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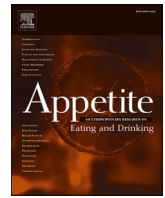
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# Pro-environmental food practices in EU countries strongly suggest mutually reinforcing improvements in gender equality and environmental sustainability

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## ABSTRACT

This paper seeks to understand how pro-environmental food practices among women and men in the EU can be supported by considering the interlinkages between gender equality and environmental sustainability. A special aspect is that the role of gender equality is interpreted in terms of Schwartz's theory on national cultural values, which relates gender equality to cultures that emphasize intellectual autonomy and egalitarianism. The paper investigated how pro-environmental food practices (including meat reduction) among women and men correlated with their countries' national income level and its level of gender equality. It was a multilevel analysis of survey data from 27 countries (Eurobarometer 95.1, Spring 2021). Considering that studies about gender equality and the environment often find problematically high correlations between gender equality and national income, this study focused on political gender equality (i.e. women's representation in parliament), which had desirable characteristics. National income and political gender equality had complementary impacts on the adoption of pro-environmental food practices (including meat reduction). Men reported more target practices when living in richer countries; the same applied even more strongly to women when living in richer and more politically gender-balanced countries. It was concluded that women may have developed more autonomy by, *inter alia*, adopting pro-environmental food practices. At the level of individual behavior, this illustrates "mutually reinforcing dynamics" in the pursuit of gender equality and environmental sustainability goals.

## 1. Introduction

This paper contributes to the understanding of how the adoption of pro-environmental food practices among women and men in the EU can be supported by considering the interlinkages between improvements in gender equality and environmental sustainability. Such interlinkages are key in the ground-breaking report on gender and the environment by the Organization for Economic Co-operation and Development (OECD, 2021). The report underlines the urgent need for an integrated approach to the United Nations Sustainable Development Goals (UN SDGs) of gender equality and environmental sustainability. The general idea is that these goals are mutually reinforcing, because, on the one hand, slow progress on environmental goals affects the condition of women and men differently and hampers gender equality, and on the other, gender equality and women's empowerment are key in driving change towards more sustainable production and consumption patterns. Although several interlinkages of gender, gender equality, and food sustainability

have been recognized (OECD, 2021), they have yet not been empirically and systematically analyzed. Also, there are key differences between more and less developed countries. The present paper focuses on food sustainability in developed countries, where it involves in particular the environmental repercussions of protein foods, which urgently require a transition from diets based primarily on animal proteins towards diets based primarily on plant proteins products (Aiking & de Boer, 2020; Springmann et al., 2018). In short, meat reduction can make consumers' pro-environmental food practices much more effective.

A key aspect of our contribution is the view that the role of gender equality can fruitfully be interpreted in terms of Sheldon Schwartz's (2014, 2015) theory on national cultural values. These values are conceptions of what is good and desirable among people in a society, which are manifested in the behavior of social institutions as well as individuals. Although the cultural values that Schwartz calculated were not available for all the countries in our study, they could be used in a preliminary analysis to decide on a meaningful measure of gender

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equality for all of them. Such a measure should reflect the degree to which a national culture emphasizes an individual's autonomy and equality (versus the importance of being embedded in existing social orders and traditions). That is, gender equality is not simply a matter of reducing differences between women and men, but also a matter of women's empowerment and gender-equal access to relevant resources in ways that allow gender-specific differences in ambition (Falk & Hermle, 2018). As the available resources depend on a country's level of income, this is a reason to consider a country's gender equality level together with its national income. Both variables can be meaningfully related to certain manifestations of culture at the individual behavioral level, such as practices.

The present paper aims to add to our knowledge in this field by examining whether gender and gender equality at the country level also play a role at the level of individual food practices. More specifically, it investigates (1) whether the idea of pro-environmental food practices, such as reducing one's meat consumption, has become a guiding principle for the behavior of certain consumer segments, (2) the degree to which women and men differ in adopting pro-environmental food practices, such as reducing one's meat consumption, and (3) how these gender differences are affected by the degree of gender equality in the country they live in, taking due account of differences in national income. The paper addresses these topics by a multilevel analysis of survey data from 27 countries (Eurobarometer 95.1, Spring 2021) collected by the European Union (EU). The following sections provide the theoretical background for the analysis at the level of individual practices, the analysis at the country level, which includes national income and gender equality, and the analysis of cross-level interactions, which investigates the relationships between country level differences and individual level differences. The final section of the Introduction describes the present study.

### 1.1. Gender differences in pro-environmental food practices

By focusing on gender differences in pro-environmental food practices, this study combines research on environmentally significant behavior with that on food practices. Many publications about environmental concern and environmentally significant behavior routinely report whether there are differences between women and men, but gender is rarely the main topic of the study (Gifford & Nilsson, 2014). Research on environmental concern in the past few decades consistently finds that women express slightly greater environmental concern than men (McCright & Xiao, 2014). Also, when studies find gender differences in connectedness to nature, it is more often concluded that women feel greater connectedness than men (Lengieza & Swim, 2021). However, the magnitude and the direction of environment-related gender differences appears to change over time, and to vary by location and type of pro-environmental behavior. Women display significantly more private environmental behaviors (e.g., recycling, reducing water use) than men do, whereas there is little gender difference in public environmental behaviors (e.g., signing a petition) (McCright & Xiao, 2014). In a particular public context, as members of the sixth (2004–09) and seventh (2009–14) European Parliament, women were significantly more likely to support environmental legislation than men—even after controlling for political ideology and nationality (Ramstetter & Haber-sack, 2019).

The findings of environment-related gender differences can be explained by differences in personality and in socialization experiences. Women tend to have more agreeable and more open personalities (Schmitt et al., 2017), who are more likely to place importance on and to act on social and environmental concerns (Lengieza & Swim, 2021; Luchs & Mooradian, 2012). They may also have early socialization experiences to be other-oriented and socially responsible (McCright & Xiao, 2014; Zelezny, Chua, & Aldrich, 2000), or later socialization experiences to be concerned about overall social welfare (Meyer, 2015). These influences are reflected by gender differences in value

orientations that are compatible with pro-environmental behavior, although these findings depend on the cultural groups studied (Schwartz & Rubel, 2005; Schwartz & Rubel-Lifschitz, 2009). Studies into food practices tend to pay more attention to socio-cultural gender aspects (Arganini, Saba, Comitato, Virgili, & Turrini, 2012), which can be explained by the fact that gender frames (i.e. cultural understandings of differences between women and men) are salient and relevant in relation to all aspects of food-getting (O'Doherty Jensen & Holm, 1999). These conditions may significantly direct the consumption of gendered foods in a gender-congruent direction (Brough, Wilkie, Ma, Isaac, & Gal, 2016; Ridgeway, 2009), such as demonstrated by particular framings of masculinity emphasizing that “real men” eat meat (Mróz, Chapman, Oliffe, & Bottorff, 2011; Schösler, de Boer, Boersema, & Aiking, 2015). Hence, as summarized in the OECD report (OECD, 2021), due to cultural norms, occupational and physical differences and distinct preferences and attitudes, men's and women's consumption patterns differ and have different environmental footprints.

The set of socially approved pro-environmental food practices has gradually grown over the past decade in Western countries. Until recently, many consumers believed that the environmental repercussions of their food consumption were limited to the material flow of packaging waste, which they could personally experience (Tobler, Visschers, & Siegrist, 2011; Van Dam, 1996). However, through various social influences and other mediating events (e.g. education), consumer beliefs about food's environmental repercussions have evolved to include criticism of pesticide use and, to a certain extent, carbon emissions through transport and meat consumption (Bostrom et al., 2012; de Boer & Aiking, 2022b). Earlier Eurobarometers and other studies examined the adoption of buying eco-friendly produced food or organic food as well as buying seasonal and local products; the latter have become reasonably accepted, food-related options to mitigate climate change (European Commission, 2015a; 2015b), although consumers may also have other reasons for choosing these products, such as quality and freshness (Bazzani, Caputo, Nayga, & Canavari, 2017; Feldmann & Hamm, 2015). In recent Eurobarometers, the option of buying seasonal and local products was replaced by an option that was explicitly related to the carbon footprint of one's food purchases, which was, however, less popular (de Boer & Aiking, 2022b).

The above findings indicate that, in their everyday food practices, consumers are focused on practical knowledge about proper and improper behavior (Reckwitz, 2002), which is related to—but not equivalent to—technical knowledge about, for instance, differences in carbon emissions (see also Wynes, Zhao, & Donner, 2020). The recent Eurobarometer data show that awareness and recognition of the necessity to change current food practices are higher in the Northwestern European countries than in the Eastern Central and Southern European countries (de Boer & Aiking, 2022b). The difference may, *inter alia*, be related to the provision of facilities and services for consumers in a country, as a result of socio-cultural and economic factors (Thomas & Sharp, 2013).

### 1.2. Country differences in sustainability and gender equality issues

Studying country differences in sustainability and gender equality issues may improve our understanding of the impacts of socio-cultural and economic factors if certain methodological considerations are followed. The first consideration is that countries are rarely homogeneous societies with a unified culture; this means that careful comparisons of socio-cultural and economic profiles are required to ensure meaningful outcomes, such as insights into conceptions of what is good and desirable among people in a society (i.e. the prevailing value emphases) (Schwartz, 2014). A second consideration is that studies examining correlates of country level differences in sustainability and gender equality issues should control for national income (per capita), as this variable can be an antecedent, correlate or consequence of various socio-cultural and environmental variables (Cling, Eghbal-Téhérani,

Orzoni, & Plateau, 2020). This prominently applies to sustainability and to gender equality, because both concepts are multidimensional and need to be seen in relationship to many income-related processes, thereby considering that the size and direction of these relationships may vary.

Cling et al.'s (2020) multivariate analysis of EU country differences in performance indicators on the Sustainable Development Goals of the United Nations (UN SDGs) revealed a split between the richest North-western European countries (henceforth NWE countries) and the Eastern Central and Southern European countries (henceforth EC&SE countries). This analysis showed that national income was homogeneously associated with higher levels of economic and social sustainability performance indicators, but heterogeneously with ecological sustainability performance indicators, relating to the environment in a broad sense (i. e. energy, climate, life on land), such as household final energy consumption per capita (Cling et al., 2020). An explanation of the heterogeneous outcomes may be that the NWE countries, on the one hand, have a longer history of environmental awareness and action (Rootes, 2004) and, on the other hand, face the environmental repercussions of higher incomes (Girod & de Haan, 2010). This agrees with the differences in the Eurobarometer data about awareness and recognition of the necessity to change current food practices (de Boer & Aiking, 2022b).

EU country differences in gender inequality can be generally assessed by the Gender Equality Index, which is an index aiming to monitor the evolution of gender equality across the EU (European Institute for Gender Equality, 2021). It measures gender gaps and considers the context and different levels of achievement of countries across a range of relevant policy areas. The GE core index is formed by 6 domains (Work, Money, Knowledge, Time, Power, and Health), running from 1 (total inequality) to 100 (full equality). By their very nature, some of these scores overlap with economic and social sustainability performance indicators and correlate with national income (Cling & Delecourt, 2022; Cling et al., 2020). According to the European Institute for Gender Equality (2021), the domain of power has seen the most improvement of all domains since 2010, but progress has been slow and uneven; women account for only one in three members of EU national parliaments, on average. Political gender equality in the form of female representation in parliament has been related to differences in national culture (Schwartz, 2015) and is a key aspect of democratic countries (Melander, 2005).

Country level research on food practices, in particular meat eating, is often focused on correlations with income growth (Henchion, Moloney, Hyland, Zimmermann, & McCarthy, 2021). The European North traditionally had a high animal protein and low plant protein diet (Montanari, 1994) but it showed a sharp meat consumption growth (+50%) since the 1960s due to rising incomes, improved availability and lower prices (Geijer, 2017; Grigg, 1995). Rising incomes in the other regions, first in the South and later in the East Central regions, also changed the demand for animal protein, there, even though historically Mediterranean civilizations (Greek, Roman) were built on agriculture and plant-based foods, primarily. However, in several NWE countries, consumption per capita stabilized in the period from 1990 to 2015, indicating that rising incomes were becoming less important for consumption growth (Geijer, 2017). These potentially new developments may indicate that non-economic factors, such as environmental, social and public health concerns, were becoming more important to certain purchasing decisions (Spangenberg, 2014; Wiedmann, Lenzen, Keyßer, & Steinberger, 2020). Indeed, some recent national surveys report slight tendencies to decrease the consumption of animal products and to increase the consumption of healthful plant-based foods (Brunin et al., 2021; Stewart, Piernas, Cook, & Jebb, 2021; Verain, Dagevos, & Jaspers, 2022).

### 1.3. Cross-level interactions

Size and direction of individual level differences may systematically vary as a function of country level differences. A well-known example of

such a cross-level interaction is that the recognition of climate change as a political issue has become associated with leftist positions rather than rightist ones (Dalton, 2009), which comes to the light in those European countries where the left-right identification has more or less the same meaning (i.e. not in former Communist countries) (McCright, Dunlap, & Marquart-Pyatt, 2016). The result of this process is that the correlation between consumers' left-right political position and their either positive or negative responses to climate-friendly food practices is found exclusively in NWE countries (de Boer & Aiking, 2022c).

The cross-level interactions have recently also drawn more attention in the field of environmental psychology (Pisano & Lubell, 2017). An early study showed that gender differences in the level of private environmental behaviors tend to be more consistent within nations at the upper end of the income distribution (Hunter, Hatch, & Johnson, 2004). Later studies revealed that gender differences in environmentally relevant values (Schwartz & Rubel-Lifschitz, 2009) and in environmental concern were larger in societies with higher levels of gender equality (Chan, Pong, & Tam, 2019). However, these studies did not pay special attention to political gender equality, and they were not able to compare the impacts of gender equality and national income in the same analysis, because the two country level variables were highly correlated.

The finding that gender differences may be larger in more egalitarian and more developed countries has also been obtained in studies about various social and economic domains, such as educational decisions, occupational choice, or financial investment (Hustad, Bandholtz, Herlitz, & Dekhtyar, 2020; Stoet & Geary, 2018). These findings contradict the idea that societal gender equality will simply reduce all kinds of gender differences, a point that has given rise to much discussion in the literature (Fors Connolly, Goossen, & Hjerm, 2020; Hustad et al., 2020). Again, a key issue is the correlation between national income and gender equality. Based on a study across a broad range of cultures and economic development levels, Falk and Hermle (2018) highlight the critical role of availability of material and social resources, as well as gender-equal access to these resources, which creates the scope for gender-specific ambitions and desires. In a similar manner, Breda, Jouini, Napp, and Thebault (2020) suggest that economic development and gender equality in rights go hand-in-hand with a reshaping of gender norms, with the emergence of new and more horizontal forms of social differentiation across genders. Whether and to what extent these interpretations are relevant for pro-environmental food practices will be reiterated in the discussion section.

### 1.4. Present study

The present study focuses on the development of pro-environmental food practices, with special attention to meat reduction, based on multilevel analyses of European survey data. At the level of the individual, the internal consistency and the correlates of pro-environmental food practices are examined. These correlates reflect mixtures of environmental and social motives for pro-environmental behavior. They include measures of concerns about global environmental issues (e.g. climate change, nature deterioration) and some characteristics of consumers who tend to have higher concerns about overall social welfare, such as level of education and level of political interest (Davidescu, Apostu, & Paul, 2020; Meyer, 2015), as well as leftist political preferences in NWE countries, which tend to be associated with pro-environmental food practices (de Boer & Aiking, 2022c).

At the country level, linkages between national income, GE core index and political gender equality are explored in a pre-liminary analysis. To support interpretations of these linkages, the analysis considers country differences in cultural values, using the theory-based cultural value orientations developed by Schwartz (2014). Schwartz (2014) views the existing value emphases in a society as the most central feature of a culture, which characterize it and provide justification for social institutions and economic systems. He distinguishes three bipolar dimensions of culture that represent alternative resolutions to each of

three problems that confront all societies: (1) the extent to which people should be treated as autonomous versus as embedded in their groups, (2) the ideal balance between egalitarianism and hierarchy, and (3) the extent to which individuals and groups should control and change their social and natural environment (i.e. mastery versus harmony) (Schwartz, 2014). The six polarities are represented by a set of seven (correlated) measures, because there are two types of autonomy (intellectual and affective). Across 75 countries in the past decades, political gender equality was related to the degree to which their national culture emphasized autonomy and egalitarianism in contrast to embeddedness and hierarchy (Schwartz, 2015). Hence, in order to choose the most meaningful gender equality variable for the present analysis, the preliminary analysis examines the correlations of the GE core index and political gender equality with existing data on cultural value orientations, controlling for national income.

Our key interest is in the main effect of gender and the cross-level interactions of gender with national income and one of the measures of gender equality. The analysis is first carried out with pro-environmental food practices as dependent variable and then checked with the single practice of meat reduction as dependent variable. Our anticipation was that women have higher scores than men on pro-environmental practices (including meat reduction), controlling for variables that reflect environmental and social motives for pro-environmental behavior, and that these gender differences are larger in countries with higher levels of gender equality and national income.

## 2. Method

### 2.1. Individual level variables

The individual level variables were derived from Eurobarometer 95.1, which includes questions about climate change and personal climate mitigation behavior as well as questions about fishery and aquaculture products. The survey was carried out by research firm Kantar in the 27 Member States of the EU between 15 March and 14 April 2021 among 26,669 European citizens. A description of the fieldwork and the questionnaire are included in the reports of the European Commission (2021a; 2021b). The normal procedure is that the participants (around 1000 in each country, 500 in the three smallest countries) are interviewed face-to-face at home in their mother tongue, based on a multi-stage, random (probability) design, providing a representative sample at the regional and national levels. However, because of the corona virus pandemic, alternative interview modes to face-to-face were necessary as a result of the situation in some countries. In these countries, participants were interviewed online, mostly after recruiting them in a probabilistic way by telephone. For all face-to-face interviews, hygiene and physical distancing measures have always been respected, and whenever possible, interviews were conducted outside homes, on doorsteps, to remain in open air and maintain social distance. Potential recruitment or measurement mode effects (Hox, De Leeuw, & Zijlman, 2015) will be taken into account in the analysis. The variables were taken from the archived data file (European Commission and European Parliament, 2021), which included a weight variable based on gender, age, region and size of locality for each country.

#### 2.1.1. Dependent variable

The variable, pro-environmental food practices, was constructed from six dichotomous items about food-related personal actions that individuals can take to fight climate change and two dichotomous items from the module on fishery and aquaculture products. Data on climate actions were derived from the set of responses to one general item ("Have you personally taken any action to fight climate change over the past six months?") and, independent of their response, 15 binary items on specific actions. Based on a rotating response list, all were asked: "Which of the following actions, if any, apply to you?" The options were related to food (and included meat reduction), household energy use,

transport and waste. The food- and waste-related options were used for the scale development. The two other items asked about the importance of environmental aspects in choosing fish for consumption.

#### 2.1.2. Independent variables

Apart from gender, the independent variables were a measure of concerns about global environmental issues and a small set of variables that indicate concerns about overall social welfare. The concerns about global environmental issues were based on the question "Which of the following do you consider to be the single most serious problem facing the world as a whole?" The 11 options, presented in rotating order, referred to environmental, societal and world peace issues. After the first response, there were at maximum three other responses ("Which others do you consider to be serious problems?"). The measure of concerns about global environmental issues (henceforth Global E-concerns) was the number of options chosen that refer to climate change, deterioration of nature, health problems due to pollution, or poverty, hunger and lack of drinking water.

The variables that indicate concerns about overall social welfare were part of the standard Eurobarometer variables. They include level of education (four categories, from primary, secondary to long tertiary level), level of political interest (see below) and left-right political position ("In political matters people talk of 'the left' and 'the right'. How would you place your views on this scale?" (10 categories, plus "don't know" or "refusal" were recoded into five categories from left to right with "don't know" or "refusal" in the middle position)). Level of political interest (four levels from not at all; slightly; moderately; to strongly) was part of the archived data file as a sum of three items based on the question "When you get together with friends or relatives, would you say you discuss frequently, occasionally or never about 1) national political matters, 2) European political matters, 3) local political matters?" For methodological reasons, a variable for interview mode (online or face-to-face) was included.

#### 2.2. Country level variables

The country level variables were taken from various sources. A dummy variable was used to distinguish the 11 former Communist countries from the others. The measure of national income, GNI (gross national income) per capita at current prices in Purchasing Power Standard (PPS, EU27 from 2020), was taken from Eurostat; the usual logarithmic transformation was applied on the variable in order to improve its normality. The scores on the GE core index were taken from the Gender Equality Index report 2021 (European Institute for Gender Equality, 2021). The political gender equality measure was the percentage of seats held by women in national parliaments and governments, taken from Eurostat and averaged over the past five years (2017–2021). Henceforth, the short names of the four variables are FCC dummy, GNI/cap, GE core index and Pct W-seats, respectively.

The set of seven (correlated) measures of the value emphases in a country was taken from data provided by Schwartz (2008). The measures cover 24 of the 27 EU countries and were therefore only used in the pre-liminary analysis. The measures refer to (1) intellectual autonomy, valuing broadmindedness, curiosity, and creativity, (2) affective autonomy, valuing pleasure, exciting life, and varied life, (3) embeddedness, valuing social order, respect for tradition, security, obedience, and wisdom, (4) egalitarianism, valuing a commitment to cooperate and to feel concern for everyone's welfare, (5) hierarchy, valuing hierarchical systems of ascribed roles to insure responsible, productive behavior, (6) harmony, valuing a world at peace, unity with nature, and protecting the environment, and (7) mastery, ambition, success, daring, and competence.

#### 2.3. Analyses

The preliminary analysis to choose between the variables GE core

index and Pct W-seats made use of the partial correlations of these variables with existing data on cultural value orientations in 24 countries, controlling for GNI/cap. Next, Cronbach’s alpha was calculated to verify that the eight binary items used to measure pro-environmental food practices were interrelated in expected ways. An advantage of binary items is that they are less affected by response biases than Likert-type scales (Clark & Watson, 1995). As the alpha-value tends to underestimate the internal consistency of scales consisting of fewer than 10 items, the average inter-item correlation was used as an alternative measure of internal consistency (Taber, 2018). This measure should fall in the range 0.15–0.50, dependent on the generality (closer to 0.15) or specificity (closer to 0.50) of the target construct (Clark & Watson, 1995). It should also be noted that the values for Cronbach’s alpha (or its alternatives) apply to the particular sample responding on a particular occasion and should not be assumed to be a fixed feature of the scale or instrument (Taber, 2018). Hence, in addition to measures based on the pooled sample, it is important to consider whether the country samples show varying degrees of internal consistency. ANOVA can be used to compare the countries. Depending on the results, it may be appropriate to check the multilevel analysis with the full scale as dependent variable after removal of the countries where the internal consistency was too low (average inter-item correlation <0.15) and check it also with a single key item (i.e., meat reduction) as dependent variable.

The multi-level analysis with pro-environmental food practices as the dependent variable was performed through linear mixed regression modeling, which considered individuals to be nested within countries. The analysis was performed in several models that stepwise added variables to the prediction (Charlton, 2013; Sommet & Morselli, 2017). As the variables were measured in quite different units, they were all standardized (mean = 0 and SD = 1). Checking for multicollinearity was done through the usual diagnostics, i.e., tolerance and variance inflation factor (VIF). The cross-level interactions were investigated by adding interaction terms to the regression model in which the relevant variables were multiplied (Jaccard & Turrisi, 2003). The predicted value of the final model was examined by means of bar charts. When the same analysis was performed with a single item as binary dependent variable, the results were checked by multilevel logistic modelling (Sommet & Morselli, 2017). All calculations were made by SPSS 26 for Windows.

### 3. Results

#### 3.1. Preliminary analyses

The most meaningful gender equality variable for the main analysis was chosen after considering the size of the correlations between GNI/cap, GE core index and Pct W-seats, as well as the size of the partial correlations between the latter two and the seven cultural value

**Table 1**  
Correlations and partial correlations of GNI/cap, GE core index and Pct W-seats with cultural value orientations in 24 countries.

Variable	Partial correlations controlling for GNI/cap		
	GNI/cap	GE core index	Pct W-seats
<i>Cultural value orientations</i>			
Intellectual autonomy	.60**	.33	.48*
Affective autonomy	.68***	.17	.28
Embeddedness	-.76***	-.32	-.51*
Egalitarianism	.61**	.27	.49*
Hierarchy	-.43*	.05	-.15
Harmony	-.03	.26	.36
Mastery	-.23	-.22	-.16
<i>Gender equality variables</i>			
GE core index	.75***	-	.75***
Pct W-seats	.51**	.75***	-

\*p < .05, \*\*p < .01, \*\*\*p < .001.

orientations, controlling for GNI/cap. The first column of Table 1 shows that GNI/cap had strong correlations with the value orientations, such as affective and intellectual autonomy and egalitarianism. The gender equality variables GE core index and Pct W-seats were strongly correlated ( $r = .78, p < .001, N = 27$ ), but Table 1 demonstrates that they had different correlations with other variables. Pct W-seats had a lower correlation with GNI/cap than GE core index (0.51 vs. 0.75) and higher positive partial correlations with Intellectual autonomy (0.48 vs. 0.33) and Egalitarianism (0.49 vs. 0.27) and a higher negative partial correlation with Embeddedness (-0.51 vs. -0.32). This means that Pct W-seats can provide a meaningful complement to GNI/cap in the multilevel analysis.

The responses to the eight binary items used to measure pro-environmental food practices were, in the pooled sample, satisfactory interrelated (Cronbach’s alpha = .67, average inter-item correlation  $r = 0.20$ ). All the items contributed to the internal consistency (see Table 2). However, the country samples showed varying degrees of internal consistency: 6 countries had an average inter-item correlation above 0.20 and an average alpha of .71, 12 had an average inter-item correlation between 0.15 and 0.20 and an average alpha of .62, and 9 countries had an average inter-item correlation lower than 0.15 and an average alpha of .49. These 9 countries were often former Communist countries; they had the lowest levels of GNI/cap and Pct W-seats as well as the highest level of Embeddedness (ANOVA of the country means,  $p$ ’s < .01). Hence, their position can be explained by content-related characteristics, which makes it less appropriate to simply remove them from the analysis. To enhance the transparency of the results, however, the multilevel analysis of the full scale was repeated after removing the 9 countries; it was, subsequently, also repeated with a single key item (meat reduction) as dependent variable.

#### 3.2. Main analysis

The descriptive statistics of the variables that were included in the main analyses are presented in Table 3. The results of the multilevel analysis are reported in Table 4, starting with the 0 Model. This model shows the effect of the country variable on the value of Pro-environmental food practices. Due to the standardization of all variables, the mean value across countries was almost 0 and the total variance almost 1. The between-country (level 2) variance is estimated as 0.164 and the within-country (individual level) variance is estimated as

**Table 2**  
Characteristics of the scale of pro-environmental food practices in the pooled sample (N = 26669).

Item text	Item mean	Corrected item-total correlation
Have you personally taken any action to fight climate change over the past six months? (Yes = 1, else = 0)	.62	.39
Which of the following actions, if any, apply to you?—You buy and eat less meat	.29	.37
You consider the carbon footprint of your food purchases and sometimes adapt your shopping	.18	.39
You buy and eat more organic food	.30	.38
You try to reduce your waste and you regularly separate it for recycling	.73	.34
You try to cut down on your consumption of disposable items whenever possible, e.g., plastic bags from the supermarket, excess packaging	.62	.36
When you buy fishery and aquaculture products, which of the following aspects are the most important for you—The environmental, social or ethical impact	.12	.31
Which of the following do you think should be mentioned on the label for all fishery and aquaculture products?—Environmental information	.36	.36

**Table 3**  
Descriptive statistics of the variables in the main analyses (before standardization).

	Minimum	Maximum	Mean	SD
<i>Individual level (N = 26,669)</i>				
Pro-environmental food practices	0	8	3.24	1.95
Gender (female = 1)	0	1	.51	.50
Level of education	1	4	2.79	.96
Level of political interest	1	4	2.80	.89
Left-right political position	1	5	2.96	1.00
Global E-concerns	0	4	1.63	.92
<i>Country level (N = 27)</i>				
FCC dummy	0	1	.4	.5
Pct W-seats	12.1	47.5	29.3	9.4
Natural logarithm of GNI/cap	9.7	10.9	10.2	.3

0.833. The variance partition coefficient (VPC) is 0.164, which indicates that 16% of the variance in the variable Pro-environmental food practices can be attributed to differences in intercept between the countries.

The Model 1 column shows the results of two additional steps in the analysis, which first included Gender and the other individual level variables and then allowed the coefficient of Gender to vary randomly across countries. The result is that the between-country variance decreased from 0.164 (via 0.108 after step 1) to 0.108, and the within-country variance decreased from 0.833 (via 0.694 after step 1) to 0.690. The five individual level variables had significant regression coefficients in this model, which explains the reduction in within-country variance. The reduction in the between-country variance suggests that the distribution of individuals by the individual level variables differed from country to country. Gender had a small, fixed effect on the dependent variable (0.124) and the between-country variance in the coefficients for Gender (UN (2,2)) was estimated as 0.015. Assuming a normal distribution of these coefficients, it would be expected that the middle 90% of countries had a coefficient for Gender between -0.08 and 0.32. In terms of the model parameters, the likelihood ratio test statistic (the difference between the values of -2 Log likelihood, before and after the random coefficient was included) was 118.261 ( $df = 2$ ), which is highly significant ( $p < .001$ ). The covariance between country intercepts and coefficients for Gender (UN (2,1)) was 0.004 (its standard error was 0.001), which means that there was a very small positive correlation ( $r$

= 0.10) between the level of the country means and the size of the coefficient for Gender.

The Model 2 column shows the results of three additional steps, which included the three country level variables in the analysis. Only GNI/cap had a significant regression coefficient. The result is that the between-country variance of intercepts decreased from .108 to .033 and that the between-country variance of the coefficients for Gender decreased from 0.015 to 0.003. Models 3, 4, and 5 show the results of adding the three cross-level interactions to the regression model. Adding the product of the FCC dummy with Left-right political position had the largest effect; the likelihood ratio test statistic was 187.865 ( $df = 1, p < .001$ ). The product of Gender and Pct W-seats created a smaller difference (the likelihood ratio test statistic was 21.303 ( $df = 1, p < .001$ )) with a significant interaction term, but no significant coefficient for Pct W-seats. The interaction term indicates that the predicted values of Pro-environmental food practices among “average” women and men, living in a country 1 SD below the mean of Pct W-seats, were estimated as 0.019 and -0.137, respectively, and that these values were 0.229 and -0.111 in a country 1 SD above the mean of Pct W-seats. In other words, there was a small positive effect among women, but no effect among men. Adding the product of Gender and GNI/cap also had a small significant effect (the likelihood ratio test statistic was 10.814 ( $df = 1, p < .01$ )). In the final model 5, both interaction terms for Gender were small and comparable in size ( $p$ 's < 0.01). A difference is that GNI/cap had positive correlations with Pro-environmental food practices among women and men, but that the correlation among women was slightly stronger.

The results have been checked in several ways. Including an interview mode variable (face-to-face or online) did not make a significant difference. The multilevel analysis with the full scale as dependent variable was repeated after removal of the nine countries where the internal consistency was too low. It was also repeated with the single item of meat reduction as dependent variable, both in a linear and in a logistic model. These analyses produced very similar results. Finally, the analysis was repeated with GE core index instead of Pct W-seats as the gender equality variable; this analysis also produced very similar results, except that in this case the interaction term of Gender and GE core index was not significant ( $p = .117$ ), whereas that of Gender and GNI/cap was slightly significant ( $p < .05$ ).

**Table 4**  
Results of the multilevel analysis of pro-environmental food practices with the five fitted models<sup>a</sup>).

	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	.013 (.077)	.010 (.062)	-.001 (.035)	-.010 (.035)	-.008 (.035)	-.009 (.035)
<i>Individual level</i>						
Gender		.124 (.012)***	.123 (.012)***	.122 (.012)***	.124 (.008)***	.123 (.007)***
Level of education		.145 (.005)***	.145 (.005)***	.144 (.005)***	.144 (.005)***	.144 (.005)***
Level of political interest		.141 (.005)***	.141 (.005)***	.139 (.005)***	.139 (.005)***	.139 (.005)***
Left-right political position		-.093 (.005)***	-.093 (.005)***	-.096 (.005)***	-.096 (.005)***	-.096 (.005)***
Global E-concerns		.250 (.005)***	.250 (.005)***	.244 (.005)***	.244 (.005)***	.245 (.005)***
<i>Country level</i>						
FCC dummy			-.080 (.048)	-.087 (.048)	-.087 (.048)	-.087 (.048)
Pct W-seats			.025 (.041)	.026 (.042)	.059 (.042)	.049 (.042)
GNI/cap			.161 (.044)**	.158 (.045)**	.158 (.045)**	.178 (.045)**
<i>Cross-level</i>						
FCC dummy*Left-right political position				.069 (.005)	.068 (.005)***	.068 (.005)***
Gender*Pct W-seats					.046 (.008)***	.031 (.008)**
Gender*GNI/cap						.028 (.008)**
<i>Variance</i>						
Residual	.833 (.007)	.690 (.006)	.690 (.006)	.686 (.006)	.686 (.006)	.686 (.006)
UN (1,1)	.164 (.044)	.108 (.029)	.033 (.010)	.034 (.010)	.033 (.009)	.032 (.008)
UN (2,2)		.015 (.005)	.003 (.004)	.003 (.004)	.001 (.002)	.001 (.001)
UN (2,1)		.004 (.001)	.004 (.001)	.003 (.001)	.001 (.005)	.001 (.000)
<i>Model</i>						
-2 Log likelihood	75303.047	69917.942	69902.167	69714.302	69692.999	69682.185
Number of parameters	3	10	13	14	15	16

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

<sup>a</sup>) Model 0 is the model with intercept only; Model 1 added the individual level variables and allowed a random coefficient for Gender; Model 2 added the country level variables; models 3, 4 and 5 added the three interaction terms.

An overall picture of the results is presented in Fig. 1. Based on all the variables in model 5, the bar charts show the mean predicted value of Pro-environmental food practices among women and men across different levels of the Pct W-seats variable. The figure demonstrates that the gender differences varied in size across the levels of Pct W-seats; this was also partly an effect of GNI/cap as both variables were moderately correlated. The mean scores of the women indicate that they reported increasingly more pro-environmental food practices than the men in countries with higher Pct W-seats levels. However, there were a few exceptions. An example was Spain with the fourth highest percentage of women in parliament, but low predicted values of Pro-environmental food practices in comparison with those values in countries as Belgium, Finland and Sweden (the three countries with the highest percentages of women in parliament). A similar figure can be made for the single item Meat reduction, also using the prediction structure of model 5. However, this figure is not shown, because the predicted value of Pro-environmental food practices and the predicted value of Meat reduction were highly correlated ( $r = 0.93$ ).

#### 4. Discussion

This paper has investigated how the development of pro-environmental food practices among women and men in the EU was correlated with the available economic resources and the political gender equality of the countries they lived in. The literature considers this development to be a function of the increasing awareness and recognition of food’s environmental repercussions and the subsequent provision of facilities and services for consumers in a country. The present study analyzed both individual- and country level aspects of this topic. The results underline that the countries sharply differed in their development of pro-environmental food practices and that the individuals in less developed countries showed less consistency in their responses to the questions than those in the more developed ones.

Additionally, there were systematic differences in terms of the adoption of these practices (including meat reduction).

The main result is that national income and political gender equality had complementary impacts on the adoption of these practices. Men reported more pro-environmental food practices if they lived in richer countries; the same applied even more strongly to women if they lived in richer and more politically gender-balanced countries. This result was found in an analysis controlling for other individual level variables that reflect environmental and social motives for pro-environmental behavior, such as level of education and left-right political position. Political gender equality in the form of women’s representation in parliament was moderately positively correlated with a country’s national income, but, controlling for that, also with existing cultural value orientations that emphasize intellectual autonomy and egalitarianism (versus the belief that people should be treated as embedded in their groups). Hence, it is an important aspect of cultural differences at the country level, which may be less visible in an analysis with more general gender equality measures.

The practical implications of the results may be limited by the small size of the statistical effects observed. However, the results should be seen in the broader context of gender-related aspects of various social and economic domains (Breda et al., 2020; Falk & Hermle, 2018) and, in particular, in relation to the potential positive interactions between gender equality and ecological sustainability, as envisioned by the OECD (2021). The results agree with recent interpretations of the ways in which economic development and gender equality in rights may go hand-in-hand (Breda et al., 2020). As noted by Falk and Hermle (2018), it is the availability of material and social resources in combination with gender-equal access to these resources that may create the scope for gender-specific ambitions and desires. Taking into account that women’s value orientations tend to be more compatible with pro-environmental behavior than those of men (Schwartz & Rubel-Lifschitz, 2009), it may be concluded that women may have

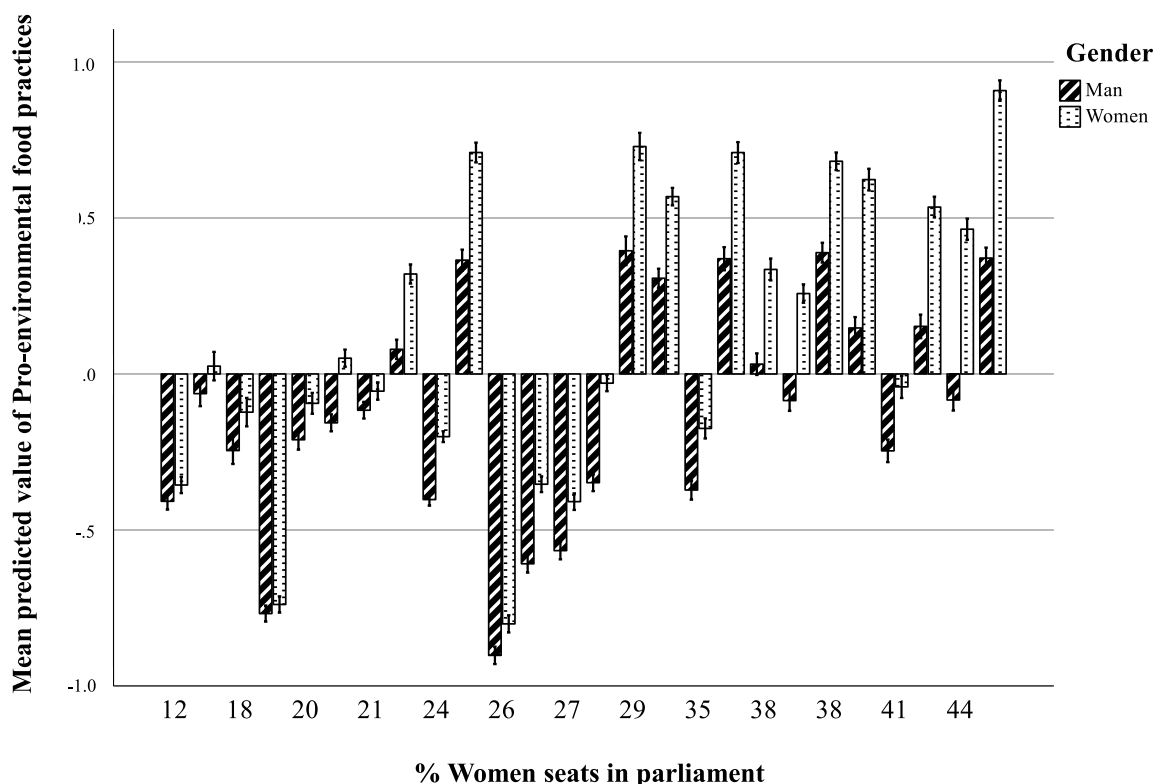


Fig. 1. Bar charts (with 95% error bars) showing the mean predicted value of Pro-environmental food practices among women and men across different levels of the Pct W-seats variable.



developed more autonomy by, inter alia, adopting pro-environmental food practices. This is an illustration at the level of individual behavior of what the [OECD \(2021\)](#) describes at the level of institutional policy making, where gender equality and environmental goals are mutually reinforcing.

Although the results do not directly give rise to remedies or interventions, the relationship between gender equality and the cultural value of autonomy may be a reason for sustainability policy makers to take gender issues in consideration before any actions are taken. In the words of the [OECD \(2021\)](#), efforts to change behavior and steer men and women toward more environmentally-friendly choices must be broadly underpinned by gender equality measures to ensure that men and women feel more comfortable embracing more green lifestyles. Recent work suggests that men tend to be more concerned than women with gender-identity maintenance and that this may affect their choice of gendered food ([Brough et al., 2016](#)). Therefore, it may be advisable, for instance, to address the perceived “unmanliness” of healthy, plant-based meals, by attempts to give meat-free meals a masculine makeover ([Mróz et al., 2011](#)). Men may also have more difficulty to change their orientations toward “more consumption” into an orientation to consume “less”, which is often inherent to sustainability goals ([Schösler et al., 2015](#)). In the eyes of economists, “less” may only be socially acceptable, regarding status as well as quality of life, if “less” is “better”, not only in a moral or normative sense, but also regarding product quality and the provision of satisfaction ([Spangenberg, 2014](#)). That is, orientations toward “more consumption” should be changed into an orientation of “better but less” for affluent groups, and toward “enough and better” for the others. Importantly, the open idea of “better” may create scope for gender-specific ambitions and desires. In the case of meat, for instance, “better” may involve combinations of quality and, for instance, animal welfare, environmental, health, territorial or other advantages related to one’s cultural identity, which women and men can interpret in their own way as long as they are consuming less animal products (for reviews of interpretations of “less but better” meat, see [de Boer & Aiking, 2022a](#); [Resare Sahlin & Trewern, 2022](#)).

#### 4.1. Limitations

It should be noted that the data offer no direct evidence that the participants perceived their own actions in terms of autonomy. As explained by [Schwartz \(2014\)](#), however, autonomy is a value endorsed by the culture the participants lived in and such cultural influences can only be measured by their manifestations. Hence, to demonstrate the role of culture requires a more qualitative approach. A real limitation of this study is that no information was available about the provision of environmental-friendly facilities and services for individuals in each of the countries. It might be expected that such facilities and services are more available in higher income countries, but that could not be specified in this study.

Another limitation is that the survey items were focused on a set of socially approved pro-environmental food practices, neglecting all the other food practices that may be decisive for someone’s ecological footprint, such as the amounts of foods consumed. They also neglect ways in which individuals in low income countries may, for example, use gardening and food self-provisioning as strategies motivated by economic needs and underdeveloped markets ([Sovová & Veen, 2020](#)). Although individuals in richer countries reported more pro-environmental food practices, the total environmental impacts of their food practices may, however, still be larger than those of individuals in lower income countries ([Girod & de Haan, 2010](#)). This can only be assessed in types of research that go beyond the scope of the Eurobarometer, because information is required about the health and sustainability impacts of country-specific dietary patterns ([van Dooren, Keuchenius, de Vries, de Boer, & Aiking, 2018](#); [Vieux et al., 2020](#); [Vieux, Perignon, Gazan, & Darmon, 2018](#)).

## 5. Conclusions

Given the urgent need to substantially reduce the environmental repercussions of our food production and consumption, it is crucial to identify and understand all the positive forces in society that can be mobilized for this purpose. This paper directed attention to particular understandings of gender and gender equality, which can play such a positive role. The paper was built upon the OECD’s conclusion that the UN Sustainable Development Goals of gender equality and environmental sustainability are mutually reinforcing. In line with these ideas, our study more specifically demonstrated that the role of gender equality can fruitfully be interpreted in terms of national cultural values, which are manifested in the behavior of social institutions as well as individuals. This view makes it easier to understand the importance of gender-equal access to relevant resources in ways that allow gender-specific differences in ambition. Our study generated conclusions at different levels of analysis. At individual level, the main conclusion is that the idea of pro-environmental food practices had become a guiding principle for certain recognizable consumer segments. At the country level, the conclusion is that there were significant country differences in the adoption of pro-environmental food practices, which were largely associated with differences in national income. The cross-level analysis led to the conclusion that national income and political gender equality had complementary impacts on the adoption of these practices and that women had increasingly higher levels of adoption than men in more egalitarian and more developed countries. Due to the culture of these countries, women may have developed more autonomy by, inter alia, adopting pro-environmental food practices. This could be a specific example of “mutually reinforcing dynamics” in the pursuit of gender equality and environmental sustainability goals. Hence, it may be concluded that there are compelling reasons for policy makers to address these issues and to take their targeted integration even more seriously.

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#### Declaration of competing interest

The authors declare no competing interest.

#### Ethical statement

The paper does not involve new human participants. The data were collected by Kantar in all Member States of the EU at the request of the European Commission, Directorate-General for Communication, and are publicly available.

#### CRediT authorship contribution statement

**Joop de Boer:** Conceptualization, Formal analysis, Writing – original draft. **Harry Aiking:** Conceptualization, Writing – review & editing.

#### Data availability

I have shared a link to my data ([European Commission and European Parliament, 2021](#)).

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