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ANALYSIS

Climate change and species decline: Distinct sources of European consumer concern supporting more sustainable diets

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ABSTRACT

This study explored whether EU's new Farm to Fork strategy (F2F)—which aims to tackle climate change, protect the environment and preserve biodiversity in the pursuit of more sustainable food practices—moves in a direction that matches consumer concerns about global issues. A key point is that the traditional differences between the policy approaches related to climate change mitigation and to biodiversity protection, respectively, correspond to differences between environment-based and nature-based attitudes at an individual level. Data from Eurobarometer 92.4 (2019) provided a set of environmental concerns and two food-related pro-environmental actions (buying local products and making a diet change to more sustainable food). Consumer responses to the latter option were assumed to indicate steps in parallel with F2F. Two multinomial regression analyses were carried out separately in Northwestern European countries, and in Eastern and Southern European countries. In both analyses, climate change and species decline were distinct sources of consumer concern, which were—independent of one another—more strongly related to reporting both options than to one option only. It was concluded that the F2F policy is in line with consumer concerns about environment and nature and that this may create important new perspectives for policymakers, businesses and consumers.

1. Introduction

Nutrition and agriculture have become increasingly important topics in the field of environmental policy-making. From a natural science perspective, it has been shown that agriculture and intensive livestock farming seriously contribute to both climate change (Carlsson-Kanyama and González, 2011) and biodiversity loss (Erisman et al., 2008; Aiking, 2014; Willett et al., 2019). Moreover, climate change has serious impacts on biodiversity loss (Bellard et al., 2012), whereas, vice versa, ecosystems are considered to be crucial for nature-based approaches to mitigate and adapt to the impacts of climate change (Mori, 2020). Despite these science-based interlinkages, however, food production and consumption, as well as climate change and biodiversity loss, are often treated very differently—and in separation—by many actors in society, such as policy makers and the public at large (Zaccai and Adams, 2012; Schebesta and Candel, 2020).

1.1. Steps toward integration

1.1.1. The EU strategy

A recent key development is the announcement by the European Union (EU) of its Farm to Fork (F2F) Strategy for a fair, healthy and environmentally-friendly food system (European Commission, 2020b). This strategy and the recent Biodiversity strategy are at the heart of EU's new, sustainable and inclusive growth strategy, the Green Deal (European Commission, 2019), aimed at addressing some of the most pressing environmental and public health concerns that European society faces. A salient characteristic of the strategies is the integrated approach, which significantly broadens the range of environmental issues linked to food production and consumption (Schebesta and Candel, 2020). This integration will be new to many stakeholders, particularly to consumers. In the recent past, for instance, many consumers believed that the environmental repercussions of their food consumption were limited to the material flow of packaging waste (Van Dam, 1996; Tobler et al., 2011). In contrast, the environmental ambition of the F2F strategy is to tackle climate change, protect the environment and preserve biodiversity, simultaneously.

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Climate change is widely considered a serious world problem but biodiversity loss has received much less attention as a global issue yet (Legagneux et al., 2018). This discrepancy may reflect the traditional divide in environmental policy agendas between “brown” issues related to the prevention and control of industrial and urban pollution and “green” issues related to managing the quantity and quality of natural resources and ecosystems (Jamison, 2003; Rootes, 2004; Agyeman, 2008; Kalinowska, 2017). In the words of Zaccai and Adams (2012), climate change is better defined and better understood as a policy issue, whereas biodiversity loss is less easily understood, more diffuse and less tangible. The divide carries potentially serious consequences for how the issues will be addressed by societal stakeholders, including consumers.

1.1.2. The consumer side

The present paper focuses on the perception and behavior of food consumers, taking into account that there is a complex relationship between consumer preferences, food production practices, and EU farm policy. Although F2F has a strong focus on the production side of food systems, it also aims to change consumption patterns: “Moving to a more plant-based diet with less red and processed meat and with more fruits and vegetables will reduce not only risks of life threatening diseases, but also the environmental impact of the food system” (European Commission, 2020b). As the Commission aims to empower consumers to make informed, healthy and sustainable food choices, an important research question is whether the F2F strategy moves in a direction that is in line with consumer concerns about global issues.

The present paper addresses this question by examining how climate change and biodiversity loss are perceived by consumers, and to what extent these perceptions are related to changes in their food practices into a more sustainable direction. Building on behavioral theory about attitudes toward environmental protection and nature preservation (e.g. Kaiser et al., 2013), our work demonstrates how different attitudes can work for activities that can be meaningfully linked to both environment and nature, such as food consumption practices (Jamison, 2003; Vogt, 2007).

1.1.3. Eurobarometer surveys

The data are survey data collected by the EU, which often uses questions in public opinion surveys (Eurobarometer) for policy development purposes (Haverland et al., 2018). Many waves of the Eurobarometer have addressed concerns about environmental issues and consumer responses to options for pro-environmental behaviors. One of the options is buying seasonal and local products, which has become a reasonably accepted, food-related option to mitigate climate change (Pirani and Secondi, 2011; Whitmarsh et al., 2011; Hoolohan et al., 2013; de Boer et al., 2016), although consumers may also have other reasons for choosing these products, such as quality and freshness (Feldmann and Hamm, 2015; Bazzani et al., 2017).

In 2019, an option was added to Eurobarometer 92.4 that asked about having changed your diet “to more sustainable food” (European Commission, 2020c). This new option is open to different interpretations. It may include—but is not limited to—food that is nutritious and healthy and has been produced with little or no use of pesticides (European Commission, 2020d). The latter is attractive to consumers who highly appreciate nature and care about species becoming extinct (Vogt, 2007; Hedlund-de Witt et al., 2014; Janssen, 2018; Ditlevsen et al., 2019). Hence, in addition to consumer responses to the first option (buying local products) their responses to the second one (making a diet change) may indicate whether they are actively taking steps in the direction intended by F2F. It is, in particular, the strength of the relationship between, on the one hand, concerns about climate change and biodiversity loss, and, on the other hand, a reported diet change, either or not in combination with reported local purchases that may reveal whether the F2F strategy moves into a direction that matches consumer concerns about global issues. In sum, the aim of the present study is to provide a theory-based, multivariate analysis of the

Eurobarometer 92.4 data (collected in December 2019) that adds significant insights to the regular survey report by the European Commission (2020c), regarding the reception of F2F ideas by consumers.

1.2. Background of climate-related and biodiversity-related attitudes

The ambition of the F2F strategy to tackle climate change, protect the environment and preserve biodiversity may be matched by supportive insights from psychology and sociology on the development of environmental attitudes and behavior. A crucial point is that, at an individual level, the “brown” and “green” policy areas may correspond to a person's basic attitudes toward environmental protection actions and toward nature preservation actions, respectively. As explained below, this distinction has direct implications for the likelihood that a person may become engaged in pro-environmental food practices, because of climate-related and/or biodiversity-related reasons. A special point of attention here is that a person can, in principle, choose the same food-related actions to address climate change and biodiversity loss simultaneously.

1.2.1. The concepts of attitude, concern and goal

In brief, an attitude is “a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor” (Eagly and Chaiken, 1993). The entity may be symbolic or concrete, such as goals, actions and objects. Empirically, it has been found that a person's evaluative responses to a set of actions, such as recycling and waste reduction, can become representative for a certain attitude, especially if the attitude implies a goal (i.e. a desirable outcome of an action), such as the goal of protecting human health or protecting the environment, that can be attained by the action (Campbell, 1963; Kaiser and Wilson, 2004; Kaiser et al., 2013). The words “environmental attitude” and “environmental concern” are sometimes used interchangeably, although the first is conceptually more accurate. By their very nature, concerns about issues or attitudes toward objects, even if highly positive, are insufficient in and of themselves to incite action, as behavior is driven by goals (Kruglanski et al., 2015). In terms of goal theory (Kruglanski et al., 2002; Kopetz et al., 2012), helping to protect the environment might become the focal goal of certain specific activities, such as recycling (Gould et al., 2016; Geiger et al., 2019). It may also become one of the background goals in the case of activities aimed at other goals. Obviously, for instance, it is not the focal goal of food consumption to protect the environment, but this activity has socially recognized environmental repercussions (e.g. waste generation (Tobler et al., 2011)) and reducing these may become a background goal (i.e. a goal of secondary importance which may also influence choices). The cultural meaning of food's environmental repercussions has evolved over time to include criticism of pesticide use (Jamison, 2003; Vogt, 2007; Hansmann et al., 2020) and, to a certain extent, meat consumption (de Bakker and Dagevos, 2012; de Boer et al., 2016; Jallinoja et al., 2016; Graça et al., 2019).

1.2.2. The goal of environmental protection

More generally, dependent on the material consequences and cultural meaning of activities, environmental protection can become an overarching background goal that is relevant to an individual in relation to many different practices (Stern, 2000; Jamison, 2003), although waste-related practices have remained appealing to the largest number of consumers (Siegrist et al., 2015; Dubuisson-Quellier and Gojard, 2016; Gould et al., 2016). Goal-directed activities are often what sociologists call “social practices” (Bourdieu, 1984; Reckwitz, 2002), involving people who actively integrate particular materials, cultural meanings and forms of competence as ingredients of a practice, such as barbecuing (Shove and Pantzar, 2005). In correspondence, practices significantly vary in the amount of behavioral difficulties (or costs) they incur, which means that, in a given social setting, individuals may be more or less likely to perform them. This applies also to the likelihood of

performing practices with different degrees of environmentally friendly effects. Analytically viewed, there could be a continuum that discriminates among individuals who put high value on the goal of environmental protection and are willing to bear high costs and individuals who value the goal much less and are only willing to do easy things (Campbell, 1963; Kaiser and Wilson, 2004). Using a Rasch-type model to mathematically model this continuum, Kaiser and Wilson (2004) showed in a Swiss study that the assumed overall goal could be linked to 50 behavioral items, which covered 6 different domains of behavior, including recycling, energy conservation, transport and mobility and consumerism (nine items of which two are related to food). In other words, an attitude toward environmental protection may generalize beyond a particular domain.

1.2.3. The goal of nature preservation

In line with this work, it has also been revealed that appreciation of environmental protection can be distinguished from appreciation of nature (represented by 40 items in Kaiser et al., 2013), as the latter is grounded in gratifying experiences involving natural settings and features of the natural world, such as enjoying gardening (Thompson and Barton, 1994; Coisnon et al., 2019). Although rigorous research is difficult in this area, studies suggest that gardening has many positive aspects, enabling people to relieve stress, to grow some vegetables and to internalize ecological principles (Jamison, 2003; Freeman et al., 2012). Measures of both activity-based attitudes (toward environmental protection actions and toward nature preservation actions) are substantially positively correlated, but there is important theoretical and practical value in treating them as separate attitudes, because, as Kaiser et al. (2013) note, the first may be linked with self-sacrifices and, thus, with unselfishness, whereas the second may reveal the power of benign self-interest in motivating ecological behavior.

The distinction between attitudes toward environmental protection actions and toward nature preservation actions does not necessarily mean that there are one-on-one relationships between these attitudes and concerns about specific environmental issues, such as climate change and biodiversity loss. These and other, more-or-less agreed upon, environmental issues have become prominent in the public mind as a result of the rise of environmental awareness in the industrialized Western democracies from the 1960s through the 1980s (Rootes, 2004). The issues are complex and the corresponding concerns are influenced by different factors such as value orientations, information exposure and the perception of actual problems (Zeus and Reif, 1990). Although it is difficult to establish a boundary around such issues, it appears that, in terms of what an individual can do, climate change is often linked to environmental protection actions, such as energy conservation (Ortega-Egea et al., 2014; European Commission, 2015a), whereas biodiversity is linked to practices, such as eco-friendly gardening (European Commission, 2015b; Coisnon et al., 2019). Hence, the distinction in attitudes could be extremely relevant to the F2F strategy, because it suggests that climate-related and biodiversity-related attitudes can work in parallel to affect activities with different environmental repercussions, such as the consumption of animal proteins, related to both climate change and biodiversity loss (e.g. Castañé and Antón, 2017).

1.2.4. “Two birds with one stone”?

The notion that food consumers may have, in principle, about the same behavioral options to address both climate change and biodiversity loss has a special meaning in terms of goal theory. The situation of a person with two goals in mind that can be satisfied by one choice is called a “multi-finality set” or “two birds with one stone”, and the coupling may increase the value of the particular choice (Kruglanski et al., 2002). In practice, this assumes that consumers understand the repercussions of their choice and that they are to some extent actively motivated by both goals in the process of decision making. However, detailed experimental research is required to validate this phenomenon, also assuming that consumers have, indeed, the same options to attain

both goals (to be reiterated in the Discussion).

1.3. The present study

This study aims to assess how both climate change concerns and biodiversity concerns, independently, are related to a diet change into more sustainable direction, by providing a theory-based, multivariate analysis of the Eurobarometer 92.4 data (collected in December 2019). As this involves a large and complex data set, the study builds on earlier work on Eurobarometers for the choice of relevant variables, the treatment of the items and approaches for incorporating the complexities of the sample design (see below). The aim of Eurobarometers is often twofold: firstly to assess the political expectations of citizens regarding an issue and secondly to consider their own contribution to solutions. This study uses both sets of questions.

1.3.1. The type of questions asked

The Eurobarometer questions that aim to measure consumers' appraisal of environmental issues build on a (short) tradition of such research since the year 1982 (Zeus and Reif, 1990). Although there have been slight differences in wording, the questions referred to potential complaints about aspects of the personal environment (noise pollution, air pollution) and general concern about the national (once more air pollution, river pollution, damage to sea life, waste streams) and the global situation (extinction of plants and animal species, climate change). Eurobarometer 92.4 did not ask the participants for separate ratings of seriousness but a choice of the four most important ones from a set of ten, in addition to the question how important environmental protection is to them personally. Earlier work showed that about 18% to 20% of the EU population in the 1980s reported some complaint about their personal situation, whereas 80% to 86% reported worries about the national and global situation (Zeus and Reif, 1990). This gap between personal complaints and global concern is not specific to environmental issues, as it is well known, for example, that someone's positive assessment of a personal economic situation may go together with a rather pessimistic evaluation of the national economic situation (Zeus and Reif, 1990). The gap is often interpreted as evidence that self-interests of the Europeans have become less important in determining the political expectations of citizens in advanced industrial democracies (Rohrshneider, 1988).

There is also a tradition in measuring responses to behavioral options, used to assess whether the participants are personally making an effort to protect the environment or help to fight climate change (e.g. by cutting down their energy consumption). These are often binary (yes/no) options. It is in this context that the options on buying locally produced products or groceries, and, recently, making a diet change, are presented to the participants. In the literature, the options are usually analyzed separately, although they appear to have many correlates in common (see also Pirani and Secondi, 2011; Meyer, 2015). The assumption that a set of items measures an underlying attitude makes it desirable to check the interrelatedness of the items by calculating Cronbach's alpha, which provides information about the interpretability of summated scores (Cronbach, 1951; Sijtsma, 2009). However, the relatively small number of (binary) items per set may not lead to scales with desirable levels of Cronbach's alpha. That might be a reason to keep the items apart.

1.3.2. Focus of the analysis

The study focuses on the relationship between selecting climate change and/or biodiversity loss (or alternative formulations for biodiversity loss) as one of the four most important issues (of ten issues in total) and the combination of the two binary questions about buying local products and about having made a diet change to more sustainable food (the dependent variable). The ten issues are the independent variables. Using the personal importance of environmental protection as one of the covariates in a multivariate analysis, the study observes

whether the participants who selected climate change and/or biodiversity loss were more likely than others to report having made a diet change to more sustainable food. Specifically, the analysis examines whether climate change and biodiversity loss could be distinct sources of consumer concern that are, independent of one another, more strongly related to a reported diet change, than to buying local products.

The literature indicates several variables that should be treated as covariates in the analysis. This refers to personal factors (including education, age, gender and political orientation) and social ones (including religion, urban–rural differences) that could have an impact on concern for the environment and how people respond to environmental problems (see e.g. Gifford and Nilsson, 2014). These variables can reveal that pro-environmental actions are not necessarily motivated by environmental concerns. Several of these variables are a standard part of Eurobarometer research.

Earlier studies found some consistent differences between European countries, mainly associated with economic factors (a higher economic performance per capita was positively associated with reported use of pro-environmental practices). The country differences can largely be attributed to three (interrelated) dimensions, i.e. economic performance, (indicators of) environmental performance (although more heterogeneous) and social indicators (including social trust), which are generally higher in Northwestern European countries than in Eastern or Southern ones (Cling et al., 2019; Coisson et al., 2019). The Northwest also has a longer history in environmental awareness (Rootes, 2004). Additionally, other authors have focused on an ideological east - west divide. According to McCright et al. (2016), in 2008 Western-European citizens on the political left reported more strongly belief in the seriousness of climate change and more support for action to mitigate it than did Western-European citizens on the right, but this association was not found in the 11 former Communist countries, which the authors attribute to the low political salience of climate change and the differing meaning of left–right identification in these countries. As modelling country differences is not the topic of the present study, the analyses were done separately for consumers in Northwestern (henceforth NW) countries and those in Eastern and Southern (henceforth E&S) countries.

2. Method

2.1. Data

The survey, covering the European population of 15 years and older, was carried out by research firm Kantar in the 28 Member States of the EU between 6 and 19 December 2019, so the results from the UK are included. Some 27,498 participants (around 1000 in each country, 500 in the three smallest countries) were interviewed face-to-face at home in their mother tongue. The basic sample design applied in all states is a multi-stage, random (probability) one, providing a representative sample at the regional and national levels. In each country, a number of sampling points was drawn with probability proportional to population size (for a total coverage of the country) and to population density, which were subsequently used to draw addresses, households and persons. For each country, a national weighting procedure, using marginal and intercellular weighting, was carried out based on gender, age, region and size of locality. The data have been archived centrally (European Commission, 2020a).

2.2. Data analyses

All calculations were made by SPSS 26 for Windows. Multinomial logistic regression (logit model) was used to estimate odds ratios (OR) to quantify the strength of association between each of the independent variables in the model and the dependent variable. Multicollinearity was checked by tolerance diagnosis performed by SPSS and inspection of the correlation matrix. In agreement with the literature (Chen et al., 2010), ORs of 1.68 and higher have been made bold, because they are

equivalent to Cohen's $d = 0.2$ (small effect size).

From a statistical perspective, the country-based sample design means that the 27,498 respondents (11,203 in NW countries and 16,295 in E&S countries) cannot be treated as independent observations. The present study takes this into account by following the strategy to pool the data in each country group and calculate the regression, while controlling for additional country differences by including country-specific intercept dummy variables (see Bryan and Jenkins, 2016).

2.3. Independent variables – Global, national and local concerns

The participants were asked to identify from a set of ten environmental issues the four they considered the most important (European Commission, 2020c, question QA3). The set included, in rotated order, two global concerns (climate change and “decline or extinction of species and habitats, and of natural ecosystems (forests, fertile soils)”, henceforth “decline of species”), seven national concerns (shortage of drinking water, frequent droughts or floods, pollution of rivers, lakes and ground water, marine pollution, air pollution, growing amount of waste, agricultural pollution (use of pesticides, fertilizers, etc.) and soil degradation), and one local concern (noise pollution).

2.4. Covariates

The *personal importance of environmental protection* was one of the control variables and was asked with four response categories (very, fairly, not very and not at all important). The other covariates were personal characteristics, including social and cultural variables, covered by the Eurobarometer survey, such as *gender*, four different *age categories* (15–24 years, 25–34 years, 35–64 years and 65 years or over), allowing for non-linear effects that reveal birth cohort and life cycle aspects, *years of full-time education* (left school at the age of 15 or earlier; the age of 16–19; or the age of 20 or later; those who were still studying were classified based on their current age), *area of living* (in rural area or village; small or middle sized town; or large town). The set also included answers to some standard questions, such as *life satisfaction* (On the whole, are you very satisfied, fairly satisfied, not very satisfied, or not at all satisfied with the life you lead?), *difficulties paying bills* (During the last twelve months, would you say you had difficulties to pay your bills at the end of the month, most of the time, from time to time, almost never/never), *level of political interest* (political interest index with four levels (not at all; slightly; moderately; strongly) constructed by summing three items), *left – right self-placement* (In political matters people talk of “the left” and “the right”. How would you place your views on this scale? recoded into 4 categories: left; center; right; don't know/refusal) and *social class self-placement* (Do you see yourself and your household belonging to...? the working class of society, the lower middle class of society, the middle class of society, the upper middle class of society, the higher class of society).

2.5. Dependent variable

The set of four combined answers to the binary questions about buying local products and about having made a diet change to more sustainable food (question QA6) is the dependent variable. The multinomial logistic regression was carried out with no local purchases and no diet change as the reference category.

3. Results

The results of the two behavioral options showed highly comparable answer patterns in both parts of Europe. Reporting local purchases was more common (57% and 40%) than a change in diet to more sustainable food (27% and 13%). Those who reported local purchases were a little more likely to also report having changed their diets than the others. The four combined answer categories are presented in Table 1. Large

Table 1
Categories and percentages of responses of the dependent variable.

Categories	Percentages of responses	
	NW countries ¹ (N = 11,203)	E&S countries ² (N = 16,295)
Reported no local purchases and no diet change	40%	55%
Reported only local purchases	33%	33%
Reported only a diet change	10%	6%
Reported both practices	17%	7%
	(100%)	(101%)

¹ NW Europe consists of Sweden, Finland, Denmark, the United Kingdom, Ireland, Belgium, the Netherlands, Luxembourg, France, Germany, and Austria.

² The E&S European countries include Estonia, Latvia, Lithuania, Poland, Czechia, Slovakia, Hungary, Bulgaria, Romania, Slovenia, Croatia, Greece, Republic of Cyprus, Malta, Italy, Spain and Portugal.

minorities only reported local purchases (33% and 33%), smaller percentages only reported a diet change to more sustainable food (10% and 6%), and slightly higher percentages reported both practices (17% and 7%).

Table 2 displays the results of each of the independent variables and the covariates. In the NW countries, concern about climate change stood somewhat apart from the other concerns, but in the E&S countries amount of waste and air pollution were deemed more important. Decline of species was fourth in the NW countries and less than that in the E&S countries. Taken together about 75% of the participants in the NW countries and 63% in the E&S countries mentioned climate change

Table 2
Independent variables and covariates: Min, Max, Mean and SD.

Independent variables	Min	Max	NW countries (N = 11,203)		E&S countries (N = 16,295)	
			Mean	SD	Mean	SD
			Global concerns			
Decline of species	0	1	0.44	0.50	0.31	0.46
Climate change	0	1	0.56	0.50	0.44	0.50
National concerns						
Marine pollution	0	1	0.47	0.50	0.31	0.46
Amount of waste	0	1	0.45	0.50	0.52	0.50
Air pollution	0	1	0.42	0.49	0.48	0.50
Water pollution	0	1	0.39	0.49	0.38	0.48
Agricultural pollution	0	1	0.29	0.45	0.35	0.48
Frequency of droughts/floods	0	1	0.27	0.44	0.28	0.45
Drinking water shortages	0	1	0.26	0.44	0.24	0.43
Local concern						
Noise pollution	0	1	0.08	0.27	0.10	0.30
Covariates						
Personal importance ¹	1	4	3.48	0.63	3.42	0.66
Female	0	1	0.51	0.50	0.52	0.50
Age 65 and older	0	1	0.23	0.50	0.23	0.0.50
Age 35–64 years	0	1	0.50	0.35	0.51	0.35
Age 25–34 years	0	1	0.14	0.35	0.15	0.35
Age 15–24 years	0	1	0.13	0.33	0.12	0.33
Years of Education	1	3	2.41	0.66	2.18	0.66
Life satisfaction ¹	1	4	3.33	0.64	2.90	0.73
Difficulties paying bills ¹	1	3	1.25	0.51	1.55	0.67
Political interest ¹	1	4	2.74	0.95	2.58	0.95
Placement: left	0	1	0.32	0.47	0.21	0.40
Placement: center	0	1	0.37	0.48	0.33	0.47
Placement: right	0	1	0.20	0.40	0.22	0.42
Don't know/refusal	0	1	0.11	0.31	0.24	0.45
Rural area – urban	1	3	1.96	0.77	1.94	0.80
Placement: higher class	0	1	0.09	0.09	0.00	0.06
Placement: higher middle	0	1	0.12	0.32	0.04	0.20
Placement: middle	0	1	0.53	0.50	0.51	0.50
Placement: lower middle	0	1	0.13	0.34	0.16	0.37
Placement: working class	0	1	0.21	0.41	0.28	0.45

¹ Recoded from low to high.

and/or species decline as one of their four main concerns, with climate change often in the lead.

Table 3 presents the OR coefficients (with 95% confidence intervals) of the multinomial logistic regression. The OR coefficient indicates the magnitude of each variable's impact on the odds of being in a particular category (local purchases, diet change, both practices) rather than in the reference category due to a unit change in the independent variable, given the other variables. The first item of the NW countries reveals that selecting the decline of species as one of the four most important environmental issues was associated with an increase of the odds of reporting both practices by a factor of 2.33, 95% CI [2.00, 2.70], given the country dummies and the other variables. This OR is higher than the ORs of only reporting local purchases (OR = 1.56) or only reporting a diet change (OR = 1.39), which were not significantly different from each other. Concern about species decline had also the largest impact on the odds of reporting both practices in comparison with the other concerns, although the difference with concern about climate change was not significant (OR = 1.94, 95% CI [1.66, 2.27]). Concern about climate change had the second best impact on the odds of reporting both practices. The other concerns were all associated with a significant increase of the odds of being in one of the three target categories, but the effect sizes were very small.

The control variables show that personal importance of the environment, being female, being 25–34 years of age, and social self-placements of being higher class or higher middle class were associated with an increase of the odds of reporting both practices with an odds ratio of at least 1.68. In fact, the coefficients show contrasting backgrounds of those who only reported purchases of local products and those who reported a diet change. Older persons and those living in rural areas more often reported only local purchases and less often a diet change, whereas the reverse applied to younger (but not the youngest) persons who lived in urban areas; those who reported a diet change also described their social status as higher than the others. Years of education and political interest were weakly positively associated with the odds of reporting both practices. Political self-placement showed some very small differences and in particular those on the left were somewhat more likely to report a diet change.

The results in the E&S countries also reveal that selecting species decline had the largest impact on the odds of reporting both practices (OR = 2.34, 95% CI [1.98, 2.77]), although the differences with a number of other variables were not significant. However, selecting climate change had not the largest impact on the odds of reporting both practices (OR = 1.57, 95% CI [1.33, 1.86]). In comparison with the NW countries, the results in the E&S countries show many small effects, often in the same direction as was found in the NW countries, and less discrimination between global, national and local concerns as correlates of this target category.

4. Discussion

The results of this study are in many ways relevant for the F2F strategy. Without directly addressing consumer practices, F2F generally depends on the political expectancies of citizens and their willingness to accept measures that may affect their future consumption behavior. In addition, F2F supports consumer oriented measures, such as improvements in the availability and price of sustainable food and the provision of clear information that makes it easier for consumers to choose healthy and sustainable diets. F2F also strongly supports the development and availability of alternative proteins such as plant, microbial, marine and insect-based proteins and meat substitutes. These plans make it important to consider the role of environmental concerns and more general personal characteristics in predicting more sustainable food practices among European consumers. The findings that will be commented on in this section build on the regression analyses, which offer some interesting and valuable insights on factors that may affect sustainability practices. Key points include the distinctive correlations of both climate

Table 3

Results of the multinomial logistic regression on the combined responses to the items on buying local and seasonal food and on buying organic and local food: Odds ratios and 95% confidence intervals of the odds ratios.

Independent variables	NW countries (N = 11,041) ^{1,2}			E&S countries (N = 15,980) ²		
	Local purchases	Diet change	Both practices	Local purchases	Diet change	Both practices
Country dummies (not shown)						
<i>Global concerns</i>						
Decline of species	1.56 [1.41, 1.61]***	1.39 [1.18, 1.63]***	2.33 [2.00, 2.70]***	1.46 [1.34, 1.58]***	1.21 [1.02, 1.43]*	2.34 [1.98, 2.77]***
Climate change	1.43 [1.28, 1.59]***	1.63 [1.38, 1.93]***	1.94 [1.66, 2.27]***	1.29 [1.19, 1.40]***	1.06 [0.91, 1.24]	1.57 [1.33, 1.86]***
<i>National concerns</i>						
Marine pollution	1.49 [1.34, 1.66]***	1.31 [1.12, 1.54]**	1.49 [1.34, 1.66]***	1.34 [1.23, 1.46]***	1.11 [0.95, 1.31]	1.98 [1.67, 2.34]***
Amount of waste	1.48 [1.33, 1.64]***	1.23[1.04, 1.44]*	1.48 [1.33, 1.64]***	1.44 [1.33, 1.56]***	1.00[0.86, 1.16]	1.83 [1.55, 2.16]***
Air pollution	1.33 [1.20, 1.48]***	1.17 [0.99, 1.37]	1.33 [1.20, 1.48]***	1.43 [1.24, 1.45]***	1.06 [0.91, 1.23]	1.45 [1.23, 1.71]***
Water pollution	1.43 [1.29, 1.59]***	1.21 [1.03, 1.42]*	1.43 [1.29, 1.59]***	1.46 [1.35, 1.58]***	1.17 [1.00, 1.37]*	1.81 [1.54, 2.14]***
Agricultural pollution	1.42 [1.27, 1.60]***	1.42 [1.19, 1.69]***	1.42 [1.27, 1.60]***	1.40 [1.29, 1.52]***	1.23 [1.04, 1.44]*	2.10 [1.78, 2.48]***
Frequency of droughts/floods	1.35 [1.20, 1.51]***	1.22 [1.02, 1.45]*	1.35 [1.20, 1.51]***	1.31 [1.20, 1.43]***	1.08 [0.91, 1.28]	1.54 [1.28, 1.85]***
Drinking water shortages	1.26 [1.13, 1.42]***	1.11 [0.93, 1.32]	1.26 [1.13, 1.42]***	1.21 [1.10, 1.33]***	1.03 [0.87, 1.23]	2.01 [1.68, 2.40]***
<i>Local concern</i>						
Noise pollution	1.56 [1.20, 1.43]*	1.47 [1.13, 1.91]**	1.52 [1.18, 1.96]**	1.20 [1.06, 1.36]**	1.64 [1.33, 2.02]***	2.09 [1.66, 2.63]***
<i>Degree of concern</i>						
Personal importance	1.22 [1.13, 1.32]***	1.61 [1.42, 1.83]***	2.71 [2.39, 3.07]***	1.16 [1.10, 1.24]***	0.99 [0.88, 1.11]	1.60 [1.41, 1.82]***
<i>Covariates</i>						
Female	1.37 [1.13, 1.50]***	1.28 [1.12, 1.47]***	1.93 [1.71, 2.17]***	1.11 [1.03, 1.19]**	1.40 [1.21, 1.61]***	1.52 [1.33, 1.74]***
Age 65 and older	1.63 [1.38, 1.94]***	0.80 [0.63, 1.02]	1.12 [0.90, 1.40]	1.80 [1.56, 2.07]***	0.68 [0.52, 0.89]**	1.12 [0.85, 1.46]
Age 35–64 years	1.62 [1.39, 1.88]***	1.03 [0.84, 1.26]	1.56 [1.29, 1.89]***	1.64 [1.45, 1.86]***	0.88 [0.71, 1.08]	1.39 [1.11, 1.74]**
Age 25–34 years	1.46 [1.21, 1.75]***	1.36 [1.07, 1.74]*	1.70 [1.35, 2.13]***	1.37 [1.19, 1.59]***	0.93 [0.73, 1.19]	1.50 [1.16, 1.93]**
Age 15–24 years	reference	reference	reference	reference	reference	reference
Years of Education [3 pts]	1.08 [1.00, 1.17]	1.02 [0.91, 1.15]	1.37 [1.23, 1.53]***	1.12 [1.05, 1.19]***	1.23 [1.09, 1.39]**	1.41 [1.26, 1.59]***
Life satisfaction [4 pts]	1.05 [0.97, 1.13]	1.12 [0.99, 1.26]	1.10 [1.00, 1.22]	1.10 [1.04, 1.16]**	1.21 [1.08, 1.35]**	1.16 [1.04, 1.29]**
Difficulties paying bills [3 pts]	0.87 [0.79, 0.97]**	0.93 [0.80, 1.08]	0.99 [0.87, 1.13]	0.88 [0.82, 0.93]	1.13 [1.00, 1.27]*	0.93 [0.83, 1.05]
Political interest [4 pts]	1.24 [1.18, 1.31]***	1.16 [1.07, 1.25]***	1.36 [1.26, 1.45]***	1.10 [1.05, 1.14]***	1.17 [1.08, 1.27]***	1.24 [1.14, 1.34]***
Placement: left	1.31 [1.10, 1.55]**	1.34 [1.03, 1.73]*	1.40 [1.12, 1.75]**	1.27 [1.13, 1.42]***	1.33 [1.06, 1.67]*	1.54 [1.25, 1.89]***
Placement: center	1.29 [1.09, 1.52]**	1.07 [0.83, 1.37]	1.00 [0.81, 1.24]	1.31 [1.19, 1.45]***	1.30 [1.06, 1.59]*	1.42 [1.18, 1.71]***
Placement: right	1.23 [1.09, 1.57]**	1.07 [0.81, 1.42]	0.79 [0.62, 1.01]	1.41 [1.26, 1.57]***	1.45 [1.17, 1.80]**	1.39 [1.13, 1.71]**
Don't know/refusal	reference	reference	reference	reference	reference	reference
Rural area – urban [3 pts]	0.77 [0.72, 0.82]***	1.16 [1.06, 1.28]**	0.86 [0.80, 0.93]***	0.97 [0.92, 1.01]	1.06 [0.97, 1.16]	1.03 [0.94, 1.12]
Placement: higher class	0.85 [0.47, 1.54]	1.90 [1.03, 3.50]***	2.36 [1.32, 4.21]***	0.62 [0.33, 1.17]	2.26 [1.04, 4.92]*	0.11 [0.01, 1.19]
Placement: higher middle	1.13 [0.92, 1.37]	1.75 [1.32, 2.30]***	2.04 [1.60, 2.60]***	0.96 [0.79, 1.17]	1.30 [0.88, 1.90]	1.06 [0.74, 1.50]
Placement: middle	1.09 [0.96, 1.24]	1.25 [1.02, 1.54]*	1.49 [1.25, 1.79]***	0.96 [0.87, 1.09]	1.42 [1.16, 1.73]**	1.07 [0.89, 1.28]
Placement: lower middle	1.14 [0.98, 1.34]	1.28 [0.99, 1.65]	1.18 [0.94, 1.49]	0.86 [0.77, 0.97]*	1.35 [1.07, 1.70]*	1.15 [0.93, 1.43]
Placement: working class	reference	reference	reference	reference	reference	reference

ORs of 1.68 and higher are highlighted in bold; they are equivalent to Cohen's d = 02 (small effect size).

¹ Statistics of the final model: likelihood ratio $\chi^2 = 2460.906$ df 114 $p < .001$ Nagelkerke $R^2 = 0.217$.

² Statistics of the final model: likelihood ratio $\chi^2 = 2252.309$ df 129 $p < .001$ Nagelkerke $R^2 = 0.150$.

change concerns and biodiversity loss concerns with more sustainable food practices. Other points are the links between these practices and some variables that hint at cultural trends as well as variables that indicate environmentally-relevant social factors. Finally, it is important to consider how the role of environmental concerns can be promoted.

4.1. The impact of distinct global concerns

The study explored whether the new F2F strategy moves in a direction that is in parallel with consumer concerns about global issues. The

analysis revealed that climate change and biodiversity loss were distinct sources of consumer concern in NW countries, which were, independent of each other, more strongly related to reporting both local purchases and a diet change than to only reporting local purchases or only reporting a diet change. This pattern was less clear in the E&S countries, where climate change was less salient than in the western part of Europe (McCright et al., 2016). Hence, it can be concluded that the new strategy may appeal to a significant minority in NW countries and that it is in line with their concerns about global issues. Also, however, it is clear that this is only a beginning and that substantial efforts will be required to

reach other consumers.

A crucial point is that the results should not be interpreted as evidence that it makes sense to simply increase the number of environmental issues that consumers may relate to their food choices. Adding yet another issue to a person's list of issues to be concerned about does not further affect the strength of a message, if all issues belong to the same category (Eagly and Chaiken, 1993). That is why the distinctive correlations between climate change concerns and biodiversity loss concerns and food-related practices may open new perspectives. Many recent behavioral studies were focused on the relationship between climate change concerns and less meat eating, both correlational (Whitmarsh et al., 2011; de Boer et al., 2013; Stoll-Kleemann and Schmidt, 2017) and experimental (Spaargaren et al., 2013; Brunner et al., 2018; Jalil et al., 2020). In this way, they placed (industrially produced) meat eating in the same category of carbon emitters as driving a car or flying for holidays (Wynes et al., 2020).

The present study suggests the potential of concerns about biodiversity loss for also motivating diet changes. Instead of focusing on carbon emitters, it is also possible to take another approach and highlight preferences for plant-based protein among those non-vegetarians who value care for nature (de Boer and Aiking, 2011; Vainio et al., 2016; Slade, 2018). Various studies show significant correlations between adult gardening (home gardening or participation in urban gardening) and higher intakes of fruits and vegetables and, to a lesser extent, reduced intakes of processed foods and meat, which the researchers see as indications that gardeners are trying to improve their diets, although the research does not allow causal interpretations (Freeman et al., 2012; Garcia et al., 2018; Beavers et al., 2020; Kegler et al., 2020). Also, urban gardeners may show pro-environmental behavior that is not always free of contradictions regarding their use of industrial pesticides and fertilizers (Sovová and Veen, 2020). Hence, more research is necessary to become more specific about whether biodiversity-motivated consumers are willing to increase the intake of protein-rich foods from plant-based materials and reduce the consumption of animal protein instead.

4.2. Cultural trends

The analysis showed several correlations that hint at increasing cultural trends to promote more sustainable, environmentally-friendly and ethical practices. A key observation is that consumers who only reported purchases of local products and those who reported a diet change showed somewhat contrasting backgrounds in terms of age, place of residence and self-described social status. Those who reported a diet change were not only younger and more urban, but also they were more likely to report a higher social status. From a public policy perspective, the latter observation suggests that F2F strategies may benefit from the positive association between social status, ethical consumption and certain new food practices in urban centers, which has been recently described in the literature (Carfagna et al., 2014; Hanser and Hyde, 2014; Sahakian and Wilhite, 2014; Hanser, 2020). In the urban context, "food has become an important avenue through which key social values are expressed and furthered; and is associated with beauty, authenticity, cultural diversity, environmental consciousness, a connection with nature and with community, a commitment to social justice, or the honest, hard work associated with small-scale farmers and craft producers" (Hanser and Hyde, 2014). This growing cultural significance of food is an important development, but it should be noted that more research is necessary to confirm its beneficial effects, especially in relation to urban animal product consumption (Goldstein et al., 2017). Moreover, policy-makers should take into account that individuals might start to see eco-friendly practices as strongly related to specific groups and normative standards, with which many of them cannot identify themselves (Dubuisson-Quellier and Gojard, 2016). Hence, any elitist tendencies in public policies aimed to address environmental and health issues should be avoided.

4.3. Environmentally-relevant social motives

The regression model showed many very small positive coefficients, which suggests a diffuse process in the direction of more sustainable food practices, supported by persons who might have social motives for pro-environmental choices. These motives may result from early socialization experiences to be other-oriented and socially responsible (Zelezny et al., 2000; McCright and Xiao, 2014), or later socialization experiences to be concerned about overall social welfare (Meyer, 2015), which may then influence pro-environmental behavior. Early socialization experiences may partly explain gender differences in pro-environmental behavior (e.g., because females tend to provide more care than males), although gender effects change over time, and vary by location and type of pro-environmental behavior (McCright and Xiao, 2014). Variables that may indicate higher concerns about overall social welfare are years of education and level of political interest (Meyer, 2015; Davidescu et al., 2020), which were associated with more sustainable food practices. Both variables may also indicate a higher level of information on complex issues.

The recent literature highlights that climate change appears to be attracting concern and action from people who are acting in response to religious beliefs (not included in Eurobarometer 92.4) (Wardekker et al., 2009; Howell and Allen, 2017). Obviously, however, religious beliefs also used to have an important role in preventing land degradation in combination with the use of food culture for promoting human health and for biodiversity conservation (Johns and Eyzaguirre, 2006; Winiwarter and Blum, 2006). Mixtures of environmental and social motives are a recurrent phenomenon in the history of environmental issues (Rootes, 2004) and played, for instance, a significant role in the normalization of modern recycling behavior (Thomas and Sharp, 2013).

4.4. Promoting the role of environmental concerns

Overall, this study is based on the assumption that for many consumers, reducing the environmental repercussions of food choices may have the status of a background goal. The literature suggests that there are several ways to facilitate the influence of a background goal on consumer decisions, some of which may easily backfire (Aspara et al., 2015). The first way is to subtly remind a person of the particular goal (e.g. eating in an environmentally friendly way) that might be satisfied by choosing one of the alternatives. Non-food-related laboratory experiments show that this approach can work if the reminders are subtle enough (Aspara et al., 2015). However, providing explicit reminders of the background goal (the second way) is likely to create a backlash effect, because it can make the person think about the importance of not missing the focal goal (e.g. food that is tasty) (Aspara et al., 2015). The third way is that the influence of a background goal on consumer decisions is facilitated by ensuring that popular focal goals (e.g. getting healthy and tasty food) are already likely to be achieved. In that case, a background goal (e.g. food that is also environmentally friendly) may gain more importance (Fishbach and Dhar, 2005; Unsworth et al., 2013).

A different way to facilitate the influence of a background goal on consumer decisions is by creating conditions to couple different background goals (multi-finality) to the benefit of one choice option (Kruglanski et al., 2002). Highlighting the combination of health and environment benefits is an example of this strategy (Jalil et al., 2020; Wolstenholme et al., 2020). As mentioned in Section 1.1., the strategy of combining climate change and biodiversity might also strengthen the role of environmental motives. This assumes that consumers understand the environmental repercussions of their choice and that they are to some extent actively motivated by both goals. One of the conditions to support such a strategy is improving the balance of climate change and biodiversity loss as issues of concern that require action.

4.4.1. Diet changes for climate change

The fact that climate change is relatively well-defined makes it feasible to calculate what consumers can do to mitigate it. Using one outcome measure, a recent study reviews the literature on mitigation potential of household consumption associated with the three end-use sectors of food, transport and housing (Ivanova et al., 2020). The food options have a sizable potential. A diet change involving a reduction in the amount of animal products consumed, such as vegan, vegetarian or Mediterranean and similar diets, has a median mitigation potential of 0.9, 0.5 and 0.4 tCO₂eq/capita, respectively (Ivanova et al., 2020). Organic food have lower emissions compared to conventionally produced food, with a median mitigation potential of 0.4 tCO₂eq/capita, although increases in GHG emissions from organic food for the same diet are not uncommon due to lower crop and livestock yields of organic agriculture and the potential increase in production. The options of choosing regional and local food and choosing seasonal and fresh food involve average reductions of 0.4 and 0.2 tCO₂eq/capita, whereas a reduction in the overall food intake and food waste reduction options each mitigate a median of 0.1 tCO₂eq/capita (Ivanova et al., 2020).

4.4.2. Diet changes for biodiversity

In contrast to these figures, there is no comparable way to calculate the impacts of individual behaviors that could be modified to benefit or reduce their negative impact on biodiversity. The literature on diet and environment tends to consider the effect of land use change as a proxy indicator for deforestation, land degradation, and biodiversity loss (Ridou et al., 2017), but more refined impact categories are urgently called for (Crenna et al., 2019). Studies demonstrate that reducing meat consumption is key due to the environmental impacts of livestock production (Machovina et al., 2015; Castañe and Antón, 2017) and that organic agriculture has many potential benefits (including higher biodiversity, enhanced profitability, and higher nutritional value) as well as many potential costs, including lower yields and higher consumer prices. In summary, the environmental benefits may be highly uncertain when controlling for lower organic yields (Seufert and Ramankutty, 2017). More specific statements require a better understanding of the trade-offs and co-benefits of high- vs lower-yield systems (Balmford et al., 2018). Therefore, the biodiversity-related message to food consumers is not as straight as the climate-related message.

4.4.3. Implications for policy and research

The literature above suggests that consumers can use about the same food-related actions to address climate change and biodiversity loss simultaneously. However, to make that work requires much effort on the part of policy-makers, researchers and stakeholders in the field of food sustainability. In general much work has to be done to increase the public's level of awareness and understanding of biodiversity issues (Kalinowska, 2017) and to identify and prioritize behavior options that can benefit biodiversity (Selinske et al., 2020).

In relation to sustainability promoting interventions, it is crucial to create an intervention context that is supportive of legitimate, culturally appropriate, healthy and tasty diet changes, such as a food environment with affordable and readily available plant-based options (Jalil et al., 2020; Päivärinta et al., 2020; Vermeir et al., 2020; de Boer and Aiking, 2021). As protein seems to have received much less attention in public food education than carbohydrates and fats (You and Henneberg, 2016; Gardner et al., 2019), it may also help to stimulate public discussion about appropriate healthy and sustainable diet improvements and crystallize judgements on practical issues. A broad, social approach to mainstream pro-environmental actions is often essential (Gould et al., 2016), which means that stakeholders, such as farmers, food processors, retailers, and restaurant owners should explicitly help consumers to eat more healthily and sustainably.

4.5. Limitations

An important limitation is that the study is based on a secondary analysis, which means that the work is limited to the questions asked by the original investigators, guided by EU policy development. On the one hand, this is a strength, because it might be assumed that the questions are policy relevant. On the other hand, it is a weakness in that the set of variables does not include the usual explanatory variables associated with buying local food or diet changes. As noted before, the term "more sustainable food" is open to interpretations. Generally, it is one of the weaknesses of the F2F strategy that there is the challenge of, what Schebesta and Candel (2020) call "the unresolved ambiguity of food sustainability". On the consumer side, a recent special Eurobarometer (European Commission, 2020d) suggests that consumers have several ideas about what they believe is a "a healthy and sustainable diet", which often includes "eating a variety of different foods, having a balanced diet" and to a lesser extent "eating meat less often". Hence, such a diet change could be a step in the right direction. Finally, it is a strength that the analyses were carried out separately in two large, but economically and culturally different, groups of countries with largely similar results.

5. Conclusion

The new F2F strategy aims to better integrate a whole range of policy domains, including food production, climate change and biodiversity loss. The present study, focusing on the consumer side, shows that, at an individual level, the traditional "brown" (environmental protection) and "green" (nature preservation) policy areas correspond to a person's basic attitudes toward environmental protection actions and toward nature preservation actions, respectively. The analysis demonstrates that the F2F strategy may appeal to a significant minority of consumers in European countries and that both attitudinal linkages can be related to improved food consumption practices, enabling individuals to better play their part in fighting climate change and biodiversity loss simultaneously, as if they could (figuratively speaking) "kill two birds with one stone". The results underline the importance of improving the balance of climate change and biodiversity loss as issues of concern that require action. This may open up interesting new perspectives for policymakers, businesses and consumers.

Declaration of Competing Interest

None.

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