



# ENOUGH

EUROPEAN FOOD CHAIN SUPPLY  
TO REDUCE GHG EMISSIONS BY 2050

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### Designing feasible policy and finance interventions for EU food consumption

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## EXECUTIVE SUMMARY

The deliverable D7.8 for the ENOUGH project, investigates the determinants of sustainable food consumption in the European Union to design feasible policy interventions and financial mechanisms. Aligned with the ambitious goals of the European Green Deal and the Farm to Fork Strategy, the research focuses on understanding consumer perceptions, socioeconomic profiles, and the effectiveness of awareness initiatives to bridge the gap between policy objectives and practical implementation.

The analysis is based on extensive data from the Eurobarometer survey (2020), comprising 27237 respondents across all 27 EU Member States. A statistical model was employed to analyse the relationship between consumer characteristics, environmental perceptions, and food-purchasing priorities. Consumers were segmented into a "green" category (prioritizing health, ethics, and environmental impact) and a "red" category (prioritizing cost, convenience, and shelf-life).

### Key Findings:

1. **Socioeconomic Disparities are Central:** Higher levels of education and income are the strongest predictors of sustainable food choices. Consumers with greater socioeconomic resources are significantly more likely to prioritize health and environmental attributes, indicating that access to sustainable food currently resembles a niche market. This highlights a critical risk of exclusion, underscoring the necessity for policies that ensure an equitable and inclusive transition for all consumer groups.
2. **Consumer understanding of sustainability is mixed and uneven:** Well-established concepts like organic food and short supply chains are widely recognized and associated with sustainable consumption. In contrast, other regulatory and informational tools, such as food labels and agricultural trade standards, are less understood and surprisingly hold greater importance for consumers primarily concerned with price and convenience. The proliferation of labels may confuse rather than guide consumers.
3. **Willingness to pay is selective:** While green consumers show a willingness to pay a premium for food that protects "health and the planet," the same effect was found for a willingness to pay specifically for products with a lower carbon footprint. This suggests that the carbon impact of food might not be yet a primary, tangible driver of consumer choice.
4. **Geographical and initiative-based divergences:** Significant disparities exist between North-Western and South-Eastern EU countries. Consumers in North-Western Europe demonstrate a stronger propensity for sustainable food consumption. The presence and number of consumer awareness initiatives (e.g., from NGOs, consumers' associations) positively influence sustainable choices, particularly in South-Eastern Europe, demonstrating the crucial role of civil society engagement in complementing top-down policy measures.

### Conclusions and Policy Recommendations:

The feasibility of Farm to Fork policies depends on a multi-faceted, integrated approach that acknowledges consumer heterogeneity. Effective interventions must combine:

- **Economic instruments:** Such as targeted subsidies for sustainable products and carefully designed fiscal measures to avoid regressive impacts on low-income households.
- **Information and education:** Long-term campaigns and clear, harmonized labelling to improve consumer understanding and connect food choices to their environmental and health impacts.

- **Behavioural nudges:** Restructuring food environments (e.g., making sustainable options the default in public canteens) to encourage change without restricting freedom of choice.
- **Strengthened civil engagement:** Increased investment and support for consumer awareness initiatives across all Member States, especially in regions with lower current engagement.

For the EU to achieve a truly sustainable food system, policies must be synergistic, socially equitable, and tailored to diverse consumer segments. Success requires moving beyond one-size-fits-all solutions and implementing a coherent framework that integrates political, market, and informational interventions to guide both informed and uninformed consumers towards more sustainable consumption patterns.

## Deliverable D7.4

### 1 INTRODUCTION

The European Union (EU) has set the ambitious goal of becoming a carbon-neutral economic power by 2050. Achieving this target requires action across multiple sectors, with sustainable food consumption (SFC) playing a central role under the Farm to Fork (F2F) strategy (European Commission, 2020; Notarnicola et al., 2017). However, despite strong political commitments, current food consumption patterns remain unsustainable, contributing significantly to greenhouse gas (GHG) emissions, water pollution, and biodiversity loss (Laestadius & Wolfson, 2019; Notarnicola et al., 2017). Promoting more sustainable diets is therefore essential for mitigating climate change, safeguarding food security, and fostering long-term economic resilience (Benvenuti et al., 2019; Myers et al., 2013).

Food consumption represents both a challenge and an opportunity. While it is a major driver of environmental pressures, it is also fundamental for human health and nutrition (Azzurra et al., 2019; Myers et al., 2013). Globally, food production accounts for nearly one-third of anthropogenic GHG emissions (Crippa et al., 2021). Yet, evidence shows that dietary choices vary widely in their environmental impact. Diets high in animal protein, for instance, are associated with resource-intensive production systems and disproportionately high emissions (Carlsson-Kanyama & González, 2009). Reducing meat intake has been identified as a more effective mitigation pathway than intensifying feed production (Ripple et al., 2014). This highlights the potential of consumer-driven dietary change as a viable strategy for sustainable development (Garnett, 2011).

Encouraging consumers to adopt sustainable practices, such as altering purchasing habits and daily food choices, can generate positive environmental outcomes and lower GHG emissions (Ivanova et al., 2020; Moss et al., 2010). Consumer demand also exerts indirect pressure on producers and retailers, influencing supply chains and shaping corporate responsibility (Grunert, 2011; De Carvalho et al., 2016). Yet, the concept of SFC remains diffuse, and it is unclear how consumers interpret sustainability or how best to guide them towards low-impact options (de Boer & Aiking, 2021; van Bussel et al., 2022).

SFC spans multiple dimensions among environmental, economic, ethical, and animal welfare considerations (Verain et al., 2021). Understanding how consumers perceive these dimensions is critical for designing effective policies and strengthening market demand for sustainable alternatives. Research shows that consumer priorities differ across social groups and that while many express concerns for environmental and social issues, these attitudes are not always reflected in actual purchasing behaviour (Feucht & Zander, 2018; Grunert, 2011; Vermeir & Verbeke, 2006).

The F2F strategy, as the EU's flagship food policy framework, seeks to make sustainable food choices more accessible and affordable, while also improving consumer awareness and procurement practices (European Commission, 2024). However, policy effectiveness depends on accounting for consumer heterogeneity. Socioeconomic characteristics, cultural preferences, and behavioural drivers all influence the gap between attitudes and purchasing

behaviour (Just & Gabrielyan, 2016; Carrus et al., 2018; Flaherty et al., 2018). A nuanced understanding of these factors is therefore essential to the success of EU food policy.

This report examines how European consumers perceive sustainability in their food purchasing decisions, with a focus on differences across socioeconomic groups. Using the Eurobarometer 93.2 dataset (collected between August and September 2020), a statistical tool was applied (Probit model) to identify the relationship between consumer characteristics, environmental perceptions, and food choice priorities.

The report's main contribution lies in mapping how consumer heterogeneity shapes attitudes toward sustainable food systems. By linking socioeconomic traits with purchasing preferences, EU policy makers can be informed how to better align consumer demand with the objectives outlined by the F2F strategy. Moreover, the report offers practical guidance for designing targeted communication campaigns and tailoring policy instruments to specific consumer segments, ultimately strengthening the transition toward sustainable food systems across Europe. By grounding recommendations in actual consumer perceptions, the report informs elements that policies should reflect to be feasible, thus being socially accepted and economically viable. This ensures that policies are not only ambitious in their sustainability goals but also realistic in terms of adoption and long-term impact.

## 2 FEASIBLE POLICIES FOR SUSTAINABLE FOOD CONSUMPTION IN THE EUROPEAN UNION

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Designing feasible policies to promote sustainable food consumption is paramount for the European Union, as targets must be translated into tangible outcomes for citizens and businesses. According to (European Commission, 2021) *Feasibility means creating measures that are economically viable, socially equitable, and politically acceptable, thereby ensuring broad support and effective implementation.* Effective and feasible policies often combine gentle nudges with stronger structural changes. For instance, harmonized front-of-pack nutrition labelling, like the ongoing discussion on a unified EU label, could empower consumer choice without being restrictive. Simultaneously, reforming public procurement rules to offer sustainable and plant-based options in schools and hospitals creates reliable markets for producers while normalizing sustainable diets. As highlighted by the European Commission's impact assessments, policies must be designed with social equity at their core, ensuring that healthier and sustainable food is affordable and accessible to all income groups to avoid being part of a niche market only accessible for wealthy consumers.

Feasibility hinges on a just transition for the entire agri-food sector, supporting farmers in adopting sustainable practices and ensuring that policies aimed at changing consumption are synergistic with those transforming production, thus creating a coherent and resilient food system. Advancing SFC in the European Union requires a balanced mix of regulatory, economic, and behavioural measures that are both practical and politically viable. Within the framework of the F2F strategy, policies must not only encourage a shift toward lower-impact diets but also take into account the diversity of consumer preferences, cultural norms, and socioeconomic conditions across Member States.

**Feasible policies** are those that are not only effective in achieving a desired objective but are also **practical and viable to implement and enforce.**

They must be economically realistic for businesses and consumers, avoiding undue financial strain. Technically, they must be administratively workable for enforcement. Crucially, they must be socially equitable to gain public acceptance and not disproportionately burden any group. This concept is central to the EU's Better Regulation Guidelines, which mandate impact assessments to evaluate these criteria before legislation is proposed.

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European Commission, 2021

One feasible approach involves information-based measures that improve transparency and guide consumer choices. Information campaigns across schools, media, and public initiatives, can raise awareness about environmental consequences of dietary choices and encourage consumers to consider alternatives with lower carbon and resource footprints. Digital tools,

such as mobile applications providing real-time information at the point of purchase, may further strengthen the link between consumer awareness and purchasing behaviour.

Economic and market-based instruments represent another pathway to shifting consumption patterns. Subsidies for fruits, vegetables, and plant-based proteins can increase the affordability of sustainable diets while helping to correct market distortions that currently favour high-impact animal-based products. Conversely, fiscal measures such as differentiated VAT rates or targeted taxes on high-emission foods could discourage unsustainable consumption, provided that such measures are carefully designed to avoid regressive effects on low-income households.

Consumer behaviour can be influenced through policies that acknowledge food-related social and cultural contexts. Considering that dietary habits are deeply embedded in traditions and lifestyles, effective interventions must address not only affordability and availability but also identity and social norms. Behavioural *nudges*, such as restructuring food environments to make sustainable options the default choice in cafeterias or supermarkets, can lead to measurable reductions in meat and dairy consumption without restricting consumer freedom. Such interventions should be tailored to different social groups, recognizing that drivers of food choice vary by income, education, and cultural background.

Taken together, these policies demonstrate that feasible interventions extend beyond the provision of information and require integrated approaches that combine financial incentives, institutional commitments, and behavioural insights. In the EU context, assessing consumers' perceptions could offer a concrete pathway to design feasible policies by aligning consumer demand with sustainable food systems.

### 3 FOOD PERCEPTION AND CONSUMPTION

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A growing body of research highlights the role sustainable diets can play in reducing the environmental damage linked to farming (Osei-Owusu et al., 2022). What we choose to eat does not just affect what is produced, it also has major consequences for public health, community well-being, and economic development (Reisch et al., 2013).

While the goal of promoting sustainable diets is clear, there is little agreement on what terms like "*sustainable food*" or "*sustainable consumption*" actually mean. In fact, one study points out that sustainable food covers a wide spectrum of concerns, from environmental health and nutrition to economic fairness, cost, and even animal welfare (Li & Kallas, 2021). How people view sustainability depends heavily on their personal context and is shaped by a complex mix of social and economic factors that are not easily defined or communicated (Torán-Pereg et al., 2023). This means that for any government or business initiative to succeed, it must first strategically understand how consumers see different food qualities when they are deciding what to buy (White et al., 2019). This is also the case when designing feasible policies to promote sustainable diets. Effective policies cannot focus on consumers alone, they must engage the many other players who shape how food is produced and consumed.

Historically, policy was designed on the assumption that people always make logical choices to get the best value. Under this view, promoting vegetarian diets, for example, would simply

require adjusting prices, taxes, and availability (Just & Gabrielyan, 2016). However, this idea is widely contested. Critics argue that this approach oversimplifies human behaviour by assuming everyone reacts the same way to economic changes (Miljkovic, 2005).

Social and cultural backgrounds greatly influence what people eat. For instance, lower-income families often consume less healthy diets, which is frequently tied to the higher cost of nutritious food (Golan et al., 2008). By contrast, people with higher education levels tend to have healthier eating habits, largely because they are more aware of nutritional guidelines (Drichoutis et al., 2005). However, food preferences are ultimately shaped by a set of behaviours, personal interests, and cultural and economic variables (Just & Gabrielyan, 2016). In reality, taste is often a much stronger driver of what people choose to eat than health considerations alone (Binkley & Golub, 2011).

Following current EU goals to spur sustainable food consumption, it is crucial that political and economic incentives are coupled with a closer understanding of EU consumers' perceptions and priorities when buying food. Although sustainability issues have been progressively acknowledged by various societal groups, several uncertainties remain (Torán-Pereg et al., 2023). Sustainable food also involves elements specific to supply chain stages such as the use of energy, water, and resources, as well as waste management and GHG emissions from production, retailing, cooling, packaging, and transportation (WHO, 2019). So far, sustainable diets have been analysed based on existing technologies, with an expectation of achieving higher productivity by making small changes to production systems (Herrero et al., 2020). Although technological advancements alone do not lead to sustainable production and consumption, they are key to supporting the transition of food systems towards sustainability and should be accompanied by political incentives. These incentives must take into account the local, cultural, and socioeconomic characteristics of consumers groups (Hall & Dijkman, 2019). Meanwhile, policymakers should consider the needs of diverse EU consumer groups to create consistent policy tools that stimulate the continuous adoption of and value for alternative foods produced under sustainable practices.

## 4 METHODS

To assess consumers' perceptions about sustainable food, the report draws from two distinct data sources. The primary source is the Eurobarometer 93.2 survey, which interviewed 27,237 civilians across the 27 EU member states. This edition is notable for being the first to include comprehensive questions on food sustainability, capturing public perceptions and attitudes on this topic. The survey methodology, which combined face-to-face, online probabilistic panel, and push-to-web techniques, ensured results were representative at both national and regional levels. It gathered extensive demographic data and measured citizen expectations concerning agriculture, the Common Agricultural Policy (CAP), and the future of the food system.

The Eurobarometer survey data was then combined with a systematically collected inventory of consumer initiatives promoting sustainability along the food supply chain, as detailed by Moreira-Dantas et al. (2022). For the analysis, a dichotomous dependent variable was constructed based on the survey question QB1 (a and b): "When you buy food, which of the following are the most important to you? Firstly and secondly." This variable captures the first and second priorities selected by consumers from the available response options (detailed in Table 1).

*Table 1. Description of survey responses to the Eurobarometer question (QB1:a,b): "When you buy food, which of the following are the most important to you? Firstly and secondly"*

Available Responses
Your ethics and beliefs (whether the item complies with your ethics and beliefs, e.g. in terms of religion, animal welfare or fair payment of producers)
Food safety (e.g. if there is a risk in eating this food)
Cost
Nutrient content (e.g. the amount of vitamins, fibre, proteins, sugar or fats)
Taste
Where the food comes from (e.g. geographical origin)
Convenience (e.g. the easiness to use, prepare)
Minimally processed
Amount of shelf-life available
Its impact on the environment and climate (e.g. carbon footprint)

Consumer decision-making priorities were used to divide the sample into two distinct clusters. For analytical clarity, these clusters are called the "traffic-light" variables. The "green" consumer group is defined by prioritizing attributes such as ethics and beliefs, food safety, nutrient content, taste, origin, minimal processing, or environmental impact as their primary concern. The "red" consumer group is characterized by prioritizing cost, convenience, or shelf-

life as their first priority. In both segments, the individual's second priority could be any of the remaining options (Table2).

*Table 2. Traffic light variable categorization according the survey answers to the question “When you buy food, which of the following are the most important to you? Firstly and secondly”*

	Cost
	Convenience (e.g. the easiness to use, prepare)
	Amount of shelf-life available
	Your ethics and beliefs (whether the item complies with your ethics and beliefs, e.g. in terms of religion, animal welfare or fair payment of producers)
	Food safety (e.g. if there is a risk in eating this food)
	Nutrient content (e.g. the amount of vitamins, fibre, proteins, sugar or fats)
	Taste
	Minimally processed
	Where the food comes from (e.g. geographical origin)
	Its impact on the environment and climate (e.g. carbon footprint)

The integration of health and environmental dimensions to define sustainable consumption is well-supported in the literature. SFC is directly linked to health claims and aligns with the FAO's definition of sustainable diets as those with low environmental impact that also support nutrition, food security, and health across generations (FAO, 2010). Therefore, combining health and environmental priorities provides a meaningful and validated representation of SFC.

To analyse the factors influencing these traffic-light segments, three categories of determinant variables were assessed: (1) socio-economic characteristics, including sex, education, age, social class, financial difficulties, occupation, and community type; (2) pro-environmental perceptions, which capture the level of agreement with broad SFC topics (detailed in Table 3); and (3) variables related to willingness to pay for sustainable options.

*Table 3. Description of questions on the level of agreeability and importance of pro-environmental food features*

Variables	Survey code	Description and coding
CAP priority	QA7_5	How important is the CAP priority “Help tackle climate change”? 0= Not important; 1= Important
Organic food	QA14_5	Organic products produced with better environmental conditions. 0= Do not agree; 1= Agree
Farming	QA22_2	EU farmers need to change the way they work in order to fight climate change even if that means that EU agriculture will be less competitive. 0= Do not agree; 1= Agree
Trade standards	QA16_3	Agricultural imports from any origin should only enter the EU if their production has complied with the EU’s environmental and animal welfare standards. 0= Do not agree; 1= Agree
Regulation standards	QB8_1	Regulations should force farmers, fishers, food manufacturers, shops and retailers, restaurants and cafés to meet more stringent sustainability standards. 0= Do not agree; 1= Agree
Food labels	QA12_3	How important are labels when buying food? 0= Not important; 1= Important
Short supply chain	QA12_4	When buying food, how important is that the food is produced in short supply chains? 0= Not important; 1= Important
Willingness to pay	QB8_10	Are you ready to spend more money for food which protects your health and the planet? 0= Do not agree; 1= Agree
Pay carbon footprint	QA22_4	You are prepared to pay 10% more for agricultural products that are produced in a way that limits their carbon footprint. 0= Do not agree; 1= Agree

Source: Eurobarometer 93.2 survey

An additional variable in the analysis captures cross-country consumer initiatives designed to promote food awareness across the EU (Moreira-Dantas et al., 2022). These initiatives take two primary forms: (i) programs led by national civil organizations, associations, and NGOs addressing food-related consumption issues, and (ii) EU-wide public efforts aimed at raising awareness of broader sustainability topics, including food waste, production systems, greenhouse gas emissions, food security, and consumption patterns. In total, 13 initiatives with either national or international reach were identified. To assess their relationship with

consumer categories, EU member states were classified into four levels based on the presence and scope of such initiatives (Table 4).

*Table 4. Description of initiative, countries, and variable coding*

Description	Countries	Code
Countries that only have initiatives promoted by the EU	Sweden, Finland, Czech Republic, Hungary, Estonia, Latvia, Malta, Slovakia, Slovenia, Portugal	0
Countries with EU initiatives and one additional national initiative	Denmark, Spain, Ireland, Luxembourg, Austria, Cyprus, Lithuania, Poland, Bulgaria, Romania, Croatia	1
Countries with EU initiatives and two additional national initiatives	Belgium, Greece, France, The Netherlands	2
Countries with EU initiatives and more than two additional national initiatives	Germany, Italy	3

Determinants of consumers' priorities when buying food are assessed by estimating a Probit model. We distinguish between consumers that prioritize mostly health and environmental issues when purchasing food products, and the remainder. The model is specified as:

$$(PrY_i = 1|X_i) = \sum \beta_j X_{ij} + \varepsilon_i \quad (1)$$

where  $i$  denotes the  $i$ -th observation in the sample,  $Pr$  is the probability of the outcome,  $\beta_j$  represents the regression coefficients of the explanatory variables  $X_j$ , and  $\varepsilon_i$  is the error term, assumed to follow a standard normal distribution:  $\varepsilon_i \sim N(0,1)$ . The Probit coefficients are estimated using the maximum likelihood method. The probability that consumers will fall in the so-called green category is given as  $P = P[y_i = 1]$ , while the probability that consumers will fall into the red category is  $P = P[y_i = 0]$ .

The model is estimated with standard errors clustered at the country level, because EU countries have different performances to accept and perceive advancements proposed by the European Green Deal (e.g. such as renewable energy and investment for sustainable ventures) (Panarello & Gatto, 2023). Therefore, this allows for a robust assessment of any arbitrary correlations within EU member states but assumes independence between them.

## 5 RESULTS

About 74% of the sample is composed of green consumers, those who prioritize elements such as health, nutrition, food origin and environmental impact when choosing what food products to consume. The models include seven socioeconomic explanatory variables: sex, education level achieved, age, self-defined social class, occupation, whether the respondent has difficulties to pay bills, and whether respondents live in a large city or rural area. The pro-environmental variables are divided into three groups: the first group includes four questions regarding perceptions of agricultural practices and sustainability; the second considers two questions about factors that are important in deciding what food to buy; and the third comprises two questions about the willingness to pay more for sustainable food. Country-specific consumer initiatives are included in a model as a categorical variable.

The estimation strategy considers the statistical differences between North-Western and South-Eastern EU member states. Table 5 presents detailed descriptive statistics of the variables used in the empirical model. In the survey, possible answers range from “tend to disagree” to “totally disagree”, as well as from “tend to agree” to “totally agree”. The first two items are coded as “disagree” and the latter two as “agree”. The same rationale was applied to questions related to “importance”.

*Table 5. Descriptive statistics of variables employed in the statistical model*

Variable	Variable description	Mean	St. dev	Min	Max
Green consumer	Red consumer=0; Green consumer=1	0,74	0,43	0	1
<b>Socioeconomic characteristics</b>					
Female	Female =1; 0 otherwise	0,53	0,49	0	1
Education	Primary level= 0; Secondary level=1; Graduate level= 2	0,69	0,86	0	2
Age	Respondent age	50,63	17,69	15	99
Age squared	Respondent squared age	2877	1789	225	9801
Social class	Low=0, Middle=1, High=2	0,70	0.63	0	2
Occupation	Student, unemployed, retired=0; Unskilled manual worker=1; Skilled manual worker=2; Business proprietors and employed professionals=3	1,30	1,17	0	3
Easiness to pay bills	How often the respondent faces difficulty to pay bills Most of the time=0, eventually=1, never=2	1,61	0,62	0	2

Community	Rural area= 0; Small and middle town=1; Large town=2	1,96	0,79	2	2
<b>Pro-environmental perceptions</b>					
<i>Agricultural practices and sustainability</i>					
CAP priority	How important is the CAP priority “Help tackle climate change”? 0= Not important; 1= Important	0,88	0,31	0	1
Organic food	Organic products produced with better environmental conditions. 0= Do not agree; 1= Agree	0,79	0,40	0	1
Farming	EU farmers need to change the way they work in order to fight climate change even if that means that EU agriculture will be less competitive. 0= Do not agree; 1= Agree	0,70	0,45	0	1
Trade standards	Agricultural imports from any origin should only enter the EU if their production has complied with the EU’s environmental and animal welfare standards. 0= Do not agree; 1= Agree	0,38	0,48	0	1
Regulation standards	Regulations should force farmers, fishers, food manufacturers, shops and retailers, restaurants and cafés to meet more stringent sustainability standards. 0= Do not agree; 1= Agree	0,83	0,37	0	1
<i>Important elements when buying food</i>					
Food labels	How important are labels when buying food? 0= Not important; 1= Important	0,51	0,49	0	1
Short supply chain	When buying food, how important is that the food is produced in short supply chains? 0= Not important; 1= Important	0,85	0,34	0	1

*Willingness to pay*

Willingness to pay	Are ready to spend more money for food which protects your health and the planet?				
	0= Do not agree; 1= Agree	0,73	0,43	0	1
Pay carbon footprint	You are prepared to pay 10% more for agricultural products that are produced in a way that limits their carbon footprint.				
	0= Do not agree; 1= Agree	0,97	0,94	0	1

*Country level consumer initiatives*

Consumer Initiatives	National and EU-wide consumers' initiatives				
	EU initiatives only=0;				
	EU initiative and 1 additional national initiative=1;				
	EU initiative and 2 additional national initiatives=2;				
	EU initiative and more than two additional national initiatives=3	1,04	0,94	0	3

**Geographic division**

East-South Europe	Countries located in East and South Europe	0,62	0,48	0	1
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*Note: the number of observations N=27237*

The main results are represented as marginal effects of two distinct probit models: the first was estimated with only socioeconomic characteristics, as shown in Figure 1, and the second with only pro-environmental variables in Figure 2 (full model results are found in the appendix).

Results suggest that higher levels of education and better economic conditions are associated with a greater likelihood of consumers prioritizing health and environmental concerns when buying food products (Figure 1).

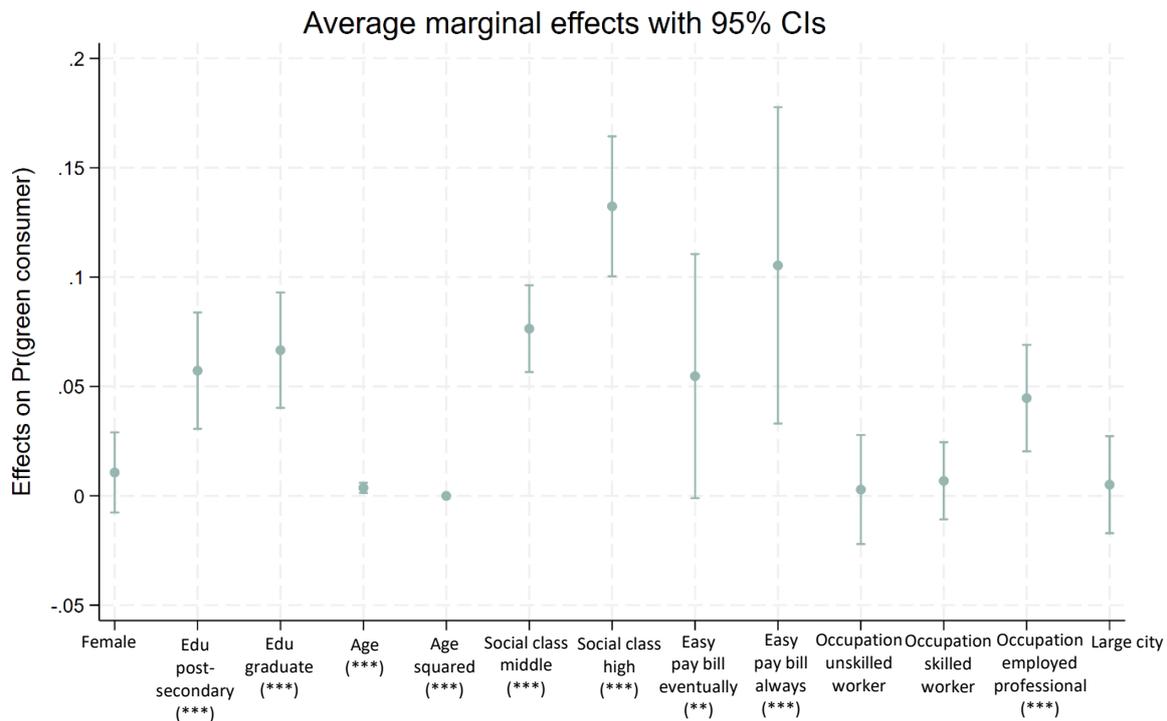


Figure 1 Marginal effects of socioeconomic variables for the probability of consumers falling into the green category.  $N = 26586$ ; Clustered standard errors in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Interestingly, consumers' perceptions of environmental variables appear mixed. While some concepts, such as organic agriculture and short supply chain seem to be relevant for consumers (positive and significant marginal effects), other core elements related to the green transition do not exhibit the expected relationship with consumer perceptions. For instance, labels seem to be more important for consumers that care about non-environmental aspects, such as those of price and convenience. Similarly, agricultural trade standards, which are designed to ensure the quality, fairness, and safety of food entering the EU (European Commission, 2024), seem to be more relevant to consumers who prioritize price over environmental issues. Regarding the willingness to pay, EU green consumers are more likely to pay a premium for food that protects their health. However, no statistical association can be identified for food produced with a lower carbon footprint. There are statistical differences between North-Western and South-Eastern EU countries. In particular, consumers in North-Western Europe are more likely to fall into the green category. Likewise, respondents living in countries that have more consumer initiatives, are more likely to prioritize health and the environment concerns in their food choices.

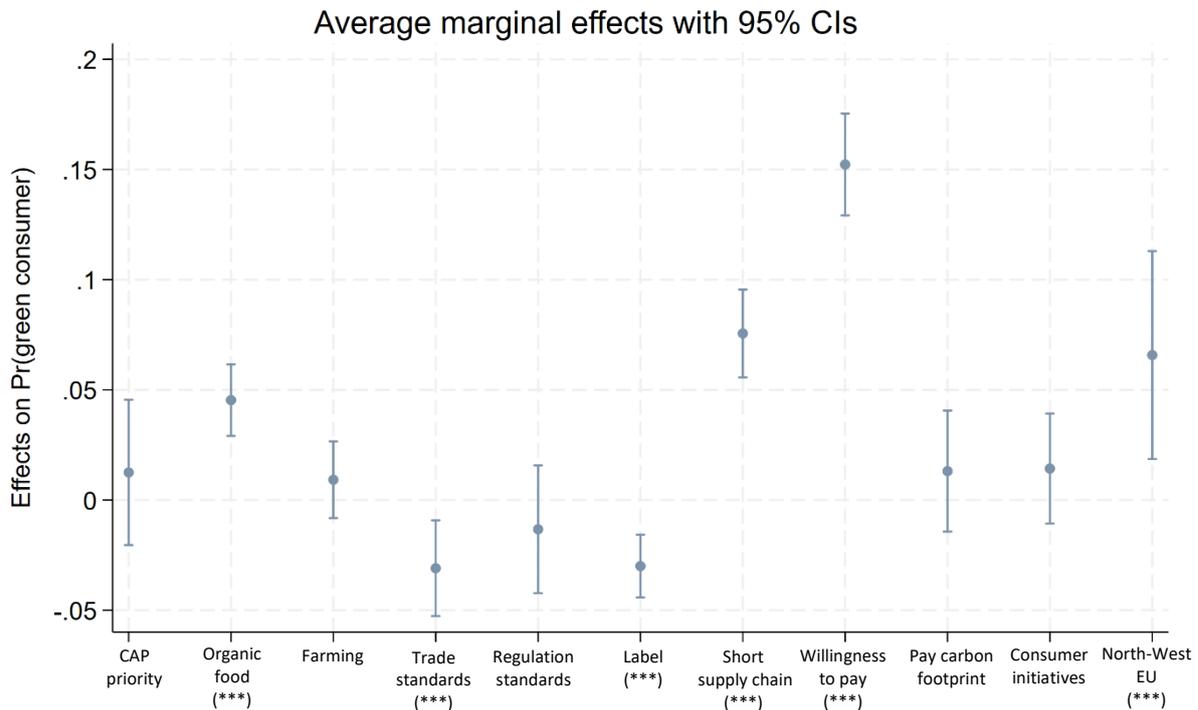
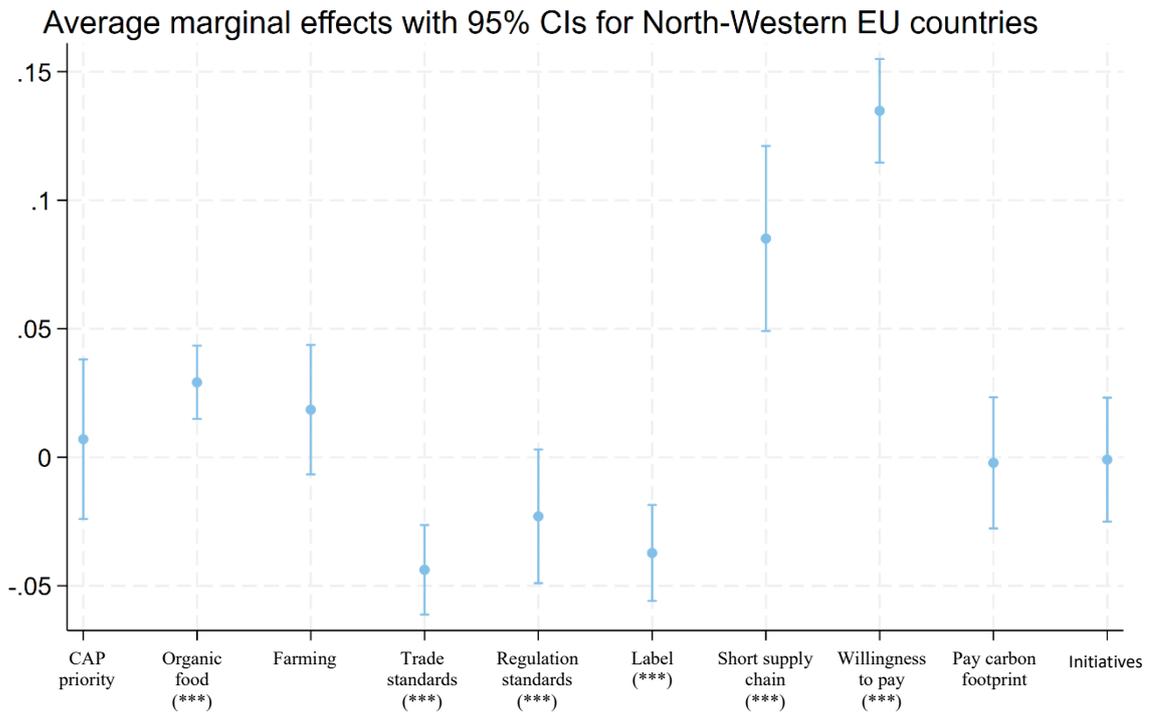
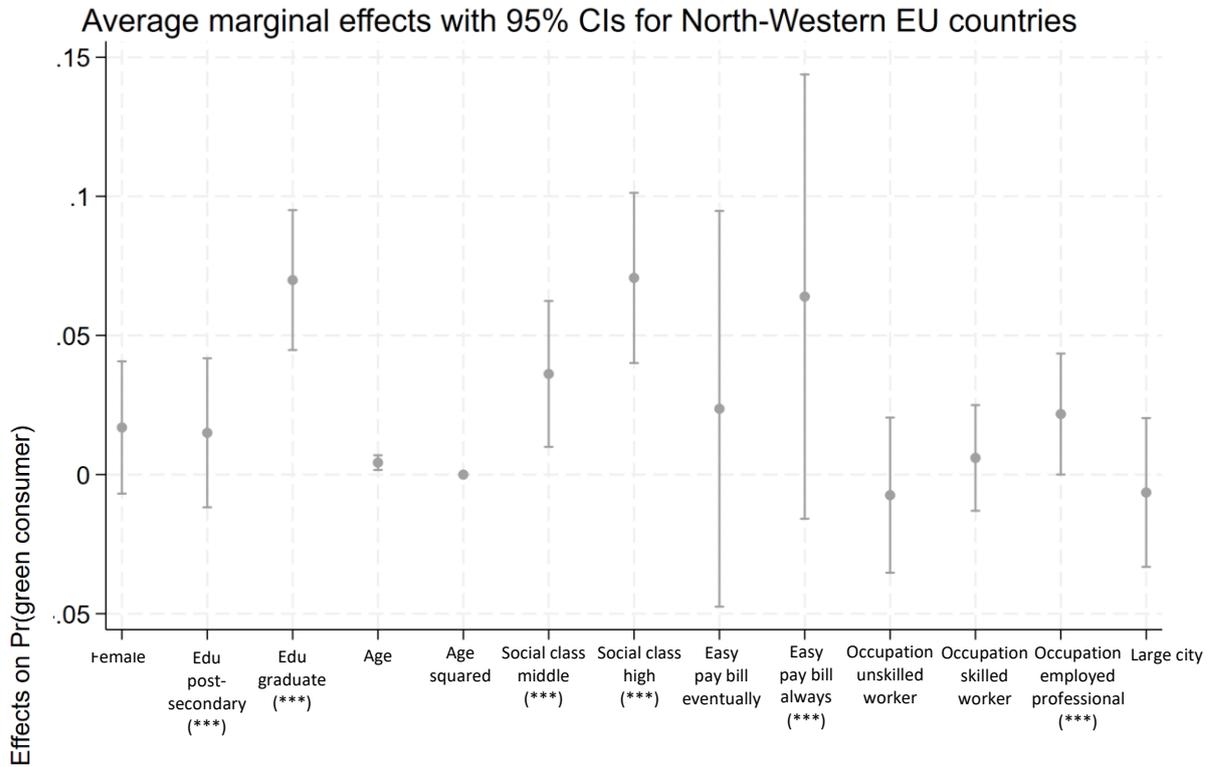


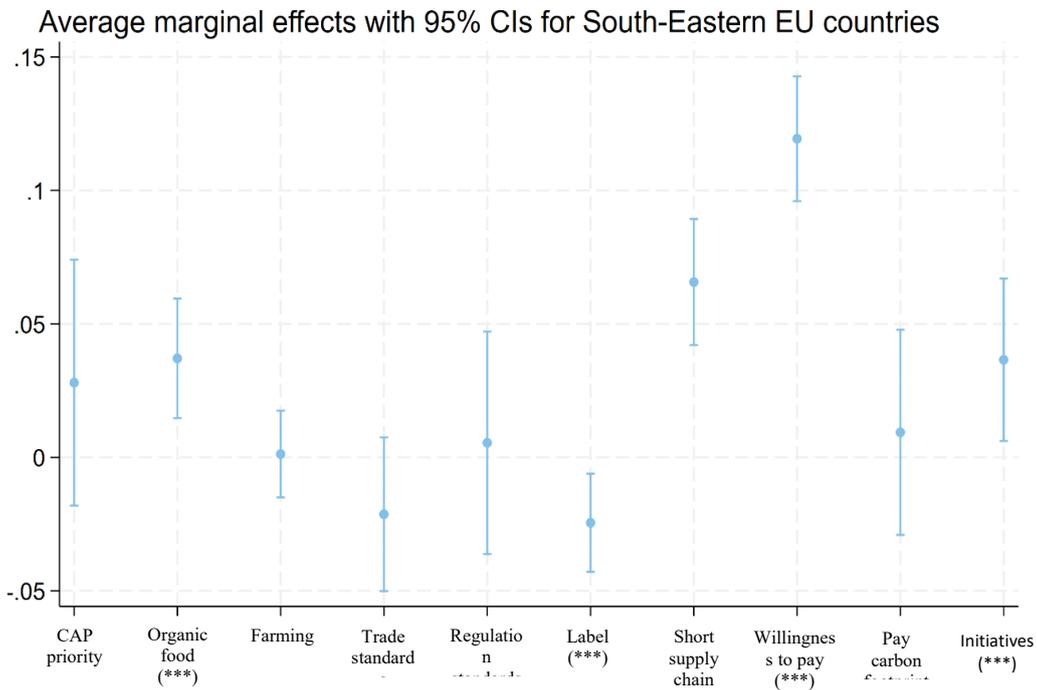
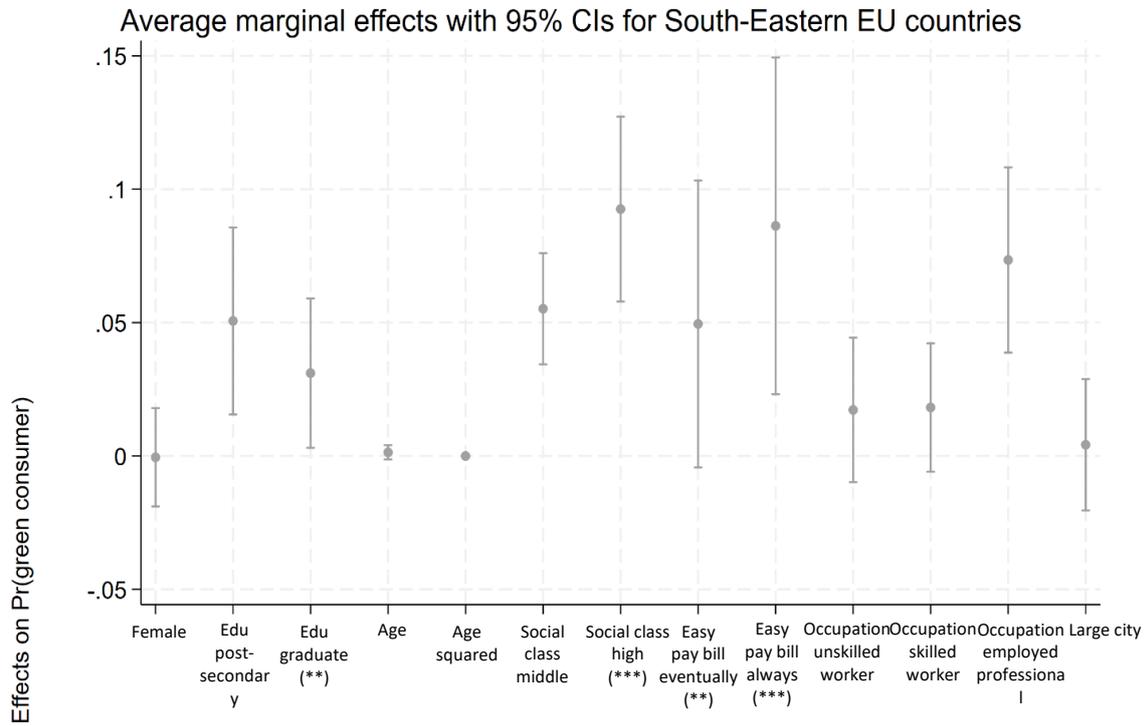
Figure 2 Marginal effects of environmental variables for the probability of consumers falling into the green category.  $N = 27237$ ; Clustered standard errors in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Figure 3 and Figure 4 set out marginal effects of two distinct Probit models: First, a model for observations in North-Western EU countries, a second model for South-Eastern EU countries. The results remain similar to the previous specifications, reinforcing the notion that individuals with better socioeconomic conditions and higher education levels tend to have stronger perception regarding health and sustainable food options when compared to those in other social strata. Concerning environmental perceptions, organic food and short supply chains are acknowledged as key attributes of sustainable food in all three specifications. Trade and regulation standards, in turn, are related to a lower probability of falling into the green category only in North-Western EU countries. Estimated coefficients for labels remain similar and statistically significant as in the main results, a fact suggesting that the informational content presented by food labels is not very informative for consumers. Marginal effects of consumer initiatives are statistically different from one region to the other. In South-Eastern EU countries, increased consumer engagement positively influences the prioritization of environmental and health concerns related to food purchases.



*N* = 10077; Clustered standard errors in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Figure 3 Marginal effects of social and environmental variables for the probability of consumers falling into the green category in North-Western EU countries.



$N = 16509$ ; Clustered standard errors in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Figure 4 Marginal effects of social and environmental variables for the probability of consumers falling into the green category in South-Eastern EU countries

## 6 CONSUMERS PROFILING AND PERCEPTIONS

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Regression results indicates that European Union consumers who prioritize environmental and health considerations in their food purchasing decisions exhibit distinct perceptions of sustainability. Well-established concepts such as organic agriculture and short supply chains are positively associated with sustainable consumption perceptions. In contrast, other elements, including food labels, trade, and regulatory standards, hold greater importance for consumers whose primary concerns lie outside environmental aspects. The analysis further identifies that respondents with higher educational levels and more favourable socioeconomic conditions demonstrate a greater propensity to consume food perceived as beneficial for both personal health and the environment. Those expressing a willingness to pay a premium for sustainable food are also more likely to be classified as green consumers, although no significant association was found for a willingness to pay more specifically for food with a low carbon footprint. Finally, civil initiatives are shown to play a crucial role in supporting sustainable consumption patterns across both North-West and South-East EU countries.

The influence of consumers' socioeconomic characteristics, particularly education, has been extensively documented. Higher education levels exert a positive influence on SFC, a relationship attributed to the fact that more educated consumers are typically better informed about environmental issues (Grunert et al., 2014). This heightened awareness frequently translates into more sustainable and healthier food choices (Mancini et al., 2017), a finding that is consistent with the overall results of this study, which indicate a strong and persistent correlation between higher education and greater engagement in sustainability actions across all model specifications. Education facilitates the green transition by harmonizing consumer understanding of sustainable processes and shaping the perceived importance of these issues. It is also a significant factor influencing the willingness to pay for healthier or low-carbon food products (Macdiarmid et al., 2021) and can leverage political interests concerning food policy (Meyer, 2015). However, for the EU to successfully decarbonize its food sector, policy measures must be fundamentally designed to integrate consumers from all socioeconomic backgrounds, ensuring that the transition to SFC is inclusive and not limited to those with higher education and greater economic means.

Concerning income, the estimation results for its proxy variables are self-defined social class and occupation. Results suggest that respondents from a higher socioeconomic class and those in better-paid occupations demonstrate a greater propensity to prioritize health and environmental considerations in their food purchasing decisions. This aligns with the existing literature, which finds that high-income consumers are less sensitive to price premiums (Steenhuis et al., 2011), whereas low-income households are disproportionately affected by the higher cost of green products (Aschemann-Witzel & Zielke, 2017). Furthermore, consumers without significant financial constraints are more likely to value animal welfare (Howard & Allen, 2010), purchase organic food (Aschemann-Witzel & Zielke, 2017), and express a willingness to pay for food produced under low-emission systems (Khanam et al., 2022; Schleich & Alsheimer, 2024). It is important to note that income and education are closely interrelated, given that higher-educated individuals often secure better-paid

employment. Consequently, consumers with improved socioeconomic conditions generally possess greater capacity and resources to seek out information on green products.

The perception of pro-environmental variables indicates a highly uneven understanding of sustainable concepts both within and across consumer groups. While certain topics, such as organic agriculture and short supply chains, are generally acknowledged as aligning with green consumption patterns, other elements like trade and agricultural standards, as well as labels, appear to hold greater significance for consumers who prioritize non-sustainable concepts in their food purchases. This variability in understanding is supported by the systematic review of van Bussel et al., (2022), which found an overall lack of knowledge concerning food-related sustainability. Their work confirms that while some consumers recognize the environmental impacts of food production, others fail to connect their own consumption patterns to broader environmental problems. This review further corroborates the present findings regarding organic and short-supply-chain concepts, as consumers commonly associate them with a healthy diet and locally produced food. Regarding labels, the scientific literature presents mixed evidence of their efficacy. Initially emerging as a strategy to enhance transparency in sustainable consumption through both voluntary and compulsory mechanisms (Lorenz-Spreen et al., 2020; Stevens, 2010), labels were designed to inform consumers and facilitate a transition to sustainable patterns. However, the proliferation of numerous labels and often unrelated information can misguide and confuse consumers (Horne, 2009; Reisch et al., 2013). Whereas labels describing energy use are generally argued to influence domestic consumption (Khanam et al., 2022; Peters, Reusswig, et al., 2013), those describing carbon emissions have demonstrated a very small effect on lowering a consumer's carbon footprint (Taufique et al., 2022), a finding which aligns with the unexpected results of this study.

Geographical differences are fundamentally linked to how consumers in the European Union approach sustainable consumption, as significant variation exists between member states in both pro-environmental perceptions and their relationship to socioeconomic characteristics. This finding aligns with the work of Zepeda et al., (2013), who identified cultural differences as a key influencer of environmental concern and consumption patterns across the EU. North-Western member states possess a well-established tradition of integrating environmental concerns with social and economic performance (Zepeda et al., 2013), implying that policies and regulations must be adapted to regional conditions to effectively address local civil demands. This is evidenced by varying levels of social engagement, where South-Eastern countries often feature general initiatives promoted by the EU, while North-Western countries benefit from a broader ecosystem of additional initiatives driven by consumer groups, associations, and NGOs. The divergent efficacy of these initiatives across regions underscores the critical role of civil engagement in promoting green consumption and reinforces the necessity of food awareness actions promoted by both civil society and governmental bodies.

Given that food prices, eco-labels, standards, green products, and socioeconomic characteristics are distinct yet interconnected components of a sustainable food system, EU political proposals would benefit from a holistic framework that integrates these elements to accurately identify consumer demands and potential responses to fiscal instruments like taxes or subsidies. For instance, regulating food price alone is unlikely to yield uniform consumption adjustments, as evidenced by studies from European countries showing that taxes can lead to

an increased consumption of complementary non-healthy products (Cornelsen et al., 2015). Consequently, in the absence of a universal policy mechanism, regulations must be designed to support effective information and knowledge transfer among consumer groups, ensuring civilians are informed about the benefits and impacts of food production (van Bussel et al., 2022).

To effectively transform food systems, the F2F strategy must reallocate financial resources along the FSCn (Wesseler, 2022) and the integration of political, market, and informational interventions. Such integration is crucial for making these actions comprehensible to both informed and uninformed civilians. As behavioural change is a gradual process, investing in long-term educational programs is essential to foster conscious consumption and encourage consumers to reflect on their moral and cultural values (Stanzus et al., 2017). Although the European Commission acknowledges the transformative potential of awareness campaigns (EC, 2017), educational action remains modest and uneven across the EU, a fact that exacerbates existing knowledge gaps between consumer groups and member states. Therefore, policy proposals should prioritize increased investment in consumer initiatives and provide enhanced support for existing programs to foster greater awareness of food production and consumption. Furthermore, policies must recognize that food demand and consumer behaviour exist on a broad spectrum, necessitating that all member states be targeted according to their unique industrial, agricultural, and social demographics.

While current sustainable consumption patterns often resemble a niche market primarily accessible to well-educated and high-income individuals sensitive to food-related environmental impacts, public concerns remain diffuse and frequently misguided. Therefore, F2F policies must not only strive to enable broader public access to green products but also commit to the long-term facilitation of information and knowledge transfer concerning sustainable diets.

A central challenge arising from the political reforms compelled by the F2F strategy lies in the implementation of cross-sectoral policy integration. For these actions to be successful, policy proposals must be synergistic, foster collaborative accomplishments among diverse actors, and be capable of accurately representing consumer demands (Bazzan et al., 2023). Consequently, consumption-related policies should be designed to promote a homogeneous public understanding of sustainability. This would enable consumers to make purchasing decisions based on a clear perception of what constitutes healthy and low-impact diets (Ammann et al., 2023). Furthermore, market instruments (e.g., bans, subsidies, restrictions, and taxes) require careful regulation to ensure that the most available and affordable food products are also those which are aligned with sustainability objectives (Ammann et al., 2023; Lee et al., 2021).

## 7 CONCLUSION

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This report investigates the role of socioeconomic factors, pro-environmental perceptions, and consumer awareness campaigns as determinants of SFC. The main findings contribute to the discourse of policy feasibility by informing policy makers how consumers perceive food sustainability, as well as their socioeconomic profile. Thus, informing policy makers about limiting factors towards the acceptance of sustainable food.

The empirical outcomes indicate that consumers with higher educational attainment and more wealth demonstrate a stronger propensity to integrate health and environmental considerations into their food purchasing decisions. This suggests that access to green products currently operates as a niche market, predominantly accessible to individuals with both the necessary information and financial resources. Furthermore, food-related and pro-environmental concepts are diffusely understood and the degree of understanding lack uniformity across different consumer segments, including those with sensitivity to environmental concerns. While concepts such as organic food and short supply chains are widely recognized and readily associated with sustainable diets, other elements like food labels and regulatory standards are less clearly understood and hold greater salience for consumers primarily concerned with price and convenience. The proliferation of labels and information from both voluntary and compulsory certification schemes often creates confusion, hindering a unified consumer understanding of sustainability promotions and potentially limiting the effectiveness of these efforts in improving environmental perceptions.

The complexity of food sustainability, encompassing economic, political, cultural, behavioural, and environmental dimensions, presents a significant challenge. Progressing SFC is difficult due to the need to address both specific components and their integration into a coherent system. For the F2F strategy to succeed, it must effectively integrate top-down and bottom-up approaches to design interventions that are suitably tailored to diverse consumer characteristics and demands. Currently, consumer engagement remains modest and uneven across EU member states, with North-Western countries exhibiting higher participation in food awareness campaigns. Therefore, enhancing the outreach of existing initiatives, supporting new programs, and investing in long-term, targeted educational campaigns are crucial steps for bridging the prevailing knowledge gap. It is essential that these initiatives operate in synergy with economic and political interventions to empower consumers to connect food choices with environmental and health impacts, adapt their behaviours accordingly, and play a more influential role in shaping future policy decisions.

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## APPENDIX

### APPENDIX 1 TABLE: PROBIT MODEL OF GREEN CONSUMERS: SOCIOECONOMIC AND ENVIRONMENTAL FACTORS

**Table Appendix 1.** Probit model of green consumers: socioeconomic and environmental factors

	(1)	(2)	(3)
	Socioeconomic	Environmental	Full model
Outcome binary variable: Green consumers=1			
Female	0.0345 (0.0304)		0.0142 (0.0255)
Education (post-secondary)	0.184*** (0.0436)		0.117*** (0.0447)
Education (graduate)	0.217*** (0.0456)		0.182*** (0.0410)
Age	0.0118*** (0.00396)		0.00881** (0.00378)
Age squared	-0.000110*** (0.0000417)		-0.0000836** (0.0000381)
Social class (middle)	0.238*** (0.0303)		0.171*** (0.0270)
Social class (high)	0.442*** (0.0549)		0.332*** (0.0405)
Easy to pay bill (from time to time)	0.159** (0.0785)		0.130* (0.0691)
Easy to pay bill (always)	0.320*** (0.104)		0.244*** (0.0847)
Occupation (unskilled manual worker)	0.00905 (0.0403)		0.0237 (0.0355)
Occupation (skilled manual worker)	0.0218 (0.0283)		0.0444 (0.0306)
Occupation (employed professionals)	0.148*** (0.0395)		0.162*** (0.0436)
Large city	0.0165 (0.0363)		0.00583 (0.0332)

CAP priority		0.0413 (0.0553)	0.0695 (0.0516)
Organic food		0.149*** (0.0278)	0.121*** (0.0278)
Farming		0.0303 (0.0291)	0.0269 (0.0271)
Trade standards		-0.102*** (0.0371)	-0.104*** (0.0349)
Regulation standards		-0.0437 (0.0487)	-0.0263 (0.0462)
Label		-0.0987*** (0.0245)	-0.101*** (0.0247)
Short supply chain		0.249*** (0.0342)	0.245*** (0.0361)
Willingness to pay		0.502*** (0.0401)	0.425*** (0.0344)
Pay carbon footprint		0.0432 (0.0462)	0.0227 (0.0455)
Consumer initiatives		0.0470 (0.0420)	0.0664* (0.0400)
North-West EU		0.217*** (0.0784)	0.109 (0.0803)
Observations	26586	27237	26586
$R^2$	0.0357	0.0561	0.0744
Clustered SE	YES	YES	YES

Note: Clustered standard errors at the country level in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## APPENDIX 2 TABLE: PROBIT MODEL OF GREEN CONSUMERS FOR NORTH WESTERN, SOUTH EASTERN EU COUNTRIES AND COUNTRY FIXED EFFECTS

*Table Appendix 2.* Probit model of green consumers for North Western, South Eastern EU countries and country fixed effects

	(6)	(7)	(8)
	North West	South East	Country FE
Outcome binary variable: Green consumers=1			
Female	0.0685 (0.0493)	-0.00155 (0.0291)	0.0362 (0.0225)
Education (post-secondary)	0.0568 (0.0514)	0.160*** (0.0596)	0.0926*** (0.0332)
Education (graduate)	0.291*** (0.0530)	0.0963** (0.0449)	0.189*** (0.0370)
Age	0.0174*** (0.00545)	0.00420 (0.00428)	0.00822** (0.00364)
Age squared	-0.000125** (5.76e-05)	-6.21e-05 (4.57e-05)	-7.82e-05** (3.59e-05)
Social class (middle)	0.140*** (0.0504)	0.168*** (0.0311)	0.155*** (0.0271)
Social class (high)	0.291*** (0.0646)	0.292*** (0.0608)	0.301*** (0.0437)
Easy to pay bill (from time to time)	0.0842 (0.125)	0.144* (0.0773)	0.179*** (0.0623)
Easy to pay bill (always)	0.241* (0.141)	0.257*** (0.0927)	0.312*** (0.0694)
Occupation (unskilled manual worker)	-0.0291 (0.0553)	0.0521 (0.0421)	0.00918 (0.0416)
Occupation (skilled manual worker)	0.0239 (0.0386)	0.0549 (0.0362)	0.0408 (0.0266)
Occupation (employed professionals)	0.0896** (0.0453)	0.233*** (0.0543)	0.144*** (0.0391)

Large city	-0.0262 (0.0563)	0.0130 (0.0387)	-0.00699 (0.0312)
CAP priority	0.0285 (0.0640)	0.0867 (0.0723)	0.0524 (0.0462)
Organic food	0.118*** (0.0323)	0.115*** (0.0359)	0.114*** (0.0305)
Farming	0.0750 (0.0522)	0.00387 (0.0256)	0.0268 (0.0249)
Trade standards	-0.177*** (0.0319)	-0.0660 (0.0460)	-0.100*** (0.0364)
Regulation standards	-0.0932* (0.0539)	0.0169 (0.0659)	-0.0240 (0.0429)
Label	-0.151*** (0.0397)	-0.0758*** (0.0291)	-0.101*** (0.0275)
Short supply chain	0.345*** (0.0754)	0.203*** (0.0372)	0.227*** (0.0357)
Willingness to pay	0.546*** (0.0434)	0.370*** (0.0395)	0.416*** (0.0335)
Pay carbon footprint	-0.00879 (0.0527)	0.0291 (0.0608)	0.0406 (0.0426)
Initiatives	-0.00371 (0.0498)	0.113** (0.0488)	0.130 (0.205)
North West			0.0868 (0.210)
Constant	-0.770*** (0.254)	-0.525*** (0.189)	-0.625*** (0.204)
Observations	10,077	16,509	26,586
$R^2$	0.0911	0.0588	0.0869
Clustered SE	YES	YES	YES
Country FE	NO	NO	YES

Note: Standard errors in parentheses: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$



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