Renewable Agriculture and Food Systems

cambridge.org/raf

How about choosing environmentally friendly beef? Exploring purchase intentions among Italian consumers

Stefanella Stranieri[1], Elena Claire Ricci[2], Alice Stiletto[3] and Samuele Trestini[3]

[1]Department of Environmental Science and Policy, Università degli Studi di Milano, Via Celoria 2, 20133 Milano, Italy; [2]Department of Business Administration, Università degli Studi di Verona, Via Cantarane 24, 37129 Verona, Italy and [3]Department of Land, Environment, Agriculture and Forestry, Università degli Studi di Padova, Viale dell'Università 16, 35020 Legnaro (PD), Italy

Research Paper

Cite this article: Stranieri S, Ricci EC, Stiletto A, Trestini S (2023). How about choosing environmentally friendly beef? Exploring purchase intentions among Italian consumers. *Renewable Agriculture and Food Systems* **38**, e2, 1–11. https://doi.org/10.1017/S1742170522000357

Received: 21 September 2021
Revised: 21 September 2022
Accepted: 17 October 2022

Key words:
Climate change; consumer preferences; ecolabeling; environmentally friendly beef; food; sustainable production and consumption; trust

Author for correspondence:
Elena Claire Ricci,
E-mail: elenaclaire.ricci@univr.it

Abstract

The increasing global demand for livestock products and its large environmental impact ask for urgent policy and managerial strategies. With regard to meat consumption, feasible actions relate to its reduction and orienting consumers toward more sustainable meat choices. The aim of the study is to investigate the determinants affecting meat consumers in their intention to buy beef whose label clearly expresses environmentally friendly characteristics. To do so, we hypothesized to apply an institutional system of ecological labeling on beef products. An extended framework based on the Theory of Planned Behavior was applied to understand the factors affecting the consumer decision-making process toward eco-labeled beef. A survey was conducted with 1139 consumers in Italy. Data were analyzed by means of confirmatory factor analysis and structural equation models. Results highlight that beef consumers are likely to change their habits, in favor of more sustainable beef choices. The analysis highlights that, together with consumer attitudes, social norms and perceived behavioral control, institutional trust and food shopping habits play an important role in activating the consumer's cognitive decision-making process toward more sustainable beef. Results add to the literature on the determinants of green food-choices and introduce new insights on the role of institutional trust in the intention to buy beef labeled with a public standard. Findings highlight that particular attention should be devoted to build trust for public institutions in order to promote sustainable food consumption behavior. Moreover, results validate previous studies on the effectiveness of information-based policies in fostering more sustainable consumption choices.

Introduction

The expected increasing global demand for livestock products and the great environmental impact induced by the activities conducted within the related supply chains ask for urgent policy and managerial adaptation strategies (EU, 2006; Herrero *et al.*, 2016). Indeed, climate change is one of the greatest challenges that human society is facing and mitigation measures need to be identified in all sectors and at all levels (Chakravarty *et al.*, 2009; Massetti and Ricci, 2013; IPCC, 2014). According to Rojas-Downing *et al.* (2017) and Hyland *et al.* (2017), the demand for livestock products will double by 2050 and the contribution of the related sector toward anthropogenic greenhouse gas (GHG) emissions counts for 14.5% of global emissions. Also, Leach *et al.* (2016) highlight that livestock production has the largest carbon, nitrogen and water footprints in the food sector. By looking at the livestock supply chain, such emissions relate to most of the activities conducted within the chain, like for example, feed production, animal rearing, processing methods and transportation of all the related raw materials (Röös *et al.*, 2013). The European Commission is putting much effort in identifying reliable methodologies for assessing the environmental performance of products and organizations as a mean to communicate trustworthy information to final consumers (European Commission, 2019). More in detail, the goal is to develop by 2024 a voluntary public standard in relation to food environmental sustainability (EC, 2020).

The negative environmental impact of livestock production can be reduced through; technological innovations to increase nitrogen use efficiency; new lower environmental impact breeding strategies; an improved management of land based on GHG mitigation strategies; and through variations in consumption patterns (Smith *et al.*, 2013). With regard to meat consumption, possible feasible actions relate to a reduction of meat consumption in the western world and to orienting consumers toward more sustainable meat choices (Röös *et al.*, 2014). Coherently with this, the European Commission launched in 2020 the Farm to Fork Strategy, as part of the European Green Deal, to fully address the challenges of sustainable food systems.

© The Author(s), 2023. Published by Cambridge University Press. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted re-use, distribution and reproduction, provided the original article is properly cited.

This strategy pays particular attention to the livestock sector to reduce its environmental impact and promote environmentally friendly production and consumption patterns (EC, 2020).

Considerable literature has focused on ecolabeling of food products (Grunert, 2011; Grunert *et al.*, 2014; Yadav and Pathak, 2017; Prieto-Sandoval *et al.*, 2020), with some studies focusing on meat consumption (de Barcellos *et al.*, 2010; de Boer *et al.*, 2014; Caracciolo *et al.*, 2016; Henchion *et al.*, 2017; Hoeksma *et al.*, 2017). However, considering the many aspects that the meat consumer has to take into consideration while shopping, it is still not clear which are the determinants affecting consumer decision to buy more environmentally friendly meat, i.e., meat whose production characteristics reflect environmental protection. To fill this gap, the aim of the present study is to investigate the determinants affecting meat consumers in their intention to buy beef meat whose label clearly expresses to consumers its greater environmentally friendly characteristics. The choice of beef is related to the fact that it is considered as the type of meat with the highest environmental impact (Bellarby *et al.*, 2013). To achieve our goal, in our study we hypothesized to apply an institutional system of ecological labeling on beef products, the EU Ecolabel (Reg. 66/2010). The EU Ecolabel was established in 1992 and it is a public certification scheme adopted by agri-food firms on a voluntary basis (i.e., without any legal obligation) to promote products which have a reduced environmental impact during their entire lifecycle and to provide consumers with accurate information on the environmental impact of products within the European territory. To achieve such a goal this certification scheme takes into consideration the European ISO Type I Ecolabel, which clearly defines criteria on the basis of the latest scientific and technological outcomes for products (ISO 14024:2001, 2001). The European Commission is responsible for the certified criteria and it assures that the EU Ecolabel Regulation is implemented correctly.

The reason behind the choice of EU Ecolabel is twofold. First, such label is widely recognized by the market as a purely green label. Second, taking into consideration a non-existing product, i.e., EU eco-labeled beef, we could exclude several factors influencing consumer attitudes, such as past experience or accessibility (Vermeir and Verbeke, 2008). To carry out the research question, we implemented a survey based on the Theory of Planned Behavior (TPB) (Ajzen, 1991) to understand the factors affecting the intention to buy eco-labeled beef products. Our survey was conducted throughout a questionnaire to 1139 beef consumers in Italy.

We choose Italy as case study for our analysis for different reasons. First, from an economic point of view, the meat sector has a relevant impact in terms of GDP and employment. Indeed, in Italy the turnover of the meat industry is about 32 billion euros each year and it employs about 180,000 workers (Golini *et al.*, 2017), with beef being one of the dominant products. Second, at the EU level, the Italian cattle sector represents about 10% of European production (Golini *et al.*, 2017). However, the livestock sector, especially beef production, in Italy has often been criticized for its high environmental impact particularly related to its generally intensive production systems. This has led to a penalization of Italian farmers in terms of EU CAP subsidies compared to those of other countries, like for example France and Ireland (Cozzi and Ragno, 2003). Third, Italian beef consumer preferences can be considered as a good example to analyze consumer preferences of a mature market with an interest and awareness toward meat labeled quality attributes like origin, traceability, animal welfare and environmentally sustainable characteristics (Merlino *et al.*, 2018).

Given the importance of the sector in economic terms, the relevance of its environmental impact and GHG-emission potential, and the existing room for improvement in the Italian system from a supply and demand side (Bragaglio *et al.*, 2018), it is important to identify feasible strategies to promote more sustainable pathways. In this direction, this paper aims at investigating if from the consumer side there is a potential appreciation for more environmentally sustainable meat products.

The results add to the existing literature on the determinants leading to green choices of beef and introduce new insights on the role of institutional trust toward the intention to buy beef labeled with a public standard.

The background on the existing research on environmentally sustainable meat labels is presented in the next section. The theoretical framework upon which the paper is based is described in section 'Conceptual framework'. Methods and data collection are described in section 'Materials and methods'. Results and discussion of findings are presented in section 'Results'. The paper ends with limitation of the study and future research directions in section 'Conclusions'.

Beef environmental-sustainability labeling

In order to promote more sustainable beef choices, consumers need to be made aware of the differences in the impacts of choosing between differently bred cattle. Thus, a system should be introduced to signal to consumers the differences in the production processes. With regard to this latter aspect, it should be considered that environmental sustainability related to production processes represents a credence attribute for consumers (Nelson, 1970) and cannot be verified either before or after consumption. Therefore, more sustainable food choices need to be guided by a reliable labeling system (i.e., ecological labeling or eco-labeling) able to fill the environmental information gap of consumers by communicating the environmental impact of a single product (Mackey and Metz, 2009) and reducing the related information costs (Teisl *et al.*, 2002). Consumer interest toward sustainability labels has strongly increased in the last years due to a general increase in awareness toward environmentally related food challenges and an increased concern toward the negative effects of food production on climate change (Napolitano *et al.*, 2010; Banterle and Ricci, 2013). Therefore, consumer choices of environmentally friendly labeled meat products may play an important role in promoting more sustainable consumption (Koos, 2011).

Despite the positive consumer attitudes toward green products, the understanding of the factors leading consumers to make environmentally sustainable choices is still controversial. The reasons behind this difficulty in conceptualizing sustainable consumer behavior in relation to environmentally friendly labeled quality attributes are mostly due to the high variety of existing labels on the market used to express the sustainability-related food properties and the cognitive associations made by consumers when they take into consideration a green label during food purchases (Angulo and Gil, 2007; Van Loo *et al.*, 2014).

For example, in Europe, the environmentally friendly characteristics of beef products can be communicated both through a variety of private standards set up both by food processors and retailers and through the European public voluntary organic label. Such labels differ in terms of type of certification, information labeled, and features of logo presentation (Pouta *et al.*, 2010;

https://doi.org/10.1017/S1742170522000357 Published online by Cambridge University Press

Vanhonacker and Verbeke, 2014; Samant and Seo, 2016). For example, for beef products most of the labels relate to private or national initiatives and most of them certify the production characteristics of products, for example animal welfare, carbon footprint information, the avoidance of genetically modified organism (GMO) use, and the origin of raw materials (Apostolidis and McLeay, 2016).

Moreover, most of the existing sustainability labels investigated by the literature are considered by consumers not exclusively for their environmentally friendly characteristics (Schuldt and Schwarz, 2010; Schuldt *et al.*, 2012). Consumers often associate such green labels with other sustainability-related concepts. For example, animal welfare labels involve also ethical considerations related to the protection of animal life and better health-related characteristics may be perceived due to pro-environmental perceived characteristics (Lazzarini *et al.*, 2016; Richetin *et al.*, 2021). Also, the organic label is often perceived by consumers not only as a tool to communicate environmentally sustainable practices but it is considered as a logo also signaling products with improved quality characteristics related to food safety, health-related aspects, taste and the absence of GMOs in production processes (Van Loo *et al.*, 2011; Demartini *et al.*, 2018). This variety of aspects that can be associated with existing meat labels represents a gap in the literature that needs to be addressed.

Conceptual framework

The theory of planned behavior

In our paper we referred to the TPB model because it has been considered as a suitable framework of analysis to study a wide range consumer analysis related to environmentally friendly behavior (Vermeir and Verbeke, 2008; Guillaumie *et al.* 2010; Costanigro *et al.*, 2015; Chen, 2016). According to Yazdanpanah and Forouzani (2015), the TPB has been applied successfully to investigate green food purchasing intention and it has been recently used to predict consumer choices of meat with specific quality characteristics (Hoeksma *et al.*, 2017).

The TPB assumes that consumer decision-making processes are determined by the assessment on the possible consequences of a certain behavior, the expectation of reference individuals and the potential resources or impediments related to that behavior. According to the TPB model, these considerations lead to independent determinants of consumer intention to perform a certain behavior: attitude toward the behavior, subjective norms and perceived behavioral control (Ajzen, 1985).

Attitudes relate to the degree of consumer evaluation toward a certain behavior. More precisely, it refers to the type of assessment a consumer has with regard to a certain behavior. Such evaluation can be both positive or negative. According to the TPB theory, the more positive consumers assess a certain product, the higher is the likelihood to buy it.

Subjective norms describe consumer perceived social pressure to perform or not to perform the behavior. In other words, such determinant aims at evaluating the importance of social influences on consumer decision-making process. Current literature on consumer environmentally friendly behavior has acknowledged the important role of this variable as a predictor of consumer intention rather than a predictor of behavior (Honkanen *et al.*, 2005; Blanchard *et al.*, 2009; de Bruijn, 2010). This 'intention-behavior gap' is probably due to the social desirability bias which affects sustainable food choices.

Finally, perceived behavioral control relates to consumer ability to perform a certain behavior. More precisely, it relates to the perceived level of difficulty in performing a certain behavior. With regard to food-related literature, Sillani and Nassivera (2015) highlight that such determinant is among the main factors which help to explain the choice of environmentally friendly food choices.

According to the TPB theory, the antecedent of behavior is the intention to perform the behavior. In general, the stronger the intention to engage in the behavior, the more likely should be its implementation. In our analysis we did not consider the behavioral outcome because our investigation relates to the analysis of a labeled information which has not been introduced in the market yet. Indeed, in this case consumer behavior cannot be measured.

An extended model for eco-labeled meat

Several authors have pointed out that the analysis of food consumer behavior often calls for other variables in addition to those used by the basic TPB theoretical framework, due to the peculiarities surrounding food choices (Menozzi *et al.*, 2015). Indeed, the use of an extended TPB model could increase the understanding of consumer decision-making process for food products (Steg and Vlek, 2009).

For this reason, we propose an extended TPB framework by considering the following variables which have been recognized to significantly affect food pro-environmental behavior in the literature: consumer trust, food shopping habits, environmental concern. We also control for consumer individual characteristics, including socio-demographic variables and beef consumption frequency (Fig. 1).

In the context of environmentally friendly products, trust is conceptualized as consumer belief about the environmental outcome of certain kind of green products (Chen and Chai, 2010). According to Henchion *et al.* (2017), consumer trust in food characteristics plays an important role to activate positive psychological consequences related to product consumption. Food-related literature is discussing the role of trust in explaining also green behavior. Giampietri *et al.* (2018) highlighted that trust affects consumer propensity to choose short supply chains for the purchase of food products. Ricci *et al.* (2018) investigated the role of trust in the intention to buy a more environmentally sustainable salad.

Their findings revealed a significant role of trust on consumer attitudes. Also, the findings from Yip and Janssen (2015) suggest that the lack of trust in food producers is the main barrier for the purchasing of organic food. Furthermore, Janssen and Hamm (2014) discussed the positive influence of consumer confidence toward certifications on consumer intention to buy green food products. On the basis of the existing research highlighting the primary role of trust in encouraging consumer environmental behavior, we expect this variable to have an effect also on consumer intention antecedents to buy meat with environmentally friendly characteristics, in particular on attitudes and on shopping habits.

Indeed, also shopping habits have been found to significantly affect food choices because of the characteristics of such behavior. First, food shopping is often performed on a daily basis or, at least, frequently. This implies that food shopping refers to repeated actions. In such conditions, past behavior and the way consumers are used to make food choices plays an important

https://doi.org/10.1017/S1742170522000357 Published online by Cambridge University Press

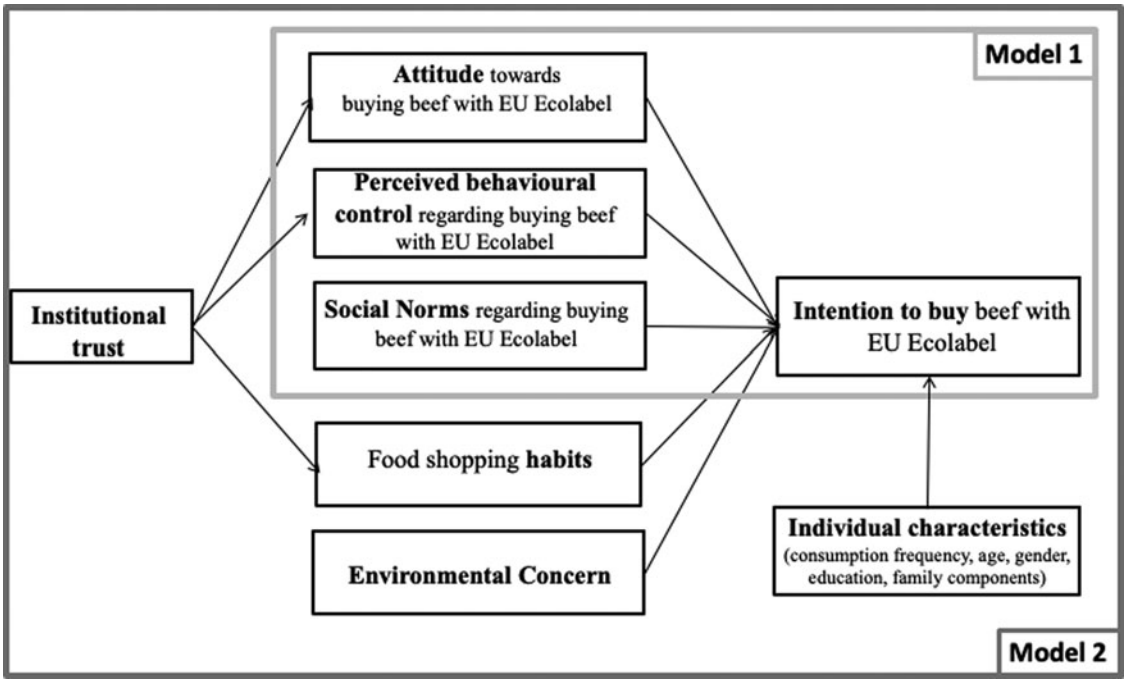


Fig. 1. Modelled variable relations.

role to guide consumer behavior in addition to their attitudes. For example, Menozzi *et al.* (2015) found that habits of looking for labeled information related to product's origin and processes were strong determinants of consumer intention to buy traced chicken among French consumers. Moreover, Stranieri *et al.* (2017) highlighted that food shopping habits significantly affected consumer intention to buy pre-packed salad with environmentally friendly characteristics. Also, Elseidi (2018) stressed how the presence of a halal logo plays an important role to moderate the halal purchasing intention. In general, the meta-analysis conducted by Massey *et al.* (2018) points out that labeled product credence attributes play an important role in explaining green food purchasing behavior.

Food-related literature has also stressed consumer environmental concern as an important factor affecting the intention to perform environmentally sustainable food choices. For example, De Groot and Steg (2007) stressed that environmental concern plays a significant role in explaining consumer intention to purchase green products. Honkanen *et al.* (2006) also highlighted that such factor can be considered among the determinants for choosing organic food. Moreover, Dowd and Burke (2013) suggested that environmental concern is an important predictor of environmentally friendly food choices. Such factor seems to affect mostly consumer choices in western countries. A recent analysis of Yadav and Pathak (2016) highlighted that environmental concern does not seem to impact purchasing intentions in developing countries.

Although this is not always the case, consumer individual characteristics may have an influence on the purchase of green products. It has been suggested that people of female gender and with a high income are more likely to purchase such products (Gracia and De Magistris, 2008; Stranieri *et al.*, 2017). Age has also been shown to sometimes be a determinant of green product choices, however, its effect is not always present or in the same direction.

Materials and methods

Construction of the variables

On the basis of the conceptual framework highlighted in the previous section, a set of latent variables that could be relevant to the research question were identified. Figure 1 highlights the variables considered, their relations and the models analyzed in this study. Indeed, we test both the basic TPB model and an extended framework with additional variables that have been shown to be relevant in the food domain.

A measurement model was then built identifying, for each of the latent variables, a set of measures attempting to capture such variables. An ad hoc questionnaire was built including a question for each of the measures selected. Table 1 reports the details of all the single questions included in the questionnaire for each of the latent constructs and for the other stand-alone variables tested in the models.

More in general, the focus is on the intention to purchase beef characterized by the EU Ecolabel certification. Given that this type of label is not already available on food products, we stop our analysis at intentions, as actual behavior cannot be measured yet. To measure intentions, we included in the questionnaire six questions related to the intention to buy EU eco-labeled beef, meat and food (variables i_1 to i_6). Then, we collected data on consumer attitudes toward such products (variables a_1 to a_9), perceived behavior control (variables c_1 to c_5) and subjective norms (variables sn_1 to sn_4). The questions related to such constructs were built referring to the TPB questionnaire. The above variables are those included in Model 1, that more closely resembles the basic TPB model.

As highlighted in Figure 1, we also test an additional—extended—model (Model 2) including the other variables discussed in section 'Beef environmental-sustainability labeling'. More in detail, food shopping habits questions (variables h_1 to h_6) were adapted from Grankvist and Biel (2001) and Menozzi

https://doi.org/10.1017/S1742170522000357 Published online by Cambridge University Press

Table 1. Variable description

Variable name (short name)	Scale	Description of variables
Intention to buy meat with the EU Ecolabel (Intention)		
INT_1	Scale (1–7)	I would buy fresh beef with the EU Ecolabel if it was to become available[1]
INT_2	Scale (1–7)	I would buy fresh beef with the EU Ecolabel if it was available on the market[1]
INT_3	Scale (1–7)	It would be important for me to find the EU Ecolabel on fresh beef products[1]
INT_4	Scale (1–7)	It would be important for me to consume fresh beef products with the EU Ecolabel[1]
INT_5	Scale (1–7)	I would buy food products with the EU Ecolabel[1]
INT_6	Scale (1–7)	I would buy fresh beef products with the EU Ecolabel[1]
Attitude toward meat with the EU Ecolabel (Attitude)		
ATT_1	Scale (1–7)	If fresh beef had the EU Ecolabel it would be healthier[1]
ATT_2	Scale (1–7)	If fresh beef had the EU Ecolabel it would be only a marketing move[1]
ATT_3	Scale (1–7)	If fresh beef had the EU Ecolabel it would be better[1]
ATT_4	Scale (1–7)	If fresh beef had the EU Ecolabel it would be more expensive[1]
ATT_5	Scale (1–7)	If fresh beef had the EU Ecolabel it would be of higher quality[1]
ATT_6	Scale (1–7)	If fresh beef had the EU Ecolabel it would be more controlled[1]
ATT_7	Scale (1–7)	If fresh beef had the EU Ecolabel it would create confusion among consumers[1]
ATT_8	Scale (1–7)	If fresh beef had the EU Ecolabel it's production would be more environmentally sustainable[1]
ATT_9	Scale (1–7)	If fresh beef had the EU Ecolabel it would help consumers make more conscious choices[1]
Perceived behavioral control (PBC)		
PBC_1	Scale (1–7)	Buying fresh beef with the EU ecolabel would be very expensive[1]
PBC_2	Scale (1–7)	Buying fresh beef with the EU ecolabel would not differ from buying organic beef[1]
PBC_3	Scale (1–7)	Fresh beef with the EU ecolabel would be available only in a few specialized shops[1]
PBC_4	Scale (1–7)	The use of the EU label would be a clear and effective way to identify ecolabeled beef[1]
PBC_5	Scale (1–7)	It will be easy to understand the information associated with the EU ecolabel on beef as it is already used for other products[1]
Subjective norms		
SN_1	Scale (1–7)	My friends would approve my purchase of beef with the EU Ecolabel[1]
SN_2	Scale (1–7)	My family would approve my purchase of beef with the EU Ecolabel[1]
SN_3	Scale (1–7)	My colleagues would approve my purchase of beef with the EU Ecolabel[1]
SN_4	Scale (1–7)	Doctors and nutritionists would approve my purchase of beef with the EU Ecolabel[1]
Food shopping habits (Habits)		
HAB_1	Scale (1–7)	When selecting beef, I regularly check the brand of the products[1]
HAB_2	Scale (1–7)	When selecting beef, I regularly check the price of the products[1]
HAB_3	Scale (1–7)	When selecting beef, I regularly check the expiry date of the products[1]
HAB_4	Scale (1–7)	When selecting beef, I regularly check for animal welfare indications[1]
HAB_5	Scale (1–7)	When selecting beef, I regularly check the presence of the organic logo on products[1]
HAB_6	Scale (1–7)	When selecting beef, I regularly check traceability information[1]
Environmental concern (Concern)		
EC_1	Scale (1–7)	Environmentally-friendly agricultural practices imply a benefit for human health[1]
EC_2	Scale (1–7)	Agricultural practices have a strong impact on water pollution[1]
EC_3	Scale (1–7)	Agricultural practices have a negative impact on human health[1]
Institutional trust (Trust)		
TR_1	Scale (1–7)	Level of trust in firms operating in the beef sector[2]

(*Continued*)

https://doi.org/10.1017/S1742170522000357 Published online by Cambridge University Press

Table 1. (*Continued.*)

Variable name (short name)	Scale	Description of variables
TR_2	Scale (1–7)	Level of trust in institutions providing beef safety and quality assurance[2]
TR_3	Scale (1–7)	Environmentally-friendly certifications for beef imply a benefit for the environment[2]
Individual characteristics		
Purchase frequency	Scale (0–5)	Beef purchase frequency[3]
Age	Scale (18–80)	Respondent's age in years
Gender	Dummy (0–1)	Gender dummy[4]
Education	Scale (1–3)	Level of completed education[5]
Income	Scale (1–3)	This variable measure income, given an national monthly average of 2500 euro[6]
Fam_comp	Discrete (1+)	Number of family components

Note: 1 (totally disagree = 0; totally agree = 7); 2 (1 = very low trust; 7 = very high trust); 3 (0 = none, I consumer other types of meat; 1 = less than once a week; 2 = once a week; 3 = twice a week; 4 = three times a week; 5 = more than three times a week); 4 (0 = male; 1 = female); 5 (1 = compulsory education; 2 = high school; 3 = university or above); 6 (1 = below average; 2 = about the average; 3 = above average).

et al. (2015). Environmental concern (variables ec_1 to ec_3) questions were also adapted from previous literature (Govindasamy *et al.*, 2001; Cranfield and Magnusson, 2003; Koenig-Lewis *et al.*, 2014). Trust-related questions (variables t_1 to t_3) concerned institutional trust relating to the EU ecolabel. The last set of questions included in Model 2 refer to individual characteristics of the respondents: gender, age, education, income, number of family components and beef consumption frequency.

Data collection

Data were collected via an online platform. Sampling followed a snowball technique by means of social media platforms. The starting sampling group for the snowballing procedure was made of students of a masterclass in environmental and food economics. We asked such students to invite their social media contacts to also share the link to the survey also among their own contacts in order to try to diversify the respondent base and reach a more heterogeneous population. Responses were collected from 1240 respondents from Italy. A screening question was included to identify meat-eating respondents. A final sample of 1139 respondents were included in the data set for the analysis.

Questions were mainly multiple-choice with a 1–7 Likert rating scale built following the indications by Ajzen (1991) and Verbeke and Vackier (2005). A definition of the EU ecolabel was provided to respondents in order to be sure that they could give correct evaluations to the questionnaire items.[1] In order to avoid social desirability bias, we tried to avoid any possible sentence which could influence consumer judgments. To test question comprehensibility and avoid issues of confusion or fatigue, the questionnaire was firstly pretested on a group of 20 students of the Faculty of Agriculture and Food Science of the University of Milan and on 40 consumers of the Milan area. Such data were excluded from the final data.

[1]The sentence reported in the questionnaire was the following: 'The EU Ecolabel is a European Union certification that has already been applied to certain products (detergents, textiles, paints, etc.) or services (campgrounds, hotels, services for tourist recreation) signaling a better environmental performance (reduced environmental impact) while maintaining the product's other quality characteristics. Currently, it is not possible to apply this label to food products, but the possibility to extend it in the future also to food products is being considered'.

The final sample of respondents was made of: 45% of male respondents and 55% female respondents; 30% of the respondents were aged between 18 and 24 years, 37% between 25 and 40, 26% between 41 and 59, 7% 60 or over. For what concerns the level of education: 6% of the respondents had completed only compulsory education, 28% had a high school diploma; 66% had a university degree or a higher title. In relation to income, we asked respondents to specify if their family income was below, about the same or above the national monthly income: 22% of respondents declared to have a lower income, 46% to be close to the average of 2500 € $month^{-1}$, while 31% declared to have a higher monthly income. Comparing the sample to the Italian population, the sample was representative in terms of gender distribution and family income. Referring to age, the sample is skewed downwards compared to the average Italian population and suffer from an over representation of respondents with a high level of education. This could be related to the sampling method; however, we control for these variables in the regression analysis.

Data analysis

The data collected were filtered so that only meat-eaters were included in the data set. This was firstly analyzed by means of descriptive statistics of the single variables. Then two confirmatory factor analyses (CFAs) were performed to verify the validity of the constructs included in the two measurement models of Figure 1. The CFAs were firstly implemented including all the items of the questionnaire associated to the single constructs (Table 1). However, for the final models, items with factor loadings lower than 0.50 were excluded (Hair *et al.*, 2010). Standardized factor loadings of the single items of the latent constructs are reported in Table 2, as well as the factor's Cronbach's α. All constructs show a Cronbach's α above 0.70 that is indicated as a threshold to consider internal consistency as satisfactory (Nunally and Bernstein, 1978).

Finally, data were analyzed by means of structural equation models to study the effects of the variables included in our conceptual framework on the intention to purchase beef with an ecolabel certification. The first model that we test is a basic TPB model including attitudes, perceived behavior control and subjective norms as antecedents of purchasing intention (Model 1). The

https://doi.org/10.1017/S1742170522000357 Published online by Cambridge University Press

Table 2. Cronbach's α and factor loadings

Variable	α	Factor loading	Variable	α	Factor loading
Intention	0.92		Subjective norms	0.92	
INT_1		0.83	SN_1		0.91
INT_2		0.88	SN_2		0.90
INT_3		0.91	SN_3		0.88
INT_4		0.92	SN_4		0.76
INT_5		0.59			
INT_6		0.65	Food shopping habits	0.78	
			HAB_4		0.84
Attitude	0.88		HAB_5		0.72
ATT_1		0.80	HAB_6		0.67
ATT_3		0.69	Environmental concern	0.75	
ATT_5		0.79	EC_1		0.72
ATT_6		0.79	EC_2		0.73
ATT_8		0.66	EC_3		0.68
ATT_9		0.74			
			Trust	0.82	
Perceived behavioral control	0.73		TR_1		0.73
PBC_4		0.81	TR_2		0.82
PBC_5		0.70	TR_3		0.79

Notes: α refers to Cronbach's α; factor loadings are standardized ones.

main model that we analyze is however an extended TPB model that includes also other variables highlighted by the literature as relevant predictors of food choice intentions (Model 2). More specifically, we include the constructs related to food shopping habits, environmental concern and some control variables related to individual characteristics. The latter include frequency of consumption of beef and a set of socio-demographic variables, namely gender, age, education level and the number of family components. We also run the same model substituting education with income, obtaining similar results and finding no statistically significant evidence of a relationship between intention and the income variable. According to previous literature, we also added trust as a further antecedent of attitudes, perceived behavior control and food shopping habits.

Analyses were performed using the Lavaan package (Rosseel, 2012) of the R software (R Core Team, 2013).

Results

The results about the estimated relationships between the constructs included in the conceptual framework are reported in Table 3. More in detail, we report the estimates and their significance level for both models analyzed. However, the discussion that follows will focus on the extended TPB model that provides more interesting insights and better values for the fit indices. In particular, in Model 2, the R^2 related to purchasing intention in the structural equation model is 0.77. This highlights a satisfactory ability to explain such intention (Sutton, 1998; Armitage and Conner, 2001; Ajzen, 2011; Menozzi *et al.*, 2015). This value is higher than that for the basic TPB model, that still scores a good value (0.70).

Focusing on the full model (Model 2), fit indices show a reasonable fit. Indeed, the root mean square error of approximation is 0.06, that is below 0.08, that is considered as the limit for a fair fit (Bagozzi and Yi, 1988; MacCallum *et al.*, 1996; Perrini *et al.*, 2010; De Noni *et al.*, 2014; Nassivera and Sillani, 2015). The standardized root mean square residual is 0.066, which is also an indicator of good fit (Hu and Bentler, 1999). A sizeable improvement of fit indices is achieved moving from Model 1 to Model 2. This is also confirmed when looking at the Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) that reach higher values with the full model.

Focusing on path analysis, our results suggest that the intention to purchase beef with an EU ecolabel certification can be predicted by the perceived behavioral outcomes, i.e., the attitudes toward the behavior, as postulated in the TPB theoretical framework. Indeed, both models show a positive and statistically significant effect.

As predicted by the TPB theory, the purchasing intention is also influenced by the perceived easiness to perform the behavior (PBC) in a positive and statistically significant way. Furthermore, also the presence of subjective norms is shown to have a positive effect on purchasing intentions. Such results are in line with the TPB theoretical framework, and they suggest that such a theoretical model can be considered effective in explaining the determinants of consumer intention to buy beef certified with the EU ecolabel. Indeed, the greater the perception of the benefits of performing the action, the greater the perceived easiness of doing so and the approval by important peers, the greater is the intention to purchase this type of beef, that is more environmentally friendly than a traditionally bred one.

https://doi.org/10.1017/S1742170522000357 Published online by Cambridge University Press

Table 3. Structural equation model results

Variable	Model 1 Estimate	Model 2 Estimate
Effect on intention1		
Attitude	0.329*** (0.03)	0.356*** (0.04)
PBC	0.162*** (0.04)	0.147*** (0.04)
Subjective norms	0.325*** (0.02)	0.295*** (0.02)
Habits		0.074*** (0.01)
Concern		0.047* (0.03)
Frequency of purchase		0.056*** (0.02)
Gender		0.068 (0.04)
Age		0.004** (0.00)
Education		0.069* (0.04)
Family members		−0.012 (0.02)
Effect on attitude		
Trust		1.226*** (0.05)
Effect on PBC		
Trust		0.990*** (0.05)
Effect on habits		
Trust		0.537*** (0.06)
Model fit indices		
CFI	0.87	0.91
TLI	0.85	0.90
SRMR	0.07	0.07
RMSEA	0.12	0.06

CFI, Comparative Fit Index; TLI, Tucker–Lewis Index, also known as Non-normed Fit Index; SRMR, Standardized Root Mean Square Residual; RMSEA, root mean square error of approximation.
Notes: Estimates refer to the unstandardized solution.
Significance levels: ***$P < 0.01$; **$0.01 \leqslant P < 0.05$; *$0.05 \leqslant P < 0.1$.
1For a more clear representation of the relations tested by the model please refer to Figure 1.

Moreover, we tested the relations between intentions and other additional variables. Food shopping habits, that in our framework relate to the use of food labels, have a positive and statistically significant effect on purchasing intentions. This suggests that those that are already prone to read food labels and to use them to choose among food products would be more prone to select beef with a public standard such as the EU ecolabel. This further confirms the fact that consumers that choose more sustainable options form their preferences using product information reported on labels.

Our results suggest that intentions can be also predicted by the individual's environmental concern. Indeed, in our extended TPB framework, the more concerned is the person, the higher is the intention to purchase EU eco-labeled beef, as it would be expected.

For what concerns the effects of trust, we find that it has a positive and significant effect on attitudes toward eco-labeled beef, as well as on food shopping habits related to food label use, and on perceived behavioral control. This highlights how trust in the EU institutions and, especially, in the ecolabel labeling system can play an important role in favoring more sustainable choices. This may be related to the fact that public standards may provide a certain level of warranty for consumers, that feel more assured that their purchase can be effective in achieving their sustainability-related goals. This is particularly important for sustainability attributes related to production processes that are invisible to the final consumer, making such attributes 'credence' in nature, i.e., requiring an act of faith by consumers.

Finally, for what concerns individual characteristics, our results suggest that respondents that consume more beef are more interested in this type of beef option. This may be connected to the fact that consumers that have a higher level of meat intake, often reluctant in reducing meat consumption (Macdiarmid *et al.*, 2016), are more interested in sustainable options for beef. This is quite an interesting result as it suggests that large beef eaters could, in some measure, potentially be part of the solution. Given the reluctance of meat consumers to reduce their meat consumption, a relatively quick way to, at least partly, reduce the environmental impact of beef consumption seems to be the promotion of more ecological technology supported by a public certification policy.

Results seem to also indicate that, ceteris paribus, older people are more prone toward this type of products. Moreover, higher educated people seem to also have a higher level of purchasing intentions.

Conclusions

One of the most debated topics in the European Green Deal is the reduction of the environmental impact of livestock farming. This objective can be achieved with a reduction in per capita consumption of meat and/or with a shift toward meat production/consumption with a lower environmental impact. The reduction of meat consumption requires a drastic change in consumer behavior, which is quite difficult for regular meat-eaters and may take a long time to implement. The present study analyses in depth the determinants affecting consumer intention to buy beef produced via more environmentally friendly processes and procedures. Results highlight that beef consumers are quite likely to change their habits, in favor of more sustainable beef choices if given the option. Interestingly, among the results achieved in the analysis, institutional trust and food shopping habits play an important role to activate the consumer's cognitive decision-making process toward sustainable beef. These findings highlight that particular attention should be devoted to build trust for public institutions in order to promote sustainable food consumption behavior. Moreover, results validate previous studies on the effectiveness of information-based policies in fostering consumers toward sustainable consumption and give important policy suggestions on the possible effectiveness of the introduction of an institutional sustainability-related label for beef products and, in general, for food.

The above discussed results need to be analyzed in the light of a set of limitations of the research. Indeed, the data collected are based on stated preferences and on a hypothetical application of an existing label to beef products. The study may indeed suffer from common method bias, given that all variables are collected with the same response method, and we do not have measures of actual behavior (Podsakoff *et al.*, 2003; Chang *et al.*, 2010). Even if the use of stated preference data is in line with the theoretical framework of the TPB, such data could suffer from consistency motif, social desirability and hypothetical bias. However, it is

https://doi.org/10.1017/S1742170522000357 Published online by Cambridge University Press

particularly difficult to capture individual attitudes, concerns and beliefs in a different way. We tried to mitigate this by interspersing the order of the items related to different attitudes, and by assuring and stressing respondent anonymity and by informing respondents that there were no right or wrong answers. The choice of a self-administered questionnaire can potentially also reduce the effects of the social desirability related to a face-to-face interviewer, even if it poses more cognitive burden on respondents.

Research could also focus on the generalizability and robustness of results by exploring consumer intention to buy other kinds of food labeled with a European Ecolabel and test possible rebound effects due to the lower environmental sustainability impacts of this type of beef. Finally, future work could be also devoted to assessing the determinants of consumer trust in order to identify policies to foster more-sustainable meat consumption.

Conflict of interest. The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Ajzen I (1985) From intentions to actions: a theory of planned behavior. In Kuhl J and Beckmann J (eds), *Action Control*. Berlin, Heidelberg: Springer Berlin Heidelberg, pp. 11–39. Available at http://www.springerlink.com/index/10.1007/978-3-642-69746-3_2.

Ajzen I (1991) The theory of planned behavior. *Organizational Behavior and Human Decision Processes* **50**, 179–211.

Ajzen I (2011) The theory of planned behaviour: reactions and reflections. *Psychology & Health* **26**, 1113–1127.

Angulo AM and Gil JM (2007) Risk perception and consumer willingness to pay for certified beef in Spain. *Food Quality and Preference* **18**, 1106–1117.

Apostolidis C and McLeay F (2016) Should we stop meating like this? Reducing meat consumption through substitution. *Food Policy* **65**, 74–89.

Armitage CJ and Conner M (2001) Efficacy of the theory of planned behaviour: a meta-analytic review. *British Journal of Social Psychology* **40**, 471–499.

Bagozzi RP and Yi Y (1988) On the evaluation of structural equation models. *Journal of the Academy of Marketing Science* **16**, 74–94.

Banterle A and Ricci EC (2013) Does the sustainability of food products influence consumer choices? The case of Italy. *International Journal on Food System Dynamics* **4**, 149–158.

Bellarby J, Tirado R, Leip A, Weiss F, Lesschen JP and Smith P (2013) Livestock greenhouse gas emissions and mitigation potential in Europe. *Global Change Biology* **19**, 3–18.

Blanchard CM, Fisher J, Sparling PB, Shanks TH, Nehl E, Rhodes RE, Courneya KS and Baker F (2009) Understanding adherence to 5 servings of fruits and vegetables per day: a theory of planned behavior perspective. *Journal of Nutrition Education and Behavior* **41**, 3–10.

Bragaglio A, Napolitano F, Pacelli C, Pirlo G, Sabia E, Serrapica F, Serrapica M and Braghieri A (2018) Environmental impacts of Italian beef production: a comparison between different systems. *Journal of Cleaner Production* **172**, 4033–4043.

Caracciolo F, Cicia G, Del Giudice T, Cembalo L, Krystallis A, Grunert KG and Lombardi P (2016) Human values and preferences for cleaner livestock production. *Journal of Cleaner Production* **112**(Part 1), 121–130.

Chakravarty S, Chikkatur A, de Coninck H, Pacala S, Socolow R and Tavoni M (2009) Sharing global CO2 emission reductions among one billion high emitters. *Proceedings of the National Academy of Sciences* **106**, 11884–11888.

Chang S-J, van Witteloostuijn A and Eden L (2010) From the editors: common method variance in international business research. *Journal of International Business Studies* **41**, 178–184.

Chen M-F (2016) Extending the theory of planned behavior model to explain people's energy savings and carbon reduction behavioral intentions to mitigate climate change in Taiwan – moral obligation matters. *Journal of Cleaner Production* **112**, 1746–1753.

Chen TB and Chai LT (2010) Attitude towards the environment and green products: consumers' perspective. *Management Science and Engineering* **4**, 27–39.

Costanigro M, Deselnicu O and Kroll S (2015) Food beliefs: elicitation, estimation and implications for labeling policy. *Journal of Agricultural Economics* **66**, 108–128.

Cozzi G and Ragno E (2003) Meat production and market in Italy. *Agriculturae Conspectus Scientificus (ACS)* **68**, 71–77.

Cranfield JAL and Magnusson E (2003) Canadian consumer's willingness-to-pay for pesticide free food products: an ordered probit analysis. *International Food and Agribusiness Management Review* **6**, 13–30.

de Barcellos MD, Kügler JO, Grunert KG, Van Wezemael L, Pérez-Cueto FJA, Ueland Ø and Verbeke W (2010) European consumers' acceptance of beef processing technologies: a focus group study. *Innovative Food Science & Emerging Technologies* **11**, 721–732.

de Boer J, Schösler H and Aiking H (2014) 'Meatless days' or 'less but better'? Exploring strategies to adapt western meat consumption to health and sustainability challenges. *Appetite* **76**, 120–128.

de Bruijn G-J (2010) Understanding college students' fruit consumption. Integrating habit strength in the theory of planned behaviour. *Appetite* **54**, 16–22.

De Groot J and Steg L (2007) General beliefs and the theory of planned behavior: the role of environmental concerns in the TPB. *Journal of Applied Social Psychology* **37**, 1817–1836.

Demartini E, Ricci EC, Mattavelli S, Stranieri S, Gaviglio A, Banterle A, Richetin J and Perugini M (2018) Exploring consumer biased evaluations: halos effects of local food and of related attributes. *International Journal on Food System Dynamics* **9**, 375–389.

De Noni I, Orsi L and Zanderighi L (2014) Attributes of Milan influencing city brand attractiveness. *Journal of Destination Marketing & Management* **3**, 218–226.

Dowd K and Burke KJ (2013) The influence of ethical values and food choice motivations on intentions to purchase sustainably sourced foods. *Appetite* **69**, 137–144.

EC (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A Farm to Fork Strategy for a Fair, Healthy and Environmentally-Friendly Food System. Brussels, 20.5.2020 COM (2020) 381 final.

Elseidi RI (2018) Determinants of halal purchasing intentions: evidences from UK. *Journal of Islamic Marketing* **9**, 167–190.

Elsen M, van Giesen R, van den Akker K and Dunne A (2019) *Consumer testing of alternatives for communicating the Environmental Footprint profile of products*. Final report for the European Commission.

EU (2006) Environmental impact of products. Analysis of the Life Cycle Environmental Impacts Related To the Final Consumption of the EU-25. Technical Report EUR 22284 EN.

Giampietri E, Verneau F, Del Giudice T, Carfora V and Finco A (2018) A theory of planned behaviour perspective for investigating the role of trust in consumer purchasing decision related to short food supply chains. *Food Quality and Preference* **64**, 160–166.

Golini R, Moretto A, Caniato F, Caridi M and Kalchschmidt M (2017) Developing sustainability in the Italian meat supply chain: an empirical investigation. *International Journal of Production Research* **55**, 1183–1209.

Govindasamy R, Italia J and Adelaja A (2001) Predicting willingness-to-pay a premium for integrated pest management produce: a logistic approach. *Agricultural and Resource Economics Review* **30**, 151–159.

Gracia A and De Magistris T (2008) The demand for organic foods in the south of Italy: a discrete choice model. *Food Policy* **33**, 386–396.

Grankvist G and Biel A (2001) The importance of beliefs and purchase criteria in the choice of eco-labeled food products. *Journal of Environmental Psychology* **21**, 405–410.

Grunert KG (2011) Sustainability in the food sector: a consumer behaviour perspective. *International Journal on Food System Dynamics* **2**, 207–218.

Grunert KG, Hieke S and Wills J (2014) Sustainability labels on food products: consumer motivation, understanding and use. *Food Policy* **44** (Suppl. C), 177–189.

https://doi.org/10.1017/S1742170522000357 Published online by Cambridge University Press

Guillaumie L, Godin G and Vézina-Im L-A (2010) Psychosocial determinants of fruit and vegetable intake in adult population: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity* **7**, 12.

Hair JF Jr., Black WC, Babin BJ and Anderson RE (2010) *Multivariate Data Analysis*, 7 edizione. Upper Saddle River, NJ: Prentice Hall College Div. Available at https://www.pearson.com/us/higher-education/program/Hair-Multivariate-Data-Analysis-7th-Edition/PGM263675.html.

Henchion MM, McCarthy M and Resconi VC (2017) Beef quality attributes: a systematic review of consumer perspectives. *Meat Science* **128**, 1–7.

Herrero M, Henderson B, Havlík P, Thornton PK, Conant RT, Smith P, Wirsenius S, Hristov AN, Gerber P, Gill M, Butterbach-Bahl K, Valin H, Garnett T and Stehfest E (2016) Greenhouse gas mitigation potentials in the livestock sector. *Nature Climate Change* **6**, 452–461.

Hoeksma DL, Gerritzen MA, Lokhorst AM and Marijn Poortvliet P (2017) An extended theory of planned behavior to predict consumers' willingness to buy mobile slaughter unit meat. *Meat Science* **128**, 15–23.

Honkanen P, Olsen SO and Verplanken B (2005) Intention to consume seafood – the importance of habit. *Appetite* **45**, 161–168.

Honkanen P, Verplanken B and Olsen SO (2006) Ethical values and motives driving organic food choice. *Journal of Consumer Behaviour* **5**, 420–430.

Hu L-T and Bentler PM (1999) Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal* **6**, 1–55.

Hyland JJ, Henchion M, McCarthy M and McCarthy SN (2017) The role of meat in strategies to achieve a sustainable diet lower in greenhouse gas emissions: a review. *Meat Science* **132**, 189–195.

IPCC (2014) *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (Eds.)]*. Cambridge, UK and New York, NY, USA: Cambridge University Press.

Janssen M and Hamm U (2014) Governmental and private certification labels for organic food: consumer attitudes and preferences in Germany. *Food Policy* **49**, 437–448.

Koenig-Lewis N, Palmer A, Dermody J and Urbye A (2014) Consumers' evaluations of ecological packaging–rational and emotional approaches. *Journal of Environmental Psychology* **37**, 94–105.

Koos S (2011) Varieties of environmental labelling, market structures, and sustainable consumption across Europe: a comparative analysis of organizational and market supply determinants of environmental-labelled goods. *Journal of Consumer Policy* **34**, 127–151.

Lazzarini GA, Zimmermann J, Visschers VHM and Siegrist M (2016) Does environmental friendliness equal healthiness? Swiss consumers' perception of protein products. *Appetite* **105**, 663–673.

Leach AM, Emery KA, Gephart J, Davis KF, Erisman JW, Leip A, Pace ML, D'Odorico P, Carr J and Noll LC (2016) Environmental impact food labels combining carbon, nitrogen, and water footprints. *Food Policy* **61**, 213–223.

MacCallum RC, Browne MW and Sugawara HM (1996) Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods* **1**, 130.

Macdiarmid JI, Douglas F and Campbell J (2016) Eating like there's no tomorrow: public awareness of the environmental impact of food and reluctance to eat less meat as part of a sustainable diet. *Appetite* **96**, 487–493.

Mackey MA and Metz M (2009) Ease of reading of mandatory information on Canadian food product labels. *International Journal of Consumer Studies* **33**, 369–381.

Massetti E and Ricci EC (2013) An assessment of the optimal timing and size of investments in concentrated solar power. *Energy Economics* **38**, 186–203.

Massey M, O'Cass A and Otahal P (2018) A meta-analytic study of the factors driving the purchase of organic food. *Appetite* **125**, 418–427.

Menozzi D, Halawany-Darson R, Mora C and Giraud G (2015) Motives towards traceable food choice: a comparison between French and Italian consumers. *Food Control* **49**, 40–48.

Merlino VM, Borra D, Girgenti V, Dal Vecchio A and Massaglia S (2018) Beef meat preferences of consumers from northwest Italy: analysis of choice attributes. *Meat Science* **143**, 119–128.

Napolitano F, Braghieri A, Piasentier E, Favotto S, Naspetti S and Zanoli R (2010) Effect of information about organic production on beef liking and consumer willingness to pay. *Food Quality and Preference* **21**, 207–212.

Nassivera F and Sillani S (2015) Consumer perceptions and motivations in choice of minimally processed vegetables: a case study in Italy. *British Food Journal* **117**, 970–986.

Nelson P (1970) Information and consumer behavior. *Journal of Political Economy* **78**, 311–329.

Nunally JC and Bernstein IH (1978) *Psychometric Theory*. New York: McGraw-Hill.

Perrini F, Castaldo S, Misani N and Tencati A (2010) The impact of corporate social responsibility associations on trust in organic products marketed by mainstream retailers: a study of Italian consumers. *Business Strategy and the Environment* **19**, 512–526.

Podsakoff PM, MacKenzie SB, Lee J-Y and Podsakoff NP (2003) Common method biases in behavioral research: a critical review of the literature and recommended remedies. *The Journal of Applied Psychology* **88**, 879–903.

Pouta E, Heikkilä J, Forsman-Hugg S, Isoniemi M and Mäkelä J (2010) Consumer choice of broiler meat: the effects of country of origin and production methods. *Food Quality and Preference* **21**, 539–546.

Prieto-Sandoval V, Mejía-Villa A, Ormazabal M and Jaca C (2020) Challenges for ecolabeling growth: lessons from the EU ecolabel in Spain. *The International Journal of Life Cycle Assessment* **25**, 856–867.

R Core Team (2013) *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. Available at http://www. R-project.org.

Ricci EC, Banterle A and Stranieri S (2018) Trust to go green: an exploration of consumer intentions for eco-friendly convenience food. *Ecological Economics* **148**, 54–65.

Richetin J, Demartini E, Gaviglio A, Ricci EC, Stranieri S, Banterle A and Perugini M (2021) The biasing effect of evocative attributes at the implicit and explicit level: the tradition halo and the industrial horn in food products evaluations. *Journal of Retailing and Consumer Services* **61**, 101890.

Rojas-Downing MM, Nejadhashemi AP, Harrigan T and Woznicki SA (2017) Climate change and livestock: impacts, adaptation, and mitigation. *Climate Risk Management* **16**, 145–163.

Röös E, Sundberg C, Tidåker P, Strid I and Hansson P-A (2013) Can carbon footprint serve as an indicator of the environmental impact of meat production? *Ecological Indicators* **24**, 573–581.

Röös E, Ekelund L and Tjärnemo H (2014) Communicating the environmental impact of meat production: challenges in the development of a Swedish meat guide. *Journal of Cleaner Production* **73**, 154–164.

Rosseel Y (2012) lavaan: an R package for structural equation modeling. *Journal of Statistical Software* **48**, 1–36.

Samant SS and Seo H-S (2016) Effects of label understanding level on consumers' visual attention toward sustainability and process-related label claims found on chicken meat products. *Food Quality and Preference* **50**, 48–56.

Schuldt JP and Schwarz N (2010) The 'organic' path to obesity? Organic claims influence calorie judgments and exercise recommendations. *Judgment and Decision Making* **5**, 144.

Schuldt JP, Muller D and Schwarz N (2012) The 'fair trade' effect: health halos from social ethics claims. *Social Psychological and Personality Science* **3**, 581–589.

Sillani S and Nassivera F (2015) Consumer behavior in choice of minimally processed vegetables and implications for marketing strategies. *Trends in Food Science & Technology* **46**, 339–345.

Smith P, Haberl H, Popp A, Erb K-h, Lauk C, Harper R, Tubiello FN, Pinto A, Jafari M, Sohi S, Masera O, Böttcher H, Ahammad H, Clark H, Dong H, Elsiddig EA, Mbow C, Ravindranath NH, Rice CW, Abad CR, Romanovskaya A, Sperling F, Herrero M, House JI and Rose S (2013) How much land-based greenhouse gas mitigation can be achieved without compromising food security and environmental goals? *Global Change Biology* **19**, 2285–2302.

https://doi.org/10.1017/S1742170522000357 Published online by Cambridge University Press

Steg L and Vlek C (2009) Encouraging pro-environmental behaviour: an integrative review and research agenda. *Journal of Environmental Psychology* **29**, 309–317.

Stranieri S, Ricci EC and Banterle A (2017) Convenience food with environmentally-sustainable attributes: a consumer perspective. *Appetite* **116**, 11–20.

Sutton S (1998) Predicting and explaining intentions and behavior: how well are we doing? *Journal of Applied Social Psychology* **28**, 1317–1338.

Teisl MF, Roe B and Hicks RL (2002) Can eco-labels tune a market? Evidence from dolphin-safe labeling. *Journal of Environmental Economics and Management* **43**, 339–359.

Vanhonacker F and Verbeke W (2014) Public and consumer policies for higher welfare food products: challenges and opportunities. *Journal of Agricultural and Environmental Ethics* **27**, 153–171.

Van Loo EJ, Caputo V, Nayga RM Jr., Meullenet J-F and Ricke SC (2011) Consumers' willingness to pay for organic chicken breast: evidence from choice experiment. *Food Quality and Preference* **22**, 603–613.

Van Loo EJ, Caputo V, Nayga RM and Verbeke W (2014) Consumers' valuation of sustainability labels on meat. *Food Policy* **49**, 137–150.

Verbeke W and Vackier I (2005) Individual determinants of fish consumption: application of the theory of planned behaviour. *Appetite* **44**, 67–82.

Vermeir I and Verbeke W (2008) Sustainable food consumption among young adults in Belgium: theory of planned behaviour and the role of confidence and values. *Ecological Economics* **64**, 542–553.

Yadav R and Pathak GS (2016) Young consumers' intention towards buying green products in a developing nation: extending the theory of planned behavior. *Journal of Cleaner Production* **135**, 732–739.

Yadav R and Pathak GS (2017) Determinants of consumers' green purchase behavior in a developing nation: applying and extending the theory of planned behavior. *Ecological Economics* **134**(Suppl. C), 114–122.

Yazdanpanah M and Forouzani M (2015) Application of the theory of planned behaviour to predict Iranian students' intention to purchase organic food. *Journal of Cleaner Production* **107**, 342–352.

Yip L and Janssen M (2015) 'How do consumers perceive organic food from different geographic origins? Evidence from Hong Kong and Shanghai', May. Available at https://kobra.uni-kassel.de/handle/123456789/2015011347164.

https://doi.org/10.1017/S1742170522000357 Published online by Cambridge University Press