

Food Waste Unveiled: Exploring Consumer Attitudes, Habits, and the Path to Sustainable Food Consumption

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Abstract

This study enriches the current state of knowledge presented in the literature review by investigating how the propensity to waste food is influenced by people's views on food waste, frequency of food purchases, and individual habits related to environmentally sustainable household practices. Binary logistic regression modelling in hierarchical form was developed from 672 completed questionnaires representing the population of the Czech Republic aged 15 and over. The research shows that the propensity to waste food is higher among individuals who are aware of their food waste and concerned about its cost, which can be explained by cognitive dissonance. The phenomenon of forgetting to consume food before it spoils is identified as an important economic reason for food waste, attributed to time inconsistency and imperfect information processing. The frequency of food purchases is found to have a nonlinear relationship with food waste, suggesting an optimal purchase frequency at which individuals can effectively manage their food stocks. Individuals who frequently bring their own bags to the supermarket and regularly sort their waste have lower levels of food waste, driven by pro-environmental behaviour, mindfulness, and adherence to social norms. The study provides practical insights such as educating the public about the environmental impact of food waste, tailoring communication strategies to address cognitive dissonance, developing community programmes that emphasise the social and moral aspects of reducing food waste and fostering a collective sense of responsibility, and implementing economic incentives or penalties to align economic behaviours with environmental and moral values regarding food waste.

Key words

food waste, propensity to waste food, logistic regression, sustainable consumption.

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Introduction

The global push toward sustainability has catalysed fundamental changes across economic, financial, and consumer behaviour domains, particularly within the European Union. As Aleknevičiene and Bendoraityte (2024) emphasise, economic development is now inextricably linked to green initiatives, with environmental protection becoming central to both business strategy and consumer choice (Aleknevičiene & Bendoraityte, 2023). This evolution of consumer consciousness coincides with a growing recognition that sustainable development requires transformative changes in consumption patterns, especially in Central European economies where sustainable practices are still gaining traction (Šálková et al., 2024). Within this context, food waste emerges as a critical intersection of consumer behaviour, environmental impact, and sustainable resource management.

The complexity of consumer decision-making in sustainable food practices is influenced by multiple factors, including price perception, quality assessment, and cultural preferences. Čvirik (2023) demonstrates how perceived price and quality, along with factors such as country of origin, significantly impact purchasing decisions (Čvirik, 2023), while Hála et al. (2024) reveal that even

among environmentally conscious Generation Z consumers, various determinants can impede sustainable choices (Hála et al., 2024). This evolving landscape of consumer behaviour is further shaped by technological advancements, with the convergence of FinTech and sustainability creating new pathways for sustainable practices (Ranjan Sethi & Ashok Mahadik, 2024). Research indicates that while consumer interest in ethical and sustainable practices is growing, this awareness does not consistently translate into behavioural changes (Šálková et al., 2024). Understanding the gap between consumer attitudes and actual behaviour regarding food waste requires examining both the barriers to sustainable consumption and the potential solutions emerging from the intersection of technology, finance, and environmental consciousness.

Food waste is a societal issue prevalent in the developed world and a symptom of consumerism and unsustainable consumption. Consumerism, an economic theory, posits that consumer spending – or individual expenditures on goods and services – is the primary driver of economic growth and a key measure of productive success in capitalist economies (Duignan, 2023). Given that consumer spending constitutes a significant portion of the gross domestic product (GDP) in most countries, governments often focus on stimulating consumer expenditure as the most effective means of boosting economic production and increasing GDP.

From a psychological and consumer behaviour perspective, consumerism refers to the collective interest in acquiring goods that may not fulfil genuine needs or desires, sometimes with the conscious (or unconscious) aim of achieving higher social status – a phenomenon American economist Thorstein Veblen termed "conspicuous consumption", arguing that individuals often buy goods not just for their utility but as a display of social status. The modern interpretation of consumerism integrates the idea that higher consumption levels reflect an improved standard of living and enhanced quality of life (Galbraith, 1958). Psychological and behavioural consumerism is a natural, though not inevitable, outcome of policies grounded in economic consumerism (Duignan, 2023).

The theory of consumerism holds that robust consumer spending is the primary engine for economic growth. According to Keynesian economics, aggregate demand, which includes consumer spending, is a key determinant of economic output and employment (Keynes, 1936). A higher demand for products encourages production, leading to job creation and further consumer spending, thereby creating a positive feedback loop that stimulates the economy.

Although consumerism supports economic growth, it also faces criticism. Overconsumption has been linked to environmental degradation, resource depletion, and the development of unsustainable economic practices (Schor, 1998). Critics argue that the relentless pursuit of material goods creates a cycle of debt and inequality, with consumers encouraged to live beyond their means.

Beyond its economic implications, consumerism has become deeply embedded in culture, particularly in the United States. The theory has expanded to explain how consumer choices shape identities, preferences, and social affiliations. Sociologists like Pierre Bourdieu (Bourdieu, 2013) argue that consumption is also a form of cultural capital, where consumer behaviour reflects one's social class, education, and status.

In this context, food waste is seen as a byproduct of consumerism, where overproduction, inefficient supply chains, and consumer behaviours like overbuying lead to the disposal of food. This theory links waste to both economic excess (Abbott, 2014) and the psychology of consumer behaviour (Durante & Griskevicius, 2018).

The issue of food waste is addressed by the global environmental initiative spearheaded by the United Nations through Sustainable Development Goal (SDG) 12, which specifically focuses on responsible consumption and production. SDG 12 is one of the 17 global goals outlined in the United Nations' 2030 Agenda for Sustainable Development. It addresses various aspects of sustainability, including waste reduction and the promotion of efficient resource use. In particular, Target 12.3 aims to "By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses." This target underscores the need

to reduce food waste not only at the consumer level but also throughout the entire food supply chain, from production to distribution and consumption. (United Nations, 2023).

Food waste represents the excessive discarding and loss of food driven by consumer behaviour and systemic inefficiencies. This issue is particularly prevalent in developed countries, where abundant food availability and consumer culture encourage overconsumption and waste. Households are the primary contributors to food waste, underscoring the need to examine the causes and determinants of food waste at the household level more closely (Eurostat, 2023).

Several factors contribute to food waste within the context of consumerism. A key issue on the supply side is overproduction, as food is mass-produced to meet market demand. In some instances, production exceeds actual demand, resulting in surplus food that may remain in storage until discarded. Variability in demand, especially during peak and lean periods, can lead to inefficiencies such as overproduction or underutilization of capacity. By ensuring that supply matches consumer needs, companies can reduce the risk of overstocking and underutilization, which are common drivers of food waste (Kumar, 2017). Furthermore, improving supply chain performance through better demand management enhances customer satisfaction and financial performance, which can promote a more sustainable and waste-conscious supply chain, ultimately reducing the amount of food waste generated in the process (Kumar et al., 2021; Rajani et al., 2022).

Another factor is the relatively short shelf life of food products. Some food is intentionally designed with a limited shelf life to encourage more frequent purchases, which increases the risk of waste if the food is not consumed promptly (Porpino et al., 2015). Alternatively, frozen foods typically have longer shelf lives compared to fresh alternatives, which can help reduce spoilage and waste in households. Understanding the factors that drive consumer adoption of frozen food products can provide insights for manufacturers and marketers to encourage more widespread use, potentially leading to reduced food waste through better preservation and storage options (Arora et al., 2022).

On the demand side, consumer preferences and expectations play a significant role (Wani et al., 2023). Consumers often favour visually perfect food, leading to the rejection of items with minor imperfections or aesthetic flaws, resulting in unnecessary food waste of otherwise edible products. Consumerism also fosters the tendency to purchase more food than is needed, which, if improperly stored or not consumed in a timely manner, can end up in landfills.

While external determinants of food waste, such as demographic and socioeconomic characteristics, are relatively well understood (Jribi et al., 2020; Schanes et al., 2018; Yetkin Özbük & Coşkun, 2020), research on internal subjective determinants has gained traction in recent years. This study seeks to complement the existing literature by examining how the propensity to waste food is influenced by individuals' attitudes toward food waste, consumer shopping behaviour, and environmentally sustainable household practices. Internal subjective determinants are more malleable than external factors, offering opportunities for more effective campaigns and interventions aimed at reducing food waste.

The objective of this article is to identify socioeconomic predictors of food waste levels and explore the underlying motives related to public opinion, consumer purchasing behaviour, and pro-environmental habits. The primary purpose of this research is to clarify the ambiguous significance of environmental, moral, and social motivations in reducing food waste. It is also worthwhile to explore regional differences, particularly comparing significant predictors in the Czech Republic with those in other regions. For instance, personal factors such as employment status, household size, and environmental concerns, as well as established household processes like itemized meal planning, food storage practices, and the reuse of leftovers, were found to be significant only in certain countries (Heng & House, 2022). One limitation of this research is the reliance on self-reported data, which may underestimate the actual amount of food waste while overestimating the associated monetary losses (Elimelech et al., 2019). However, self-reporting questions are a common method in sociological research.

Binary logistic regression is the appropriate method for this analysis, as it allows for identifying the optimal set of parameters (coefficients) that best describe the relationship between independent variables and the probability of consumers being classified into groups – specifically, households with relatively higher or lower levels of food waste compared to those of similar size. To verify the robustness of the model, hierarchical modelling and testing for non-linear relationships were applied. The study utilizes data from the Czech Social Science Data Archive, collected in 2022, representing the Czech population aged 15 and older. The sample is representative in terms of Czech regions, place of residence size, gender, age, and education level. The Czech Republic was chosen as a case study because of its status as an EU member state experiencing economic growth and a rise in consumerism. Over recent decades, the country has seen significant economic development and improvements in living standards, reflected in the expansion of its retail sector, which offers a wide array of goods and services. As an open economy, the Czech Republic has access to both local and multinational products and brands. It shares many commonalities with other EU member states, such as similar lifestyles, consumer habits, and distribution systems. The following literature review delves into the motivations behind food waste and efforts to avoid it, drawing on key empirical studies from recent years. The review provides the foundation for the hypotheses tested in this study. The subsequent data and methods section outlines the research design, sample structure, and the quantitative methods employed to evaluate the hypotheses. The research findings are discussed within relevant theoretical frameworks and compared to existing empirical studies. The study concludes by summarizing key findings, acknowledging limitations, and offering implications for future research.

1. Literature review

The first section of the literature review presents the current findings of empirical research focused on internal subjective determinants of food waste. The second section addresses potential external influences in the form of sociodemographic and socioeconomic variables. The discussion examines how these variables are associated with food waste behavior and whether certain groups are more or less likely to engage in food waste practices.

1.1 *Internal determinants (motives) for food waste*

A recent systematic literature review explores the use of theoretical frameworks in the design and implementation of food waste reduction programs (Kim et al., 2022). The review identifies a notable lack of theoretical model application in studies addressing food waste behaviours. It finds that deterministic approaches, which focus on how individual thoughts and emotions shape behaviour, are frequently referenced. However, the analysis calls for more trials utilizing stochastic approaches, such as nudge theory, to expand our understanding and strengthen the evidence base on effective theories for altering food waste behaviour. The study emphasizes the importance of incorporating multiple theoretical constructs in program methodologies to enhance the effectiveness of behaviour change strategies aimed at reducing food waste.

In the literature, four primary types of motivations for avoiding food waste are identified: environmental, moral, financial, and social (Ribbers et al., 2023). *Environmental motivation* arises from concerns about the environmental burden posed by food waste. Food production demands significant resources, including land, water, energy, and fertilizers. Food waste is connected to lifestyle sustainability, attitudes toward waste (Liu & McCarthy, 2023), environmental awareness, spatial limitations for recycling, policies, and household time constraints or priorities (Nunkoo et al., 2021).

However, the literature varies in its assessment of whether environmental concern is the primary driver of food waste avoidance (Ribbers et al., 2023). It is essential to consider individuals' knowledge and awareness of the potential environmental impacts of food waste (Graham-Rowe et al., 2014; Knezevic et al., 2019). For instance, distorted environmental awareness can lead to the misconception that food waste naturally decomposes without harming the environment. Consumers are also often unaware of the secondary impacts of food waste when it is packaged and discarded in plastic (Djekic et al., 2019).

A lack of theoretical knowledge about assessing food edibility (Teng et al., 2021) and a poor understanding of food waste (Farr-Wharton et al., 2014) also negatively influence food waste behaviours. The experimental study (Linder et al., 2018) investigates the effectiveness of an informational leaflet in promoting food waste recycling among urban households. Conducted in Stockholm, the study employed a natural field experiment and utilized a difference-in-difference analysis to assess the leaflet's impact. The results revealed a significant increase in food waste recycling and a reduction in overall household waste within the treatment group compared to the control group, demonstrating the leaflet's effectiveness in encouraging sustainable waste management behaviours.

Additionally, automatic motivations, such as consumer habits and routines (González-Santana et al., 2022) and automatic barriers related to concerns about pests, odours, poor hygiene, and local authority capabilities in food waste collection (Allison et al., 2022), are important contributing factors. Clarifying the ambiguous role of environmental motivations in reducing food waste is one of the objectives of this research.

Moral motivation, on the other hand, is linked to conscience, concern, and feelings of guilt toward those who lack adequate access to food. Moral motivation to prevent food waste in households is related to food security, ethical treatment of animals, addressing social justice issues, environmental stewardship, responsible behaviour, respect for food's intrinsic value, and recognition of the efforts of those involved in food production (Richter & Bokelmann, 2018). When consumers are aware of the harmful effects of food waste, subjective moral norms (Bretter et al., 2023) and perceived behavioural control positively influence their intention to reduce food waste (H. Wang et al., 2023). However, it is crucial to clarify the focus of moral barriers to food waste, as expressed through various moral constructs (Ribbers et al., 2023).

Some studies include measures of moral norms related to a sense of responsibility for preventing food waste and guilt regarding hunger (P. Wang et al., 2021), while others incorporate environmental factors (Stancu et al., 2016) or moral obligations to purchase "suboptimal" food (Aschemann-Witzel et al., 2018). The ambiguity in the relationship between moral norms and food waste is further supported by the discrepancy between stated intentions and actual behaviours. Although consumers may perceive food waste as immoral, this intuitive moral imperative alone is often insufficient to reduce food waste (Gjerris & Gaiani, 2013).

One of the most common reasons for food disposal includes expired expiration dates and perceived signs of spoilage, such as undesirable odours and tastes (Djekic et al., 2019). Additionally, the frequency of grocery shopping influences the amount of household food waste, though not necessarily the tendency to purchase discounted products (Giordano et al., 2019).

Financial motivation is a significant factor and involves concerns about the cost of discarded food. For many individuals, saving money appears to be a more powerful motivator than environmental or moral concerns (Graham-Rowe et al., 2014; Neff et al., 2015). Most qualitative and quantitative studies agree that price-sensitive consumers are less prone to food waste (Ribbers et al., 2023).

By reducing food waste, households can save money by maximizing the use of purchased food. For example, an Australian study found that food storage practices, reuse of leftovers, eating behaviours, food expenditures, and grocery shopping frequency all significantly impact household-level food waste (Ananda et al., 2021). Proper meal planning, ingredient storage, cooking techniques, and leftover utilization can help reduce food expenses and minimize waste (Aloysius et al., 2023; dos Santos et al., 2022; Principato et al., 2021).

Physical capabilities, such as managing food waste through home composting or feeding pets, along with the time and financial costs involved, are significant barriers to food waste recycling in the United Kingdom (Allison et al., 2022). On one hand, food waste is associated with financial losses (Amirudin & Gim, 2019; Stangherlin & De Barcellos, 2018). On the other hand, food waste recycling incurs financial costs, which should be borne by other market participants, such as retailers (Graham-Rowe et al., 2014).

Financial motivations, including the notion that “time is money,” also influence decisions about discarding food. Leftovers can save individuals time if there is enough for a complete meal and no future meals are planned. Furthermore, if a meal is prepared at home, time costs are already associated with its preparation, and individuals may be less inclined to waste leftovers (Ellison & Lusk, 2018).

Social motivation for avoiding food waste involves self-presentation, particularly how individuals are perceived by others in relation to social norms (Principato et al., 2021). Injunctive norms, which stem from the expectations of others – regardless of whether these individuals follow such norms themselves – are especially important (Ribbers et al., 2023). However, adherence to social norms often conflicts with consumer convenience, which negatively affects food waste behaviours (Celestino et al., 2022). Efforts to improve personal image can encourage individuals to engage in community initiatives, such as community gardens, food rescue programs, or sharing surplus food. Social motivations, although not extensively explored in the literature, have not been highlighted as primary drivers of food waste avoidance (Graham-Rowe et al., 2014; Grandhi & Appaiah Singh, 2016; Van Geffen et al., 2020).

1.2 External factors of food waste (demographic and socio-economic influences)

Food waste is also influenced by consumers' *demographic characteristics*, and decisions to discard food vary depending on contextual factors (Ellison & Lusk, 2018). Among the socioeconomic determinants of food waste, key factors include gender, age, education, housing characteristics, household size, and income level.

Younger individuals (aged 18-44) tend to waste food more frequently than older consumers, likely due to having fewer cooking skills, less available time, and lower marginal productivity in food preparation (Ellison & Lusk, 2018). An Irish study found that young men dispose of food waste unsustainably, despite expressing some level of concern about the issue; however, they take minimal actions to reduce waste at all stages of consumption (Flanagan & Priyadarshini, 2021).

Thus, gender and age can influence food waste, although the relationship with age may not be linear. Increased awareness of nutrition can lead to higher levels of food waste in households with both young and elderly individuals involved in food decision-making, whereas it tends to reduce food waste in households with middle-aged individuals who typically provide for their families. Education also plays a role in food waste, as higher levels of education in nutrition improve individuals' habits in planning household food consumption (Heidari et al., 2020).

Regarding *housing characteristics*, it is important to consider whether consumers reside in densely populated areas (e.g., high-rise apartment complexes) or in more dispersed neighbourhoods with single-family homes. Consumers living in high-rise buildings in densely populated areas are less likely to participate in recycling programs, and improving recycling outcomes in such settings typically requires greater effort and resources (Rispo et al., 2015). Household size also affects the extent of preventable food waste. For example, Danish households consisting of a single individual are less likely to generate preventable food waste compared to households of other sizes (Edjabou et al., 2016).

Additionally, the positive impact of food knowledge on reducing household food waste diminishes as income levels increase (Z. Wang et al., 2023). Wealthier consumers, particularly those with young children who frequently dine out, tend to waste food more often despite claiming to be aware of their food waste habits (Liu & McCarthy, 2023; Szabó-Bódi et al., 2018). Factors contributing to a higher proportion of food being disposed of as general waste include perceived inconvenience in using a dedicated food waste container, living in apartment units, and higher household income (Aschemann-Witzel et al., 2019; Nguyen et al., 2022).

1.3 Research questions

Based on the literature review, the research addresses key questions relating to food waste, consumer behaviour, and sustainability.

1. What are the internal and external determinants of food waste in households?

The literature review highlights studies on both internal subjective determinants (e.g., psychological factors, attitudes, values, and beliefs) and external determinants (e.g., demographic,

socioeconomic factors like age, education, and income). These determinants help explain food consumption and waste patterns, as cited in the works of (Jribi et al., 2020; Schanes et al., 2018; Yetkin Özbük & Coşkun, 2020). This study aims to examine how these factors influence household food waste behaviour in the Czech Republic.

2. How do consumer attitudes and habits influence the likelihood of food waste?

The document discusses environmental, moral, financial, and social motivations that impact food waste behaviour (Ribbers et al., 2023). The role of attitudes toward waste, such as environmental concerns or moral guilt about food disposal, plays a significant role, as suggested by the studies of (Graham-Rowe et al., 2014; Richter & Bokelmann, 2018). The research seeks to investigate these attitudes and their connection to food waste patterns, building on previous theoretical models of behaviour and consumption.

3. What impact do shopping behaviours have on food waste?

Consumer shopping behaviours, like frequency and volume of purchases, can lead to overbuying and subsequent waste (Wani et al., 2023). Previous research has shown that purchasing patterns, driven by sales and aesthetic preferences, contribute significantly to food being discarded. The research examines how these behaviours, such as meal planning, shopping frequency, and decisions around purchasing organic or discounted food, impact the likelihood of food waste.

4. To what extent do environmentally sustainable practices reduce food waste?

The literature review emphasizes the role of environmentally conscious actions, such as waste separation, use of reusable products, and composting, in mitigating food waste. Studies by (González-Santana et al., 2022; Richter & Bokelmann, 2018) note that individuals who adopt pro-environmental habits tend to waste less food. This research aims to link specific sustainable household practices, such as composting and using reusable bags, with reduced food waste.

3. Research Design

3.1 Data and sampling

The primary data source for this research consists of secondary data obtained from the "Foods 2022" survey, which was retrieved from the Czech Social Science Data Archive (CSDA). The CSDA serves as a national data service centre dedicated to the social sciences (Czech Social Science Data Archive, 2022).

The survey successfully gathered data from a total of 821 individuals, representing the population of the Czech Republic aged 15 and above. For each question, respondents had the option to either refuse to answer or indicate that they did not know the answer. Because not all respondents answered all questions, the final sample includes 672 completed questionnaires. Respondents were selected using quota sampling, with quotas established based on region (NUTS 3), size of residence, sex, age, and education. Data collection was conducted through the Computer-Assisted Personal Interviewing (CAPI) method by trained interviewers from the Public Opinion Research Centre of the Institute of Sociology of the Czech Academy of Sciences, between July 14, 2022, and September 4, 2022.

This research focused on various topics, including food waste, shopping and consumption behaviours of Czech households, the disposal of imperfect fruits and vegetables based on appearance, public awareness of the Czech Federation of Food Banks, dietary habits, purchasing behaviours, environmental attitudes and behaviours of Czech society, and public attitudes towards food waste.

The dataset was adjusted through post-stratification weighting to achieve structural representativeness of the Czech Republic's population. Weights were computed using an iterative proportional fitting (raking) method, with the weighting variables including education (four categories) × NUTS 2, age (four categories) × NUTS 2, sex × region, size of residence (eight categories) × age (four categories), and education (four categories) × age (four categories). The Czech Statistical Office provided the data for the weighting, and weight values were constrained to a range between 0.333 and 3.

3.2 Definition of variables

Dependent variable: food waste. The "Foods 2022" database evaluates food waste using two primary measures: (i) the percentage of food discarded by households (measured in intervals) and (ii) a comparative assessment of the proportion of discarded food relative to households of similar size (1 = higher amount of food waste, 2 = same amount of food waste, 3 = lower amount of food waste) computed from (i). Therefore, the dependent variable is not a subjective comparison of the level of household food waste, but rather the comparison of waste levels is based on an interval estimate of household waste across the entire sample (automatic calculation). The second measure, which incorporates a benchmark comparison, is deemed more appropriate as it not only assesses the percentage of discarded food per household, as in the first measure, but also provides a comparison with households of similar size. The authors argue that this approach offers a more comprehensive assessment of food waste, particularly given that benchmark evaluations and comparisons are frequently used in academic literature, such as in the assessment of organizational financial health (Uhlener et al., 2007).

Due to the relatively small number of respondents who reported discarding a higher amount of food compared to similarly sized households (9.2%), two response categories were consolidated and recoded as follows: 0 = wastes less (representing individuals with lower subjective food waste), and 1 = wastes the same or more (representing individuals with unsustainable food waste behaviours). The two groups are approximately equal in size. By transforming the original variable into a binary form, binary logistic regression can be employed to analyse the model's effectiveness in accurately predicting household membership in the risk group that discards the same or more food than similarly sized households.

The main effects of the research, for which statistical hypotheses were formulated, were divided into three thematic blocks.

Block A. The Public Opinion Research Centre assessed respondents' agreement with statements related to food waste through a series of questions (question codes correspond to those in the original dataset). Respondents rated their level of agreement on a scale from 1 (strongly disagree) to 5 (strongly agree). The frequency distribution of responses to these questions is presented in Appendix A.

- PL_126a Agreement with statement - feels guilty when wasting food.
- PL_126b Agreement with statement - feels remorseful when wasting food because others have nothing to eat.
- PL_126c Agreement with statement - tries not to waste food but still does.
- PL_126d Agreement with statement - could prevent frequent food waste.
- PL_126e Agreement with statement - thinks about the environmental impact of food waste.
- PL_126f Agreement with statement - considers food waste a problem for the environment due to its biodegradability.
- PL_126g Agreement with statement - believes food packaging is worse for the environment than food waste.
- PL_126h Agreement with statement - concerned about the amount of wasted food.
- PL_126i Agreement with statement - only buys products from the shopping list.
- PL_126j Agreement with statement - plans meals in advance for more efficient shopping.
- PL_126k Agreement with statement - buys more than intended when items are on sale.
- PL_126l Agreement with statement - never buys food that is already at home.
- PL_126m Agreement with statement - concerned about the expenses related to wasted food.
- PL_126n Agreement with statement - tries to utilize everything possible when preparing meals.
- PL_126o Agreement with statement - freezes leftovers for later.
- PL_126p Agreement with statement - consumes leftovers the next day.
- PL_126q Agreement with statement - always prepares more food than needed.

- PL_126r Agreement with statement - decides what to discard based on appearance/smell.
- PL_126s Agreement with statement - pays attention to not consuming food after the expiration date.
- PL_126t Agreement with statement - prefers to throw away better quality food than risk consuming something unsafe.
- PL_126u Agreement with statement - forgets to eat food before it spoils.
- PL_126v Agreement with statement - finds it satisfying to empty the refrigerator and get rid of old food.

Block B. Furthermore, consumer shopping behaviour was monitored using four questions (question codes were taken from the original dataset). The frequencies of responses to these questions are provided in Appendix B.

- PL_14: Goes grocery shopping. 1 = Yes, handles all grocery shopping by themselves; 2 = Yes, mostly does the grocery shopping themselves, but others also shop; 3 = Yes, others mostly handle the shopping, but they also shop themselves; 4 = No, never does grocery shopping.
- PL_41: How often they go grocery shopping. 1 = Every day; 2 = Several times a week; 3 = Once a week; 4 = Once every two weeks; 5 = Less often than once every two weeks.
- PL_34: How often they purchase organic food. 1 = Never; 2 = Rarely; 3 = Occasionally; 4 = Frequently; 5 = Always.
- PL_43: Monthly household expenditure on groceries. Eight expenditure levels were monitored (1 = up to 2,000 CZK; 2 = 2,001 - 4,000 CZK; 3 = 4,001 - 6,000 CZK; 4 = 6,001 - 8,000 CZK; 5 = 8,001 - 10,000 CZK; 6 = 10,001 - 12,000 CZK; 7 = 12,001 - 14,000 CZK; 8 = more than 14,000 CZK). The average exchange rate for CZK to USD in 2022, rounded to two decimal places, is 0.04 USD per 1 CZK.

Block C. In the last part, individual habits related to environmentally sustainable household practices were monitored (Appendix C). Respondents indicated the frequency on a scale from 1 = never to 5 = always.

- PL_55a How often do you bring your own bag for shopping?
- PL_55b How often do you buy fruits and vegetables using reusable bags?
- PL_55c How often do you use your own reusable water bottle?
- PL_55d How often do you use environmentally friendly cleaning products?
- PL_55e How often do you prefer to buy food products made in the Czech Republic?
- PL_55f How often do you prepare meals in containers?
- PL_55g How often do you avoid single-use plastic products?
- PL_55h How often do you limit driving a car for environmental reasons?
- PL_55i How often do you save energy and water for environmental reasons?
- PL_55j How often do you separate regular waste for recycling?
- PL_55k How often do you compost?

3.3 Control variables

The literature review findings identify key control variables for the model. These variables include sex, age, education, housing characteristics, household size, economic activity, and household income level. Table 1 provides an overview of the sample's structural characteristics based on these control variables.

- Sex: 1 = male, 2 = female. This is a categorical indicator variable with a reference level of 1.
- Age of the respondent in 2022. This is a scale variable.
- Education according to the International Standard Classification of Education (ISCED): Level 1 = 3C (General Certificate of Secondary Education, International Baccalaureate); Level 2 = 3A/4A (college with A level); Level 3 = 5A (university degree: bachelor's, master's, doctoral degree). This is a categorical indicator variable with a reference level of 1.

- Size of the municipality based on the number of inhabitants. 1 = up to 1,999 inhabitants; 2 = 2,000 - 4,999 inhabitants; 3 = 5,000 - 19,999 inhabitants; 4 = 20,000 - 49,999 inhabitants; 5 = 50,000 - 199,999 inhabitants; 6 = 200,000 and more. This is a categorical indicator variable with a reference level of 1.
- Household size is assessed using two questions.
 - Living with a partner: 1 = yes (58.5%), 2 = no (41.5%). This is a categorical indicator variable with a reference level of 1.
 - Number of household members. This is a scale variable.
- Economic activity of the respondent: 1 = inactive; 2 = active. This is a categorical indicator variable with a reference level of 1.
- Income level is assessed based on the respondent's subjective living standard: 1 = good, 2 = neither good nor bad, 3 = bad. This is a categorical indicator variable with a reference level of 1.

Table 1. Structural characteristics of the sample (N = 672).

Variable	Descriptives
Sex	Male (49.1 %), Female (50.9 %)
Age	Min = 15, Max = 91, Mean = 47.44, Std. Dev. = 17.411
Education	L1 (44.7 %), L2 (33.8 %), L3 (21.5 %)
Size of the municipality	L1 = up to 1,999 (26.2 %), L2 = 2,000-4,999 (12.7 %), L3 = 5,000-19,999 (16.6 %), L4 = 20,000-49,999 (12.7 %), L5 = 50,000-199,999 (12.1 %), L6 = 200,000 and more (19.6 %)
Living with a partner	Yes (58.5 %), No (41.5 %)
Number of household members	Min = 1, Max = 8, Mean = 2.54, Std. Dev. = 1.237
Economic activity of the respondent	No (43.3 %), Yes (56.7 %)
Subjective living standard	Good (58.0 %), Neither good nor bad (34.1 %), Bad (7.6 %)

Source: Author composition.

3.4 Statistical methods

The set of questions assessing the level of agreement with statements about food waste (PL_126a to PL_126v) was subjected to the Kaiser-Meyer-Olkin (KMO) test, a statistical measure used to evaluate the suitability of data for factor analysis (Cureton & D'Agostino, 2013). The resulting KMO value of 0.74 indicates moderate suitability. This suggests that while some manifest variables may be grouped into latent variables, others cannot and should be analysed separately. Consequently, factor analysis was not conducted, and the variables in the PL_126a to PL_126v question set were treated as independent variables.

Given the nature of the dependent variable, binary logistic regression was applied as suggested by recent studies (Abu Hatab et al., 2022; Lang et al., 2020; Tonini et al., 2023). Logistic regression is a statistical method used to estimate the probability of an event (the dependent variable) based on certain known factors (the independent variables) that may influence its occurrence (Pampel, 2000). In this model, the event – whether or not the phenomenon occurred – is represented by a random variable that takes a value of 0 if the event did not occur and 1 if it did. In this case, a code of 0 signifies lower relative food waste compared to similarly sized households, while a code of 1 indicates the same or higher level of food waste. Cases coded as 1 represent households with a higher propensity for food waste.

Logit models use the logistic function to link the linear combination of the independent variables to the probability of the binary outcome. The logistic function is characterized by its "S-shaped" curve, which asymptotically approaches 0 and 1. Mathematically, the logit link function is the log of the odds ratio:

$$P(Y = 1|X) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X)}} \quad (1)$$

where $\beta_0 + \beta_1 X$ represents the linear combination of predictors.

The error terms (unobserved factors affecting the outcome) in a logit model are assumed to follow a logistic distribution, which has slightly fatter tails compared to the normal distribution (Pampel, 2000).

One way to check robustness is by changing the specification of the model. This involves including or excluding certain variables to see if the results remain consistent. If the key coefficients of interest remain stable across different model specifications, this suggests that the model is robust. Two approaches were applied: 1) Hierarchical modelling, 2) Testing for non-linear relationships. Ad 1)

To check the robustness of the model, the regression analysis was conducted through a series of hierarchical steps (models), which allowed for a more systematic examination of the variables and facilitated the identification of key factors influencing food waste. Hierarchical regression is a statistical method that assesses the relationship between a dependent variable and multiple independent variables, while controlling for the effects of other variables. The primary purpose of hierarchical multiple regression is to evaluate the unique contribution of each independent variable to the prediction of the dependent variable, after accounting for the effects of the other variables (Stam & Elfring, 2008). This approach is widely used in the social sciences and enables comparisons between alternative models, both with and without interaction terms. An interaction effect is present only if the interaction term significantly improves the variance explained in the dependent variable beyond the main effects of the explanatory variables (Veidal & Flaten, 2014). We started with a simple model that includes only control variables, then incrementally added blocks of independent variables (as done in hierarchical regression). If the coefficients for the main variables of interest remain consistent, it indicates robustness.

- **Model 1** includes all control variables in linear form.
- **Model 2** includes all categorical control variables in linear form, while continuous variables (age and household size) are modelled in quadratic form. If no significant influence of the quadratic terms is found in Model 2, only linear relationships will be considered in subsequent models. This approach is consistent with (Cavicchioli et al., 2019).
- **Model 3** includes all control variables and the significant main effects from Block A (agreement with statements about food waste).

H1: People's attitudes toward food waste influence their likelihood of wasting food.

- **Model 4** includes all control variables, the significant main effects from Block A (attitudes toward food waste), and the significant main effects from Block B (consumer purchasing behaviour).

H2: Consumer shopping behaviour influences their likelihood of wasting food.

- **Model 5** includes all control variables, the significant main effects from Block A, Block B, and the significant main effects from Block C (individual habits related to environmentally sustainable household practices).

H3: Individual habits related to environmentally sustainable household practices influence their likelihood of wasting food.

A forward stepwise regression based on the Likelihood Ratio Test was employed to select the main effects in Blocks A, B, and C, as the Wald test may lose power under certain conditions. This process involved calculating logistic regression results for models both with and without the predictor of interest, followed by testing the difference in chi-square values to assess significance (Osborne, 2008).

Ad 2) Testing for non-linear relationships: If continuous variables are modelled linearly, check robustness by including polynomial terms (e.g., quadratic) or by transforming variables (log transformation) to capture potential non-linear effects. We tested the quadratic form of age and number of household members.

After performing the logistic regression, indicators of the predictive ability of the model were calculated. Sensitivity is the probability that the model predicts a positive outcome for a positive object

(i.e., correctly classifying a case into the risk group of individuals with a propensity to engage in excessive food waste). Nagelkerke's R^2 is a measure of the goodness of fit in logistic regression analysis. Specificity is the probability that the model predicts a negative outcome for a negative object (i.e., correctly classifying into the group of individuals with a lower propensity to waste food). The cut point probability for classifying a case into the respective group is 0.5. The ROC curve (Receiver Operating Characteristic curve) displays sensitivity against specificity for each cut point. The area under the ROC curve (AUC) is the most commonly used quantitative index describing the ROC curve and also expressing the accuracy of the test. The following threshold values are used for evaluating the test: 0.9-1 excellent, 0.8-0.9 very good, 0.7-0.8 good, 0.6-0.7 sufficient, 0.5-0.6 insufficient (Pampel, 2000). In this study, the area under the ROC curve was calculated for the final Model 5.

The Hosmer-Lemeshow test (H-L) of goodness of fit is used when the outcome variable is binary and when the sample size is sufficiently large to assess the fit of the model to the data.

$$G_{HL}^2 = \sum_{j=1}^n \frac{(O_j - E_j)^2}{E_j(1 - \frac{E_j}{n_j})} \quad (2)$$

where $O_j = \sum_i y_{ij}$ is the observed number of events in the j -th group. $E_j = \sum_i \hat{p}_{ij}$ is expected number of events in the j -th group.

If the H-L test statistic is greater than the significance level, we cannot reject the null hypothesis that there is no difference between the observed and expected values predicted by the model. This means that the model estimates correspond to the data at an acceptable level (Hosmer & Lemeshow, 1980).

4. Results

Table 2 provides a comparison of the logit regression models, while Table 3 presents their predictive performance. Model 1 includes all control variables in linear form, and Model 2 incorporates continuous control variables in quadratic form.

Table 2. Results of the logit regression - odds ratios in the Models 1 to 5.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
<i>Control</i>					
Sex: F-M	0.644**	0.636**	0.673	0.630*	0.726
Age	0.976***	-	0.987	0.986	0.993
Age (squared)	-	1.000***	-	-	-
Education					
L2-L1	0.870	0.863	0.768	0.755	0.875
L3-L1	0.785	0.763	0.998	0.910	1.170
Size of the municipality					
L2-L1	1.431		1.430	1.603	1.747
L3-L1	0.538*	1.419*	0.507*	0.626	0.541
L4-L1	0.623	0.554	0.554	0.583	0.541
L5-L1	0.742	0.630	0.722	0.830	0.739
L6-L1	1.040	0.764	1.221	1.339	1.132
Living with a partner: No-Yes	0.981	1.031	0.879	0.896	0.989
Number of household members	1.086	-	1.010	1.045	1.099
Number of household members (squared)	-	1.021	-	-	-
Economic activity of the respondent: Yes-No	1.874**	1.761**	1.796**	1.567*	1.622*
Subjective living standard					
Neither good nor bad – Good	1.587*	1.574*	1.369	1.404	1.360
Bad – Good	1.495	1.478	1.879	1.639	1.404

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
<i>Main effects: Block A</i>					
PL_126d Could prevent frequent food waste			1.368**	1.362**	1.278*
PL_126m Concerned about the expenses related to wasted food.			1.325**	1.302**	1.310**
PL_126n Tries to utilize everything possible when preparing meals			0.456***	0.447***	0.538***
PL_126u Forgets to eat food before it spoils.			1.520***	1.521***	1.542***
<i>Main effects: Block B</i>					
PL_41 How often they go grocery shopping			-	0.660**	0.667**
<i>Main effects: Block C</i>					
PL_55a How often do you bring your own bag for shopping?			-	-	0.702***
PL_55j How often do you separate regular waste for recycling?			-	-	0.690***
Constant	2.080	1.276	2.049	5.896	34.220
N	672	672	672	672	672

Note: *, ** and ***, denote significance at 10%, 5% and 1%, respectively.

Source: Author composition.

Based on the post-estimation characteristics outlined in Table 3, no significant differences were observed between Model 1 and Model 2. Consequently, only the linear forms of the control variables are examined in subsequent models.

Table 3. Post-estimation statistics for comparable models – logit models.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Nagelkerke's pseudo R ²	0.136	0.135	0.313	0.327	0.380
Sensitivity (%)	60.6	59.9	69.1	68.1	74.9
Specificity (%)	67.3	66.7	71.4	70.4	76.0
Correctly classified (%)	64.2	63.5	70.3	69.3	75.5
Chi-squared	43.479	43.042	107.664	113.318	135.335
-2LL	514.474	514.911	450.289	444.636	422.618
H-L test: chi-sq (p-value)	18.064 (0.021)	18.587 (0.019)	7.808 (0.452)	5.738 (0.677)	3.654 (0.887)

Note: 0.5 cut-off value. Area under Curve (AUC) of the Model 5 = 0.727 (Std. Error = 0.02, p-value = <0.001).

Source: Author composition.

Sex, age, and economic activity emerge as statistically significant predictors of an individual's propensity to waste food. Model 1 shows that women are less likely to waste food compared to men, food waste decreases with age, and economically active individuals have a higher tendency to waste food compared to those who are economically inactive. Additional details on the correlation coefficients of the control variables are provided in the Appendix D.

Age is an important control variable, as it influences whether individuals live with a partner, their economic activity, their standard of living, and the number of household members. As age increases, individuals are more likely to live with a partner, the number of household members decreases (empty nest syndrome), economic activity declines (due to retirement or part-time work), and subjective living standards tend to decrease. A decrease in the number of household members is also associated with a decline in subjective living standards. Thus, age can be considered a key control variable that affects other observed control variables.

After including the main effects in Block A, which express personal opinions related to food waste, age is no longer a statistically significant control variable. However, economic activity remains significant at the $\alpha = 0.05$ level. Individuals who recognize that they waste food and are concerned about the associated expenses exhibit a higher likelihood of food waste (PL_126d: “Frequent food waste could be prevented,” odds ratio = 1.368; PL_126m: “I am concerned about the expenses related to wasted food,” odds ratio = 1.325). Forgetting to consume food before it spoils is also a significant economic reason for food waste (PL_126u, odds ratio = 1.520). In contrast, individuals who make an effort to use all possible ingredients in food preparation are less likely to waste food (PL_126n, odds ratio = 0.456). Hence, economic factors are the dominant predictors of consumers' propensity to waste food.

The loss of age significance after adding Block A is due to its correlation with several key opinions, including the belief that frequent food waste could be prevented ($r = -0.369$; $p < 0.001$), forgetting to consume food before it spoils ($r = -0.219$; $p < 0.001$), and the effort to use all possible ingredients in food preparation ($r = 0.236$; $p < 0.001$). Older individuals are less likely to acknowledge that frequent food waste can be prevented and are more efficient in using all ingredients during food preparation. They are also less likely to admit to forgetting to consume food before it spoils. Individuals living with a partner tend to be more concerned about the financial implications of wasted food ($r = -0.130$; $p < 0.001$).

Model 4 extends the predictors to include consumer shopping behaviour (Block B). The frequency of grocery shopping is a significant predictor of food waste. A higher score on question PL_41 indicates less frequent grocery shopping, and as shopping frequency decreases, the likelihood of being classified as prone to food waste also decreases (odds ratio = 0.660). However, this relationship is not entirely linear, as shown in Appendix E. Food waste decreases as shopping frequency declines from daily to once a week, but when shopping occurs less frequently (once every 14 days or less), the proportion of wasteful individuals increases. A lower frequency of shopping beyond the optimal level likely leads to excessive stockpiling of ingredients that consumers cannot process in time.

The relationship between grocery shopping frequency and age exhibits a nonlinear pattern (linearity test $F = 0.132$; $p = 0.717$). Older individuals tend to shop once or several times per week (average age 48.35 and 48.78 years, respectively), while younger individuals either shop daily (average age 43.72 years) or less frequently, once every 14 days (average age 43.05 years) or even less frequently (average age 38.33 years).

Model 5, the final model, further extends the analysis by including individual habits related to environmentally sustainable household practices (Block C). Environmental factors play a role in food waste reduction. Individuals who frequently bring reusable bags when shopping (PL_55a, odds ratio = 0.702) and those who regularly separate waste for recycling (PL_55j, odds ratio = 0.690) have a lower propensity to waste food (see Fa and Fb Appendix). Bringing one's own shopping bag instead of regularly purchasing new plastic bags from stores may seem inconspicuous, but it is a significant signal of sustainable behaviour in practice.

There is a significant relationship between the use of reusable bags and age (linearity test $F = 52.891$; $p < 0.001$). The average age of those who never use reusable bags is 33.86 years, while those who always use them are, on average, 51.39 years old. Regarding waste separation, older individuals either do not separate waste at all (average age 50.88 years) or always do so (average age 49.94 years). Younger generations show more uniformity in their waste separation practices.

According to the Hosmer-Lemeshow (H-L) test, Model 5 provides a good fit to the data and can correctly predict nearly three-quarters of individuals who waste food at the same rate or more compared to households of the same size (sensitivity = 74.9%). The area under the receiver operating characteristic (ROC) curve for Model 5 is 0.727, which is considered a strong result.

5. Discussion

The study found that individuals who are aware of their food waste and concerned about the cost of wasted food exhibit a higher propensity to waste food. This behaviour can be explained through the concept of cognitive dissonance, which refers to the psychological discomfort that arises when a person holds conflicting beliefs or engages in behaviours that contradict their values or beliefs (Hinojosa et al., 2017). In this case, people who recognize that they waste food and are concerned about the cost experience cognitive dissonance, as their behaviour of wasting food conflicts with their value of being cost-conscious. To reduce this discomfort, they rationalize their behaviour by continuing to waste food, maintaining consistency between their actions and beliefs. This rationalization can perpetuate a cycle of food waste.

However, alternative explanations exist. First, individuals more aware of their food waste might also be more attuned to environmental or economic concerns, which may introduce a bias in how food waste is measured or perceived. Those more sensitive to waste might overestimate their waste compared to those less aware or concerned, introducing a form of measurement bias (Jones-Garcia et al., 2022). Additionally, food waste could be more a result of ingrained habits and routines than conscious decision-making. People often develop routines around food purchasing and consumption that inadvertently lead to waste, independent of their awareness or concern about costs (Verplanken & Orbell, 2022).

Another explanation involves social influence and peer behaviour. People may be influenced by the behaviour of those around them, making food waste a normalized behaviour, regardless of personal beliefs (Manika et al., 2022). Furthermore, there is often a psychological distance between the act of wasting food and its perceived consequences. While individuals may intellectually understand the cost of food waste, they may not emotionally or practically connect it to their daily behaviours (Aydin & Yildirim, 2021).

One significant economic reason for food waste is that consumers forget to eat food before it spoils. This can be explained by the concepts of time inconsistency and imperfect information processing. Time inconsistency refers to the tendency of individuals to prioritize immediate gratification over delayed rewards (Adams et al., 2014). When faced with the choice between eating food immediately or saving it for later, individuals tend to prioritize immediate consumption, often forgetting to eat the food before it spoils. Additionally, imperfect information processing plays a role; individuals may underestimate how quickly food spoils or overestimate their ability to consume it before it goes bad. This over-optimism can result in unintended food waste.

Individuals who actively try to use all available ingredients during food preparation are less likely to waste food. This aligns with the principle of frugality and resourcefulness. People who make an effort to utilize every ingredient are more mindful of minimizing waste, reflecting a value of efficiency and reducing unnecessary consumption (Shoham & Brenčič, 2004).

Moreover, these individuals likely engage in meal planning and portion control, further reducing food waste. By carefully planning meals and portions, they align consumption with their needs, lowering the chances of excess food going unused (Aloysius et al., 2023).

The frequency of food purchases is a significant nonlinear predictor of food waste, indicating an optimal purchase frequency. Optimal purchase frequency refers to how often individuals can effectively manage their food inventory, minimizing waste while meeting consumption needs (Calvo-Porrall & Levy-Mangin, 2016). In the case of food purchases, the optimal frequency is likely to fall within a range where individuals can adequately consume the food before it spoils.

When individuals purchase food more frequently (e.g., daily), they are more likely to buy smaller quantities that align with immediate needs, reducing the likelihood of excess food going unused. As purchase frequency decreases from daily to once a week, the rate of food waste also decreases. However, when individuals purchase food at an extremely low frequency, such as once every 14 days or less, they may struggle to manage their food inventory, leading to excessive stockpiling and increased waste. A significant factor driving this behaviour is consumer stockpiling in response to

price promotions (Bell et al., 2002). Therefore, purchase frequency is closely tied to effective planning as a tool for reducing food waste (Aloysius et al., 2023; dos Santos et al., 2022; Principato et al., 2021).

Poor management of the agricultural supply chain, especially in perishable goods like fruits, can lead to significant post-harvest losses, contributing to food waste before products even reach consumers (Kumar & Nath, 2020). A more efficient supply chain that minimizes waste in the production and distribution stages can reduce the amount of food that spoils or is discarded, thus impacting the overall levels of consumer food waste (Kashav et al., 2023; Sharma et al., 2022).

AI-technology-based interventions, particularly those drawing from behavioural theories such as nudging, could be applied to influence consumers' decision-making processes regarding food consumption and waste. By enhancing individuals' awareness and prompting behavioural changes, similar to the effects observed in hospitality settings, AI-driven solutions could potentially reduce food waste by encouraging more mindful consumption patterns (Bangwal et al., 2023).

The final model's findings show that individuals who frequently bring their own bags to the grocery store and regularly sort their waste are less likely to waste food. This can be explained through the concepts of pro-environmental behaviour, mindfulness, and social norms (Dharmesti et al., 2020; Richter & Bokelmann, 2018; Thiermann & Sheate, 2022). Bringing reusable bags and sorting waste are examples of pro-environmental consumer habits that reflect an awareness of environmental issues and a commitment to reducing waste (González-Santana et al., 2022). Individuals who engage in pro-environmental behaviours in one aspect of their lives are more likely to extend this mindfulness to other areas, such as food consumption (Vorobeve et al., 2022). This heightened conscientiousness often translates into reduced food waste.

Frequent use of reusable bags and sorting waste requires individuals to be more mindful of their consumption habits. Mindfulness involves being fully aware of one's actions and their consequences. Individuals who practice mindfulness in their daily routines often extend it to food consumption, becoming more attentive to the amount of food they purchase, serve, and store. This mindfulness helps reduce food waste by promoting more intentional and efficient consumption. Research has shown that people with high mindfulness are more likely to support food waste reduction policies, regardless of the communication method (Olavarria-Key et al., 2021). Additionally, perceived behavioural control and routines related to shopping and reuse of leftovers are significant drivers of food waste, with planning routines contributing indirectly (Stancu et al., 2016).

Social norms and environmental consciousness also influence pro-environmental behaviours, such as bringing reusable bags and sorting waste. When individuals observe others practicing sustainable behaviours or when society encourages these actions through campaigns and regulations, social norms form, promoting these behaviours (De Groot et al., 2021). As a result, individuals who adopt these practices are more likely to engage in other sustainable actions, such as reducing food waste. However, some studies suggest that economic consciousness has a stronger effect than environmental consciousness on the intention to reduce food waste (Graham-Rowe et al., 2014; Neff et al., 2015; Secer et al., 2023).

Among the control variables, age was identified as a key determinant of food waste. Different generations may have distinct attitudes, behaviours, and cultural norms regarding food consumption and waste. Older generations, who may have grown up during times of scarcity or economic hardship, tend to value food more and are less likely to waste it. This is particularly relevant in the Czech Republic, where consumers experienced limited food availability during the pre-1989 socialist period (Ioniță, 2017). In contrast, younger generations, especially those raised in an era of increased environmental awareness, may have a stronger understanding of the environmental consequences of food waste (Ahmed, 2021).

Age is also associated with lifestyle factors that influence food waste (Aschemann-Witzel et al., 2021). Younger adults or individuals with busy lifestyles may have less time to plan meals, shop efficiently, or manage perishable food, leading to impulse purchases and higher food waste (González-

Santana et al., 2022). Conversely, older adults tend to have more established routines and cooking habits, as well as better meal planning skills, all of which contribute to reducing food waste.

Economic activity is another significant predictor of food waste. Economically active individuals, such as those working full-time or with demanding schedules, are more likely to waste food than economically inactive individuals. Time constraints often limit their ability to plan meals, shop thoughtfully, or cook at home, leading to a reliance on convenience foods, takeout, or eating out (Liu & McCarthy, 2023; Szabó-Bódi et al., 2018). These food options, often served in larger portions or pre-packaged, can result in excess food and increased waste.

Conclusions

The study provides insights into the determinants of food waste and offers theoretical explanations for the observed patterns. The findings suggest that the propensity to waste food is shaped by factors such as cognitive dissonance, time inconsistency, imperfect information processing, and the principles of frugality and resourcefulness. People's attitudes toward food waste significantly affect their likelihood of wasting food (H1). Specifically, individuals who are aware of their food waste and concerned about the associated costs may experience cognitive dissonance, leading to a rationalization of their behaviour, which perpetuates the cycle of food waste. Additionally, food wastage driven by economic factors can be explained by time inconsistency and imperfect information processing, where individuals prioritize immediate consumption and underestimate the rate at which food spoils. In contrast, individuals who emphasize using all available ingredients and engage in meal planning and portion control are less prone to waste, reflecting values of efficiency and minimizing unnecessary consumption.

The study also underscores the role of food purchasing frequency in influencing food waste. Consumers' shopping behaviour significantly affects their propensity to waste food (H2). There appears to be an optimal purchasing frequency at which individuals can effectively manage their food inventory and minimize waste. As the frequency of purchases decreases from daily to weekly, food waste tends to decline. However, when purchasing frequency drops below optimal levels, such as once every 14 days or less, the likelihood of food waste increases due to the accumulation of excessive raw materials that individuals may not have time to consume before spoilage occurs.

Moreover, pro-environmental behaviours, such as regularly bringing reusable bags and sorting waste, contribute to reducing food waste. Individual habits related to environmentally sustainable household practices significantly impact their propensity to waste food (H3). These behaviours are associated with increased environmental awareness, mindfulness, and adherence to social norms that promote sustainability.

Additionally, age and economic activity emerged as key control variables in the analysis. Older individuals and those who are economically inactive tend to generate lower levels of food waste, likely influenced by generational differences, lifestyle factors, resource management practices, and heightened awareness of waste-related issues.

Understanding these determinants of food waste can inform interventions and strategies aimed at reducing waste throughout the food system, from production to consumption. Addressing cognitive dissonance, promoting mindful consumption, emphasizing the optimal frequency of purchases, encouraging resourcefulness, and fostering pro-environmental behaviours can all contribute to mitigating food waste and promoting more sustainable consumption practices.

The study makes a significant theoretical contribution to the field of sustainable consumer behaviour, particularly in the context of food waste. It addresses a critical gap in the existing literature by examining both internal subjective determinants (such as personal views on food waste, cognitive dissonance, and individual habits) and external factors (including socioeconomic influences) that shape food waste behaviour.

This comprehensive approach extends beyond the typical focus on demographic and socioeconomic characteristics by exploring the psychological and behavioural dimensions that

influence food waste. By employing binary logistic regression models and analysing data from a representative sample of consumers in the Czech Republic, the study provides valuable insights into the motivations driving food waste, including cognitive dissonance and economic factors. The findings reveal the complex interaction between awareness, attitudes, and habits in determining an individual's propensity to waste food, underscoring the importance of targeted interventions and strategies aimed at reducing household food waste.

The originality of the study lies in its holistic examination of the diverse factors contributing to food waste behaviour, offering a nuanced understanding that is essential for developing effective waste reduction strategies. This theoretical contribution deepens our knowledge of the drivers behind food waste, which is crucial for addressing this pressing issue in the broader context of global sustainability challenges.

Several successful initiatives from various countries offer valuable insights that could be adapted to the Czech context. For instance, France's pioneering 2016 law requiring supermarkets to donate unsold food to charities has resulted in a 22% increase in food donations, demonstrating the effectiveness of legislative approaches. In Denmark, the "Stop Wasting Food" (Stop Spild Af Mad) movement has successfully reduced household food waste by 25% through public awareness campaigns and partnerships with retailers, particularly by promoting the sale of imperfect produce at discounted prices. Similarly, South Korea's implementation of the "Pay as You Throw" system, where households are charged based on the amount of food waste they generate, has led to a 10% reduction in food waste within its first year of implementation. The Netherlands has demonstrated success through its "United Against Food Waste" program, which brings together businesses, research institutions, and government agencies to create innovative solutions, resulting in a 29% reduction in consumer food waste between 2016 and 2022. Italy's approach combines tax incentives for food donations with simplified donation procedures, leading to a 40% increase in recovered food since 2018. In Australia, the "Love Food Hate Waste" campaign has successfully engaged over 137,000 households through practical education programs, cooking workshops, and digital tools for meal planning, achieving an average reduction of 15% in household food waste. These initiatives align with our findings in the Czech Republic, where consumer awareness and economic incentives were identified as key drivers of food waste reduction. The success of these international programs suggests that a multi-faceted approach combining legislation, public education, and economic incentives could be particularly effective in the Czech context. Notably, the Danish and Dutch models of stakeholder collaboration could be especially relevant, given the similar market structure and consumer behaviours observed in our study.

This research on food waste, consumer attitudes, and sustainable consumption offers several potential benefits to society. The study highlights how food waste contributes to environmental degradation by wasting resources like water, land, and energy. By identifying key factors that lead to food waste, the research can inform strategies to minimize waste at the household level, thus helping reduce the carbon footprint and the strain on natural resources. By examining consumer attitudes, shopping habits, and pro-environmental behaviours, the study provides insights into how individuals can be encouraged to adopt more sustainable consumption practices. For example, using reusable bags, composting, and better meal planning can be promoted to reduce waste. The study identifies financial motivations as a key driver of food waste, showing that households often waste food due to poor planning or buying too much. By promoting better food management and reducing food waste, the research can help households save money.

The research can inform policymakers and businesses about the societal and economic costs of food waste. Policymakers can use the findings to develop regulations or incentives to reduce food waste, such as supporting food recovery programs or encouraging retailers to sell "imperfect" produce. By highlighting the importance of food waste recycling and sustainable household practices, the research supports the concept of a circular economy, where resources are reused and repurposed, rather than wasted.

The study highlights moral and social motivations for reducing food waste, such as guilt over global hunger or concern for environmental degradation. By understanding these motivations, initiatives can be designed to foster a stronger sense of social responsibility regarding food waste.

The research clarifies the previously ambiguous roles of environmental, moral, and social motivations in food waste reduction. It reveals that cognitive dissonance plays a significant role among individuals who are aware of and concerned about food waste yet continue to engage in wasteful practices due to economic considerations. The study emphasizes the influence of economic factors, such as forgetting to consume food before it spoils, and highlights the positive impact of environmentally conscious behaviours, like bringing reusable bags to stores, in reducing food waste. By elucidating these motivations and behaviours, the research offers practical insights for developing effective strategies to combat food waste. Specifically, the study suggests:

- Educating the public on the environmental consequences of food waste to cultivate a deeper sense of moral responsibility and promote pro-environmental behaviours.
- Designing communication strategies that address cognitive dissonance by aligning individuals' environmental and moral beliefs with their actual food consumption and waste behaviours.
- Creating community programs that emphasize the social and moral dimensions of reducing food waste, fostering a collective sense of responsibility.
- Implementing economic incentives or penalties to better align economic behaviour with environmental and moral values concerning food waste.

The research has several limitations. First, the study is based on a specific sample from a single country, which limits the generalizability of the findings to a broader international population. It is important to recognize that different demographic groups, cultural contexts, and socioeconomic factors can influence food waste behaviour, and the study's sample may not fully capture the diversity of these influences across countries.

Second, the study relied on self-reported data, which can be subject to biases and inaccuracies, particularly social desirability bias (Cerri et al., 2019). While this research focuses on individuals' subjective opinions rather than objectively measurable food waste, participants may have been inclined to provide socially desirable responses. This could lead to an underreporting of food waste behaviours or an overstatement of pro-environmental actions, potentially affecting the accuracy of the data and distorting the findings. Future studies might consider using objective measures or observational data, such as waste compositional analysis, to validate self-reported information (Quested et al., 2020).

Finally, the study did not account for all control variables that could potentially influence food waste behaviour, as it was based on secondary data. Incorporating additional control variables in future research could provide a more comprehensive understanding of the determinants of food waste.

This study has provided valuable insights into the determinants of food waste, offering important implications for understanding consumer behaviour and informing waste reduction strategies at both the individual and household levels. However, several areas remain for further investigation. As this study focused on a specific context, cultural and contextual factors may influence food waste differently across regions or countries. Future research could explore how cultural norms, values, and societal attitudes toward food waste affect consumer behaviour. Examining the role of cultural factors in shaping attitudes, practices, and perceptions of waste could aid in developing more effective strategies tailored to specific cultural contexts.

Since aging populations are becoming more prominent globally, studying the relationship between food waste and aging can yield valuable insights. One of the research ideas could investigate how retirement affects food consumption and waste patterns. As individuals retire and their daily routines change, they may have more time for meal planning, food preparation, and efficient food use. This could lead to reduced food waste. Close to this topic, researchers could also study the relationship between loneliness, social isolation, and food waste among older adults. Older adults living alone may experience different food waste patterns due to cooking for one person or lacking the motivation to

prepare meals. Finally, it would be good to explore how dietary restrictions and health-conscious food choices among aging populations influence food waste. Older adults often adjust their diets due to health conditions (e.g., low-sodium or diabetic diets), which might lead to food waste if specific food items are not consumed in time.

Another valuable study could assess the effectiveness of technological tools, such as smart refrigerators, meal-planning apps, or reminders, in reducing food waste in aging households. Technology may help older individuals better manage their food inventory, reducing forgotten or spoiled food. However, there might be a learning curve or access issues.

Investigating the underlying decision-making processes that contribute to food waste could also yield valuable insights for designing interventions. Future studies could examine the cognitive and psychological factors that influence consumer decisions related to food purchasing, consumption, and waste. Understanding how elements such as habit formation, decision heuristics, perceived behavioural control, and subjective norms shape food waste behaviour could help in developing targeted interventions that address these cognitive processes.

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Code availability: Standard statistical software – IBM SPSS 29

Data Availability Statement: The data is publicly available on the website <https://archivdv.soc.cas.cz/>. The database is available after registering (free of charge) under the title Potraviny 2022 (Foods 2022).

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