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Individuals' personality and consumption of organic food

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ABSTRACT

This paper adds to the debate on sustainable food consumption by probing the relation between individuals' personality and choice of organic foods. We make use of the Big Five personality model which consists of the personality traits: Extraversion, Agreeableness, Conscientiousness, Emotional stability, and Openness to experience. The Graded Response Model, logistic regression models, and interval regression models are applied to explore the impact of personality on choice of organic food. Five hypotheses regarding the connection between personality and consumption of organic foods were tested using eight different models. The results indicate that Openness to experience is positively related, while Extraversion is negatively related, to the attitudes of organic foods. Some of the tests showed positive relations between Agreeableness and attitudes towards organic foods. In addition, individuals high in Conscientiousness have a lower willingness to pay for organic foods compared with conventional foods. The consequence of the connection between Openness to experience and organic food is that stakeholders may take this into account when planning strategies and methods to increase sales.

1. Introduction

The change in environmental attitudes and consumption practices is of increasing importance in the common goal to cope with grand global challenges. At the most superior level, the importance of consumption behavior or practices for sustainable development is highlighted as important in the Intergovernmental Panel on Climate Change (IPCC Special Report, *Global Warming of 1.5 °C* (2018)[1] and the UN *Sustainable Development Goal 12: Responsible Production and Consumption*,[2] respectively. Further, the Food and Agriculture Organization of the United Nations (FAO) defines sustainable diets as:

Sustainable Diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources (FAO, 2012, p.7).

Much effort has been taken to probe and understand the variables and dynamics for sustainable consumption from different perspectives. To fully understand and promote the phenomena of sustainable consumption, perspectives should ideally be regarded in an interdisciplinary approach and as complementary. However, they are often understood as competing in explaining and developing consumption in a more sustainable direction (Fitzgerald et al., 2013). Different segmentation models can also be understood as competing in the effort to understand what characterizes sustainable consumption and consumers. Based on Yilmazsoy et al. (2015) and Balderjahn et al. (2018), Golob and Kronegger (2019, p.3) claim that "the literature on segmenting environmentally conscious consumers suggests that there is now a consensus among scholars that attitudinal and behavioural variables best determine green or sustainable consumer segments". Yet, they also suggest that other factors might be employed for further profiling the segments. Segmenting environmental consciousness according to personality represents such an additional factor, and our analysis of personality and the consumption of organic food is an example of the relevance of understanding the importance of personality related to alternative consumption patterns and sustainable consumer/customer attitudes and lifestyles. We claim that, in combination with other perspectives and segmentation models, the focus on personality in sustainable and organic consumption expands and strengthens both the theoretical, methodological, and substantial understanding of sustainable and organic consumption.

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[1] https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf.

[2] https://www.un.org/sustainabledevelopment/sustainable-consumption-production/.

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Organic production and consumption are, in general, understood to be more sustainable than conventional. However, there are also other opinions and analysis questioning this notion (Azzurra et al., 2019). As Vittersø and Tangeland (2015) indicate, several approaches and perspectives have been employed to study the consumption of organic food. In this regard, consumer background variables have been important, as have socio-cultural and/or socio-economic variables in recent studies.

In this article, we strive to elaborate and give nuances to a set of consumer background variables for understanding the demand and consumption of organic food. We use the analysis of personality and organic consumption in Norway as a case to show that personality is one of several variables and theoretical perspectives that should be included in the research on sustainable consumption. Our overarching research question is: Are there any personality traits that characterize people demanding/purchasing/consuming organic food?

We use the Big Five personality model which consists of the following personality traits: Extraversion, Agreeableness, Conscientiousness, Emotional stability, and Openness to experience. These traits say something about the way people think and act, if they are more interested in people and things rather than in subjective experiences, if they have a tendency to act unselfishly and cooperatively, if they are organized and hard-working, to what degree they are prone to psychological stress, and if they are open to new aesthetic, cultural, or intellectual experiences.

Psychological research has linked environmental concern with the personality traits of Agreeableness and Openness to experience (Hirsh, 2010; Milfont and Sibley, 2012; Nisbeth et al., 2009). A higher degree of agreeableness tends to be consistent with altruistic behavior and emphatic concern about the environment. More Openness to experience is associated with aesthetic interests.

Against this backdrop, we formulate our research hypotheses as follows.

H1. Extraversion does not influence the attitude towards organic foods.

H2. Agreeableness has a positive influence on the attitude towards organic foods, i.e., agreeable individuals are, on average, more pro-organic than individuals low in agreeableness.

H3. Conscientiousness does not influence the attitude towards organic foods.

H4. Emotional stability does not influence the attitude towards organic foods.

H5. Openness to experience has a positive influence on the attitude towards organic foods, i.e., individuals high in the trait Openness to experience are, on average, more pro-organic than individuals low in Openness to experience.

In section 2, we discuss how organic food can be related to sustainability. In section 3, we discuss the concept of personality and how it can be measured by the Big Five taxonomy. In section 4, we present a review of the research on consumers' personality and consumption of organic food. In section 5, we describe our methods and data source. In section 6, we present the results from the estimation of the models concerning personality and consumption of organic food. In section 7, we discuss the results, and section 8 concludes the article.

2. Organic food and sustainability

In research literature, organic food is often understood as sustainable (Vega-Zamora et al., 2019; Gan et al., 2016; Magistris and Gracia, 2016). As mentioned above, many people perceive organic production and products as being better for the environment, better for health, and tastier than conventionally produced food. A lot of people also think that modern farming methods require people to shift to organic food to improve environmental outcome (Teisl, 2011). Hole et al. (2005) reviewed 76 studies comparing the biodiversity in organic versus conventional agriculture. They found that organic farming is significantly better than conventional farming in 66 out of 99 species comparisons, while 25 had mixed or no impact. Eight showed negative effects. The Norwegian Scientific Committee for Food Safety (2014) performed an assessment of organic and conventional food based on a review of the scientific literature on plant health, animal health and welfare, and human health. Their conclusion regarding plant health was that crop losses due to plant diseases, plant pests, and weeds are higher in organic than in conventional agriculture. Concerning the content of nutrients, there are small differences between organic and conventional farming, except for fruits and berries where higher levels of dry matter, ascorbic acid, and antioxidants have been found. For animal health and welfare, the report concludes that the strong animal regulations in Norway imply small differences in animal welfare between organic and conventional farming. In addition, concerning human health, no consistent difference between an organic diet and a conventional diet was found. Tuomisto et al. (2012) performed a meta-analysis comparing the environmental impact of organic farming in Europe. They concluded that organic farming generally has a positive impact on the environment per unit of area, but not necessarily per product unit. They recommend that research effort and policies should be targeted to develop farming systems that produce high yields with low negative environmental impacts drawing on techniques from both organic and conventional systems.

To summarize, former research shows variations in understanding organic food as sustainable. It varies both between and within the *emic* (the group of consumers and stakeholders) and *ethic* (researchers) groups.

3. Measuring personality

The personality of an individual describes the intensity of his/her thoughts and feelings, and patterns of behavior in relation to other people. Personality defines how an individual responds to the world, in a broad sense. It develops over time, from birth to adulthood, and it is thought to be relatively stable from around 30 years of age (McCrae and Costa, 2003). Personality comprises hundreds of different degrees of traits and qualities. For example, two persons may be described as neurotics, but one of them may be more neurotic than the other. The sum of all these traits defines the individual as a person and guides how she will react in different situations or what kind of choices she will make. Additional to other contextual conditions, her personality will indicate whether she will approach decisions cautiously or impulsively, whether she will act emotionally or rationally, whether her choices are made deliberately or spontaneously, etc. It is important for some people to retain a certain moral value when making decisions, while others are strongly guided by anxiety in everything they do. Some people are strongly guided by pleasure and instant gratification; for these people decisions are often impulsive and lack rational judgment.

Personality traits can be measured according to a range of different methods and scales. One of them is the five factor model or the Big Five. This model and psychological theory assumes that personality may be described by five general factors: Extraversion, Agreeableness, Conscientiousness, Emotional stability, and Openness to experience. Extraversion is associated with assertiveness, sociability, talkativeness, and the tendency to seek stimulation in the company of others. Individuals who are perceived as extraverts often seek attention and are authoritarian/dominant. Individuals who are

perceived as reserved and reflective are classified as Introverts, scoring low on Extraversion. Agreeableness is the tendency to be compassionate towards and trusting of others. Individuals who have a low score on Agreeableness are often suspicious and antagonistic towards others. Conscientiousness is about organization, self-discipline, and the ability to work hard to achieve goals. Emotional stability is associated with the degree to which an individual is responsive to psychological stress— whether he or she is calm and stable or exhibiting nervousness when faced with stress. Openness to experience is associated with curiosity, creativity, and preference for variety and novelty. None of the five factors can be observed directly. However, by making use of a survey questionnaire, the latent variables measuring the five factors can be estimated, for example, by using the Graded Response Model.

4. Consumption of organic food and personality

Consumption of organic food has been approached by scholars from a variety of disciplines with a range of perspectives and research questions. Numerous reviews and studies have mapped and systematized factors that impact consumers' personal perceptions, values, behaviors, etc., related to the consumption of organic food (Hughner et al., 2007; Aertsens et al., 2009; Massey, O'Cass, and Otahal, 2018; Eertmans et al., 2005; Rana and Paul, 2012; Asioli et al., 2017). Several of these contributions claim to include the personality traits of consumers. However, few contributions or reviews have probed the impact of consumers' personality and how it relates to understanding the purchase or consumption of organic food.

Most contributions linking personality and the Big Five model to food consumption relate to the psychological/physiological health effects, such as personality and dietary styles (Forestell and Nezlek, 2018; Keller and Siegrist, 2015). One exception is Bazzani et al. (2017) who found that personality traits can be sources of heterogeneity in consumers' preferences for locally produced food, but not for organic applesauce.

The most common way to construct personality trait variables from the Big Five is to use the mean of the items for each individual. This is a basic method, which gives equal weight to each of the items in each personality trait. This method was used by the papers cited above. Our contribution to this methodological perspective, is to construct latent personality variables with the Graded Response Model using the Big Five taxonomy. The latent variables are then included in choice models and models measuring the willingness to pay (*WTP*) for organic food compared with ordinary food. In this way, we are better able to analyze the connection between organic food and personality.

5. Methods and data

To unpack the relation between individuals' personality and their choice of organic food compared with ordinary food, we make use of the Graded Response Model to estimate the latent Big Five personalities. The five latent variables are then incorporated into binary logistic regression models and interval regression models together with other predictors. Then the models are estimated with maximum likelihood to find associations between personalities and attitudes towards organic foods. The models are used with data from the Norwegian Monitor (NM) database to find probabilities and *WTP* for organic foods.

5.1. The Graded Response Model

The Graded Response Model was suggested by Samejima (1969). It is defined as:

$$P\left(y_i=k\middle|\theta\right) = P\left(y_i\geq k\middle|\theta\right) - P\left(y_i\geq k+1\middle|\theta\right) = \frac{\exp(\alpha_i(\theta-\beta_{ik}))}{1+\exp(\alpha_i(\theta-\beta_{ik}))} - \frac{\exp(\alpha_i(\theta-\beta_{i,k+1}))}{1+\exp(\alpha_i(\theta-\beta_{i,k+1}))}, \quad k=1,2,.,K, \tag{1}$$

which is the probability to choose the response k from K possible choices, where $K=7$ in our case (7 point Likert scale). Our aim is to find θ for each individual. θ is the latent variable that describes the position of the individual on the scale from the lowest to highest. These five personality traits are then included in the logistic regression models, where the outcomes are y_1–y_7 and y_8 is the basis for the *WTP* model. In addition to the personality variables, the predictors in Table 3 are included in the models.

5.2. The binary logistic regression model

To model the probability of purchasing/being interested in Norwegian organic food (y_1–y_7 in Table 3), we use binary logistic regression models (Cameron and Trivedi, 2005). The models are specified with the probability functions such as:

$$P_i = \Pr(y_i=1|x) = \Lambda(x'\beta) = \frac{e^{x'\beta}}{1+e^{x'\beta}}, \tag{2}$$

where $i=1,\ldots,7$ indicating the binary outcome variables y_1–y_7 in Table 2, Λ is the logistic distribution function, and x is a vector of explanatory variables (including five personality variables). β is the vector of coefficients to be estimated.

5.3. The interval regression model

To estimate the *WTP*, we see from Table 2 that y_8 is grouped into intervals. This makes it convenient to estimate *WTP* using the interval regression model as was done by Einarsdottir et al. (2019) and Ghisetti (2014). Wooldridge (2002) is a common reference for interval regression. The interval regression model is a generalization of the Tobit model when we have known intervals (Amemiya, 1973). We assume that the underlying outcome variable is normally distributed, and the likelihood function of *WTP* for organic food is:

$$L = \prod_{WTP=0} \Phi\left[\frac{x_i\beta}{\sigma}\right] \prod_{0<WTP\leq 15}\left(\Phi\left[\frac{15-x_i\beta}{\sigma}\right]-\Phi\left[\frac{1-x_i\beta}{\sigma}\right]\right) \prod_{15<WTP\leq 30}\left(\Phi\left[\frac{30-x_i\beta}{\sigma}\right]-\Phi\left[\frac{16-x_i\beta}{\sigma}\right]\right) \prod_{30<WTP}\left(1-\Phi\left[\frac{31-x_i\beta}{\sigma}\right]\right), \tag{3}$$

Table 1
The Norwegian Version of the Big Five, BFI-20. Percentage of individuals responding in each of the cells in a 7 point Likert Scale.

	Disagree strongly						Agree strongly
	1	2	3	4	5	6	7
Extraversion							
Is talkative	4.9	7.5	13.8	23.9	20.8	14.8	14.3
Tends to be quiet	13.4	18.4	17.1	18.8	15.2	10.3	6.8
Is outgoing, sociable	2.6	4.8	10.3	17.9	21.9	23.1	19.4
Is sometimes shy, inhibited	28.6	23.2	15.1	14.1	11.5	5.7	1.9
Agreeableness							
Can be cold and aloof	32.4	23.4	16.4	14.3	9.2	3.2	1.1
Is helpful to others and unselfish	1.3	1.8	4.2	15.3	25.9	32.8	18.5
Is sometimes rude to others	24.2	27.4	14.9	13.2	11.9	6.8	1.6
Is considerate and kind to almost everyone	0.7	0.8	1.4	5.4	15.2	40.6	35.7
Conscientiousness							
Does a thorough job	0.7	1.1	2.3	9.5	20.1	36.2	30.2
Tends to be disorganized	35.8	27.7	12.5	9.6	8.5	4.1	1.7
Makes plans and follows through with them	1.5	3.6	9.6	21.0	24.6	26.7	12.9
Can be somewhat careless	14.1	23.1	16.6	18.9	15.8	8.8	2.6
Emotional stability							
Is depressed, blue	41.4	25.2	11.3	10.9	6.6	2.8	1.8
Is relaxed, handles stress well	3.4	6.8	13.1	18.8	18.8	25.8	13.3
Worries a lot	14.2	19.5	14.3	16.8	15.8	12.5	6.8
Gets nervous easily	21.1	24.6	15.9	16.6	11.7	7.2	2.9
Openness to experience							
Is original, comes up with new ideas	8.4	8.5	16.2	27.1	20.9	13.0	5.8
Has an active imagination	7.7	10.4	13.4	22.7	18.9	15.6	11.2
Likes to reflect, play with ideas	6.2	10.2	14.3	21.8	21.2	17.8	8.6
Has few artistic interests	20.3	16.6	13.1	13.7	11.1	13.7	11.5

where Φ is the cumulative distribution function for the standard normal, σ is the standard error of *WTP*, β is a vector of parameters, and x is a vector of variables.

5.4. The data

NM is the most comprehensive consumer and opinion survey[3] in Norway. It is a Norwegian representative cross-sectional survey consisting of 3000–4000 adults. The survey covers a broad range of topics such as demographic and socioeconomic information, political preferences, stands on moral and ethical issues, health, and eating habits, including attitudes towards organic foods. The respondents are drawn from the Norwegian population who are 15 years and above, from telephone directories. In the first round, respondents are interviewed by telephone. The respondents then answer the bulk of the questions in a self-completion questionnaire. The survey has been conducted every second year since 1985. The NM database is explained in Hellevik (2016). NM has been used in a lot of other research, including Øvrum et al. (2014) and Gustavsen and Rickertsen (2018). In 2015, a 20 item version of the Big Five Inventory (BFI-20) was for the first time included in NM. Data from this year are used in this paper. BFI-20 was developed by Engvik and Clausen (2011) and it was based on the 44 item personality taxonomy developed by John et al. (1991). BFI-20, with the percentage of individuals responding in each of the cells in a 7 point Likert scale, is shown in Table 1.

Table 2 shows our outcome variables, y_1 to y_8, together with the predictors (the personality variables estimated from BFI-20 are not included in the table). Our sample consists of 3501 individuals from 20 to 89 years of age. Nineteen percent place emphasis on "organic" when purchasing food for themselves and their families. Fifty-five percent say that they are willing to pay more for meat labeled "organic", and 57% are willing to pay more for organic fruits and vegetables. Fifty-six percent think organic food is healthier than other food, and 40% of the sample participants think organic food tastes better than other food. Forty-nine percent purchased organic food in the previous year, and 29% think a large selection of organic food is important when they choose where to shop for groceries. Thirty-nine percent are not willing to pay more for organic food while 51% are willing to pay more.

The predictors consist of age and income, which are continuous, and nine different indicator variables for gender, social status, education, and place of living. Before the estimation of the models, age and income are standardized (from each observation the mean of the variable is withdrawn, and it is divided by the standard deviation) to get approximately the same scale.

We see from Table 2 that the average age is 50 years and the average household income was 502 000 NOK in 2015 (USD 62 000[4]); the sample contains 48% males, 67% of the individuals are married or cohabit, and 60% has three years or more of university education. More than half of the sample participants live in the Oslo area or other south-eastern areas, and 25% live in one of the four major cities of Norway (Oslo, Bergen, Trondheim, and Stavanger).

6. Estimation results

The estimation process was performed as follows. We first estimated the five latent personality traits with the Graded Response Model using the grm packet in R. These five personality variables were inserted into logistic regression models, as in equation (2), using the outcome variables y_1 to y_7 and the other predictors in Table 2. The models were estimated with the glm command in R. After that, the personality variables and the other predictors in Table 2 were used with y_8, and the likelihood function was coded as in equation (3). This was done in the R package intReg.

Fig. 1 shows the histograms of the estimated latent BFO-20 personality variables. They all have means close to 0, and more than 80% of the probability mass is between −1.2 and 1.2 for each of them.

[3] The surveys are performed by the research institute, Ipsos. They have done this comprehensive consumer and opinion study since 1985, and they decide which variables they want to include. The firms that purchase the data are invited to contribute with a few questions. The rest is decided by Ipsos.

[4] Average exchange rate from the Central Bank of Norway in 2015.

Table 2
The outcome variables and the predictors used in the models.

Variable	Explication	Mean	Sd
Outcome variables			
y_1	= 1 if I emphasize that the food I purchase is organic	0.19	0.39
y_2	= 1 if I agree or partly agree to the statement that I am willing to pay more for meat labeled "organic"	0.55	0.50
y_3	= 1 if I agree or partly agree to the statement that I am willing to pay more for fruits and vegetables labeled "organic"	0.57	0.50
y_4	= 1 if I agree or partly agree to the statement that organic food is more healthy than other food	0.56	0.50
y_5	= 1 if I agree or partly agree to the statement that organic food tastes better than other food	0.40	0.49
y_6	= 1 if I, on purpose, purchased organic food during the last 12 months	0.49	0.50
y_7	= 1 if a large selection of organic food is very important or important when I choose where to shop for groceries	0.29	0.45
y_8	How much are you willing to pay for organic food compared with ordinary food?		
	Nothing, I will not pay more	0.39	0.49
	Up to 15% more	0.40	0.49
	Between 16 and 30% more	0.09	0.28
	More than 31% more	0.02	0.12
	I don't know	0.11	0.32
Predictors			
Age	= Age of the individual, in years	50.02	17.44
Income	= Household income per consumer unit in 2015 (in 1000 NOK)	501.50	267.72
Male	= 1 if male, 0 otherwise	0.48	0.50
Married	= 1 if married or cohabit, 0 otherwise	0.67	0.47
University	= 1 if 3 years or more of university education, 0 otherwise	0.60	0.49
R_1	= 1 if place of living is Oslo area	0.24	0.43
R_2	= 1 if place of living is other eastern areas	0.29	0.45
R_3	= 1 if place of living is western Norway	0.24	0.43
R_4	= 1 if place of living is middle of Norway	0.15	0.35
R_5	= 1 if place of living is northern Norway	0.09	0.28
BCity	= 1 if place of living is Oslo, Bergen, Trondheim, or Stavanger	0.25	0.43

The sample consists of individuals from 20 to 89 years of age, $n = 3501$.

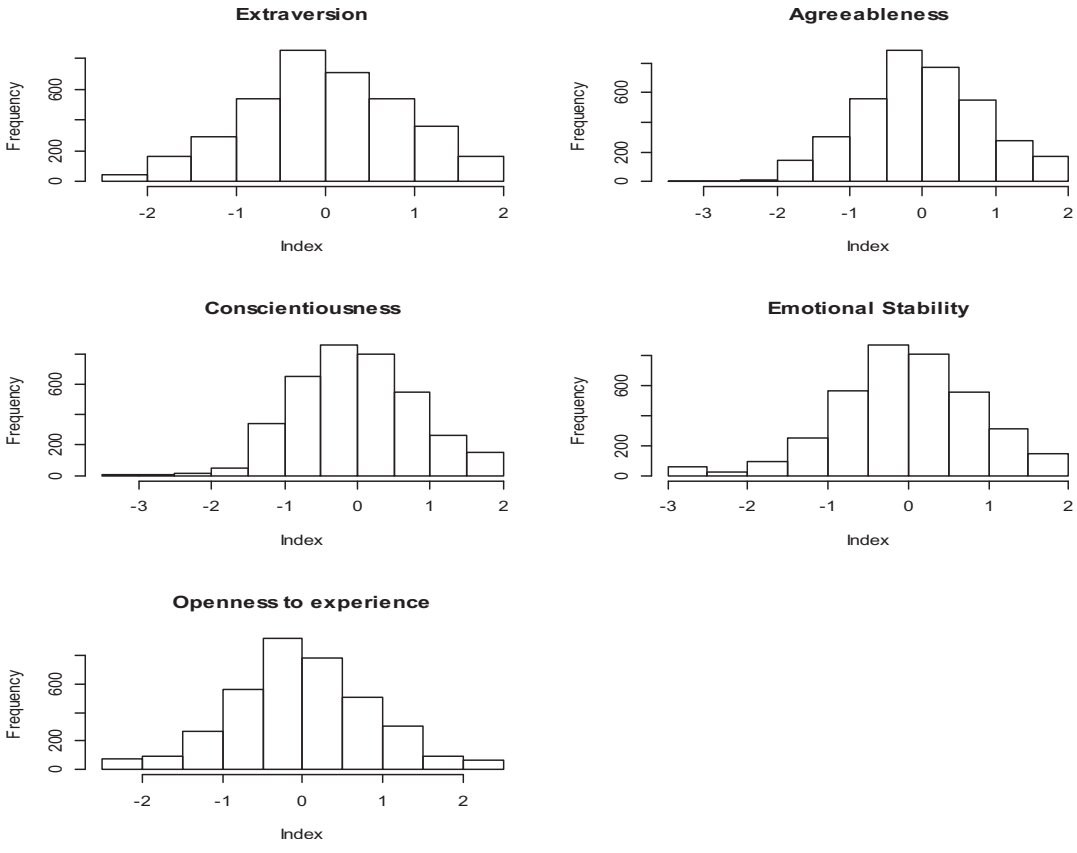

Fig. 1. Histograms of the estimated Big Five personality variables.

One can see from Table 3 that Extraversion is negative in all the seven probability models, P_1–P_7, and in four of the probability models it is significantly different from zero. This indicates that more introverts than extraverts are interested in organic food. On the other hand, Agreeableness is positively related to the interest in organic food and, in three of the models, the effect is significantly

Table 3
Estimated parameters in the logistic regression models (P_1–P_7) and WTP model.

		P_1	P_2	P_3	P_4	P_5	P_6	P_7	WTP
Intercept	Int	−1.22 * (0.15)	0.11 (0.12)	0.24* (0.12)	0.07 (0.12)	−0.34* (0.12)	−0.05 (0.12)	−0.69* (0.13)	1.39 (0.82)
Extraversion	*EE*	−0.11* (0.06)	−0.11* (0.04)	−0.13* (0.04)	−0.04 (0.04)	−0.05 (0.04)	−0.13* (0.04)	−0.04 (0.05)	−1.02* (0.29)
Agreeableness	*AA*	0.08 (0.06)	0.15* (0.04)	0.13* (0.05)	0.16* (0.05)	0.07 (0.05)	0.06 (0.05)	0.05 (0.05)	0.23 (0.32)
Conscientiousness	*CC*	−0.00 (0.06)	−0.01 (0.05)	−0.01 (0.05)	0.01 (0.05)	0.01 (0.05)	0.04 (0.05)	−0.03 (0.05)	−0.96* (0.33)
Emotional stability	*ES*	0.05 (0.06)	−0.05 (0.05)	−0.03 (0.05)	−0.08 (0.04)	−0.06 (0.05)	0.00 (0.05)	−0.02 (0.05)	−0.54 (0.31)
Openness to experience	*OE*	0.41* (0.05)	0.26* (0.04)	0.25* (0.04)	0.17* (0.04)	0.25* (0.04)	0.28* (0.04)	0.40* (0.05)	1.73* (0.29)
The age of the individual	*Age*	0.04 (0.05)	0.03 (0.03)	0.01 (0.04)	0.04 (0.04)	−0.02 (0.04)	−0.06 (0.04)	0.14* (0.04)	−0.61* (0.26)
Household income per consumer unit	*Income*	−0.04 (0.05)	0.08* (0.04)	0.06 (0.04)	0.00 (0.04)	0.03 (0.04)	0.08* (0.04)	0.03 (0.04)	0.95* (0.25)
Male	*Male*	−0.65* (0.10)	−0.41* (0.08)	−0.47* (0.08)	−0.29* (0.07)	−0.52* (0.08)	−0.53* (0.08)	−0.61* (0.08)	−2.77* (0.52)
Married	*Married*	−0.05 (0.10)	0.16 * (0.08)	0.14 (0.08)	0.22* (0.08)	0.14 (0.08)	0.06 (0.08)	0.04 (0.09)	0.55 (0.53)
University education	*University*	0.44* (0.10)	0.33* (0.08)	0.32* (0.08)	0.16* (0.08)	0.06 (0.08)	0.50* (0.08)	0.22* (0.08)	4.25* (0.54)
Lives in eastern Norway (other than the Oslo area)	R_2	−0.15 (0.13)	−0.04 (0.11)	−0.02 (0.11)	0.17 (0.11)	0.21 (0.11)	−0.11 (0.11)	−0.10 (0.12)	−1.74* (0.75)
Lives in western Norway	R_3	−0.56* (0.13)	−0.11 (0.10)	−0.08 (0.10)	0.09 (0.10)	−0.04 (0.10)	−0.26* (0.10)	−0.27 (0.11)	−1.91* (0.71)
Lives in the middle of Norway	R_4	−0.10 (0.14)	−0.06 (0.12)	−0.05 (0.12)	0.04 (0.12)	−0.14 (0.12)	−0.03 (0.12)	−0.21 (0.13)	−0.14 (0.79)
Lives in northern Norway	R_5	−0.20 (0.18)	0.02 (0.15)	0.07 (0.15)	0.17 (0.14)	0.14 (0.15)	−0.17 (0.15)	−0.42 (0.17)	−0.80 (0.99)
Lives in a big city	*BCity*	0.03 (0.12)	0.11 (0.09)	0.12 (0.09)	−0.07 (0.09)	0.01 (0.09)	0.16 (0.09)	0.10 (0.10)	0.05 (0.64)

Note: Standard deviations in parentheses. The numbers marked with asterisk are significantly different from zero at 5% level. For the place of living variables, R_2–R_5, R_1 is base.

different from zero. Neither Conscientiousness nor Emotional stability has any significant effect on the interest in organic food. However, Openness to experience is positive and significant in all the seven probability models. Additionally, most of the parameters are rather similar, around 0.25. The column on the extreme right in Table 3 shows that Extraversion and Conscientiousness are negatively associated, while Openness to experience is positively associated, with the *WTP* for organic food compared with ordinary food.

The income is not significantly different from zero, except in the equations for P_2 and P_6 and *WTP*. However, the *Male* variable has a large and negative effect in all the models. For example, for P_7, "a large selection of organic food is very important or important when I choose where to shop groceries," if we consider a woman ($Male = 0$) measured at average personality (the value of each of the personality variables is 0), and average age and income (the variables are standardized, so average age is 0 and average income is 0), not married ($Married = 0$), not university educated ($University = 0$), living in the Oslo area ($R_2 = R_3 = R_4 = R_5 = 0$), and living outside the city ($BCity = 0$), then using Table 3 we find that the expected probability is $\exp(-0.69)/(1 + \exp(-0.69)) = 0.33$. For a male assessed similarly, the expected probability measured at the same point, is $\exp(-0.69-0.61)/(1 + \exp(-0.69-0.61)) = 0.21$. That is a 12 percentage point difference in probability. Being married has a significant effect on two of the outcomes, while university education has a large effect on most of the outcomes. The "place of living" variables, R_2–R_5, have little effect on the outcomes. Further, we see from Table 3 that university educated individuals are, on average, a lot more interested in organic foods and they are willing to pay for it.

7. The connection between personality and organic food consumption

To better capture the quantitative connection between personality and behavior towards organic food, we estimated the same models as in Table 3 with the nonparametric bootstrap with 500 iterations. In each iteration, we constructed the difference of the probability in question (and *WTP*) evaluated at the 90th quantile and 10th quantile of one personality trait at the time, holding all the other personalities and other predictors fixed at their means. From the bootstrap differences in probabilities, we constructed the average and their respective *t*-statistics. The *t*-statistics can then be used to test the hypotheses: there is no difference between attitudes towards organic food for individuals high in Extraversion and individuals low in Extraversion, there is no difference in attitudes towards organic food for individuals high in Agreeableness and individuals low in Agreeableness, etc. The significant associations, at 5% level, when $|t| > 1.96$, are marked with an asterisk.

The rows in Table 4 show the estimated average difference in probabilities between the 90th quantile and the 10th quantile of

Table 4
The difference in attitudes towards organic food between individuals high and low in different personality traits.[a].

	Probabilities/WTP	Extra version	Agree-ableness	Conscien-tiousness	Emotional stability	Openness to experience	Mean
P_1	Emphasize that the food is organic	−0.05* (−2.39)	0.03 (1.48)	−0.01 (−0.30)	0.02 (0.99)	0.14* (7.21)	0.19* (26.08)
P_2	Willing to pay more for meat labeled "organic"	−0.07* (−2.53)	0.09* (3.11)	−0.02 (−0.60)	−0.03 (−1.16)	0.13* (5.43)	0.55* (61.44)
P_3	Willing to pay more for fruits and vegetables labeled "organic"	−0.06* (−2.29)	0.09* (3.01)	−0.02 (−0.62)	−0.03 (−0.96)	0.12* (5.10)	0.57* (66.30)
P_4	Organic food is more healthy than other food	−0.02 (−0.86)	0.10* (3.69)	−0.02 (−0.61)	−0.03 (−0.95)	0.07* (2.92)	0.56* (61.74)
P_5	Organic food tastes better than other food	−0.05* (−2.07)	0.05 (1.74)	−0.02 (−0.78)	−0.01 (−0.47)	0.12* (4.63)	0.40* (43.53)
P_6	Purchased organic food during the last 12 months	−0.07* (−2.39)	0.05 (1.85)	−0.00 (−0.10)	−0.00 (−0.13)	0.16* (6.47)	0.51* (55.46)
P_7	A large selection of organic food is important when selecting a grocery store	−0.02 (−1.07)	0.03 (1.09)	−0.01 (−0.53)	−0.01 (−0.61)	0.18* (8.20)	0.28* (33.37)
WTP	How much are you willing to pay for organic food compared with ordinary food? (%)	−1.22* (−2.95)	0.21 (0.50)	−1.02* (−2.38)	−0.59 (−1.42)	1.80* (4.84)	5.78* (36.88)

[a] *t*-values in parentheses. The numbers marked with asterisks are significantly different from zero at 5% level.

the personalities, and the respective *t*-statistics. In the column on the extreme right are the respective probabilities (and *WTP*) evaluated at the mean of all the predictors. Since the mean of each of the personality variables is close to 0, we see that half the difference in the trait is above the mean of the probability and half is below, i.e., p_6, the probability of having purchased organic food during the last 12 months, is 0.51. The difference in Openness to experience for p_6 is 0.16. It means that 43% of individuals low in Openness to experience (in the 10th quantile) are expected to purchase organic food while 59% of individuals high in Openness to experience (in the 90th quantile) are expected to purchase organic food. The average *WTP* for organic food compared with ordinary food is 5.78%. The difference in *WTP* between the 90th and the 10th quantile of Extraversion is −1.22. Hence, individuals low in Extraversion (i.e., introverts) are willing to pay 6.39% more for organic foods compared with ordinary foods. For individuals high in Extraversion, the *WTP* is 5.17%.

Our research hypotheses from the Introduction section can be related to Table 4. The first hypothesis (H1) is "Extraversion does not influence the attitude towards organic food". This hypothesis is not supported by the data. In six of the models, the difference between the 90th quantile of Extraversion and the 10th quantile of Extraversion is significantly negative. This indicates that Extraversion is negatively associated with the behavior towards organic foods. Introverts think organic food tastes better; they have a higher probability of purchasing organic food and a higher rate of introverts is willing to pay more for organic food.

The second hypothesis (H2) is "Agreeableness has a positively influence on the attitude towards organic foods". This hypothesis is supported in three out of eight models. Both P_2 and P_3 are significantly positive for Agreeableness, but *WTP* is positive but not significant. This means that individuals high in Agreeableness might be willing to pay more for organic foods than ordinary food. However, since the difference in *WTP* is not significantly different from zero, the individuals high in Agreeableness do not have a much higher *WTP* than individuals low in *WTP*.

The third hypothesis (H3) is "Conscientiousness does not influence the attitude towards organic foods". This hypothesis is supported by the data in all the models, except from the *WTP* model. Results from this model shows that individuals high in Conscientiousness are less willing to pay for organic foods.

The fourth hypothesis (H4) is "Emotional stability does not influence the attitude towards organic foods". This hypothesis is fully supported by the data. There is no significant difference between individuals high in Emotional stability and individuals low in Emotional stability.

The fifth hypothesis (H5) is "Openness to experience has a positive influence on the attitude towards organic foods, i.e., individuals high in the trait Openness to experience are, on average, more pro-organic than individuals low in Openness to experience". This hypothesis is fully supported by the data. The association between Openness to experience and organic food is significant and positive in all the models. And in all the models, except for one, this personality trait has the highest effect.

Of our five hypotheses, two were supported fully (H4 and H5), two were supported partly (H2 and H3), and one was rejected (H1). H4 is acceptable. With regard to H5, the positive association between Openness to experience and organic food is supported by psychological research connecting Openness to environmentally conscious behavior (DeYong et al., 2005). Openness is associated with greater cognitive ability, which relates to a greater awareness of the consequences of environmental behavior (Hirsh, 2014). In addition, individuals open to experience are more open to change, which means that they are more open to habits that they think are sustainable, such as eating organic food. Individuals high in Openness may also evaluate nature's aesthetic more than individuals low in Openness.

The positive association between Agreeableness and organic food in H2 is partly supported by data. Hirsh (2014) writes that more agreeable individuals tend to display greater empathy and compassion, whereas less agreeable individuals tend to be more selfish and antisocial. In addition, the positive relationship between agreeableness and environmental concern is consistent with research demonstrating that altruistic concerns are one of the major components of pro-environmental attitudes.

Regarding H3, except for a less *WTP* for organic food, Conscientiousness is not associated with either positive or negative attitudes towards organic food. The reason for the negative *WTP* among individuals high in Conscientiousness may be found in Norwegian small-scale farming (Kvakkestad et al., 2018), with excellent plant health and animal health. Most Norwegians do not see a big difference between organic food and ordinary food. That opens the possibility that individuals high in Conscientiousness may be more aware of that than individuals low in Conscientiousness.

Regarding H1, the data shows that introverted individuals are more positive towards organic food than extraverted ones. Why is it so? One explanation is that there are some traits or values that are negatively correlated with extraversion and positively correlated with organic food, or vice versa.

We know that some personalities choose organic food more often than others, but we do not know their motives. Do they do it because it is their aim to contribute commonly to sustainability? Or do they choose it because of their care for their own body? Or is it a combination of several motives? Such questions open areas for looking more into the fine tuning between personalities and motivation, and how this relates to cleaner production. However, the psychological interpretation should also be supported with a more sociological perspective.

Since the late 1980s, it has been an ambition for The Norwegian Agricultural Authority (NAA) to increase the production and consumption of organic food in Norway. The last few governments had different ambitions about organic production and consumption. The targets have previously been 15% organic food production and consumption by 2015,[5] and 15% by 2020.[6] The seated government's goal is "to stimulate organic production demanded in the market".[7] However, the desired evolution has proven to be a long and winding road. In 2018, NAA reported that the market shares for organic food in the first half of 2018 accounted for 2% of the total sale of food products in Norway.

Although the production and consumption have grown slightly, the organic products do not compete with the conventional bulk product qualities. This lack of demand has partly been ascribed to the notion that the Norwegian consumers understand conventional products as having similar qualities as that of organic (Storstad and Bjørhaug, 2003; Vittersø and Tangeland, 2015). The discourse of understanding and framing food products is, thus, related to how it is understood by different persons. Representations of organic food, with a strong distinction to standard products, may be understood as more attractive for consumers with high Openness to experience. Accordingly, organic products communicated and understood as being more similar to standard products may be more attractive

[5] https://www.regjeringen.no/globalassets/upload/smk/vedlegg/2005/regjeringsplatform_soriamoria.pdf (Retrieved April 1st, 2019).

[6] https://www.regjeringen.no/globalassets/upload/smk/vedlegg/2009/ny_politisk_plattform_2009-2013.pdf (Retrieved April 1st, 2019).

[7] https://www.regjeringen.no/contentassets/e4c3cfd7e4d4458fa8d3d2bb1e43bcbb/plattform.pdf (Retrieved April 1st, 2019).

for consumers with a low Openness to experience. One may, therefore, ask, what would happen if qualities of organic foods had been framed differently in the Norwegian discourse on organic food? Would this have impacted differently on different personalities? If so, stakeholders should take the connection between the psychological trait of Openness to experience, organic food, and the subsequent discursive conditions into account when deciding how to develop their strategies.

8. Conclusion

A wide range of variables, dimensions, and initiatives have been analyzed and identified to understand and promote sustainable consumption in the last few years.[8] In this article, we have elaborated on a set of consumer background variables for individuals' understanding and consuming of organic food by focusing on personality. In this regard, the well known aphorism "Tell me what you eat, and I will tell you what you are",[9] by the famous gastronome Jean Anthelme Brillat-Savarin, is an appropriate inspiration for a further concluding discussion on sustainable consumption in general, and more specifically the question: Are there any personality traits that characterize people demanding/purchasing/consuming organic food?

Our results show that consumers' personality have an impact on the consumption of organic food. This may support psychological research that have linked environmental concern with the personality traits of Agreeableness and Openness to experience (Hirsh, 2010; Milfont and Sibley, 2012; Nisbeth et al., 2009).

From a personality perspective, the results show that, in all models, the latent variable Openness to experience is a significant predictor for purchasing/consuming/preferring organic food. In all choices made by the individuals, this personality trait was one of the most important predictors. Individuals with the highest score on Openness to experience purchase organic food more often. They understand organic food as being healthier than other foods. They report that organic food tastes better than other foods. They also report that they are willing to pay a higher price for organic food than for conventional food. The personality trait Openness to experience also includes interests in trying new experiences, new foods, new tastes, things that are different, etc. This can explain the higher interest for organic food by people who score high on Openness to experience than people that score low. However, the trait Openness to experience may also indicate a willingness to believe organic food as being better than other foods and qualities. "Organic" is a credence attribute and a lot of positive qualities are related to organic food.

Our analysis indicates a need to develop more knowledge and understanding of consumers' personality, preferences, and behavior, and to relate this to discursive dynamics. New research questions and hypothesis can be related to whether the personality trait of Openness to experience is related to the history of a product in the market and the theory of diffusion of innovations (Rogers, 2003 [1962]). Is a product that has been in the market for a longer period understood as less "new" aesthetically or culturally? And what are the consequences? These questions may be approached by comparing the age of different food in the market and seeing if this has an impact on how they are perceived by consumers who score low and high on Openness to experience. A possible way to do this may be to relate consumers' personality to products that have different qualities and have been introduced at different stages in the market. The combination of personality and adoption may be further studied to understand the impact of personality on consumption in general. In addition to organic food, this may also include local food specialties, "standard" food, and also new qualities represented by products such as insects, GMO, and others. More knowledge about early adopters of sustainable qualities and their personal traits should be of increased interest when transitioning to more sustainable consumption and cleaner production.

[8] The restriction of space does not allow us to elucidate the diversity of topics and perspectives through extended examples. However, only in JoCP has this been given considerable attention. *Wellbeing* (Guillen-Royo, 2019), *Sharing economy* (Wang et al. (2019), and *Trust* (Vega-Zamora et al., 2019) are a few examples.

[9] *Dis-moi ce que tu manges, je te dirai ce que tu es,* Jean Anthelme Brillat-Savarin, *Physiologie du Goût* (1825).

Declaration of competing 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.

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