,023	0,066	,086*	,121**	,127**	,117**	-,085*
Sig. (2-tailed)	0,905	<,001	<,001	<,001	<,001		<,001	<,001	0,573	0,013	0,035	0,013	0,498	0,056	0,013	<,001	<,001	0,001	0,013
Age (7)	-0,025	-0,063	0,005	0,065	,111**	,149**	1	-,277**	-,323**	-,239**	-,256**	,305**	,316**	,424**	0,043	,150**	,081*	0,012	,072*
Sig. (2-tailed)	0,449	0,06	0,889	0,071	0,002	<,001		<,001	<,001	<,001	<,001	<,001	<,001	<,001	0,205	<,001	0,026	0,731	0,031
Political orientation (8)	-0,061	-0,058	0,017	-0,051	-0,066	-,127**	-,277**	1	0,016	-0,013	-0,004	-,196**	-,124**	-,137**	-0,055	-,191**	-0,041	-0,008	,135**
Sig. (2-tailed)	0,085	0,102	0,646	0,176	0,077	<,001	<,001		0,663	0,708	0,912	<,001	<,001	<,001	0,121	<,001	0,287	0,837	<,001
TV (9)	0,01	,079*	-0,042	0,07	,074*	0,019	-,323**	0,016	1	,406**	,377**	0,042	-0,05	-,075*	,112**	-0,003	-0,028	-0,003	-,069*
Sig. (2-tailed)	0,757	0,018	0,219	0,052	0,036	0,573	<,001	0,663		<,001	<,001	0,208	0,133	0,025	<,001	0,929	0,437	0,937	0,04
Printed media (10)	0,041	0,043	-0,039	0,013	,109**	,085*	-,239**	-0,013	,406**	1	,456**	0,048	0,014	-,067*	,144**	0,013	0,004	0,044	-,122**
Sig. (2-tailed)	0,217	0,195	0,26	0,719	0,002	0,013	<,001	0,708	<,001		<,001	0,151	0,679	0,046	<,001	0,705	0,904	0,217	<,001
Radio (11)	-0,001	,080*	0,02	0,032	,078*	,073*	-,256**	-0,004	,377**	,456**	1	,085*	-0,007	-,066*	,134**	0,004	0,061	0,005	-,103**
Sig. (2-tailed)	0,984	0,017	0,57	0,384	0,028	0,035	<,001	0,912	<,001	<,001		0,011	0,842	0,05	<,001	0,895	0,094	0,895	0,002

Online news (12)	-0,041	-0,03	,165**	0,043	,097**	,085*	,305**	-,196**	0,042	0,048	,085*	1	,616**	,532**	,282**	,196**	0,066	,095**	-,312**
Sig. (2-tailed)	0,216	0,364	<,001	0,238	0,006	0,013	<,001	<,001	0,208	0,151	0,011		<,001	<,001	<,001	<,001	0,071	0,007	<,001
Online discussions, blogs (13)	-0,007	-,075*	,080*	0,005	0,019	0,023	,316**	-,124**	-0,05	0,014	-0,007	,616**	1	,650**	,339**	,090**	0,062	0,065	-,179**
Sig. (2-tailed)	0,846	0,025	0,02	0,896	0,584	0,498	<,001	<,001	0,133	0,679	0,842	<,001		<,001	<,001	0,007	0,088	0,065	<,001
Social networks (14)	-0,036	-0,045	0,066	0,049	,090*	0,066	,424**	-,137**	-,075*	-,067*	-,066*	,532**	,650**	1	,342**	,131**	0,066	0,041	-0,063
Sig. (2-tailed)	0,284	0,178	0,055	0,175	0,011	0,056	<,001	<,001	0,025	0,046	0,05	<,001	<,001		<,001	<,001	0,068	0,25	0,06
Offline discussions (15)	0,049	-0,004	,072*	0,014	0,014	,086*	0,043	-0,055	,112**	,144**	,134**	,282**	,339**	,342**	1	,077*	,103**	,096**	-,074*
Sig. (2-tailed)	0,142	0,909	0,036	0,69	0,684	0,013	0,205	0,121	<,001	<,001	<,001	<,001	<,001	<,001		0,022	0,005	0,007	0,028
Standard of living (16)	0,015	,098**	,149**	,125**	,149**	,121**	,150**	-,191**	-0,003	0,013	0,004	,196**	,090**	,131**	,077*	1	0,016	0,054	-,240**
Sig. (2-tailed)	0,659	0,003	<,001	<,001	<,001	<,001	<,001	<,001	0,929	0,705	0,895	<,001	0,007	<,001	0,022		0,657	0,123	<,001
Behavior affects climate (17)	-0,065	-0,071	0,035	,114**	,086*	,127**	,081*	-0,041	-0,028	0,004	0,061	0,066	0,062	0,066	,103**	0,016	1	,336**	-0,025
Sig. (2-tailed)	0,074	0,051	0,346	0,003	0,023	<,001	0,026	0,287	0,437	0,904	0,094	0,071	0,088	0,068	0,005	0,657		<,001	0,491
Concerns about climate (18)	-,095**	-,177**	0,027	,151**	0,024	,117**	0,012	-0,008	-0,003	0,044	0,005	,095**	0,065	0,041	,096**	0,054	,336**	1	-,107**
Sig. (2-tailed)	0,007	<,001	0,454	<,001	0,524	0,001	0,731	0,837	0,937	0,217	0,895	0,007	0,065	0,25	0,007	0,123	<,001		0,002
Education (19)	0,045	-0,014	-,145**	-,078*	-0,063	-,085*	,072*	,135**	-,069*	-,122**	-,103**	-,312**	-,179**	-0,063	-,074*	-,240**	-0,025	-,107**	1
Sig. (2-tailed)	0,181	0,672	<,001	0,032	0,074	0,013	0,031	<,001	0,04	<,001	0,002	<,001	<,001	0,06	0,028	<,001	0,491	0,002	

*** correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). Source: own computations based on data (Sociologický ústav. Akademie věd ČR. 2021).*

12.3. Appendix 2. Principal component analysis of perceptions on climate change and conserns about environment

Table 25. Pearson correlations of preceptions of climate change and environmental conserns

Correlations						
		Satisfaction with the environment	Enough info about environment	Urgent areas - environment	Behaviour affects climate	Concerns about climate change
Satisfaction with the environment	Pearson Correlation	1	,079*	,161**	-0,071	-,177**
	Sig.		0,021	<,001	0,051	<,001
	N	898	849	898	758	803
Enough info about environment	Pearson Correlation	,079*	1	0,024	0,035	0,027
	Sig.	0,021		0,489	0,346	0,454
	N	849	853	851	731	771
Urgent areas - environment	Pearson Correlation	,161**	0,024	1	-0,065	-,095**
	Sig.	<,001	0,489		0,074	0,007
	N	898	851	902	759	805
Behaviour affects climate	Pearson Correlation	-0,071	0,035	-0,065	1	,336**
	Sig.	0,051	0,346	0,074		<,001
	N	758	731	759	761	743
Concerns about climate change	Pearson Correlation	-,177**	0,027	-,095**	,336**	1
	Sig.	<,001	0,454	0,007	<,001	
	N	803	771	805	743	807

** Correlation is significant at the 0.05 level (2-tailed). ** correlation is significant at the 0.01 level (2-tailed).*

12.4. Appendix 3. Environmentally conscious consumption as predicted by ordinal regression analysis. Results. Purchasing decisions.

The more urgent is perceived the environment protection, the more the respondent buys local food and the environmentally friendly products.

- The more the respondent is satisfied with the local environment, the more he buys local food.
    - This association is natural as one wants to eat "non-polluted" food; thus, the indicator of buying local food may be viewed both as an indicator of satisfaction with the local environment and an indicator of environmentally friendly behavior.
- The more the respondents believe that they have enough information about how to be environmentally friendly, the more they purchase local food and environmentally friendly products.
- The more the respondents believe that their behavior can affect climate change, the more they buy local food.
    - This is understandable, as limiting the need to transport the products is presented as one of the ways how to reduce CO2 emissions and slow down climate change.
- The more the respondents are worried about the impacts of climate change, the more they report buying organic food and environmentally friendly products.
    - Thus, climate change is viewed as one of the manifestations of environmental degradation. Environmentally friendly products are likely to include those that reduce climate change.
- The more the respondent believes that European integration in the area of environmental protection is beneficial, the more they report buying organic food and environmentally friendly products.
- The less the respondent follows social life TV, the more he buys environmentally friendly products.
- The more the respondent follows social life printed media, the more he buys organic food.
- The more the respondent follows social life in internet discussions and blogs, the more he buys organic food and environmentally friendly products.

- The less the respondent follows social life on social networks, the more he buys organic food.
- The more the respondent follows social life on social networks, the more he buys local food.
- Women report more often purchasing organic food, local food, and environmentally friendly products compared to men.
- Older people buy less organic food.
- The more the respondent adheres to right-wing political orientation, the more he buys organic food, local food, and environmentally friendly products.
- Respondents with higher education report purchasing more organic food compared to all the other types of education.
- Respondents with basic and secondary w/o state exam education buy less local food compared to the respondents with higher education.
- People living in large cities, average and small towns buy less organic food than people living in small villages.
- People living in large cities buy less local food compared to small villages.
- People living in suburbs of large cities buy more local food compared to small villages.

13. List of abbreviations

ČR	Czech Republic
EU	European Union
GHG	Green House Gasses
GP	Green Purchasing
LNPS	Large Nuclear Power Stations
NE	Nuclear Energy
NPS	Nuclear Power Station
OECD	Organization for Economic Cooperation and Development
PCA	Principle Component Analysis
SD	Standard Deviation
SNR	Small Nuclear Reactor
US	United States

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