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Why trust is crucial – The moderating role of trust in the relationship between motivation and intention to buy healthy, sustainable and novel foods

Anna L. Macready [a], Sophie Hieke [b,f], Magdalena Klimczuk-Kochańska [c], Szymon Szumiał [c], Katharina Wachter [b], Matthieu H. Arnoult [a], Liesbet Vranken [d], Klaus G. Grunert [e,*]

[a] *University of Reading, Reading, UK*
[b] *EUFIC, Brussels, Belgium*
[c] *University of Warsaw, Warsaw, Poland*
[d] *KU Leuven, Leuven, Belgium*
[e] *Aarhus University, Aarhus, Denmark*
[f] *Munich Business School, Germany*

A B S T R A C T

Within an increasingly resource-challenged food system, consumers need greater confidence in their ability to make better and more informed food choices. We investigated the role of trust as a moderator of the relationship between the motivation to make healthy, sustainable and novel food choices and the intention to actually do so, based on the reasoning that novel healthy and sustainable food products are marketed by credence attributes, where consumers must rely on information that is provided by food chain actors. In an online survey conducted in 13 European countries over two years with a sample of 25,610 respondents, we explored how social trust, beliefs in trustworthiness and overall trust moderate the motivation-intention relationship. Results show that while trust cannot compensate for a lack of motivation to engage in healthy or sustainable behaviours, the relationship between motivation and intention was strengthened by higher levels of trust for sustainable and innovative food choices, but not for healthy food choices, and this finding was largely consistent across both years. For sustainable choices, the motivation-intention relationship was moderated by trust in farmers and retailers but not in manufacturers or authorities. All types of trust moderated the motivation-intention relationship for adoption of novel foods. This has implications for investment in trust initiatives on the part of policymakers, food businesses and food system actors.

1. Introduction

Food production and consumption is an important cause of environmental change. Food production is, for example, responsible for up to 30 % of global greenhouse gas emissions and 70 % of freshwater use (Willett et al., 2019). Dietary choices also have a vast impact on human health as many diseases such as coronary and heart diseases or type 2 diabetes are associated with our food choices. Diet thus links environmental and human health (Tilman & Clark, 2014) and making our diets healthier and more sustainable is one of the great societal challenges (Clark et al., 2019; Tilman & Clark, 2014; Willett et al., 2019).

The European Commission (EC) aims to enhance the sustainability of our socio-economic system with the European Green Deal. Natural resources should be used more efficiently, biodiversity should be enhanced and pollution reduced (EC, 2019). This requires effort from all sectors, including the agri-food sector. To realize this ambition, farmers, food processors and retailers are called upon to make the products they produce healthier and more sustainable. They have an impact on consumers' food choices through the types and nutritional composition of the food they produce, their choice of suppliers, production methods and packaging, transport, merchandising and marketing practices (EC, 2020). However, it is explicitly recognized that consumers also play an important role with respect to pull factors, by demanding healthier, more sustainable and affordable food. To stimulate sustainable food consumption and promote healthy food choices, consumers need to have the tools to make informed choices (EC, 2019). The Farm2Fork strategy

of the EC wants to empower consumers to choose healthy, sustainable and novel foods by providing them with clear information on which to base their choices. To empower consumers, harmonized mandatory front-of-pack nutrition labelling is proposed, and ways to harmonise voluntary green claims and create a sustainable labelling framework will be examined (EC, 2020). Whether such mandatory and voluntary schemes effectively help us to alter our food choices will depend on the information provided, product availability, cost and, not least, consumer trust (e.g., (Meijer et al., 2021; Siegrist & Hartmann, 2020).

In order to use the information provided to make informed food choices for a healthy and sustainable lifestyle, consumers need to trust the food system actors who provide the information, either through labels, green claims, or in any other format. As such, it will be of the utmost importance not only to introduce innovative products that are healthier and more sustainable and provide food impact information to consumers, but also to ensure trust in the food system actors.

Previous studies indicated that consumers are increasingly motivated to improve the sustainability and healthiness of their food consumption patterns, however their motivations are not always translated into behavioural intentions and actual food choice behaviours (e.g., Terlau & Hirsch, 2015; Yamoah & Acquaye, 2019). Various reasons can explain this gap, such as product affordability and availability. Trust, or lack of trust, in the actors and the information that they provide can also explain this gap. However, it remains unclear what role trust plays in the motivation-intention-behaviour gap. Therefore, this study investigates the role of trust in forming intentions to buy foods that are promoted as healthy, sustainable or new, given people's motivation to do so.

2. Conceptual development

In the development of our conceptual framework for analysing the role of trust in the adoption of healthy, sustainable and novel foods, we draw on three streams of literature: asymmetric information theory and the distinction of search, experience and credence attributes; socio-cognitive theory and the motivation-intention-behaviour gap; and theories of trust.

2.1. Choice of products with credence characteristics

According to asymmetric information theory, product attributes can be divided into search, experience and credence attributes (Darby & Karni, 1973; Nelson, 1970). For search attributes, consumers can ascertain these attributes in-store prior to their purchase, e.g., whether the product has an appealing appearance. Experience attributes, such as taste, texture and convenience of preparing the product can be evaluated only after the purchase. Credence attributes cannot be verified by the consumer, not even after consuming the product. They include, for example, the production methods used, the environmental impact of the product, the country of origin, and the healthiness of the product. In order to mitigate the risk that is associated with buying products with unknown qualities, consumers use cues (or signals in economic theory) to form expectations about the unknown attributes of the product (Steenkamp, 1990; Szybillo & Jacoby, 1974). These cues can be intrinsic (the physical composition of a product) or extrinsic (price, brand, product label information) in nature (Liefeld, 2014). Extrinsic cues are pieces of information that the sender (i.e., farmers, manufacturers, retailers) can choose whether and how to communicate (signal) it to the receiver (i.e., the consumer), and the receiver can choose how to interpret it. As consumers cannot verify the accuracy of the information provided as extrinsic cues, use of these cues in decision-making will depend on the extent to which consumers trust the information given (Grunert, 2005). This includes both trusting what is said about the product, e.g., that it has been organically produced, and trusting what the product will do for the consumer, e.g., that it is healthy (Henchion et al., 2017). How much or how little consumers trust the extrinsic cues can depend on the source of the product information. For food products,

sources can range from farmers to processors, retailers, governments, producer associations, experts, and other consumers. For example, studies have shown that expert labels are highly trusted across countries and food types (Rupprecht et al., 2020).

2.2. The motivation-intention-behaviour gap

While progress has been made by the food system to provide sustainable and healthy alternatives to unsustainable food sources, consumers have not always adopted them, even when they think buying such products is a good idea. This basic issue has been framed as a particular instance of the attitude-behaviour gap (Vermeir & Verbeke, 2006). Attitudes, qua their utilitarian and self-expressive functions (Katz, 1960), have a motivational function – a positive attitude towards an object leads to approach behaviour, and a positive attitude towards a particular behaviour increases the likelihood of this behaviour being performed. Socio-cognitive approaches to the explanation of behaviour by attitudes have dealt with possible gaps between attitudes and behaviour in two ways. One is by introducing the concept of behavioural intention, which is predicted by attitude and which predicts behaviour, while allowing that both behaviour and intention may differ, mostly due to unforeseen circumstances. The other is by introducing additional variables that can predict intention and behaviour, and that may explain why attitude and behaviour do not align. This includes the constructs of self-efficacy (Bandura, 1986, 1991; Bandura & Locke, 2003; Maddux & Rogers, 1983) and perceived behavioural control (Ajzen, 1991; Williams & Rhodes, 2016). They both focus on the individual's perceived capability to perform target behaviours, as distinguished from the individual's motivation to perform these behaviours. Capability, or an individual's perception of that capability, can therefore prevent an intention being formed and/or a behaviour being carried out, even when the person is motivated to engage in this behaviour: if a person thinks they cannot perform the behaviour, they will not form the intention to do it.

In the case of credence attributes of healthy, sustainable and novel foods, people may not believe they have the ability to distinguish the healthy from the unhealthy, or the sustainable from the unsustainable. This may be because people believe there is insufficient information on which to form a judgement about what is healthy or sustainable, or because people do not believe the information they are given. It is in this latter case where trust can play a role. If people trust food chain actors, then they are more likely to find the information provided by those actors about the healthiness and sustainability of food products to be useful and to empower them to actually choose healthier and more sustainable food products. If they don't trust food chain actors, they may be doubtful about the credibility of any information provided and will find it difficult to turn their motivation to buy healthy, sustainable and novel foods into intentions and actual choices.

2.3. Trust and its role in promoting the intention to choose healthy, sustainable and novel foods

In conceptualizing trust, we follow the much-cited definition by Rousseau and colleagues of trust as "a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of another" (Rousseau et al., 1998, p. 395). Trust is thus assigned to other people or to organizations consisting of people. When it comes to trust having an impact on the credibility of information about credence characteristics of food products, we regard trust in four types of actors as relevant: farmers and producers, manufacturers and processors, retailers, and authorities. While the demand for food products positioned in terms of health and sustainability may be mostly influenced by trust in manufacturers, the other actors form relevant parts of the food system (Macready et al., 2020; Tonkin et al., 2019), as farmers have a major influence on the sustainability of food products, retailers decide whether to have them on the shelves, and

authorities set and enforce rules.

We distinguish between overall trust in food actors and beliefs about their trustworthiness. Overall trust is partly based on cognitive beliefs about trustworthiness and partly on spontaneous affective reactions to the person or organization to be trusted (Lewis & Weigert, 1985; McAllister, 1995), a distinction that has been widely applied in the trust literature. Following earlier work (Macready et al., 2020), we distinguish three types of beliefs about the trustworthiness of actors in the food chain: beliefs about competence, about care and about openness.

In addition to trust in food chain actors, we also look at social trust, defined as "the belief that others will not deliberately or knowingly do us harm" (Delhey & Newton, 2005, p. 311), i.e., a general belief in the trustworthiness of others. Higher levels of social trust can be expected to lead to higher levels of trust in food chain actors and this can, in itself, affect confidence in food products positioned in terms of health and sustainability as well as confidence in novel products.

To date, the role of trust in decision-making for products with credence characteristics has been conceptualized in two different ways. One approach has been to add trust as an additional determinant of consumer intention to buy, or of actual purchasing behaviour, in addition to other determinants like values, attitudes and beliefs. For example, Nuttavuthisit and Thøgersen used the Theory of Planned Behaviour (TPB) to explain demand for organic food in Thailand, and added trust as an additional determinant of both beliefs and actual behaviour (Nuttavuthisit & Thøgersen, 2017). Likewise, Carfora and colleagues used a TPB approach and added trust in different food chain actors as additional determinants of purchase intention for organic food in Italy but found that only trust in farmers had a significant effect (Carfora et al., 2019). Additionally, Lassoued and colleagues used trust as a determinant to show both direct and indirect effects on purchase intentions, via consumer confidence in credence attributes (Lassoued et al., 2015). These studies, however, raise the question about whether trust can be a direct driver of purchase intention, meaning that consumers want to purchase foods because they trust in food chain actors.

As a consequence, the other approach is to view trust as a moderator, moderating the relationship between motivational factors and intentions/behaviours. For example, trust has been used as a moderator in a TPB-based framework in an attempt to explain demand for organic food in Australia and the effects of the TPB constructs on behaviour were indeed found to be moderated by trust in food chain actors (Sultan et al., 2020). Using a different theoretical framework, Tandon and colleagues used self-determination theory to predict the purchase of organic food with trust as a moderator for the relationships between various facets of motivation, attitude and buying behaviour, finding that trust moderates some, but not all of the hypothesized relationships (Tandon et al., 2020).

In line with research on behavioural change with regard to healthy and sustainable behaviours (Steg, 2016; Zhang et al., 2019), we will in our work investigate the role of trust as a moderator (and not as a predictor), based on the argument that trust cannot compensate for a lack of

motivation to engage in healthy or sustainable behaviours, but that trust can actually facilitate such motivations, turning them into intentions and eventually behaviours.

2.4. Conceptual model and aim of study

Our conceptual model is shown in Fig. 1. We believe that trust moderates the relationship between motivation to buy food products with credence characteristics and the intention to actually do so. Trust may also moderate the relationship between intention and actual behaviour, although this is outside the scope of the present study. We believe that social trust, beliefs in trustworthiness and overall trust all are potential moderators and that it is an empirical question as to which of these has the strongest moderating power.

The aim of the present study is therefore to investigate whether trust – social trust, beliefs about the trustworthiness of food chain actors and/or overall trust in food chain actors – moderates the relationship between motivation for healthy eating and sustainable living and the intention to make healthy and sustainable food choices. In addition, as we are especially interested in the adoption of newly developed healthier and more sustainable food products, we also analyse the relationship between motivation for innovation and intention to make novel food choices.

3. Methodology

The data for the study were collected as an online survey in 13 European countries in both 2019 and 2020, as part of the TrustTracker® project (Macready et al., 2020). In the following we will present the measures and describe sampling procedure and analyses.

3.1. Measures

The questionnaire was based on the conceptual model shown in Fig. 1. Validated measurement scales were used or adapted for use where necessary.

Trust. The questionnaire sought to measure three types of trust. (1) Social trust, 3 items adapted from Gefen and Straub (2004), where participants were asked whether they generally trusted others, and felt they were trustworthy and reliable; (2) Overall trust in four main food system actors (farmers-producers, manufacturers-processors, retailers, authorities) with respect to the production, selling, and regulation of food, 4 items adapted from Sapp et al. (2009); and (3) Beliefs in trustworthiness of these 4 food system actors following de Jonge et al. (De Jonge, Van Trijp, Goddard, & Frewer, 2008; De Jonge, Van Trijp, van der Lans, et al., 2008), on the three dimensions of 'competence' (e.g. doing a good job, being competent, skilled), 'care' (e.g. acting in the public interest, listening to concerns and to ordinary people), and 'openness' (e.g. being informative, honest, open), derived from
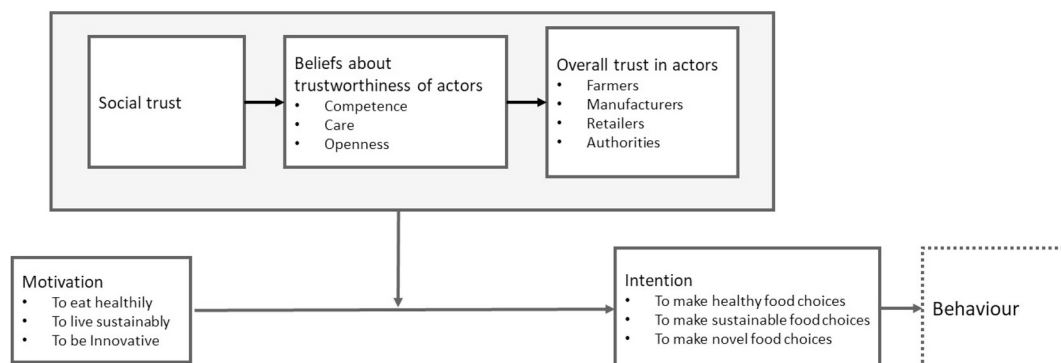

Fig. 1. Conceptual model.

Poortinga and Pidgeon (2003) and De Jonge et al. (2007).

Motivation. For motivation to eat healthily, we selected three positively framed items with the highest loadings from the Finnish Health and Taste Attitudes questionnaire (Roininen et al., 1999). The two negative items from this scale often load onto a second factor and were therefore excluded. For motivation towards sustainable living, we used three positively framed items from Thøgersen et al. (2010), adapted originally from Dunlap (1978). We excluded two items from this scale, as they referred to self-reported behaviour rather than motivation. To measure motivation towards innovativeness, we chose five items from the new Food Related Lifestyle questionnaire, an instrument that has been tested in several countries with very good reliabilities (Brunsø et al., 2021).

Intention. Our measures for intention to engage in healthy eating and sustainable living were adapted from the 'green buying intention' scale (Lu et al., 2015). Consumer intentions towards adopting new products were measured using an adapted version of the 'intentions for new product adoption' scale (Goldsmith & Hofacker, 1991), which was judged to be the most appropriate measure for innovativeness in food product choice. All motivation and intention items are shown in the appendix.

Scales: For all items, a 7-point scale was used (1 = 'Totally disagree' to 7 = 'Totally agree'), apart from the measure of overall trust, where the 7-point scale ranged from 1='Very little trust' to 7='Very high level of trust'.

Demographics and piloting: In addition, a range of demographics were measured (e.g., age, gender, country of residence, urban-rural living area, education, work status, household status), and items were piloted to obtain participant feedback on the general usability of the questionnaire.

3.2. Participants and sampling procedure

Our target population was European food consumers aged 18+ years from 13 European countries (Belgium, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Poland, Spain, Switzerland, The Netherlands, UK). Participants from these countries represent a broad cross-section of European consumers and national clusters. In these 13 countries, two rounds of data collection took place from May to July, in 2019 and 2020. In each round of data collection, we aimed for samples of at least 1000 per country. Samples were nationally representative for age, gender, urban and rural living and socio-economic group, and represented a broad cross-section of European national cultures. Recruitment, piloting and data collection were coordinated by Ipsos. This took place via computer-assisted web interviewing (CAWI), with respondents drawn randomly from volunteer participant online panels. Data collection complied with General Data Protection Regulation (GDPR) via Ipsos's professional ethical processes, standards and procedures. Translated questionnaires were developed in 7 languages from a finalised English master questionnaire: Danish, Dutch, Finnish, French, German, Hebrew, Italian, Polish, Spanish. Standard measures were used to assess socio-demographic characteristics. The questionnaire was piloted on a small sub-sample ($n = 100$/country), and items within scales were presented in randomised order so as to avoid item ordering effects. No changes to the questionnaire were made between the pilot and the main study. The survey was given ethical permission to proceed by the University of Reading's School of Agriculture, Policy and Development's ethics committee.

3.3. Data analysis

The main data analysis was based on a set of moderation analyses. Overall trust, beliefs in trustworthiness and social trust were analysed as moderators of the relationship between motivation (to eat healthily, to live sustainably, to make novel food choices) and intentions (to make healthy, sustainable and novel food choices). This analysis was based on

the macro PROCESS (Hayes, 2017) conducted within the Statistical Package for the Social Sciences (SPSS) 24, and macro PROCESS version 2.16.1 (www.processmacro.org). Moderation analyses (PROCESS model 1) were performed separately on data from 2019 and 2020 using the bootstrapping method.

We first assessed to what extent trust in all actors, beliefs in trustworthiness of all actors and social trust moderated the relationship between motivations (to eat healthily, to live sustainably, to make novel food choices) and intentions (to make healthy, sustainable and novel food choices). Next, we explored whether trust in or beliefs in trustworthiness of a specific actor (farmers, manufacturers, retailers, authorities) moderated the relationship between motivations (to eat healthily, to live sustainably, to make novel food choices) and intentions (to make healthy, sustainable and novel food choices).

Statistically significant interactions were interpreted with simple effects calculated at the mean value of the moderator (i.e. overall trust, beliefs and social trust) as well as at the mean value plus/minus one standard deviation from the mean. Appropriate confidence intervals for the effects were also calculated.

If interaction between motivation and overall trust, beliefs or social trust was statistically significant, the Johnson-Neyman technique (Bauer & Curran, 2005) was used to probe for interactions and to identify the effect of motivation (to eat healthily, to live sustainably, to make novel food choices) on intention (to make healthy, sustainable and novel food choices) at the minimum and maximum value as well as for the 1st, 2nd and 3rd quartile value of the moderator. The technique does not only assess the effect of motivation on intention at different values for the moderator, but also allows the confidence interval of the effect to be identified.

4. Results

4.1. Sample composition and reliability check

In total, 25,610 completed questionnaires were obtained from 13 countries that took part in the TrustTracker® Survey in 2019 ($n = 11,310$) and 2020 ($n = 14,300$). Sample composition for each survey year and country is described below in Table 1 in terms of gender, age, living in rural vs. urban areas, education, work status and household status. Over the two years, participant mean age was 47.2 years (range 18–96), with the highest and lowest age being 18 years for each country and 96 years for Belgium. Female respondents accounted for 51 % in 2019 and 2020. The percentage of respondents living in rural areas was 26 %, from 13 % in Israel to 46 % in Switzerland. Approximately half the sample had graduated from tertiary education, however some country differences were seen in education level. In Italy, for instance, 35 % of respondents had received tertiary education, whereas in Spain the proportion increased to 68 %. Retired respondents made up a higher proportion of the sample in Denmark and Finland. The highest number of employed or self-employed respondents was found in Israel, Spain and Poland. Overall, samples were similar in demographic composition across the 13 countries and across the two years.

4.2. Overall trust, beliefs in actors' trustworthiness and social trust as moderators of the relationship between motivation and intentions

Table 2 presents 95 % confidence intervals for the estimates of interaction effects between the moderator (i.e. overall trust, beliefs in trustworthiness and social trust) and the focal predictor (i.e. motivation to eat healthily, to live sustainably, to make novel food choices), based on the bootstrapping method. The 95 % confidence intervals with statistically significant interactions are marked in bold.

Overall trust, beliefs and social trust did not affect the positive relationship between motivation for healthy eating and intention to perform healthy choices. The only exception was beliefs in the trustworthiness of manufacturers moderating this relationship, and only for

Table 1
Socio-demographic characteristics of the sample (2019 & 2020).

		Germany	Spain	France	Poland	UK	Belgium	Denmark	Finland	Ireland	Israel	Italy	Switzer-land	Nether-lands	Total
No of Observations		1970	1970	1970	1970	1970	1970	1970	1970	1970	1970	1970	1970	1970	25,610
Age (in years)	(mean)	49	47	48	45	48	48	48	48	45	43	48	47	49	47
Male respondents	(%)	49	49	48	48	49	49	49	49	49	49	48	50	49	51
Living in rural areas	(%)	27	15	31	18	23	39	24	20	32	13	17	46	32	26
Education															
Primary	(%)	1	1	2	1	1	2	13	7	1	1	3	3	1	3
Secondary	(%)	58	28	40	49	38	44	21	51	33	30	60	39	46	41
Tertiary	(%)	38	68	53	46	56	49	46	36	58	50	35	43	48	48
Still studying full-time	(%)	2	2	2	2	2	3	2	3	5	7	1	2	2	3
Other qualification	(%)	1	1	3	1	3	1	16	2	3	11	1	10	2	5
Work status															
Employed (full-time/part-time/self)	(%)	61	66	60	65	60	48	55	49	61	74	59	62	56	60
Unemployed	(%)	8	15	13	9	15	18	9	13	16	8	19	11	16	13
Retired	(%)	26	16	25	22	22	27	29	31	16	11	17	21	23	22
Student / pupil / in full time education	(%)	4	3	3	4	2	8	7	6	6	8	5	6	5	5
Household status															
Household with children (single/couple/other)	(%)	30	58	43	53	42	42	34	27	54	70	59	34	38	45
Household without children (single/couple/other)	(%)	70	42	57	47	58	58	66	73	46	30	41	66	62	55

the 2019 data, with stronger beliefs in trustworthiness associated with higher correlations between motivation and intentions. Overall trust and social trust moderated the relationship between motivation for sustainable living and intention to perform sustainable choices both in the 2019 and 2020 data. Beliefs regarding the trustworthiness of farmers and retailers moderated the relationship between motivation for sustainable living and intention to perform sustainable choices both in the 2019 and 2020 data. Beliefs in the trustworthiness of manufacturers and authorities did not moderate the relationship between motivation for sustainable living and intention to make sustainable choices. Overall trust, beliefs in trustworthiness and social trust moderated the relationship between motivation to innovate and adopt novel products, both in the 2019 and 2020 data. Effect of motivation to innovate on intention to buy novel food products was moderated by trust in each of the four food system actors as well as by beliefs in trustworthiness in each of the four food system actors that they care, are open and competent[1].

Table 3 illustrates how the effect of the explanatory variable, motivation, on intention depends on the value of the moderator variable. We present the effect estimates for 5 out of 21 levels of moderators provided by the Johnson-Neyman method, i.e. for minimum value, 1st, 2nd and 3rd quartile and for the maximum value. The Z-scores in Table 3 represent standardized values of the specific moderator that was considered (i.e. overall trust, beliefs and social trust). The B values represent standardized regression coefficients of the effect of motivation (to live sustainably or to make novel food choices) on intention (to make sustainable or novel food choices) for the different values of the moderator.

The positive relationship between motivation and intentions was strengthened by overall trust, beliefs in trustworthiness and social trust. The higher the level of overall trust and the higher the level of social trust, the stronger the association between motivation for sustainable living and intention to make sustainable choices, both in the, 2019 and, 2020 data. The higher the level of overall trust, the higher the level of beliefs about trustworthiness, and the higher the level of social trust the stronger the effect of motivation to innovate on intention to adopt new products, both in the, 2019 data and 2020 data.

5. Discussion

5.1. Theoretical implications for the role of trust in the purchases of food with credence characteristics

Consumer demand for products positioned in terms of credence attributes such as health and sustainability are, almost by definition, contingent on the availability of information about these attributes that consumers find credible. In spite of this, the role of trust in consumers' intention to buy products with credence attributes has received only scant attention in the literature. Our results underline the importance and role of trust in bridging gaps between motivation to buy such products and intentions to do so, showing that higher levels of trust strengthen the relationship between motivation and intention. From the perspective of socio-cognitive theory, this suggests that trust in the actors involved in the provision of information about credence attributes increases people's self-efficacy when buying such products, a topic to be investigated in further research.

We found that trust is a moderator of the relationship between motivation and intention to purchase sustainable and/or novel products, but not for healthy products. In other words, the relationship between health motivation and intention to buy healthy products was not affected by the level of trust in food chain actors (with one exception, trust in manufacturers, and only for one of the two years where we had data). We believe that a likely explanation for this finding is that the

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[1] Results broken down for the four food chain actors are available from the authors upon request.

Table 2
Results of moderation analysis for the data from 2019 and 2020

Relationship		Moderator		
Motivation	**Intention**	**Overall trust**	**Beliefs**	**Social trust**
2019		*All actors*		
Healthy eating	Healthy choice	[−0.01;0.01]	[−0.01;0.01]	[−0.01;0.02]
Sustainable living	Sustainable choice	**[0.01;0.04]**	[−0.01;0.03]	**[0.03; 0.05]**
Innovation	New product adoption	**[0.06;0.08]**	**[0.06;0.08]**	**[0.05; 0.07]**
2020		*All actors*		
Healthy eating	Healthy choice	[−0.01;0.02]	[−0.01;0.01]	[−0.01;0.01]
Sustainable living	Sustainable choice	**[0.01;0.04]**	[−0.01;0.02]	**[0.02; 0.09]**
Innovation	New product adoption	**[0.06;0.08]**	**[0.07;0.09]**	**[0.04; 0.06]**
2019		*Farmers*		
Healthy eating	Healthy choice	[−0.02; 0.01]	[−0.02; 0.01]	
Sustainable living	Sustainable choice	**[0.02; 0.05]**	**[0.01; 0.04]**	
Innovation	New product adoption	**[0.05; 0.07]**	**[0.05; 0.08]**	
2020		*Farmers*		
Healthy eating	Healthy choice	[−0.01; 0.02]	[−0.01; 0.01]	
Sustainable living	Sustainable choice	**[0.01; 0.03]**	**[0.01; 0.03]**	
Innovation	New product adoption	**[0.04; 0.07]**	**[0.05; 0.07]**	
2019		*Manufacturers*		
Healthy eating	Healthy choice	[−0.01; 0.02]	**[0.01; 0.03]**	
Sustainable living	Sustainable choice	[−0.01; 0.03]	[−0.02; 0.01]	
Innovation	New product adoption	**[0.05; 0.07]**	**[0.06; 0.08]**	
2020		*Manufacturers*		
Healthy eating	Healthy choice	[−0.01; 0.02]	[−0.01; 0.02]	
Sustainable living	Sustainable choice	**[0.01; 0.03]**	[−0.02; 0.01]	
Innovation	New product adoption	**[0.05; 0.08]**	**[0.06; 0.09]**	
2019		*Retailers*		
Healthy eating	Healthy choice	[−0.01; 0.01]	[−0.01; 0.02]	
Sustainable living	Sustainable choice	**[0.02; 0.05]**	**[0.01; 0.04]**	
Innovation	New product adoption	**[0.05; 0.08]**	**[0.05; 0.07]**	
2020		*Retailers*		
Healthy eating	Healthy choice	[−0.01; 0.02]	[−0.01; 0.02]	
Sustainable living	Sustainable choice	**[0.02; 0.04]**	**[0.01; 0.03]**	
Innovation	New product adoption	**[0.05; 0.08]**	**[0.06; 0.08]**	
2019		*Authorities*		
Healthy eating	Healthy choice	[−0.02; 0.01]	[−0.02; 0.01]	
Sustainable living	Sustainable choice	**[0.01; 0.03]**	[−0.01; 0.02]	
Innovation	New product adoption	**[0.04; 0.07]**	**[0.05; 0.08]**	
2020		*Authorities*		
Healthy eating	Healthy choice	[−0.01; 0.02]	[−0.02; 0.01]	
Sustainable living	Sustainable choice	**[0.01; 0.03]**	[−0.01; 0.01]	
Innovation	New product adoption	**[0.03; 0.06]**	**[0.04; 0.06]**	

Numbers are 95 % confidence intervals for interaction coefficients. Statistically significant interactions are in bold.

choice of healthy products today is less based on information and more about the consumer's own knowledge. Based on decades of information on food and health, most people have some idea about which products are healthy and which are not, and are therefore less dependent on information to inform their decisions. Health-related choices may be based more on search attributes like the product category (e.g., vegetables vs. meat-base) or the degree of processing. Also, a great deal of information from sources that are not part of the food chain is available to consumers, and these sources provide additional advice on which products are more, and which are less healthy. For both sustainability and novel products, there is a greater likelihood of product-related uncertainty, which in turn makes information from food chain actors more relevant for consumer intention formation.

The relationship between motivation for sustainable living and intention to make sustainable food choices is moderated by overall trust for all four food chain actors, although the result for, 2019 for manufacturers was not significant. Beliefs about trustworthiness also moderate this relationship, but only for farmers and retailers. This may be because, for the other actors, social trust may be the major driver for the overall trust.

Social trust, overall trust and beliefs in trustworthiness for all four food chain actors are significant moderators for the relationship between motivation to be innovative and intention to adopt novel food products. Perceived risk in novel food products is typically higher than for established food products, and therefore trust plays a more important

role to mitigate this.

Finally, it is an interesting finding that social trust also moderates the motivation-intention relationship. Social trust is not linked to any particular actor but mirrors the general beliefs on the extent to which other people can be trusted. It is a well-known fact that social trust is partly a cultural issue, and that there are differences in levels of social trust between countries (Ferrin & Gillespie, 2010). Differences in the adoption of products with credence characteristics between countries, like the well-documented differences in the adoption of organic food, could therefore be related to differences in social trust. This is a topic for future research.

5.2. Implications for food policy

In our study, we found that motivation to try new and more sustainable products based on credence attributes is moderated by trust. This recognition of the important role of trust in supporting the adoption of food solutions that enhance our food security has strong implications for food policy and policy-makers moving forward, highlighting the need to develop opportunities for a more trusted food system. Trust in credence attributes of food products can be achieved through various ways including certification schemes, communication and source credibility. Credence attributes can be signalled through certification by an authority that consumers can trust to provide reliable information (Becker, 1999; Caswell & Mojduszka, 1996). Some research even

Table 3

Strength of the effect of motivation on intention for different values of the moderator overall trust, beliefs in trustworthiness and social trust, based on the data from 2019 and 2020

2019				2020			
Z	B	t	p	Z	B	t	p
Motivation for sustainable living ➔ Intention to make sustainable choices, moderated by **overall trust**							
	0.51				0.48		
−2.99	[0.47; 0.55]	25.07	***	−3.34	[0.44; 0.52]	23.51	***
	0.55				0.51		
−1.66	[0.52; 0.57]	44.14	***	−1.93	[0.49; 0.54]	40.87	***
	0.58				0.55		
−0.33	[0.57; 0.60]	75.86	***	−0.52	[0.54; 0.57]	76.36	***
	0.62				0.59		
1.00	[0.6; 0.64]	53.76	***	0.89	[0.57; 0.61]	60.64	***
	0.65				0.62		
2.33	[0.62; 0.69]	33.84	***	2.31	[0.59; 0.66]	37.04	***
Motivation for innovation ➔ Intention to adopt new products, moderated by **overall trust**							
	0.40				0.37		
−2.99	[0.36; 0.44]	19.46	***	−3.34	[0.33; 0.41]	17.53	***
	0.49				0.47		
−1.66	[0.47; 0.52]	38.65	***	−1.93	[0.45; 0.50]	35.36	***
	0.59				0.57		
−0.33	[0.57; 0.60]	77.47	***	−0.52	[0.56; 0.59]	78.91	***
	0.68				0.67		
1.00	[0.66; 0.70]	67.94	***	0.89	[0.66; 0.69]	78.06	***
	0.78				0.77		
2.33	[0.74; 0.81]	45.52	***	2.31	[0.74; 0.80]	49.49	***
Motivation for innovation ➔ Intention to adopt new products, moderated by **beliefs in trustworthiness**							
	0.39				0.34		
−3.00	[0.35; 0.43]	19.47	***	−3.34	[0.30; 0.38]	17.01	***
	0.49				0.46		
−1.62	[0.46; 0.51]	39.95	***	−1.85	[0.43; 0.48]	37.30	***
	0.58				0.57		
−0.23	[0.57; 0.60]	78.65	***	−0.37	[0.56; 0.58]	84.55	***
	0.68				0.68		
1.15	[0.66; 0.70]	63.11	***	1.12	[0.67; 0.70]	70.41	***
	0.78				0.8		
2.54	[0.75; 0.82]	42.80	***	2.60	[0.76; 0.83]	46.29	***
Motivation for sustainable living ➔ Intention to make sustainable choices, moderated by **social trust**							
	0.49				0.48		
−2.45	[0.45; 0.52]	28.43	***	−2.55	[0.45; 0.52]	3.10	***
	0.53				0.52		
−1.37	[0.51; 0.55]	48.26	***	−1.42	[0.50; 0.54]	5.54	***
	0.57				0.55		
−0.28	[0.56; 0.59]	74.34	***	−0.29	[0.54; 0.56]	78.83	***
	0.61				0.58		
0.80	[0.59; 0.63]	58.41	***	0.84	[0.56; 0.60]	61.08	***
	0.66				0.62		
1.88	[0.62; 0.69]	39.58	***	1.96	[0.59; 0.65]	4.43	***
Motivation for Innovation ➔ Intention to adopt new products, moderated by **social trust**							
	0.47				0.48		
−2.45	[0.43; 0.50]	26.43	***	−2.55	[0.45; 0.52]	29.39	***
	0.53				0.54		
−1.37	[0.51; 0.56]	46.31	***	−1.42	[0.52; 0.56]	51.01	***
	0.60				0.60		
−0.28	[0.59; 0.62]	79.21	***	−0.29	[0.59; 0.61]	88.29	***
	0.67				0.66		
0.80	[0.65; 0.69]	71.66	***	0.84	[0.64; 0.67]	77.89	***
	0.73				0.71		
1.88	[0.70; 0.76]	49.38	***	1.96	[0.69; 0.74]	52.14	***

Z - standardized values of overall trust, beliefs in trustworthiness and social trust; *B* – standardized regression coefficients with 95 % confidence intervals; *t* – values of statistical test for significance of relationships between explanatory and explained variables; *** – 0.001 statistical significance.

Note. We present the effect estimates for 5 out of 21 levels of moderators provided by the Johnson-Neyman method, i.e. *for minimum value, 1st, 2nd and 3rd quartile and for the maximum value.*

suggests that providing this information could transform former experience or credence attributes into search attributes (Caswell & Mojduszka, 1996). Simple labelling by food manufacturers and retailers, especially for eco-labels, is not seen as trustworthy because food brands are not independent third parties (Wessells, 2002). But even within independent third parties, some have been found to be seen as more trustworthy than others. Röhr and colleagues (2005) found German consumers to mistrust information both from food producers and third parties, such as the agricultural ministry and the media, while environmental organizations, nutritionists or physicians were seen as more trustworthy. Furthermore, it has been shown that the more trusted an organization (e.g., environmental association, advocacy group) is seen to be, the higher the belief in the credence attributes they "vouch" for (Goddard et al., 2019; Russo, Simeone and Perito, 2020). Importantly, specifically in the context of a food produced by new technologies, information from reliable third parties like government institutions can, together with personal experiences with the food's credence attributes, increase consumer trust (Del Giudice, Cavallo and Vecchio, 2018).

5.3. Implications for the food sector

Despite consumers trusting third parties more than the supply chain actors themselves when it comes to credence attributes (Berg et al., 2005; De Jonge et al., 2007; Sapp et al., 2009), how supply chain actors **communicate** about their food attributes matters a great deal and can improve their perceived trustworthiness. For example, trust is linked to emotional attachment, and so continuous personalised communication enables inferences about a business's trustworthiness (Papadopoulou et al., 2001). Furthermore, the framing of messages has been found to influence perceived credibility: In the case of online communication, negative messages are perceived as more credible than positive ones, when they are posted by someone with whom people feel they have a close social relationship (Pan & Chiou, 2011). The perceived closeness of social relationships is also relevant in the offline context. Knowing, and sometimes even having a personal relationship with fruit and vegetable producers can increase the perceived freshness and taste of the produce and can enhance trust in these foods more so than a certification would be able to do (Midmore et al., 2005).

5.4. Conclusions

Our study shows that trust is a moderator for the relationship between motivation to live sustainably and the intention to actually do so. This shows that improving consumer trust in the food chain is an important element in the green transition of the food sector. We also show that trust moderates the relationship between motivation to adopt novel food products and the intention to actually to do so, showing that the adoption of novel food products is also contingent on consumer trust. Since the green transition is dependent on the introduction of novel, healthy and sustainable food products, this gives additional support to the importance of improving consumer trust in the development of a more sustainable food sector.

Appendix 1 – Questionnaire items to measure motivation and intention towards healthy eating, sustainable living and innovation.

	Mean	Cronbach's α
Motivation for healthy eating	4.724	0.795
I am very particular about the healthiness of the food I eat		
It is important to me that my diet is low in fat		
I always follow a healthy and balanced diet		
Motivation for sustainable living	5.387	0.889
I am concerned about the development of the global environment		
I feel it is a moral obligation to use environment-friendly products		
It concerns me that people do not care enough for the environment		
Motivation for innovation	4.736	0.933
I love to try recipes from different countries.		
Recipes and articles on food from other culinary traditions encourage me to experiment in the kitchen.		
I look for ways to prepare unusual meals.		
I like to try out new recipes.		
I like to try new foods that I have never tasted before		
Intention to make healthy food choices:	4.723	0.756
I make a special effort to buy food products that are healthy		
I have switched food products for health reasons		
When I have a choice between two equal food products, I purchase the one that is healthier		
Intention to make sustainable food choices:	4.457	0.884
I make a special effort to buy food products that are produced in an sustainable way		
I have switched food products for sustainability reasons		
When I have a choice between two equal food products, I purchase the one that is more sustainable		
Intention to make novel food choices:	3.789	0.917
In general, I am among the first in my circle of friends to try a new food product when it appears in the shops		
If I heard that a new food product was in the shops, I would be interested in buying it		
In general, I am among the first in my circle of friends to hear about new food products		

Appendix 2 – Questionnaire items to measure social trust, trustworthiness of actors and confidence in food products and their technologies (see Macready et al., 2020).

	Mean	Cronbach's α
Overall trust in actors: How much <u>trust</u> do you have in the following groups regarding the <u>production, selling and regulation of food</u>?	4.472	0.820
Farmers (producing plants and animals for human consumption)		
Food manufacturers (preparing, preserving and packaging food)		
Retailers (supermarkets, markets, food stores)		
Authorities (government agencies at national and EU level)		
Beliefs about trustworthiness of actors:	4.318	0.973
Farmers…	4.722	0.947
…are doing a good job with regard to producing food		
…are competent enough to deal with the production of food		
…have the necessarily skilled people to produce food		
…are acting in the public interest with regard to producing food		
…listen to concerns regarding food production raised by the public		
…listen to what ordinary people think about food production		
…provide all relevant information about food production to the public		
…are honest about the production of food		
…are sufficiently open about the production of food		
Manufacturers…	4.125	0.949
…are doing a good job with regard to producing food		
…are competent enough to deal with the production of food		
…have the necessarily skilled people to produce food		
…are acting in the public interest with regard to producing food		
…listen to concerns regarding food production raised by the public		
…listen to what ordinary people think about food production		
…provide all relevant information about food production to the public		
…are honest about the production of food		
…are sufficiently open about the production of food		
Retailers…	4.312	0.946
…are doing a good job with regard to selling food		
…are competent enough to deal with the selling food		
…have the necessarily skilled people to sell food		
…are acting in the public interest with regard to selling food		
…listen to concerns regarding food raised by the public		
…listen to what ordinary people think about food		
…provide all relevant information about food to the public		
…are honest about how they sell food		
…are sufficiently open about how they sell food		
Authorities…	4.114	0.959
…are doing a good job with regard to regulating food		
…are competent enough to deal with the regulation food		
…have the necessarily skilled people to regulate food		
…are acting in the public interest with regard to regulating food		
…listen to concerns regarding food raised by the public		
…listen to what ordinary people think about food		
…provide all relevant information about food to the public		
…are honest about how they regulate food		
…are sufficiently open about how they regulate food		
Social trust:	4.391	0.921
I generally trust other people		
I feel that people are generally trustworthy		
I feel that people are generally reliable		

Ethical statement

CRediT authorship contribution statement

Anna L. Macready: Writing – review & editing, Writing – original draft, Supervision, Methodology, Funding acquisition, Conceptualization. **Sophie Hieke:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Magdalena Klimczuk-Kochańska:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Szymon Szumiał:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation. **Katharina Wachter:** Writing – review & editing, Writing – original draft. **Matthieu H. Arnoult:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Conceptualization. **Liesbet Vranken:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Klaus G. Grunert:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization.

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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Data availability

Data will be made available on request.

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