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Journal of Cleaner Production 275 (2020) 123058

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Increasing organic food consumption: An integrating model of drivers and barriers

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ARTICLE INFO

Article history:
Received 27 July 2019
Received in revised form
22 June 2020
Accepted 23 June 2020
Available online 14 July 2020

Handling editor. Cecilia Maria Villas Bôas de Almeida

Keywords:
Organic food
Healthy nutrition
Sustainable food consumption
Environmental awareness
Behavioral decision-making

ABSTRACT

A survey of 620 Swiss households was conducted to investigate the determinants of purchases of organic fruits and vegetables and identify subjectively perceived requirements for more environmentally friendly and healthier food consumption. An integrative behavior model incorporating various psychological and socio-structural variables was applied to explain the ratio of organic vs. non-organic purchases. The theory of planned behavior was considered fundamental for the development of this integrative model, and supplementary variables were included, accounting for moral justifications, education level, income, and further aspects. The resulting model accounted for 42% of the variance of organic food consumption. Financial and environmental justifications for purchasing non-organic food resulted as the most important predictors, followed by recent consumption changes, health-related aspects of attitudes and social norms, perceived behavioral control, environmental values, income, and education level. The participants considered more knowledge and information and having more money at their disposal to be important requirements for achieving more environmentally friendly and healthier food consumption. Furthermore, they considered having more time to prepare meals oneself as particularly important to achieving healthier food consumption.

1. Introduction

Food production and consumption have large impacts on the environment as well as on people's health. Therefore, it is important to achieve transformations towards greater sustainability in the food sector. In this regard, organic food production is an important approach (Muller et al., 2017; Squalli and Adamkiewicz, 2018). Various life-cycle assessments have demonstrated environmental benefits of organic food consumption, considering criteria such as biodiversity, ecotoxicity impacts and the soil quality of the cultivated land (cf. He et al., 2018; Jungbluth et al., 2000; Meier et al., 2015; Muller, 2009; Treu et al., 2017; Tricase et al., 2018; Tuomisto et al., 2012). Organic food products are also strongly associated with improvements in food quality and health due to reduced pesticide residues and heavy metals compared to conventional food (Engels et al., 2010; Johansson et al., 2014; Nicolopoulou-Stamati et al., 2016; Probst et al., 2010; Saba and Messina, 2003; WHO, 1990). European Union (EU) standards for organic food production aim at sustainable agriculture and food processing to protect natural ecosystems and the health of soil, water, plants, and animals, as well as the production of high-quality nutritional foods that prevent harm to human health (EU, 2007). In Switzerland, where this study was conducted, food products need to fulfill criteria equivalent to the organic standards of the EU as a basic requirement in order to be marketed as organic products. However, various organic food labels used in Switzerland, such as Bio-Knospe, Naturplan, and Demeter, have developed their own ecological, ethical, and social standards, which exceed basic legal requirements (Bio-Suisse, 2018).

The operative decision to produce food organically is taken by

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https://doi.org/10.1016/j.jclepro.2020.123058

farmers whose decisions are strongly based on market-oriented considerations (Monfared et al., 2015; Morris and Potter, 1995). Therefore, the demand for organic products is crucial for transforming agricultural production in more ecological and sustainable directions (Arya et al., 2009). It is thus very important to understand the psychological and structural determinants underlying preference formation and purchase decisions regarding organic products (e.g. Bilal Basha and Lal, 2019; Michaelidou and Hassan, 2008; Yazdanpanah and Forouzani, 2015). Towards that end, an integrative behavioral model of organic food consumption, which considers a comprehensive set of predictors found relevant in previous research (e.g. Arvola et al., 2008; Di Vita et al., 2019; Oraman and Unakitan, 2010; Saba and Messina, 2003; Thøgersen and Ölander, 2006; Torres-Ruiz et al., 2018a; Yazdanpanah and Forouzani, 2015), was developed. In addition, this study inquires into consumers' subjective perception of possible barriers to more environmentally friendly and healthier food consumption to substantiate recommendations for promoting organic food products (cf. Mkhize and Ellis, 2019; Shashi et al., 2015; Torres-Ruiz et al., 2018b). The aim is to support the development and implementation of policy interventions, education and marketing activities around organic food consumption and to provide valuable insights for the further development of behavioral decision-making models. A particular focus in the latter regard is on the role of justifications and moral aspects of organic food consumption.

In the following, previous findings of psychological consumer research on organic food consumption will be presented and the conceptual framework and hypotheses of this study will be explained. Thereafter the proceeding, questionnaire and participants will be described in a method section. Then the results of the statistical analyses will be shown followed by a discussion section, where the findings are interpreted and connected to previous research and implications for practice. Finally main insights gained through this study are summarized in the concluding section.

2. Previous research on determinants of organic food consumption

2.1. Theory of planned behavior (TPB) and further behavioral decision making models

Consumers are increasingly concerned about being exposed to toxic substances such as pesticide residues in their diet. Corresponding risk perceptions and health beliefs have contributed to the trend in favor of organic food products observed in recent years, as consumers purchasing organic products appear to be motivated by personal as well as environmental concerns (Baker et al., 2004; Chekima et al., 2017, 2019; Dickson-Spillmann et al., 2011; European Commission, 2006; Magnusson et al., 2003; Oraman and Unakitan, 2010; Schifferstein and Oude Ophuis, 1998; Siegrist et al., 2015; Singh and Verma, 2017).

Various psychological models – such as the norm activation model (Schwartz, 1977), the value-belief norm model (Stern et al., 1999), the model of interpersonal behavior (Triandis, 1977, 1980), the focus theory of normative conduct (Cialdini et al., 1990; Reno et al., 1993) and many more (see e.g. Jackson, 2005) – have been developed to predict ecologically relevant behavior of individuals.

Among these models, the TPB (Ajzen, 1991, 2012) has gained large recognition because of its high explanative power. The TPB is a further development of the theory of reasoned action (Fishbein and Ajzen, 1975) and has been frequently applied to explain behaviors in diverse domains (Armitage and Conner, 2001), including health-related behavior (Watson et al., 2014; Zemore and Ajzen, 2014), nutrition-related behavior (Chao, 2012; Johe and Bhullar, 2016; Lorenz et al., 2015; Riebl et al., 2015; Vermeir and Verbeke, 2008), and also choices between organic and non-organic food products (e.g. Aertsens et al., 2009; Arvola et.al., 2008; Chen, 2007; Scalco et al., 2017; Tarkiainen and Sundqvist, 2005; Yazdanpanah and Forouzani, 2015).

According to the TPB, behavioral intentions are the most powerful determinants of behavior, and are themselves determined by i) an individual's attitude towards a behavior, ii) subjectively perceived social norms, and iii) his or her perceived behavioral control. Attitudes towards a behavior are, in turn, determined by the evaluation of subjectively expected consequences. Subjectively perceived social norms are determined by behavioral expectations of important persons in the social environment and by an individual's motivation to comply with these expectations. Perceived behavioral control reflects an assessment of existing restrictions and options and one's personal ability to actually perform a particular behavior successfully.

In a meta-analysis of 185 studies by Armitage and Conner (2001), the TPB model explained an average of 27% of the variance of a broad range of behaviors and 39% of the variance in behavior intentions in a broad variety of domains. Attitudes resulted as the strongest predictor of intentions, followed by perceived behavioral control and subjective norms. In a TPB meta-analysis of studies on food related behaviors, Riebl et al. (2015) found likewise that attitudes are the best predictor of intentions, followed by perceived behavioral control and subjective norms, but there were also substantial variations across studies in this regard.

2.2. The role of moral norms and justifications in organic food consumption

The strong relation between intentions and behaviors assumed by the TPB has been repeatedly validated empirically (Ajzen, 1991, 2012; Webb and Sheeran, 2006), but there still remains what is known as an intention–behavior gap, which researchers and those concerned with interventions aiming at behavioral change in practice would like to close (Sheeran, 2002). It is interesting to note in this regard that various studies have shown that feelings of moral obligation increase the likelihood that intentions are realized (Godin et al., 2005; Sheeran and Webb, 2016), while at the same time justifications connected to moral licensing increase the intention–behavior gap between positive environmental or social intentions and behaviors (De Witt Huberts et al., 2012, 2014a; 2014b; Taylor et al., 2014).

Various researchers thus suggested extending the TPB by adding a moral component to it when explaining ethically relevant behaviors (e.g. Armitage and Conner, 2001; Kaiser, 2006; Kaiser and Scheuthle, 2003; Sun, 2019). Indeed, Ajzen (1991) himself found that supplementing the usual TPB variables with measures of "perceived moral obligation further increased the explained variance by 3–6%" (p. 200) in the prediction of various behaviors with clear moral implications. Recent TPB studies on the choice between organic and conventional food products by Arvola et al. (2008) and Yazdanpanah and Forouzani (2015) likewise found that adding a moral component to the TPB model increased its explanative power.

The role of moral considerations and ethics in explaining human behavior and in particular of sustainable consumption decisions has attracted substantial research interest (Ellemers et al., 2019; Goldman et al., 2020; Valor et al., 2020). In this context, processes of justifications may explain why people sometimes take behavioral decisions that run counter to their own moral standards. According to the Neutralization theory by Sykes and Matza (1957) justifications can neutralize personally internalized moral norms and thus protect individuals from the self-blame which would normally be connected to violating such norms. Neutralization theory was

originally applied by Sykes and Matza and others in criminological research (e.g., Copes, 2003; Costello, 2000). However, studies have shown that justifications play a similarly crucial role in the domain of ecologically relevant behavior, where they can analogously deactivate moral norms that could otherwise prevent humans from engaging in environmentally harmful behaviors (De Witt Huberts et al., 2012, 2014a; 2014b; Diekmann and Preisendörfer, 1992; Fritsche, 1999; Hansmann et al., 2006a; Hansmann and Steimer, 2015, 2017; Schahn et al., 1995; Taylor et al., 2014).

Justifications preceding environmentally negative behaviors can be understood as neutralizations, which facilitate such violations of pro-environmental norms, whereas justifications developed after environmentally negative norm-violating behaviors represent rationalizations (Goldman et al., 2020; Sykes and Matza, 1957). However, rationalizations for environmentally harmful behavior in the past can serve as neutralizations facilitating the performance of similar harmful behaviors in the future, and "negative environmental behavior can thus be stabilized over time leading to the formation of negative habits" (Goldman et al., p. 130).

2.3. Previous research on further influential variables

Besides TPB-related variables and justification, scholars found various additional aspects to be significantly related to purchases of organic food products.

Firstly, basic environmental values are crucial (Stern, 2000; Stern et al., 1999), since a consistency between the values of consumers and the values represented by organic labels is critical for food choices in favor of organic products (Engels et al., 2010; Hansmann et al., 2006b). General environmental values are conceptually closely related to general environmental attitudes. A recent study by Chekima et al. (2019) suggests distinguishing between general environmental attitudes and product-specific attitudes when aiming to predict organic food consumption. This differentiation is supported by the claim of Ajzen (1991) that specific attitudes possess higher explanative power for the prediction of certain behaviors compared to general attitudes.

Secondly, knowledge and trust influence consumer behavior, according to previous research (Bamberg and Möser, 2007; Hines et al., 1987; Lazzarini et al., 2017; Mkhize and Ellis, 2019; Siegrist, 2000; Siegrist et al., 2000; Vega-Zamora et al., 2019; Vittersø and Tangeland, 2015). Trust in labels seems to be a particularly important factor, because consumers are usually not able to determine themselves whether or not standards of organic food production have been met for a product (Daugbjerg et al., 2014; Mkhize and Ellis, 2019; Weiber and Adler, 1995). Consumers' trust thus represents a prerequisite for the market success of sustainability-oriented labels (Barney and Hansen, 1994; Hansmann et al., 2006b) and has been identified as a crucial determinant for purchasing decisions regarding organic food products (Konuk, 2018; Nuttavuthisit and Thø;gersen, 2017; Saba and Messina, 2003; Torres-Ruiz et al., 2018a; Vega-Zamora et al., 2019).

Thirdly, structural and socio-demographic variables have been shown to be related to organic food purchases. Both higher income and higher education levels were found to be associated with increased purchasing intentions and actual purchases of organic food products (Di Vita et al., 2019; Shashi et al., 2015; Wier et al., 2008).

Furthermore, relations to life stages or life events have been found. Studies showed that the presence of small children in a household relates to a higher share of organic food purchases, presumably because parents of young children are more concerned about health and food safety issues (Hartmann et al., 2014; Olson, 2005).

2.4. Conceptual framework and hypotheses of this study

In this study, an encompassing environmental behavior model including diverse variables substantiated by previous research was applied to explain the consumption of organic fruit and vegetables in Switzerland. Fig. 1 presents a schematic depiction of this integrative model which considers TPB-related psychological variables together with further psychological and behavioral variables, and objective aspects represented by socioeconomic and demographic variables.

A set of seven hypotheses was developed in relation to the integrative model as described in the following. These hypotheses were considered confirmed if the corresponding variables proved to be significant predictors in the linear multiple regression representing the integrative behavioral model.

In line with a majority of previous findings regarding TPB, the following Hypothesis 1 was formulated: Variables related to the three TPB constructs a) attitude b) subjective norms, and c) perceived behavioral control are significantly connected to purchases of organic fruits and vegetables.

A moral component referring to the acceptance of justifications for buying non-organic products was included in the integrative behavior model, as previous research outlined above suggests that organic consumption has considerable moral significance. A corresponding Hypothesis 2 was formulated: Justifications for purchasing non-organic products are negatively related to organic purchases.

With regard to general environmental values, Hypothesis 3 was formulated, as previous research indicates a positive connection to organic consumption.

Hypothesis 3. General environmental concern is positively related to organic purchases.

Furthermore, knowledge, acceptance, and trust regarding the standards for organic food products are considered in the integrative model and based on previous research.

Hypothesis 4. a) Knowledge, b) evaluation, and c) trust with regard to label standards are positively related to organic purchases.

Non-psychological contextual and demographic factors (e.g., household income, number of persons living in the household, gender, age, and level of education) are also considered in the integrative model and previous findings allowed us to formulate the corresponding Hypotheses 5 and 6 in relation to two of these variables, namely income and education level.

Hypothesis 5. Income is positively related to organic purchases.

Hypothesis 6. Education level is positively related to organic purchases.

Recent changes towards increased or decreased consumption of organic foods were integrated into the behavioral model to arrive at a more encompassing and dynamic model of behavior and behavioral change. A corresponding Hypothesis 7 was formulated based on the basic statistical consideration that increases in the past contribute to a high current level.

Hypothesis 7. Recent increases in the share of purchase of organic fruit and vegetables are positively related to their current share in such purchases.

Regarding subjectively perceived barriers to healthier and more ecologically friendly consumption, no explicit hypotheses were formulated, since this complementary part of the study was considered explorative. The corresponding findings will be related to previous studies in the Discussion.

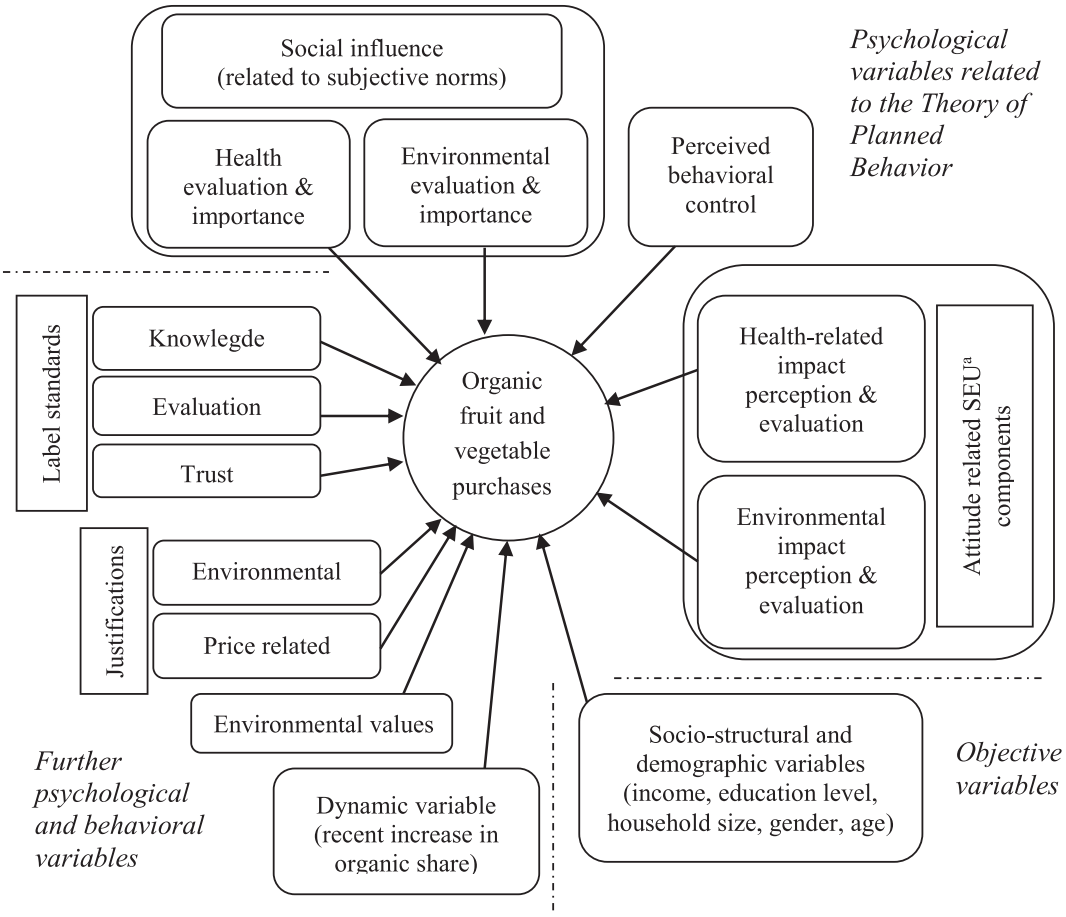

Fig. 1. Integrative conceptual framework for the explanation of choices between organic and non-organic fruit and vegetable purchases.
[a] SEU = Subjective expected utility.

3. Method

3.1. Survey implementation

The survey was conducted online from 8th August to 16th September 2018. Invitations were sent out by conventional mail to a stratified random sample of 3000 Swiss households drawn from the address register of the Swiss Federal Statistical Office. The study thus aimed at a large sample size, which seemed important as manifold variables were to be included in a complex multiple regression model to explain organic fruit and vegetable purchases. To increase the response rate, an additional reminder was mailed three weeks after the invitation letter to those households that had not responded to the survey. In a deviation from a genuine random sampling approach, a stratification based on two variables was conducted to obtain more responses from households with recently born children and from persons who had recently moved into a new home, which are two factors known from previous research to influence food consumption behavior (e.g., El Ansari et al., 2012; Hartmann et al., 2014). Accordingly, 30% (N = 900) of the invited households included a recently born household member (born after 31st March 2017), and an additional 30% (N = 900) were households that had recently moved to a new address (or where at least one person had moved in after 31st March 2017). The postal invitations contained a link to the online survey, and the invitation letter specifically encouraged that the person of the household mostly concerned with nutrition purchases be designated as the survey respondent.

3.2. Questionnaire

The questionnaire addressed demographic and structural variables, along with food consumption patterns and possible recent changes in this regard, as well as psychological predictor variables. In addition, respondents were asked to identify requirements for healthier and more environmentally friendly food consumption.

Considerable care was taken to ensure that the measures of psychological constructs that were developed and selected by the authors of this study represent valid representations of the psychological constructs to be measured. However, social desirability bias and limitations of participants' recall and introspection capabilities may impair the accuracy and validity of the obtained responses. Additional studies assessing actually observed behaviors are therefore important (see section *4.3. Limitations and future research needs*). Furthermore, it is known that psychological scales using various items to measure a certain psychological construct tend to have a higher reliability than single item measures. However, at the same time a brief questionnaire seemed important to reduce the probability of dropouts during participation and to not overload the voluntary and unpaid participants in our sample. Since our questionnaire assessed manifold psychological constructs and also asked for detailed nutrition consumption patterns (not addressed in this study), we thus used only selected items of a longer scale and single items for the measurement of the psychological constructs.

The items for psychological constructs related to the TPB that were included in the survey do not represent an exact or rigid

implementation of the TPB as described by Ajzen (1991). Intentions were not assessed because self-reported past behavior served as the dependent variable to be explained. Furthermore, variables related to subjectively perceived social norms, and attitude antecedents resulting from cross-products between expected outcomes and their evaluation were only addressed in relation to health and environmental aspects.

Justification items were formulated in relation to price and environmental aspects, as previous research shows that high prices of organic products are a major barrier to organic consumption (Di Vita et al., 2019; Shashi et al., 2015; Vittersø and Tangeland, 2015) and that organic food products have considerable negative environmental impacts (cf. Bosona and Gebresenbet, 2018; Chapa et al., 2019; Ghasemi et al., 2018; Jungbluth et al., 2000; Ronga et al., 2019).

In the following sub-sections, a detailed description of these parts is provided according to their sequence in the questionnaire.

3.2.1. Demographic and socio-structural variables, life events

The first items of the questionnaire asked participants to identify their gender and age. Items requesting further personal information such as nationality, level of education, household income, type and number of persons living in the household were asked at the end of the survey following respondents' completion of the parts described in the following sub-sections.

3.2.2. Food consumption patterns and possible recent changes

The participants were asked about the proportion of organic fruits and vegetables among the total amount of fruits and vegetables they had recently purchased. This was measured on a five-point Likert scale (1 = *only conventional*, 2 = *mainly conventional*, 3 = *roughly equal share of conventional and organic fruits and vegetables*, 4 = *mainly organic*, 5 = *only organic*) along with an additional response option that was separate from the scale: "I did not purchase any fruits or vegetables recently." This self-reported past behavior served as the main dependent variable of the environmental behavior models applied in the study. Participants were also asked whether or not they had changed their diet in any way during the last 12 months, and if so, they were asked whether they were currently eating more or less organic food products than they had previously consumed (five-point Likert scale: 1 = *less than before;* 2 = *slightly less than before;* 3 = *unchanged; 4 = more than before*; 5 = *more than before*). A one-year period was used as a reference period for this item because it was expected that recalling this period would still be feasible for the participants, while choosing a considerably smaller period (e.g. one week) would have severely limited the probability of obtaining a substantial number of cases where such changes had been experienced. In addition, this part contained various detailed questions on the nutrition behavior of the participants that are not investigated in this study.

3.2.3. Life events

The third part of the survey asked whether certain life events had occurred during the last 12 months. Two items asked for the birth or adoption of a first child, and for the birth or adoption of a second or subsequent child. Two further items asked whether the participants had moved to a new place (a different village, town or town quarter), and whether they had changed their workplace (or entered a new education program) during the last 12 months.

3.2.4. Psychological predictor variables

As suggested by Ajzen (1991), antecedents of attitudes were assessed in a multiplicative form with cross-products of importance ratings and corresponding beliefs concerning organic food products. The focus was exclusively on health- and environment-oriented aspects of attitudes. The level of agreement with the importance statements ("A healthy diet is particularly important to me" and "An environmentally conscious diet is particularly important to me") as well as the evaluative statements ("Organically produced food is particularly healthy" and "Organically produced food is particularly environmentally friendly") was measured on five-point Likert scales (1 = *disagree*, 2 = *rather disagree*, 3 = *undecided*, 4 = *rather agree* to 5 = *agree*). These response options were ordered visually as a scale in the questionnaire and in addition, apart from the scale "*I do not want to respond to this question*" and "*I do not know*" were offered as further response options. It was thus ensured, and pretests confirmed, that participants perceived the third response option as between "*rather disagree*" and "*rather agree*" on the scale.

Perceived behavioral control was assessed with just one item asking for the level of agreement on the same five-point scale with the statement "If I want to buy organic fruits and vegetables, I can buy them."

Subjectively perceived social norms were elicited as a cross-product of importance ratings and evaluations attributed to significant others in the participant's social environment. For this purpose, items focused on health- and environment-related social norms elicited participants' levels of agreement with the respective statements "Many people who are important to me pay attention to a healthy diet" and "Many people who are important to me pay attention to an environmentally conscious diet," as well as "Many people who are important to me think organic food is healthy" and "Many people who are important to me consider organic food to be environmentally friendly." Accordingly, these items do not explicitly address the injunctive social pressure exerted by significant others and the motivation of participants to comply with these social expectations. This represents a deviation from the cross-products recommended by Ajzen (1991) for measuring antecedents of subjective norms. It was, however, feared that injunctive formulations addressing felt social pressure and asking about the motivation to comply with the norms of others may elicit reactance and could thus distort participants' responses, as people prefer to determine their behavioral norms autonomously (Brehm, 1972). Research on social norms has shown that individuals can be influenced by social conformity pressures when perceiving the opinions of others and their behavior, even if these others do not express injunctive norms, behavioral expectations or requirements to conform (e.g. Asch, 1956; Cialdini et al., 1990; Levine, 2013; Paulus, 2015; Reno et al., 1993). Accordingly, it seemed interesting and promising to assess social pressure by using non-injunctive items of social influence in this study.

Knowledge of the standards of organic labels was assessed on a subjective basis through the direct question "Do you know the standards or conditions that organically produced fruit and vegetables must meet in order to be allowed to be labeled 'organic'?" (Likert scale: 1 = *no*, 2 = *rather no*, 3 = *undecided*, 4 = *rather yes*, 5 = *yes*; with the additional response options "*I do not want to respond to this question*" and "*I do not know*"). Trust in the compliance of organic food producers with certified standards was assessed through soliciting levels of agreement with the statement "With the organic labels for food, one can rely on compliance with their standards in general," and an evaluation of these standards was elicited through querying respondents' levels of agreement with the statement "The standards that organic labels prescribe for food are mostly meaningful."

Furthermore, agreement with regard to two justifications for purchasing conventional food products was assessed, namely "Buying organic fruits and vegetables is too expensive for me" and "Even organic products pollute the environment, and therefore it is also okay to buy fruits and vegetables that are not organic" (the

same five-point Likert scale as above). To measure environmental values, four items were selected from the revised New Environmental Paradigm (NEP) scale (Dunlap et al., 2000), which was translated into German by Seidl et al. (2011). The bases of the items' selection were rather high item-scale correlations (all above $r = 0.40$) and content-related considerations. The incorporated items assessed levels of agreement with the statements 1) "When humans intervene in the processes of nature, this often has catastrophic consequences"; 2) "The environment is heavily abused by humans"; 3) "Plants and animals have the same right to exist as humans"; and 4) "The balance of nature is strong enough to cope with the impacts of modern industrial nations" on five-point agreement scales (reversely poled for item 4).

3.2.5. Requirements for healthier and more environmentally friendly food consumption

Participants were additionally asked what they were lacking in terms of healthier and more environmentally friendly food consumption. For this purpose, five possibilities were presented: 1) "access to better restaurant options"; 2) "access to better shopping facilities"; 3) "more time to prepare meals myself"; 4) "more money to buy more environmentally friendly/healthy food products"; and 5) "more knowledge and information on environmental/health aspects of different foods." Agreement with each of these possibilities regarding improvements for health and environmental protection was rated by the participants on a five-point scale.

3.3. Participants

A total of 620 persons completed the survey fully, which corresponds to a participation rate of 20.7% in relation to the 3000 invitations that were sent. There were in addition 37 persons, who logged themselves into the survey, but did not complete it. These persons were excluded from all statistical analyses. The number of responses nevertheless varies between different items since various items of the questionnaire contained the options "I do not want to respond to this question" and "I do not know". The resulting number of participants nevertheless allowed for conducting a complex multiple linear regression analysis with considerable statistical power to also detect weak effects and with robustness against possible moderate violations of the multivariate normal distribution assumption (cf. Bortz, 1999). Table 1 shows the distribution of the participants regarding gender, age, nationality, income, education level, and type and size of their household. For age and number of persons in the household, average values are also presented there. In addition, the distribution of specific life events during the last 12 months in the sample is shown there (birth or adoption of the first or a subsequent child; having moved to a new place; change of job and/or workplace or education).

4. Results

4.1. Consumption of organic fruits and vegetables

A total of 589 participants responded to the question of whether they mainly bought organic or conventionally grown fruits and vegetables. The response distribution was 7.5% *conventional only*, 27.7% *mainly conventional*, 33.3% *approximately the same amount of organic and conventional*, 25.8 *mainly organic*, and 5.8% *organic only*. On the corresponding five-point scale, the mean value was 2.95 ($SD = 1.03$), which is very close to the 3-point scale value of "approximately the same amount of organic and conventional" products. Males ($M = 2.90$, $SD = 1.04$) and females ($M = 2.99$, $SD = 1.02$) did not differ significantly with regard to their preference for organic fruits and vegetables (t-test, $p = .28$), nor did Swiss ($M = 2.96$, $SD = 1.03$) and non-Swiss participants ($M = 2.85$, $SD = 1.04$, $p = .29$). The two variables "moving home" (t-test, $p = .40$) and "change in work-place or a starting a new (professional) education during the last 12 months" ($p = .28$) were not significantly related to the proportion of purchased organic fruits and vegetables, nor were the "birth or adoption of the first child" ($p = .67$) or "birth or adoption of subsequent children" ($p = .82$).

No significant correlation was found between the number of persons living in the household and the share of organic fruits and vegetables ($r = 0.01$, $p = .87$), nor was there a significant relationship between the type of household and the proportion of organic food purchases (one-way ANOVA, $p = .32$). However, there were significant positive correlations between the income and education levels of the participants and the proportion of organic fruits and vegetables they consumed (for income $r = 0.19$, $p < .001$ and for education level $r = 0.21$, $p < .001$).

4.2. Recent dietary changes in favor or disfavor of organic food products

Among the 620 participants, a large majority of 77.3% reported that they had not changed their food consumption patterns during the last 12 months, whereas 22.3% reported such changes and 0.5% responded with "I do not know." There was no significant difference between the males (19.7% "yes") and the females (24.5%) in this regard (Chi-square test, df = 1, $p = .125$; participants responding with "I do not know" were excluded from this test). However, a higher proportion of younger people than older people reported having changed their food habits. A t-test comparing the age of those who reported changes in their food related behavior ($M_{age} = 41.9$ years) versus those who did not ($M = 45.7$ years) revealed a significant difference ($p = .007$), thus suggesting that food habits become more stable with higher age.

Those participants who had reported dietary changes during the last 12 months were additionally asked whether they were eating more or fewer organic food products at the time of the survey. Only 4.4% of these persons reported currently eating somewhat less (1.5%) or much less (2.9%) organic foods, whereas 39.4% claimed that their change in diet did not affect the proportion of organic food products they consumed and 56.2% reported eating somewhat more (33.6%) or much more (23.6%) organically produced foods. Thus, the data revealed a clear trend towards the increased consumption of organic food products. There was no significant relationship between age and increased or decreased (1 = *somewhat less* to 5 = *much more* organic products) consumption of organic food products ($r = -0.05$, $p = 0.539$), nor was there a significant gender difference in this regard ($M_{female} = 3.7$, $M_{male} = 3.8$, t-test: $p = 0.36$).

4.3. Attitudes, subjective norms, and perceived behavioral control

Table 2 presents the average values for the TPB-related items and predictors. It was deemed useful to investigate whether participants considered a healthy or an environmentally friendly diet to be more important. Paired sample t-tests showed that a healthy diet ($M = 4.3$) was significantly more important for the participants than an environmentally conscious diet ($M = 4.0$, $p < .001$). A difference could also be observed for corresponding judgments about other persons. The level of agreement with the statement that other personally important people pay attention to a healthy diet ($M = 3.8$) was significantly higher than the mean value of agreement with the statement that important others pay attention to an environmentally conscious diet ($M = 3.4$, $p < .001$).

The difference between agreement with the statements "Organically produced food is particularly environmentally

Table 1
Distribution of survey participants with regard to the socio-demographic variables gender, age, nationality, household income, education level, type and size of household and selected life events.

Gender ($n = 620$)	Percentage (%)
Female	52.3
Male	47.6
Other	0.2
Age ($n = 620$), $M = 44.9$, $SD = 15.7$, *median* = 39.5	
15–24 years (*min.* = 20)	2.3
25–34 years	31.6
35–54 years	40.3
55–74 years	21.1
75 years or more (max. = 97 years)	4.7
Nationality ($n = 617$)[a]	
Swiss	81.8
Not Swiss	18.2
Household income ($n = 534$)[a]	
less than 60 000 CHF/year	22.5
60 001–88 000 CHF/year	25.5
88 001–120 000 CHF/year	24.2
120 001–164 999 CHF/year	15.9
165 000 CHF/year or higher	12.0
Education level ($n = 601$)[a]	
Compulsory school	8.5
Vocational commercial school, vocational secondary school, secondary diploma certificate or similar	41.6
High school degree	6.0
University or technical college degree	39.6
Completed doctorate	4.3
Type of household ($n = 605$)[a]	
Single-person households	20.0
Couples without children	25.1
Couples with children	46.3
Other categories, e.g., flat-sharing communities or single parent households with children	8.5
Household size ($n = 609$)[a], M = 2.6, SD = 1.26, median = 2	
1 person	19.9
2 persons	31.0
3 persons	24.3
4 persons	17.6
5 or more persons (max. = 9 persons)	7.2
Birth or adoption of children during the last 12 months ($n = 620$)	
Birth or adoption of first child	13.1
Birth or adoption of a second or subsequent child	6.8
Participants who moved during last 12 months ($n = 620$)	
Moved to a new town or town quarter	13.5
Change of work/education during last 12 months ($n = 620$)	
Changed employment/workplace/or education	13.1

[a] This was not an obligatory question and some participants did not respond to it.

Table 2
Descriptive analysis of the TPB related items and resulting predictor variables representing attitudes, subjective norms, and perceived behavioral control.

Items (numbered)[a]/Predictors	N	Min.	Max.	M	SD
1 *Healthy diet is particularly important to me*	616	2	5	4.34	0.69
2 *Organic food is particularly healthy*	598	1	5	3.42	0.94
3 *Environmentally conscious diet is particularly important to me*	614	1	5	3.96	0.85
4 *Organically produced food is particularly environmentally friendly*	584	1	5	3.49	0.89
Attitude cross-product "health" (*items 1 x 2*)	595	2	25	15.06	5.08
Attitude cross-product "environment" (*3 x 4*)	581	1	25	14.13	5.11
5 *Many people, who are important to me, pay attention to a healthy diet*	590	1	5	3.76	0.86
6 *Many people who are important to me think organic food is healthy*	585	1	5	3.54	0.98
7 *Many people who are important to me, pay attention to an environmentally conscious diet*	584	1	5	3.41	0.92
8 *Many people who are important to me consider organic food to be environmentally friendly*	576	1	5	3.55	0.95
Subjective norm cross-product "health" (*5 x 6*)	576	1	25	13.65	5.59
Subjective norm cross-product "environment" (*7 x 8*)	568	1	25	12.53	5.43
Perceived behavioral control:	608	1	5	4.13	.944
9 *If I want to buy organic fruits and vegetables, I can buy them.*					

[a] Response scale for all nine items was 1 = *disagree*, 2 = *rather disagree*, 3 = *undecided*, 4 = *rather agree*, and 5 = *agree*.

friendly" ($M = 3.5$) and "Organic food is particularly healthy" ($M = 3.4$) was quite small in absolute terms but still statistically significant (paired samples *t*-test, $p = .047$). However, both agreement ratings were significantly above the neutral scale value of "3" (= *undecided*) according to one-sample t-tests ($p < .001$ for both ratings).

Average agreement ratings for the two statements "Many people who are important to me consider organic food to be

environmentally friendly" and "Many people who are important to me think organic food is healthy" were nearly identical (paired samples *t*-test, $p = .77$). Considering that organic food labels are primarily ecologically oriented, the small difference between the judgments on environmental benefits and health benefits seems surprising. As a striking consequence, the average attitude cross-product between health effects and importance ratings ($M = 15.1$) is significantly higher than that between environmental effects and importance ratings ($M = 14.1$; paired samples *t*-test: $p < .001$). The same is true for the subjective norm cross-products, which have an average value of $M = 13.7$ for health aspects and $M = 12.5$ for the environmental aspects (paired samples *t*-test: $p < .001$).

4.4. Label knowledge, trust, justifications, and environmental values

Table 3 depicts the average ratings of the subjectively-assessed own label knowledge and subjective evaluations of the usefulness of label standards and trust in the fulfillment of these standards. The average value of responses to the question "Do you know the standards or conditions that organically produced fruits and vegetables must meet in order to be allowed to be labeled 'organic'?" ($M = 2.8$) was slightly below the neutral scale value (3 = undecided). Ratings evaluating the organic label standards ($M = 3.6$) and trust in compliance with them ($M = 3.3$) were above the neutral scale value and hence indicated a positive tendency.

In addition, Table 3 displays the average agreement ratings for two justifications for consuming non-organic food products. With average ratings of $M = 3.1$ and $M = 3.0$, both justifications received an average agreement corresponding closely to the neutral midpoint of the scale, which represented "undecided."

4.5. Application of the integrative behavioral model

An integrative regression model was formulated based on the General Linear Model to predict the proportion of organically produced fruits and vegetables based on psychological, socio-economic and one dynamic variable. The psychological predictor variables included five variables that were inspired by the TPB —namely health and environment-related attitude components, subjective norms related to health aspects, and perceived behavioral control— as well as label knowledge, the evaluation of label standards, trust in label-standards, and agreement with the two justifications for buying non-organic products (referring to high costs and environmental impacts of organic products). In addition, the contextual, situational, and demographic variables that proved to be significantly related to the proportion of organic fruit and vegetable purchases (according to the bivariate analyses described above) were included in the model. These were the two variables household income and education level. Finally, recent changes in food-related behaviors in direction of either increased or decreased consumption of organic food products were included as a dynamic predictor in the full model.

Occasional missing values of predictor variables were imputed with variable means to avoid the accumulation of missing values for the analysis. A different approach was taken regarding structural missing values for the dynamic variable "recent increase/decrease in bio-share" which resulted because the corresponding item was not presented to participants who stated that they had not changed their diet during the last 12 months. Here, the resulting missing values were estimated by the value 3 (= *unchanged*) in line with the content of the structural precondition for the presentation of the item.

Collinearity diagnostics for all predictors were highly acceptable with variance inflation values (VIF) ranging from a minimum of VIF = 1.05 to a maximum of 2.86. This shows that the predictors are to a considerable extent independent of each other and thus possess some discriminant validity, which represents a crucial precondition for the reliability of the beta-weight estimates to be obtained. To further validate the measures of the predictors included in the linear regression model a corresponding Confirmatory Factorial Analysis (CFA) was conductedFigure A1 . The model obtained a RMSEA value of 0.056 (Goodness-of-Fit-Index GFI = 0.94; Adjusted-Goodness-of-Fit-Index AGFI = 0.92; Chi-square ratio: $\chi^2/df = 2.88$; for further indices see Appendix A1) which seems acceptable according to Backhaus et al. (2003). The specific results of the CFA provided support for the internal consistency and convergent validity of the partial NEP scale as the CFA-regression weights of all three scale items on the latent NEP-related general environmental attitude variable were substantial and statistically significant ($\beta_1 = 0.63$; $\beta_2 = 0.76$, $p < .001$; $\beta_3 = 0.40$, $p < .001$). The CFA-findings furthermore supported the discriminant validity of the partial NEP scale as correlations between all other latent variables and the NEP-based general environmental attitude were small (for all predictors, $r < .20$; see Figure A1 of the Appendix). The discriminant validity of the other measures was also supported by the CFA as their mutual correlations tended to be moderate.

As Table 4 shows, the integrative model was able to account for 42.2% (adjusted $R^2 = 40.8\%$) of the variance of the dependent variable. Among the TPB-related predictors, perceived behavioral control and health-related attitudes and subjective norms turned

Table 3
Average values of subjective knowledge and evaluation of label standards, trust in compliance with standards, justification for purchasing non-organic products, and environmental value items and scale.

Items/Predictors	N	Min.	Max.	M	SD
Knowledge of label standards[a]	609	1	5	2.82	1.325
Evaluation of label standards[b]	512	1	5	3.63	0.89
Trust in compliance with label standards[b]	538	1	5	3.33	0.96
Justification price[b]	614	1	5	3.10	1.20
Justification environmental impact[b]	598	1	5	3.03	1.19
NEP scale items					
catastrophic consequences of human interventions[b]	607	1	5	3.92	0.95
Environment is heavily abused by humans[b]	613	1	5	4.31	0.82
Plants and animals have the same right to exist as humans.[b]	606	1	5	4.09	1.02
Partial NEP scale[c]	598	1.67	5	4.11	0.71

See *Questionnaire* sub-section for the exact formulation of the items.
[a] Response scale: 1 = *no*, 2 = *rather no*, 3 = *undecided*, 4 = *rather yes*, 5 = *yes*.
[b] Response scale: 1 = *disagree*, 2 = *rather disagree*, 3 = *undecided*, 4 = *rather agree* to 5 = *agree*.
[c] Average value of three items. Cronbach's alpha value $\alpha = 0.63$. The fourth NEP item was excluded from the partial scale used here to increase the reliability (for all four items, the Cronbach alpha value was $\alpha = 0.60$).

Table 4
Results of a multiple linear regression model predicting the share of purchased organic fruits and vegetables by the variables of the integrative behavior model (and bivariate correlations with the dependent variable).

	B	SE B	T	β	Sig. p	Partial Eta-squared	r (bivariate)
Constant term	[1.325]	0.434	3.05		.002	0.016	
Attitude components							
1 health aspects (crossproduct)	**.029**	0.009	3.18	**.136**	**.002****	**0.017**	**.365*****
2 environmental aspects (crossproduct)	.007	0.010	0.73	.034	.464	0.001	**.358*****
Subjectively perceived social norms							
1 health aspects (crossproduct)	**.033**	0.010	3.24	**.170**	**.001****	**0.018**	**.321*****
2 environmental aspects (crossproduct)	-.015	0.011	−1.40	-.075	.161	0.003	**.262*****
Perceived behavioral control	**.095**	0.039	2.46	**.085**	**.014***	**0.010**	**.268*****
Further psychological variables							
Knowledge of label standards	.046	0.026	1.77	.058	.077	0.005	**.156*****
Evaluation of label standards	.019	0.053	0.35	.014	.728	0.000	**.263*****
Trust in compliance with label standards	-.020	0.047	−0.42	-.017	.676	0 .000	**.188*****
Justification price	**-.235**	0.032	−7.46	**-.272**	**<.001*****	**0.088**	**-.438*****
Justification environmental impact	**-.207**	0.034	−6.08	**-.235**	**<.001*****	**0.060**	**-.466*****
NEP (partial scale)	**.122**	0.050	2.43	**.081**	**.016***	**0.010**	**.139*****
Social variables, demographics							
Income level	**.062**	0.030	2.04	**.072**	**.041***	**0.007**	**.138*****
Education level	**.064**	0.032	2.00	**.070**	**.046***	**0.007**	**.204*****
Dynamic variable							
Recent increase in bio-share	**.252**	0.063	4.02	**.131**	**<.001*****	**.027**	**.200*****
Mult. R^2 (Adjusted mult. R^2)		**0.422**	**(.408)**		**< .001*****		

Note: $n = 589$. Significant parameter printed boldly. *$p < .05$, **$p < .01$, ***$p < .001$.

out to be significant predictors and Hypothesis 1 was accordingly confirmed by the analysis. However environmental aspects of attitudes and subjective norm did not contribute significantly to the explanative power of the integrative model.

The largest effect-size was obtained by the two justification variables (partial $\eta^2 = 0.088$ and partial $\eta^2 = 0.060$, respectively) which confirmed Hypothesis 2 ($p < .001$). General environmental concern as measured by the partial NEP scale also proofed to be a significant predictor confirming Hypothesis 3. On the contrary, Hypothesis 4 has to be rejected as neither the knowledge nor the evaluation and trust with regard to label standards were significantly positively related to organic purchases within the multiple regression model.

Additional significant predictors were household income and education level which confirmed Hypothesis 5 and Hypothesis 6 (both $p < .001$). Finally, confirming Hypothesis 7, the dynamic variable representing recently decreased or increased consumption of organic food products proved to be a highly significant predictor ($p < .001$) and achieved a considerable effect size (partial $\eta^2 = 0.027$) in this regard.

All significant relationships found were in the expected direction (i.e., positive for the significant TPB-related variables, environmental values, education level, income, and the dynamic variable, but negative for the acceptance of justifications for purchasing non-organic foods).

Complementary to the integrative model, bivariate correlations between the 14 predictors and the purchases of organic fruits and vegetables were also calculated (Table 4). In line with findings of previous research as reflected in our Hypotheses 1–7, all predictor variables showed highly significant ($p < .001$) bivariate correlations with the dependent variable. So even in relation to the variables for which our main hypotheses had to be rejected, there resulted some indications for the expected relationships.

Supplementary, an explorative Principle Component Analysis (PCA) was conducted to gain insights into the factorial structure of the predictor variables. The corresponding scree plot and the component loading matrix after extraction of three factors and Varimax rotation are provided in the Appendix (Figure A2; Table A2). The interpretation of the scree plot following recommendations by Catell (1966) suggested the extraction of three factors as Eigenvalues increased considerably from the fourth ($\lambda_4 = 1.0$) to the third ($\lambda_4 = 1.3$) extractable component ($\lambda_2 = 1.7$, $\lambda_1 = 3.7$). Component loadings with absolute values above 0.40 were considered as substantial for the interpretation of the factors (c.f. Guadagnoli and Velicer, 1988). Accordingly, environmental and health aspects of attitudes loaded together with environmental and health aspects of social norms on the first component. The items measuring perceived behavioral control, knowledge and evaluation of label standards, trust in the compliance with label standards and the agreement to both justifications loaded on the second component. The economic justification additionally loaded on the third factor, together with the partial NEP scale, income level, and education level. An intriguing detail in this regards was that the partial NEP scale loaded negative on this third component. Small, but statistically significant negative rank correlations between the partial NEP scale and both income ($r = 0.14$, $p \leq .001$) and education level ($r = 0.13$, $p \leq .001$) may underlie this negative loading. The partial NEP scale measuring general environmental attitudes was however significantly positively correlated with the health and environmental aspects of attitudes towards organic food ($r = 0.21$ respectively $r = 0.22$, both $p < .001$). The dynamic predictor variable (*recent increase in bio-share*) was the only predictor that did not load substantially on any of the three PCA factors.

4.6. Requirements for environmentally friendly and healthy food consumption

According to the participants' ratings, more knowledge and information ($M = 3.5$) and more money to buy more environmentally friendly food products ($M = 3.4$) are the most important requirements for reducing the environmental impacts of their food consumption (Table 4). More time to prepare the own meals and having more money at one's disposal were rated as the most important requirements for achieving healthier food consumption (for both $M = 3.4$). Better restaurant and shopping options were rated as being of lesser importance for improving both health- and environment-related aspects of nutrition (all four ratings $M < 3.0$).

Paired sample t-tests showed that participants judged better

restaurant options, better shopping facilities, more money, and more knowledge and information to be more important requirements for reducing the environmental impacts of food consumption than for achieving healthier food consumption, whereas the opposite was true for 'having more time to prepare one's own meals' (Table 5).

5. Discussion

5.1. Determinants of organic fruit and vegetable purchases

An integrative model using psychological and socio-structural variables was applied in this study to explain self-reported purchases of organic fruits and vegetables and thus improve our understanding of the determinants influencing corresponding consumer choices. Consistent with previous findings organic products were perceived to be both healthier and more environmentally friendly than conventionally produced products (Oraman and Unakitan, 2010; Schifferstein and Oude Ophuis, 1998; Williams and Hammit, 2001). However, within the integrative model, only the attitude components and subjective norms related to health motivations proved significant, whereas those related to environmental effects did not significantly contribute to the prediction of self-reported organic fruit and vegetable purchases. Moreover, the health-related cross-products for both attitudes and subjective norms were significantly higher than the corresponding environmentally related cross-products. These results indicate that consumers are influenced more strongly by health benefits of organic products assumed by themselves and their social environment than by assumed environmental benefits. A reason for the possible dominance of health considerations over environmental effects could be that the former is perceived as being more directly and personally impactful, whereas the latter could seem more distant to consumers. Accordingly, communication aiming to promote purchasing decisions in favor of organic fruit and vegetable products should have a strong focus on the possible health benefits of these foods. However, there may be country-specific differences related to cultural aspects and food security standards could moderate the influence of health oriented and environmental considerations on purchases of organic products. Therefore the accomplishment of an international meta-analysis over the many studies addressing these aspects (e.g. Dickson-Spillmann et al., 2011; Magnusson et al., 2003; Makatouni, 2002; Oraman and Unakitan, 2010; Singh and Verma, 2017) would seem important.

Justifications addressing financial and environmental concerns for buying non-organic products, as well as income and education level, general environmental concern and past consumption changes contributed to the explanation of self-reported purchases of organic fruits and vegetables. Three of these explanatory factors (perceived behavioral control, monetary justification, and income) appear to be—at least partly—related to the comparably high price of organic products compared to non-organic products. Low-income households may lack sufficient means to exclusively or predominantly purchase organic food products and therefore a significant relationship between income and organic versus non-organic choices is not surprising. Decreasing the costs of organic food production and corresponding products is accordingly an approach that policy makers could take in order to increase consumption of organic products in Switzerland as well as in other countries (cf. Shashi et al., 2015; Vittersø and Tangeland, 2015).

Financially and environmentally oriented justifications for purchasing non-organic products were found to be the strongest predictors of organic food purchases. Their effect size values outweigh those of the other significant predictors by far. The current findings thus align with those yielded by previous analyses of psychological justification processes in the context of environmental behavior (Diekmann and Preisendörfer, 1992; Fritsche, 1999; Hansmann et al., 2006a; Hansmann and Steimer, 2015, 2017; Schahn et al., 1995), and further research in this regard is needed. The important role of justifications as determinants of organic food purchases also confirms the moral implications of this behavior (Yazdanpanah and Forouzani, 2015). When analyzing justifications, one needs to consider that their validity can vary strongly, and subjectively perceived and actual validity need to be distinguished. For example, the high cost of organic products clearly represents a barrier hindering many consumers from buying organic food products, and the justification concerning the environmental impacts of cultivating organic produce—though seemingly formulated like a cheap excuse—also met considerable agreement and should not be simply discarded. Indeed, organically produced foods have considerable negative environmental impact (e.g., Meier et al., 2015; Squalli and Adamkiewicz, 2018). Consumption of organic food is not per se more environmentally friendly than consumption of conventional food, since aspects such as transportation, storage and preparation of food have to be considered as further influential factors, and because ecological benefits due to lower pesticide use and the exclusion of chemical fertilizers are partly compensated as organic agriculture tends to have lower yields, which means that more land is required to produce the same amount of food (Jungbluth et al., 2000; Muller et al., 2017; Treu et al., 2017; Tuomisto et al., 2012). An important aim is therefore to further reduce the negative environmental impacts of organic food products (cf. Bosona and Gebresenbet, 2018; Chapa et al., 2019; Ghasemi et al., 2018; Ronga et al., 2019), which could in turn further increase their attractiveness for environmentally conscious people.

The significant influence of education level on the self-reported consumption of organic food products may reflect that more educated people understand the importance of environmentally friendly, more sustainable food consumption better than less-educated persons do. This finding aligns with previous research showing a positive relationship between education level and environmental awareness (Franzen and Vogl, 2013). Education could increase individuals' knowledge about environmental problems, which in turn could enhance their environmental concern

Table 5
Comparison between agreement ratings for different requirements for more environmentally friendly versus healthier food consumption.

Requirements for achieving more environmentally friendly/healthier food consumption[a]	$M_{(\text{more environmentally friendly})}$	$M_{(\text{increase healthy})}$	t	df	p
… better restaurant options	2.72 (1.33)	2.50 (1.29)	−5.24	575	<.001
… better shopping facilities	2.93 (1.29)	2.62 (1.31)	−7.16	595	<.001
… more time to prepare meals myself	3.07 (1.28)	3.42 (1.28)	8.83	594	<.001
… more money to buy more environmentally friendly/healthy food products	3.44 (1.30)	3.37 (1.33)	−2.15	596	= .032
…. more knowledge and information on environmental/health aspects of different food products	3.50 (1.24)	3.23 (1.28)	−7.53	594	<.001

[a] See *Questionnaire* sub-section for the full text of the items; the response scale for all 10 items was 1 = *disagree*, 2 = *rather disagree*, 3 = *undecided*, 4 = *rather agree* to 5 = *agree*.

and promote behavioral decisions in favor of organic food products (Zelezny, 1999). In this regard, education specifically focusing on the problems and processes related to food production and consumption seems to be particularly important. Such education could raise the awareness on ecological, social and health benefits of organic food products and could accordingly increase the valuation of such products, an aspects identified as crucial in previous research (Torres-Ruiz et al., 2018b). The importance of sustainability and environmentally oriented education and information in relation to organic products is also substantiated by the positive influence of general environmental values as measured by the partial NEP scale on organic consumption (Stern, 2000; Stern et al., 1999).

5.2. Implications for the further development of integrative behavioral models

The integrative model developed in this study achieved an explanation of 42% of the variance of the target behavior, and justifications proved to be the most powerful predictors of the model. This confirms the suggestion of many scholars to supplement the TPB through a moral component when aiming to explain morally relevant behavior, as is the case for organic food consumption (cf. Ajzen, 1991; Armitage and Conner, 2001; Kaiser, 2006; Kaiser and Scheuthle, 2003; Sun, 2019; Yazdanpanah and Forouzani, 2015). Sustainability is a normative concept and as such has tremendous ethical implications (Hansmann, 2010; Sandberg et al., 2019; Parra et al., 2020). Therefore moral aspects need to be recognized as crucial determinants of sustainability oriented consumer behaviors in diverse domains and considered more thoroughly in corresponding psychological models (Goldman et al., 2020; Valor et al., 2020).

The conceptualization of moral aspects through justifications appears particularly promising in light of the current findings and previous findings which showed that justifications can widen the intention behavior gap (De Witt Huberts et al., 2012, 2014a; 2014b; Taylor et al., 2014). Taking into account the negative role of justifications in determining morally relevant behaviors seems a promising approach to better understand and possibly reduce the behavior intention gap, which is an important aim of current behavior research. Justifications seem important for the intention formation and for upholding intentions for environmentally harmful behaviors by protecting the self from self-blame and from social blame by others. Furthermore, justifications can stabilize negative behaviors over time as justifications for misconduct in the past, can serve as proactive justifications (neutralizations according to Sykes and Matza, 1957) for performance of the same negative behaviors in the future. To consider these processes in a future integrative behavior model appears important.

In line with previous research, variables related to the TPB proved to be important factors for the explanation of purchasing decisions in favor of organic food products (cf. Johe and Bhullar, 2016; Scalco et al., 2017). This confirms the validity and explanatory power of TPB related variables and the fundamental role of this theory for the development of integrative behavioral decision making models.

A noteworthy deviation of the items used to conceptualize TPB related variables concerns the measurement of subjective norms. In this study neither motivations to comply with the norms of important others nor the behavioral expectations of others were assessed. Instead assumed perceptions and evaluations – corresponding to assumed opinions of others – were elicited. The significant explanative power of a social influence component conceptualized in this way, shows that such tacit aspects of social orientation have significant effects on behavior. According to theory and research on group processes, social influence results from the combination of both informative and normative social influence (e.g. Crott and Hansmann, 2003; Crott and Werner, 1994; Deutsch and Gerard, 1955; Levine, 2013; Paulus, 2015). It is generally difficult to disentangle these two types of influence as they are often operating simultaneously. Nevertheless, one may argue that the operationalization of social influence through the items used in this study corresponds more to informative influence (perceiving the evaluations and opinions of others in a process of social orientation to find out what is right, appropriate or best) -or is at least somewhat balanced regarding informative and normative aspects- compared to the assessment of subjective norms as recommended by Ajzen (1991). The latter recommendations are clearly normatively oriented as they suggest to assess straightforwardly whether a certain behavior is approved by important others and how strong the motivation to comply with these expectations is.

Combining items of both types – addressing subjectively perceived normative and informative social influence – in a future study would make it possible to formulate an enhanced integrative behavior model with improved explanative power that covers normative and informative social influences as two separate components. Such a model would take into account that a person can be influenced by others, and particularly by role models, even if this person has no inclination to comply per se with the expectations of these others, simply because the person considers the behavior of the other persons or their opinions to be (morally) appropriate or beneficial (Bandura, 1986; Morgenroth et al., 2015).

Furthermore, a general implication of the present findings is that including more predictor variables in integrative, complex and interdisciplinary models taking advantage of information about psychological as well as sociological, economic and physical variables and restrictions and options seems promising to adequately reflect the complexity of environmental behavioral decisions. Purely psychological models seem incapable to capture the complex interactions between psychological, social and financial aspects and situational constraints and options which determine behavioral decisions, whereas integrative behavioral decision-making models can achieve an interdisciplinary integration of the framing and analysis of environmentally harmful behaviors. This seems particularly important because psychological measures such as education, training and campaigns need to be combined with logistic, economic and sociological approaches to solve environmental problems and promote environmentally friendly behaviors.

5.3. Perceived barriers and implications for practice

A remarkable set of findings of this study was that respondents rated having more time as the most important requirement for achieving (what they presume to be) healthier diets, whereas greater knowledge and information was rated as most important for achieving more environmentally friendly food consumption. Having more money was rated as the second most important requirement for ameliorating both the health and environmental aspects of participants' food consumption. The problem of the high price of organic products which has been identified as a major obstacle preventing increased consumption in previous research (Torres-Ruiz et al., 2018b) has thus been substantiated in various ways by this study. This may appear surprising as Switzerland is known to be a high-income country. However, considering that the general living costs in Switzerland are very high and so are prices of organic fruit and vegetables, ultimately not all can or want to afford them. The findings should accordingly motivate policy makers to take measures that allow farmers and sellers to reduce prices for organically labeled products as already addressed above. In addition, the responses of consumers raise the questions of how time

and knowledge barriers can be overcome and how lower-cost healthy and environmentally friendly food options can be provided to less wealthy consumers. Preparing their own meals rather than eating out or buying pre-prepared meals gives consumers the possibility to actively influence the quality, health, and environmental aspects of meal ingredients and may also save them money. Accordingly, promoting nutrition knowledge and skills (including cooking skills) could be a helpful approach in this regard (Hartmann et al., 2013). Current trends like "slow-food" (Hsu, 2015; Page, 2012) are an example of people's interest in such activities.

Urban gardening and agriculture are another possible method of facilitating low-cost healthy, environmentally friendly, and socially inclusive food production and consumption (Horst et al., 2017). Such approaches can be coordinated with place-based projects facilitating food justice (Gottlieb and Joshi, 2010), whether by integrating socially disadvantaged people as producing members of community gardens or donating or selling organic food products at discounted prices to low-income consumers (Hagey et al., 2012; Levkoe, 2011). Various studies have demonstrated that practitioners of urban agriculture often save money by supplementing some of their food purchases with their own produce (Corrigan, 2011; Gray et al., 2013). Urban gardening and agriculture projects and systems are very heterogeneous in scale and with respect to the goals they pursue, and their impact on total food consumption is currently small in spite of existing potentials (Grewal and Grewal, 2012). However, these and various other innovative approaches could be implemented and further developed to transform food consumption towards greater sustainability. An important characteristic of many such promising endeavors is that they are place-based and locally anchored; they facilitate and are inherently connected with social interactions and networks and can thereby generate synergies toward improving social inclusion and quality of life in urban areas (Hagey et al., 2012; Horst et al., 2017; Levkoe, 2011).

5.4. Limitations and future research needs

In contradiction to previous findings, "trust" did not prove to be a significant predictor of organic food purchases within the integrative model. However, the bivariate correlation between trust and purchases of organic fruit and vegetables was significant, and therefore the findings do not mean that trust is unimportant. It may be that the relationship between trust and organic food purchase is low because Swiss consumers generally tend to possess a high level of trust in ecological labels (Hansmann et al., 2006b). Furthermore, a more complex measure of trust could be used in a future study to capture various aspects of trust in the organic labels.

The failure to detect significant relationships between life events, such as the birth or adoption of a new child or moving the place of residence and organic food consumption requires future research. Perhaps a larger sample with more persons experiencing these life-events would allow a better investigation of the effects of these events on organic purchases.

Although the integrative model reaches satisfying explanative power, some limiting aspects point to various possibilities for further elaborating on the integrative model to improve it. Firstly, considering the attitude measurement, some additional components could be considered. For example beliefs and evaluations in relation to the taste of organic fruit and vegetables compared to conventional products may also possess considerable predictive power and could be included to enhance the integrative model. Secondly, various further justifications for buying non-organic food products could also exist and their inclusion in the integrative model could eventually improve it. In-depth interviews or focus group discussions could be used in future studies to identify such justifications. Considering justifications seems thus helpful for developing formal models aiming to explain behavior, and in addition represents a possible means to gain a deeper understanding of consumer choices. A third possibility for improving the explanative power of the integrative model could be the use of more complex and detailed measures or scales for psychological concepts such as label knowledge, trust and perceived behavioral control that were assessed through only one item each in this study.

Considering the social norm component of the integrative model, the findings raise the question whether using injunctive subjective norm items including a measure of the motivation to comply with the expectations of others in addition to the descriptive social norm items used in this study would further improve the integrative model. A survey combining both types of items could help to answer this question in a future research project. Finally, a possibility to further improve the integrative model could be derived from including additional psychological variables found relevant in previous research, as for example the construct of environmental or green self-identity (Johe and Bhullar, 2016).

Furthermore, it would be important to apply the integrative model in a future study to predict objectively observed purchases of organic food products, instead of self-reported behavior. For example, consumers' food baskets could be analyzed after shopping in an online store or in a conventional grocery store with regards to shares of organic products followed by a survey. It also needs to be considered in this regard that purchases of organic food products and the actual consumption (eating behavior) of such products are two separate behaviors that can be distinguished from each other and may therefore be determined to some extent by different factors (cf. Chekima et al., 2019).

6. Conclusion

The study developed an integrative model including psychological, dynamic and social variables to predict behavioral decisions in relation to the consumption of organic fruits and vegetables. The model achieved considerable explanative power with justifications for buying non-organic such as the high price of organic products and their environmental burdens resulting as the strongest predictors. It therefore seems important to consider justifications in models of behavioral decision-making referring to morally relevant behaviors (c.f. Hansmann and Steimer, 2015, 2017).

Lacking financial means and lacking information and knowledge were identified as important barriers for the consumption of more environmentally friendly and healthy food products. Policy measures should therefore take approaches aiming at a reduction of prices for organic products or support low-income consumers and the marketing of organic fruits and vegetable products should communicate health and environmental benefits of organic food so that they become more highly valued and appreciated (cf. Torres-Ruiz et al., 2018b).

CRediT authorship contribution statement

Ralph Hansmann: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing. **Ivo Baur:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Validation, Writing - original draft, Writing - review & editing. **Claudia R. Binder:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing.

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.

Acknowledgements

We thank Marlyne Sahakian and Stefanie Krauth for valuable ideas, feedback, and discussions that facilitated the development of the questionnaire used in this study. We thank the anonymous reviewers for their excellent comments. We also thank the Swiss Federal Statistical Office for its operative support. This work was supported by the Swiss National Science Foundation within the National Research Programme NRP 69 “Healthy Nutrition and Sustainable Food Consumption”.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jclepro.2020.123058.

Appendix

A1. Confirmatory Factorial Analysis (CFA) of the measurement model of the predictor variables of the integrative environmental behavior model

A1.1 CFA - Analysis Summary

Sample size = 598
Number of variables in your model: 33
Number of observed variables: 16
Number of unobserved variables: 17
Number of exogenous variables: 17
Number of endogenous variables: 16

Computation of degrees of freedom (Default model).

Number of distinct sample moments:	136
Number of distinct parameters to be estimated:	40
Degrees of freedom (136 - 40):	96

A1.2 CFA – Regression weights and Goodness of Fit measures Chi-square

Chi-square = 276,776

Degrees of freedom = 96

Probability level = ,000

Chi-square/df = 2,8

CMIN.

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	40	276,776	96	,000	2883
Saturated model	136	,000	0		
Independence model	16	912,188	120	,000	7602
Zero model	0	4776,000	136	,000	35,118

RMR, Goodness of fit indices (GFI).

Model	RMR	GFI	AGFI	PGFI
Default model	2653	,942	,918	,665
Saturated model	,000	1000		
Independence model	4525	,809	,784	,714
Zero model	5510	,000	,000	,000

Baseline Comparisons.

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	,697	,621	,779	,715	,772
Saturated model	1000		1000		1000
Independence model	,000	,000	,000	,000	,000

Parsimony-Adjusted Measures.

Model	PRATIO	PNFI	PCFI
Default model	,800	,557	,617
Saturated model	,000	,000	,000
Independence model	1000	,000	,000

NCP.

Model	NCP	LO 90	HI 90
Default model	180,776	134,790	234,405
Saturated model	,000	,000	,000
Independence model	792,188	699,850	891,992

FMIN.

Model	FMIN	F0	LO 90	HI 90
Default model	,464	,303	,226	,393
Saturated model	,000	,000	,000	,000
Independence model	1528	1327	1172	1494

RMSEA.

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	,056	,048	,064	,092
Independence model	,105	,099	,112	,000

Regression Weights: (Group number 1 - Default model).

	Estimate	S.E.	C.R.	P	Label
VAL_1<—Environmental_Values	1000				
VAL_2<—Environmental_Values	1015	,128	7928	***	
VAL_3<—Environmental_Values	,811	,099	8198	***	

Standardized Regression Weights: (Group number 1 - Default model).

	Estimate
VAL_1<—Environmental_Values	,628
VAL_2<—Environmental_Values	,756
VAL_3<—Environmental_Values	,494

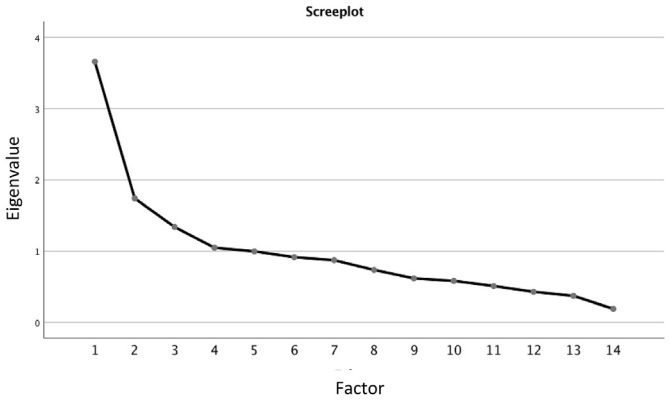

Fig. A2. Scree plot of a PCA of the predictor variables of the linear regression model Note. The bent of the Eigenvalue curve at Factor 4 suggests the extraction of three factors (principal components). 2

A1.3 CFA - Path diagram

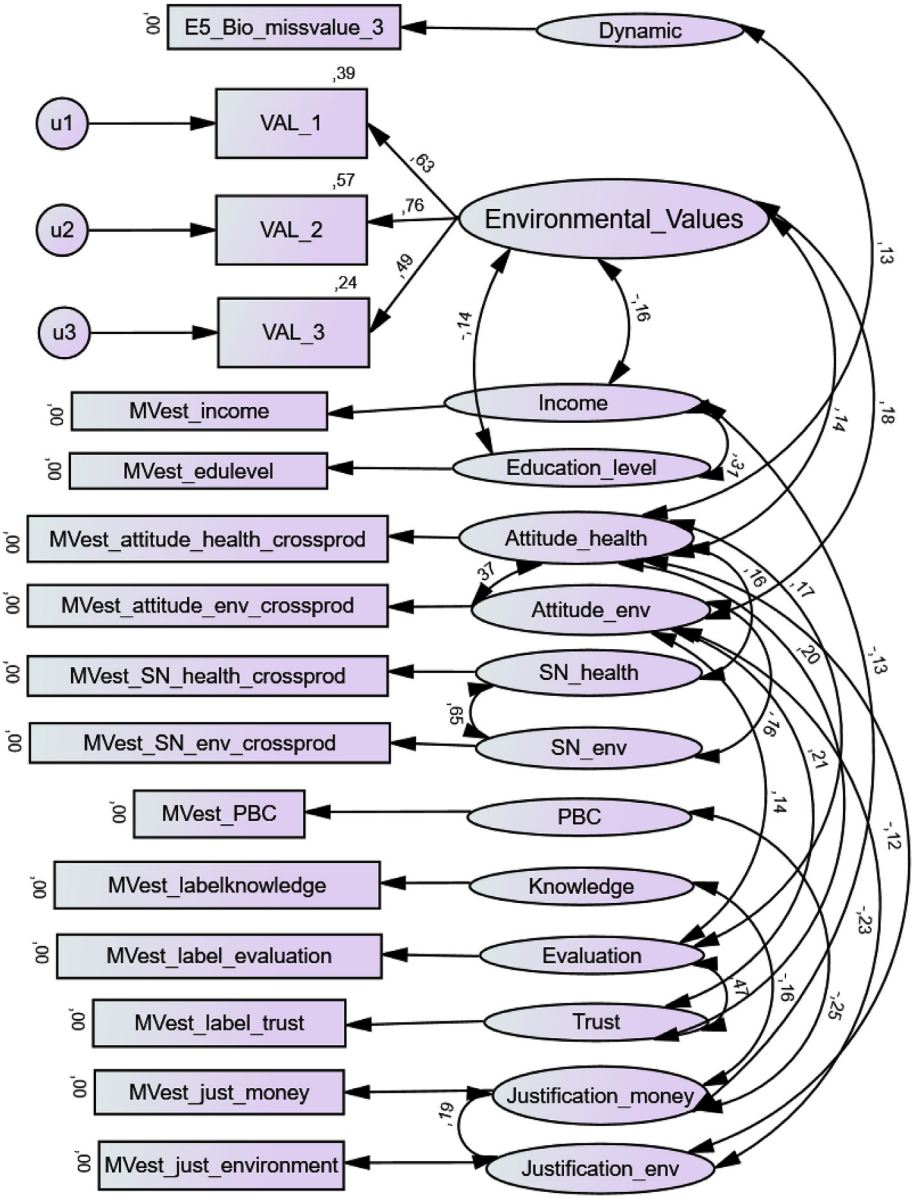

Fig. A1. Path diagram resulting from the CFA of the measurement model of the latent variables included in the integrative environmental behavior model
Note: Correlation paths representing r values smaller than 0.1 were set to zero (eliminated from the model) in a sequential procedure to arrive at this final model.

A2. Principal component analysis of the predictor variables of the integrative environmental behavior model

Table A2
Rotated component loading matrix of a PCA of the predictor variables of the linear regression model.

	Component		
	1	2	3
Attitude - health aspects (crossproduct)	**0.607**	0.413	−0.221
Attitude - environmental aspects (crossproduct)	**0.582**	0.534	−0.108
Subjective norms - health aspects (crossproduct)	**0.844**	0.077	0.046
Subjective norms - environmental aspects (crossproduct)	**0.821**	0.149	0.005
Perceived behavioral control	0.081	**0.464**	0.286
Knowledge of label standards	−0.225	**0.514**	0.037
Evaluation of label standards	0.306	**0.650**	−0.152
Trust in compliance with label standards	0.117	**0.717**	−0.14
Justification price	0.049	**−0.534**	**−0.457**
Justification environmental impact	−0.366	**−0.516**	−0.131
NEP (3 item, partial scale)	0.185	0.151	**−0.455**
Income level	0.107	0.045	**0.748**
Education level	0.135	0.092	**0.702**
Dynamic variable (recent organic share increase)	0.318	−0.097	0.091
Eigenvalues of rotated components	2.56	2.49	1.68

Notes.
Extraction method: Principal component analysis.
Rotation method: Varimax with Kaiser-Normalization.
Components loadings with absolute values above 0.4 printed boldly.

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