

**Exploring consumers' interpretation and use of contested nutritional,
environmental and ethical evidence regarding food**

Edoardo Maria Pelli

Vollständiger Abdruck der von der TUM School of Management der Technischen Universität München zur Erlangen eines Doktors der Wirtschafts- und Sozialwissenschaften (Dr. rer. pol.) genehmigten Dissertation.

Vorsitz: Prof. Dr. Philipp Lergetporer

Prüfende der Dissertation:

1. Prof. Dr. Jutta Roosen
2. Prof. Dr. Sebastian Hess

Die Dissertation wurde am 06.09.2024 bei der Technischen Universität München eingereicht und durch die TUM School of Management am 15.12.2024 angenommen.

Acknowledgments

I would like to dedicate this dissertation to my grandfather, Mario Giannini Santa Maria.

He was an esteemed civil lawyer and canon lawyer. He was really passionate about studying his subjects, he loved me and he helped me fundamentally in my path.

I would like to thank my supervisor, Prof. Dr. Jutta Roosen, for her constant supervision and support and for teaching me to study systematically. Thank you also for the academic freedom that you gave me during my phase as doctoral candidate with the possibility of doing a visiting research period at University of Alberta in Canada and attending various PhD courses across Germany. I would like to thank all the colleagues and visitors that I met at the Chair of Marketing and Consumer Research at the Technical University of Munich, for the research discussions and seminars about our research at the Chair and during the research retreats.

I would like to thank Prof. Dr. Ellen Goddard for hosting me at University of Alberta, Canada for my visiting research period in 2022. Thank you for the possibility that you gave me to do research in Canada and for the very interesting literature that you showed me. I would like to thank all the graduate students, postdocs, professors and visitors at the Department of Resource Economics and Environmental Sociology (REES) at University of Alberta, Canada, for welcoming me and inviting me to present at a REES Brown Bag Seminar. I would like to thank Michael Olufemi, Katherine Rogers, Yiyuan Miao, Prof. Dr. Brent Swallow and all the other collaborators for our presentations at two conferences of the Canadian Agricultural Economics Society (CAES) in 2022 and in 2023. I would like to thank Dr. Tsegaye Ginbo Gatiso for being my office mate at University of Alberta.

I would like to thank the German Research Foundation (DFG), grant n. 667754, and the Chair of Marketing and Consumer Research (held by Prof. Dr. Jutta Roosen) at the School of Management at Technical University of Munich, Germany, for funding my doctorate. I would like to thank also the former DFG research group 2448 (former project coordinator: Dr. Olga Sparschuh). I would like to thank the former Co-operative Chair in Agricultural Marketing and Business (formerly held by Prof. Dr. Ellen Goddard) at the Department of Resource Economics and Environmental Sociology (REES) at University of Alberta, Canada, the Graduate School at Technical University of Munich, Germany and the Graduate Center of the School of Management at Technical University of Munich, Germany for the additional funding provided during my doctorate.

I would like to thank Prof. Dr. Jutta Roosen and Prof. Dr. Sebastian Hess for being my examiners and Prof. Dr. Philipp Lergetporer for chairing the commission.

I would like to thank my dear friend and colleague Dr. Filippo Rossi from Università Cattolica del Sacro Cuore, Italy. Thank you Dr. Filippo Rossi for your friendship and your constant support and mentoring during my academic and professional path. Thank you Dr. Filippo Rossi, you helped and are helping me fundamentally in my path.

I would like to thank Prof. Dr. Paolo Sckokai for being my supervisor for my M. Sc. at Università Cattolica del Sacro Cuore, Italy, and for his support. I would like to thank Prof. Dr. Vincenzina Caputo (Michigan State University, U.S.) for her co-supervision during my M. Sc. Thesis. I would like to thank also Prof. Dr. Giovanni Sogari (University of Parma, Italy) and Prof. Dr. Jeffrey Swada (Michigan State University, U.S.) for the interesting talks about research during that period. I would like to thank Dr. Rinaldo Nicoli Aldini, Prof. Dr. Roberta Dordoni and all the other researchers and professors at Università Cattolica del Sacro Cuore,

Italy. I would like to thank all the students that I met at Università Cattolica del Sacro Cuore, Italy.

I would like to thank Prof. Dr. Sean Cash for the welcoming at Tufts University, U. S., and for his important support and advice during my path.

I would like to thank Prof. Dr. Jorge Sellare (Wageningen University, the Netherlands), and all the other co-authors of our commentary paper published in *Nature* for this great opportunity.

I would like to thank Prof. Dr. Travis Lybbert (University of California, Davis, U.S.) for his participation to our presentation at the 2022 conference of the Agricultural and Applied Economics Association (AAEA) in California, U.S., and Prof. Dr. David Wuepper (University of Bonn, Germany) for introducing me to Prof. Dr. Travis Lybbert.

I would like to thank Prof. Dr. Bernhard Dalheimer (Purdue University, U.S.) and the entire AgEcon Meet Board for inviting me to present at the AgEcon Meet online seminar in November 2022 and thanks also to the other presenters, Prof. Dr. Frederic Ang (Wageningen University, the Netherlands) and Prof. Dr. Liesbet Vranken (KU Leuven, Belgium).

I would like to thank Prof. Dr. Sebastian Hess, Prof. Dr. Christine Wieck, Dr. Dominik Baaken, Franziska Mittag and all the other PhD students and professors at University of Hohenheim, Germany, for inviting and welcoming me to present at the seminars at the University of Hohenheim in 2021 and in 2022.

I would like to thank all the colleagues from the Chair of Agricultural Production and Resource Economics at Technical University of Munich.

I would like to thank Hannah Jost, Elias Schaller and Dr. Dominik Baaken for their help in translating from English to German the abstract and the summary of the dissertation and my CV.

I would like to thank my friend and colleague Prof. Dr. Mauro Ceroni from University of Pavia, Italy, for his friendship and our talks about research.

I would like to thank my mother Claudia and my father Gerolamo for their love and support and for their constant monitoring and advice during my path. Also, without the support of my father and my mother, I would have not been able to study and work internationally in different countries for so long. I would like to thank my grandmothers, my uncle, my sisters, my brother, with his wife and my niece, for their love and support. I would like to thank my godmother for her love and support.

I would like to thank Giuseppe Barbiero, with his wife, for our interesting discussions on economic aspects in general and regarding the agri-food system.

I would like to thank all the friends in U.S. and Canada for their welcoming and friendship.

Now I am ready for the next challenge. Thank you Professor Nicholas Tyack and Professor Yang Yang for the opportunity. I am really looking forward to meeting you and all the other students, researchers and professors at University of Saskatchewan, Canada during my work as a Postdoctoral Fellow.

Summary

This dissertation explores consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food from a conceptual and empirical perspective. This dissertation recognizes the importance of psychological aspects in economic analyses of human attitudes and behavior, as suggested by Thaler (2016).

After introducing the background, the objectives and the structure of the dissertation, this dissertation shows that nutritional evidence of food is a contested issue, through the work of Pelli and Roosen (2023) (Essay I). This work shows, from a conceptual perspective, the relevance of psychological aspects, particularly moral values, and of cultural context in exploring consumers' interpretation of contested nutritional evidence, at the example of superfoods. Superfoods are foods promoted as "healthy"; however, the literature on functional foods (which can be "natural" foods such as superfoods or artificially fortified foods) suggests that there is limited evidence coming from human trials for the presumed nutritional benefits of these foods (Bassaganya-Riera et al. 2021). Moral values are conceptualized according to the moral foundation theory (MFT) (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013).

Then the dissertation explores further the topic of contested nutritional evidence in Essay II. Essay II argues that, in the context of contested nutritional evidence of foods, for consumers it may be difficult to be sure what constitutes a healthy diet and therefore consumers may have moral concerns for the specific issue of unhealthy diets (in relation to the concept of moral intensity developed by Jones 1991). In this context, moral concerns for the issue of unhealthy diets, together with subjective and objective nutritional knowledge, may play a role in determining consumers' interpretation (defined as attitudes) of contested nutritional evidence. In this context, Essay II carries out a cross-cultural empirical analysis on a sample of German

and Canadian consumers on the influence of subjective nutritional knowledge, objective nutritional knowledge and moral concerns for the issue of unhealthy diets on nutritional attitudes, through the implementation of linear regression analyses. Results show that objective and subjective nutritional knowledge, together with moral concerns for the issue of unhealthy diets, play a role in influencing nutritional attitudes in both countries. More specifically, a positive and significant effect of subjective nutritional knowledge on nutritional attitudes in both countries have been always detected. Furthermore, some significant effects of objective nutritional knowledge on nutritional attitudes have been observed. Moreover, moral concerns for the specific issue of unhealthy diets significantly influenced nutritional attitudes in both countries. Particularly in Canada there was a stronger influence of moral concerns on nutritional attitudes, in comparison to Germany, as shown by more statistically significance results. These significant differences across the two countries suggest that culture may play a role in these processes.

Finally, Essay III expands the issue of evidence contestation to a situation of contested nutritional, environmental and ethical evidence at the example of a specific superfood, quinoa. Drawing upon the conceptual framework of Essay I, Essay III provides a cross-cultural empirical analysis on a sample of German and Canadian consumers, on the influence of moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) on consumers' use (defined as behavior, in particular product choices) of three food quality labels (organic, Nutri-Score and Fairtrade). These labels were chosen for the study as they can represent a possibility, but not a certainty, to provide consumers with more environmental, nutritional and ethical evidence for the superfood quinoa. To investigate this issue, consumers' answers to the Moral Foundations Questionnaire (MFQ) (Graham et al. 2008; Graham et al. 2011) are combined with an hypothetical discrete choice experiment on the superfood quinoa with the three food quality labels. Half of the participants received an information treatment on the contested nutritional, environmental and ethical evidence of quinoa, that had

moral connotations. Results were obtained through mixed logit models. The results suggest that the information on contested nutritional, environmental and ethical evidence of quinoa influences consumers' preferences for the food quality labels and that moral values play a role in influencing consumers' preferences and willingness to pay (WTP) for the food quality labels, in both countries. Also Essay III found significant differences across the two countries. More specifically, moral values and the information on contested nutritional, environmental and ethical evidence of quinoa (which had moral connotations) influenced more Canadian consumers in comparison to German consumers, thus suggesting that culture may play a role in these processes.

These findings of Essay III are interestingly in line with the respective findings in Essay II. In both essays moral aspects seem to influence more Canadian consumers than German consumers: interestingly, two different moral scales, across the process of consumers' decision making, from nutritional attitudes to food choice, have a similar effect in Canada respect to Germany.

Taken together, this study contributes to the field of behavioral economics, defined by Thaler (2016), page 1577, as the: "[...] growing interest in the mixture of psychology and economics [...]", by including a relevant type of psychological aspects, namely moral aspects, in an economic analysis of food consumption. Indeed, this study shows, from a conceptual and empirical cross-cultural perspective, that moral aspects are relevant in influencing consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food.

Zusammenfassung

Diese Dissertation untersucht aus einer konzeptionellen und empirischen Perspektive, wie Verbraucher kontroverse ernährungsphysiologische, ökologische und ethische Evidenz im Zusammenhang mit Lebensmitteln interpretieren und nutzen. Sie erkennt, wie von Thaler (2016) vorgeschlagen, die Bedeutung psychologischer Aspekte in der ökonomischen Analyse menschlicher Einstellungen und Verhaltensweisen an.

Nach einer Einführung, die den Hintergrund, die Ziele und die Struktur der Dissertation darlegen, zeigt diese Arbeit anhand der Forschungsarbeit von Pelli and Roosen (2023) (Essay I), dass die ernährungsbezogene Evidenz für Lebensmittel ein kontroverses Thema ist. Diese Arbeit zeigt aus konzeptioneller Sicht die Relevanz psychologischer Aspekte, insbesondere moralischer Werte sowie die des kulturellen Kontextes bei der Untersuchung der Interpretation umstrittener ernährungsbezogener Evidenz durch Verbraucher am Beispiel von Superfoods. Superfoods werden als “gesund“ beworben, aber die Literatur zu funktionellen Lebensmitteln (bei denen es sich um „natürliche“ Lebensmittel wie Superfoods oder künstlich angereicherte Lebensmittel handeln kann) weist darauf hin, dass es nur begrenzte Belege aus Humanstudien für die behaupteten ernährungsbezogenen Vorteile dieser Lebensmittel gibt (Bassaganya-Riera et al. 2021). Der Einfluss moralischer Werte wird anhand der Moral Foundations Theory (MFT) betrachtet (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013).

Anschließend wird das Thema der umstrittenen ernährungswissenschaftlichen Beweise in Essay II empirisch untersucht. In Essay II wird argumentiert, dass es im Kontext umstrittener ernährungswissenschaftlicher Evidenz für Verbraucher schwierig sein kann zu wissen, was eine gesunde Ernährung ausmacht. Daher haben Verbraucher unter Umständen moralische Bedenken für spezifische Probleme von ungesunden Diäten (im Vergleich zum Konzept von moralischer Intensität, die von Jones 1991 entwickelt wurde). In diesem Zusammenhang

können moralische Bedenken hinsichtlich ungesunder Ernährung zusammen mit subjektivem und objektivem Ernährungswissen eine Rolle bei der Bestimmung der Interpretation (definiert als Einstellung) umstrittener ernährungsbezogener Beweise durch Verbraucher spielen. In diesem Zusammenhang führt Essay II eine kulturübergreifende empirische Analyse an einer Stichprobe deutscher und kanadischer Verbraucher durch, um den Einfluss von subjektivem Ernährungswissen, objektivem Ernährungswissen und moralischen Bedenken hinsichtlich ungesunder Ernährung auf ernährungsbezogene Einstellungen mittels linearer Regressionsanalysen zu untersuchen. Die Ergebnisse zeigen, dass objektives und subjektives Wissen über Ernährung, gepaart mit moralischen Bedenken für das Problem von ungesunder Ernährung, eine Rolle in beiden Ländern spielt, wenn es um die Beeinflussung von ernährungsbezogener Haltung geht. Mehr noch, ein positiver und signifikanter Effekt von subjektivem Ernährungswissen über ernährungsbezogene Haltung wurde in beiden Ländern festgestellt. Außerdem wurden wichtige Effekte von objektivem Ernährungswissen auf Ernährungseinstellungen untersucht. Des Weiteren beeinflussten moralische Bedenken für den spezifischen Sachverhalt von ungesunder Ernährung signifikant die Ernährungseinstellungen in beiden Ländern. Insbesondere in Kanada gab es einen stärkeren Einfluss von moralischen Bedenken auf Ernährungseinstellungen als im Vergleich zu Deutschland, wie in weiteren statistisch relevanten Ergebnissen gezeigt wurde. Diese starken Unterschiede über beide Länder hinweg suggeriert, dass Kultur eine Rolle in diesen Prozessen spielen könnte.

Abschließend erweitert Essay III das Thema der Kontroverse auf eine Situation umstrittener ernährungsbezogener, ökologischer und ethischer Evidenz am Beispiel eines spezifischen Superfoods, Quinoa. Aufbauend auf dem konzeptionellen Rahmen von Essay I führt Essay III eine kulturübergreifende empirische Analyse an einer Stichprobe deutscher und kanadischer Verbraucher durch, um den Einfluss moralischer Werte auf die Nutzung (definiert als Verhalten und Lebensmittelauswahl) von drei Lebensmittelqualitätssiegeln (Biosiegel, Nutri-

Score und Fairtrade) durch Verbraucher zu untersuchen. Diese Labels wurden für die Studie ausgewählt, da sie eine Möglichkeit, aber keine Garantie darstellen, den Verbrauchern mehr ernährungsbezogene, ökologische und ethische Evidenz für das Superfood Quinoa zu geben. Um dieses Thema zu untersuchen, werden die Antworten der Verbraucher auf den Moral Foundations Questionnaire (MFQ) (Graham et al. 2008; Graham et al. 2011) mit einem hypothetischen diskreten Choice Experiment am Beispiel des Superfood Quinoa mit den drei Labels kombiniert. Die Hälfte der Teilnehmer erhielt ein Informationstreatment über die umstrittenen ernährungsbezogenen, ökologischen und ethischen Beweise von Quinoa mit moralischen Konnotationen. Die Daten wurden durch gemischte Logit-Modelle und nachfolgende Schätzungen analysiert. Die Ergebnisse deuten darauf hin, dass die Informationen über umstrittene ernährungsbezogene, ökologische und ethische Evidenz von Quinoa die Präferenzen der Verbraucher für die Lebensmittelqualitätsiegel beeinflussen und dass moralische Werte eine Rolle bei der Beeinflussung der Präferenzen und der Zahlungsbereitschaft (WTP) für die Lebensmittelqualitätslabels in beiden Ländern spielen. Essay III fand signifikante Unterschiede zwischen beiden Ländern. Insbesondere die moralischen Werte sowie die Informationen über kontroverse ernährungs-, umwelt- und ethikbezogene Evidenz von Quinoa (welche eine moralische Konnotation aufwies) beeinflusste kanadische Verbraucher mehr als Deutsche. Somit suggeriert es, dass Kultur eine Rolle in diesen Prozessen spielen könnte.

Die Ergebnisse von Essay III decken sich interessanterweise mit den Ergebnissen von Essay II. In beiden Essays scheinen moralische Aspekte kanadische Verbraucher mehr zu beeinflussen als deutsche: Bemerkenswerterweise haben zwei verschiedene moralische Maßstäbe, vom Prozess der Entscheidungsfindung hin zu Ernährungshaltungen bezüglich der Essenswahl, einen ähnlichen Effekt jeweils in Kanada und Deutschland.

Zusammenfassend leistet diese Studie einen Beitrag zur Verhaltensökonomie, die Thaler (2016) auf Seite 1577 als „[...] growing interest in the mixture of psychology and economics

[...]“ definiert, indem sie relevante psychologische Aspekte, nämlich moralische Aspekte, in eine ökonomische Analyse des Lebensmittelkonsums einbezieht. Diese Studie zeigt aus einer konzeptionellen und empirischen kulturübergreifenden Perspektive, dass moralische Aspekte relevant sind, um die Interpretation und Nutzung kontroverser ernährungsbezogener, ökologischer und ethischer Evidenz durch Verbraucher zu beeinflussen.

Table of contents

- Acknowledgments.....ii
- Summary.....vi
- Zusammenfassung.....ix
- Table of contents.....xiii
- List of tables.....xvii
- List of figures.....xix
- List of abbreviations.....xx
- 1 Introduction.....1
 - 1.1 Background.....1
 - 1.1.1 Scientific evidence contestation at large and in the food domain.....1
 - 1.1.2 The importance of psychology in economics and consumer research.....7
 - 1.1.3 The importance of moral aspects to study consumers’ interpretation and use of contested nutritional, environmental and ethical evidence regarding food.....10
 - 1.2 Objectives and Structure of the dissertation.....12
- 2 Exploring Consumers’ Interpretation of Contested Nutritional Evidence: The Relevance of the Moral Foundations Theory (Essay I).....16
 - 2.1 Introduction.....17

2.2	The Contested Nutritional Evidence for Superfoods.....	21
2.3	The Need for Psychological Approaches to Study Consumers' Interpretation of Contested Nutritional Evidence.....	24
2.4	The Contribution of the Moral Foundation Theory to Investigating Consumers' Interpretation of Contested Nutritional Evidence.....	27
2.5	Conclusion.....	38
3	Investigating the influence of nutritional knowledge and moral concerns on nutritional attitudes: a quantitative study in Germany and Canada (Essay II).....	40
3.1	Introduction.....	42
3.2	Material and methods.....	50
3.2.1	Data.....	50
3.2.2	Survey development... ..	50
3.2.2.1	Nutritional attitudes.....	51
3.2.2.2	Subjective and objective nutritional knowledge... ..	51
3.2.2.3	Measure of moral intensity for the issue of unhealthy diets.....	52
3.2.3	Data analysis.....	53
3.3	Results.....	54
3.3.1	Socio-demographic characteristics.....	54
3.3.2	Factor analysis.....	55
3.3.3	Descriptive statistics and correlations.....	57

3.3.4	Linear regressions.....	59
3.4	Discussion.....	63
3.5	Appendix.....	67
3.5.1	Nutritional attitudes questions.....	67
3.5.2	Subjective nutritional knowledge questions.....	67
3.5.3	Objective nutritional knowledge questions.....	68
3.5.4	Socio-demographic characteristics.....	69
3.5.5	Correlations.....	73
4	Which is the role of moral values on German and Canadian consumers’ preferences and WTPs for food quality labels? (Essay III).....	76
4.1	Introduction.....	78
4.2	Material and methods.....	84
4.2.1	Data.....	84
4.2.2	Survey development.....	85
4.2.2.1	Moral foundations’ measures.....	85
4.2.2.2	Discrete choice experiment.....	85
4.2.3	Data analysis.....	89
4.3	Results.....	92
4.3.1	Socio-demographic characteristics.....	92
4.3.2	Descriptive statistics of the moral foundations.....	93
4.3.3	Mixed logit models.....	93
4.3.3.1	Simple mixed logit model.....	95

4.3.3.2	Complex mixed logit model with the moral founda- tions interacted with the attributes.....	96
4.3.4	Willigness to Pay (WTPs).....	99
4.4	Discussion.....	105
4.5	Appendix.....	108
4.5.1	Moral Foundations Questionnaire (MFQ).....	108
4.5.2	Socio-demographic characteristics.....	109
5	Discussion and Conclusion.....	113
	References.....	126

List of Tables

Table 1: Factor analysis of the moral intensity dimensions (Essay II).....	57
Table 2: Descriptive statistics (Essay II).....	59
Table 3: Linear regression results (Essay II).....	60
Table 4: Objective nutritional knowledge questions (Essay II).....	68
Table 5: Germany – Socio-demographic characteristics (Essay II).....	69-70
Table 6: Canada – Socio-demographic characteristics (Essay II).....	71-72
Table 7: Germany – Correlations of the subjective nutritional knowledge questions (Essay II).....	73
Table 8: Canada – Correlations of the subjective nutritional knowledge questions (Essay II).....	73
Table 9: Germany – Correlations of the variables of the regressions (Essay II).....	74
Table 10: Canada – Correlations of the variables of the regressions (Essay II).....	75
Table 11: Attributes and attribute levels (Essay III).....	86
Table 12: Example of a choice set for Germany (Essay III).....	86
Table 13: Example of a choice set for Canada (Essay III).....	87
Table 14: Descriptive statistics of the moral foundations (Essay III).....	93
Table 15: Mixed logit models (Essay III).....	93-94-95
Table 16: WTPs for the German sample (Essay III).....	99

Table 17: WTPs for the Canadian sample (Essay III).....100

Table 18: Germany – Socio-demographic characteristics (Essay III).....109-110

Table 19: Canada – Socio-demographic characteristics (Essay III).....111-112

List of Figures

Figure 1: Conceptual framework (Essay I).....	32
Figure 2: Possible relationship between the attribute: “healthy” and the moral foundations/values (Essay I).....	34
Figure 3: Possible relationship between the specific role of communication of some influencers and moral foundations/values (Essay I).....	35
Figure 4: Extension of the conceptual framework through the role of cultural development (Essay I).....	37
Figure 5: WTPs of the organic label for the German sample (Essay III).....	100
Figure 6: WTPs of the Nutri-Score label for the German Sample (Essay III).....	101
Figure 7: WTPs of the Fairtrade label for the German sample (Essay III).....	101
Figure 8: WTPs of the organic label for the Canadian sample (Essay III).....	102
Figure 9: WTPs of the Nutri-Score label for the Canadian sample (Essay III).....	102
Figure 10: WTPs for the Fairtrade label for the Canadian sample (Essay III).....	103

List of abbreviations

DGE	Deutsche Gesellschaft für Ernährung
FBDG	Food-Based Dietary Guidelines
FOPL	Front-of-Pack Labelling
GNKQ	General Nutrition Knowledge Questionnaire
MFQ	Moral Foundations Questionnaire
MFT	Moral Foundations Theory
WTP	Willingness to Pay

1 Introduction

This dissertation explores consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food with a conceptual and an empirical perspective.

The research background is outlined in the following section.

1.1 Background

1.1.1 Scientific evidence contestation at large and in the food domain

Scientific evidence can be a contested issue within and outside the scientific community. Indeed, uncertainty is inherent to science because the advancement and discovery of knowledge require an abandonment of previous truths (Light et al. 2022). Debates ensue within the scientific community (Mozaffarian et al. 2018). Even with the best scientific practices and intentions, there is the possibility of scientists to draw conclusions that would be recognized as incorrect in the future (Oreskes 2019). Science critique is a useful resource inside academia.

Through the constructive critique of scientific peers, activities such as journal peer-review, and discussions at academic conferences and seminars, scientific evidence claims can be critically evaluated within the scientific community (Zachmann et al. 2023).

As described by Light et al. (2022), for some issues scientific consensus among the majority of the scientific community have been reached. These issues include, as described by Light et al. (2022), the influence of the human activity on climate change (Anderegg et al. 2010; Core Writing Team et al. 2015), the safety of genetically modified foods (American Association for the Advancement of Science 2012; European Commission, Directorate-General for Research and Innovation 2010), the necessity of building more nuclear plants (Funk et al. 2015), the fact that benefits of vaccinations outweigh their risks and that vaccination has no link with au-

tism (Funk et al. 2015; Gust et al. 2008; DeStefano et al. 2013), the lack of evidence for efficacy of disease treatment by the homeopathic medicine (National Health and Medical Research Council 2015; National Center for Complementary and Integrative Health (NCCIH), National Institutes of Health (NIH), U.S. Department of Health & Human Services 2021), the Big Bang theory (The Nobel Prize in Physics 2011), the evolution of living species (American Association for the Advancement of Science 2006; Rainie et al. 2015) and the efficacy of measures such as social distancing and wearing a mask in reducing the spread of Covid-19 (Matrajt and Leung 2020; Mayo Clinic Staff 2023). However, even for these issues, the consensus within the scientific community is not straightforward. For example, Light et al. (2022) points out that only 65% of the members of the American Association for the Advancement of Science (AAAS) are in favor of building more nuclear power plants (Funk et al. 2015). Even if they represent the majority, the scientific consensus is still debated in the scientific community as this finding means that 35% of the members of the AAAS are not in favor of building more nuclear plants. Furthermore, beyond the academic community, these issues have been contested in the past decades and are being contested now by various actors in the society, such as anti-consensus movements (e.g., anti-nuclear movements) and anti-consensus citizens (Zachmann et al. 2023). This means that for some issues such as climate change, nuclear power, environmental effects of pesticides used in agriculture and the benefits of vaccinations, the criticism used in the scientific community has spread to the society at large, questioning not only the nature of the various types of scientific evidence but also their practical use for political decision making. A well-studied example is the historical attempt by environmentalists to make changes at the political decision making level in order to limit the use of hazardous pesticides in agriculture (Zachmann et al. 2023).

Evidence criticism and contestation is an essential aspect of science and it is useful within the scientific community and outside the scientific community to foster the advancement of science and the development of better political decision making based on scientific evidence.

(Light et al. 2022; Zachmann et al. 2023). Indeed, the fact that scientific knowledge is incomplete and that new scientific discoveries may replace old ones can be read as a proof of scientific progress (Oreskes 2019). However, there is sort of a tension between constructive scientific evidence criticism which is essential to foster the advancement of science and better political decision making for the whole society (Light et al. 2022) (Zachmann et al. 2023), and an extremist criticism that can lead to negative outcomes. In this latter case, as outlined by Light et al. (2022), page 7: “if opposition to the consensus is driven by an illusion of understanding and if that opposition leads to actions that are dangerous to those who do not share in the illusion, then it is incumbent on society to try to change minds in favor of the scientific consensus.” These cases, where negative consequences for the whole society may result, include phenomena such as the opposition to vaccines or neglecting the negative effects and the influence of human activity on climate change (Light et al. 2022; Zachmann et al. 2023). Similarly, Oreskes (2019) argue that opposers to scientific consensus are unhappy with scientific authority. They want science to be devaluated because scientific consensus has challenged their interests or beliefs. Furthermore, in this context, Oreskes (2019) argues that, given that scientific consensus on some issues has been formed within the scientific community, what is lacking is the cultural acceptance by actors that found a way to challenge science. Furthermore, some actors may be biased in their evaluation of scientific evidence also due to non-cognitive aspects that can influence their evaluation processes. For example, in the context of food safety, particularly through the case of plant protection products, Hassauer and Roosen (2020), reviewing the literature on this topic, argue that consumers’ psychological factors might lead to systematic errors in their determination of the safety of plant protection products, that individual characteristics of consumers may influence their determination of the safety of plant protection products and that consumers’ socio-cultural factors also may influence their risk perception regarding plant protection products. Consequently, these factors, among others (including also cognitive factors such as knowledge), may contribute to form

consumers' valuing decisions regarding the safety of plant protection products. (Hassauer and Roosen 2020).

There is a particular field of sciences in which scientific evidence is strongly contested with many implications for consumers' lives, that is the field of nutritional sciences (Oreskes 2019). Nutritional sciences are a young discipline, with a natural science-based approach that appeared only in the 19th century (Barlösius 2016). Therefore, many scientific questions in the field remain open and nutritional scientists debate on the possible relationships between foods, nutrients and human health (Mozaffarian et al. 2018). Moreover, scientific evidence in the field of nutritional sciences is contested because the food industry funds substantially nutritional research, leading to conflict of interests and to the "funding effect", which relates to the likelihood that scientific studies funded by the food industries lead to findings that are in line with the sponsors' interest. (Nestle 2020). Furthermore, nutritional evidence is a contested issue in media and journalism, as journalists often write about nutritional issues without the necessary scientific skills needed in order to critically evaluate scientific studies. (Pelli and Roosen 2023; Ladher 2016). For example, Bartlett et al. (2002) evaluated all original studies published in *Lancet* and *BMJ* between 1999 and 2000 (1193 articles focusing on medical research), of which 517 (43%) were presented in press releases and 81 (7%) were reported in the *Times* and/or *Sun* newspapers. The study carried out by Bartlett et al. (2002), page 81, show that "newspapers underreported randomised trials, emphasised bad news from observational studies, and ignored research from developing countries."

In this context of uncertainty around nutritional information, as it will be discussed later in this dissertation, it may be difficult for consumers to discern what constitutes a healthy diet. These patterns are evident in recent years in the debates about consuming red and processed meat and the likelihood to develop cancer or in the marketing phenomenon of the presumed healthiness of the so-called nutritious "superfoods". (Pelli and Roosen 2023; Ladher 2016)

This latter phenomenon relates to the marketing trend of superfoods. Superfoods are often produce or seeds, such as quinoa and avocado, coming from the Global South and marketed in the Global North with purported health benefits due to beneficial nutritional properties. However, the evidence of the health benefits of superfoods is limited, oftentimes lacking and contested. (Pelli and Roosen 2023; Bassaganya-Riera et al. 2021). Furthermore, there is no regulated definition of the term superfood worldwide (Harvard T.H. Chan School of Public Health). In addition to the contested nutritional evidence of superfoods, these products can present environmental and ethical problems in the countries where they are produced. For example, quinoa production leads to an intensive use of pesticides in Peru and small-scale quinoa farmers in the region of the Andes may lack the bargaining power to negotiate fair prices and trading conditions (Andrango et al. 2020b; Pelli and Roosen 2023). These observations illustrate that superfoods represent an example of contested nutritional, environmental and ethical evidence within the agricultural and food sector. Consumers at the end of the supply chain may have moral concerns for these contested issues (Pelli and Roosen 2023).

The agricultural and food sector presents contested evidence also at the global scale in its supply chain system, as outlined by Sellare et al. (2022). Indeed, globally, as explained by International Labour Organization et al. (2022), approximately 12.3% of people in forced labor (2.1 million) and 70% of the child laborers amounting to around 112 million (International Labour Organization and United Nations Children's Fund 2021) work in the agricultural sector. Moreover, approximately 51% of global forest loss between 2001 and 2015 went into agriculture (Curtis et al. 2018). This is part of the problem of a lack of tracking and implementing due-diligence along global supply chains (in sectors such as agriculture and mining but not only), and this is why the European Commission proposed a directive on corporate due diligence for sustainability in February 2022, as outline by Sellare et al. (2022), page. 861, with an example:

“A chocolate bar bought in the United States might have been made in Belgium with cocoa from Côte d’Ivoire, almonds from Morocco, vanilla from Madagascar and sugar from Brazil. It is hard to know, however, whether these ingredients were grown on deforested land or harvested using forced or child labor. It’s the same story for smartphones, clothes and cosmetics. Sourcing and manufacturing their components might have contaminated rivers, exposed workers to toxins or caused biodiversity loss. That’s why, in February [2022], the European Commission proposed a directive on corporate due-diligence for sustainability.”

Regarding the effects of these problems of the supply chains on consumers, Sellare et al.

(2022), page 862, state:

“If companies cannot prove that due-diligence requirements are being met along their supply chains, consumers have no reason to believe that the products were produced sustainably, and will not pay a higher price for them.”

This suggests that the evidence with regard to effective due-diligence along global value chains regarding environmental and ethical issues (including in the agricultural and food sector) may be lacking and contested and this would have a negative effect on consumers. The paper by Sellare et al. (2022) suggests that the evidence regarding environmental and ethical issues in the agricultural and food sector at the global scale is contested and that consumers may have moral concerns for these problems along the global agri-food supply chains, which in the end, may negatively affect their willingness to pay for agri-food products.

Starting from the issue of scientific evidence contestation at the general level across different issues, this section has shown that within the food domain and in the context of superfoods in particular, consumers face various types of contested nutritional, environmental and ethical evidence. Especially in these situations of uncertainty with regard to the scientific evidence of food, consumers may not act totally rationally, as expected by neo-classical economics. This highlights the need of the inclusion of psychological aspects in economic analyses when exploring consumers’ interpretation and use of contested scientific evidence. This issue is outlined in the following section.

1.1.2 *The importance of psychology in economics and consumer research*

The importance of psychology has been always present in the history of economics. According to the historical approach of Mandler (1999), adopted also by Angner and Loewenstein (2012), the history of modern economics can be divided in the following phases: classical economics (18-19th century), early neoclassical economics (late 19th-early 20th centuries) and postwar neoclassical economics.

During the period of classical economics, psychological aspects were considered part of the human economic decision making processes. The father of classical economics, Adam Smith, in his book “The Theory of Moral Sentiments” (Smith 1759) , laid down the psychological principles of individual behavior, as discussed by Camerer and Loewenstein (2004). Adam Smith wrote (Smith 1759):

“How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure of seeing it. Of this kind is pity or compassion, the emotion which we feel for the misery of others, when we either see it, or are made to conceive it in a very lively manner. That we often derive sorrow from the sorrow of others, is a matter of fact too obvious to require any instances to prove it; for this sentiment, like all the other original passions of human nature, is by no means confined to the virtuous and humane, though they perhaps may feel it with the most exquisite sensibility. The greatest ruffian, the most hardened violator of the laws of society, is not altogether without it.”

Consequently, psychological aspects played an important role in Smith’s view of human beings, and emotional aspects, such as moral sentiments, are considered, together with rational aspects. Furthermore, Smith’s view is different from the later neoclassical economic assumption, critically discussed by Thaler (2016), that the primary motivation of economic agents is self-interest. As reported by Thaler (2016), Angner and Loewenstein (2012) and Camerer and Loewenstein (2004) , classical economics began with an open-minded view of the economic human decision-maker, that included psychological aspects.

Indeed, as reported by Camerer and Loewenstein (2004), the rejection of psychology by some economists began with the neoclassical revolution in post-war neoclassical economics

(Angner and Loewenstein 2012). As discussed by Thaler (2016), economics after War World II, in the process of becoming more mathematically sophisticated, lost its good intuitions about human behavior and economic textbooks had no longer any “humans”. Thaler (2016) names as “Homo Economicus” or “Econs” the post-war neoclassical view that no longer contemplate the inclusion of psychological aspects in economic decision-making and human behavior. Instead, Thaler (2016) argues that behavioral economists replace this limited view with “Homo Sapiens” or “Human”, which is a more complete and realistic view of human decision-making and behavior that takes into account the psychological aspects. In his critique to the post-war neo-classical view, Thaler (2016), page 1579, trying to answer to the question on why post-war neoclassical economics rejected psychology and economic textbooks has no longer any “Humans”, makes an interesting example:

“I believe that the most plausible explanation is that models of rational behavior became standard because they were the easiest to solve. This conjecture is not meant as a put-down. One begins learning physics by studying the behavior of objects in a vacuum; atmosphere can be added later. But physicists never denied the existence or importance of air; instead they worked harder and built more complicated models. For many years, economists reacted to questions about the realism of the basic model by doing the equivalent of either denying the existence of air, or by claiming that it just didn't matter all that much.”

This example suggests that post-war neoclassical economists have built economic models by assuming only rational behavior and by excluding non-rational, psychological aspects of human economic decision-making and behavior.

In contrast to this trend in neoclassical economics, behavioral economics arose, trying to redirect economics to how it had begun, with Adam Smith, and therefore, trying to include psychological aspects in the study of economic decision-making and human behavior (Thaler 2016). As reported by Camerer and Loewenstein (2004), page 3: “Behavioral economics increases the explanatory power of economics by providing it with more realistic psychological foundations”. As discussed by Angner and Loewenstein (2012), early behavioral economics started with some psychological approaches that emerged during the late neo-classical period.

As discussed also by Thaler (2016), important examples of incorporation of psychological aspects into economics include the work of Herbert Simon, for example, Simon (1955) and Simon (1957), and the work of George Katona, for example, Katona (1953). In this context, behavioral economics emerged with the works of the psychologists Daniel Kahneman and Amos Tversky, in works such as Tversky and Kahneman (1974), and Kahneman and Tversky (1979). Thaler (2016), page 1581, argues that “Tversky and Kahneman (1974) showed that humans make judgements that are *systematically* biased” and that “[...] people often make judgements using some kind of rule of thumb or heuristics.” Furthermore, discussing the work of Kahneman and Tversky (1979) on prospect theory, Thaler (2016), page 1581, argues that: “Kahneman and Tversky’s research documented numerous choices that violate any sensible definition of rational.” In the similar time period of Kahneman and Tversky, also the economist Richard H. Thaler contributed to the field of behavioral economics by incorporating psychological aspects into economics, for example, by Thaler (1980) and Thaler (1985). Thaler (1980), page 39, introduce his paper with this claim:

“Economists rarely draw the distinction between normative models of consumer choice and descriptive or positive models. Although the theory is normatively based (it describes what rational consumers should do) economists argue that it also serves well as a descriptive theory (it predicts what consumers in fact do). This paper argues that exclusive reliance on the normative theory leads economists to make systematic, predictable errors in describing or forecasting consumer choices.”

In the conclusion, Thaler (1980), page 58, argues: “What I have argued in this paper is that the orthodox economic model of consumer behavior is, in essence, a model of robot-like experts. As such, it does a poor job of predicting the behavior of the average consumer”. As outlined by Angner and Loewenstein (2012), page 33:

“Like Tversky and Kahneman, then, Thaler used cognitive psychology, first, to identify in which way people’s choices diverge from the predictions of rational choice theory, and second, to develop more empirically adequate theories. Thaler (1985) also proceeded to spell out the implications for economic decisions, in this case for marketing. The fact that Thaler spent so much time spelling out the implications of behavioral decision research, prospect theory and so on, certainly helped bring the relevance of these developments home to economists and other social scientists with an interest in economic decisions.”

In this context, Thaler (2016) remarks that it is useful to incorporate psychological factors into economic analysis, given that they can contribute to explain better human attitudes and behavior.

Following the suggestion of Thaler (2016), an important question may arise: which type of psychological factors may be important to conduct a conceptual and empirical analysis on consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food? The answer to this question is proposed in the following section

1.1.3 The importance of moral aspects to study consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food

Moral aspects may be important. Indeed, consumers are faced with contested nutritional, environmental and ethical evidence regarding food, and they therefore may have moral concerns for this contested evidence. Examples of contested evidence of food include heavy marketing campaigns of superfoods, the issue of unhealthy diets, the negative environmental impacts of the production of superfoods, and the unclear conditions of farmers and laborers involved in superfood production in the Global South. Furthermore, as outlined by Pelli and Roosen (2023), page 288:

“...in this context of uncertainty around the nutritional aspects of foods, several types of foods are often considered “good foods for health” or “bad foods for health”, and these definitions may have a strong moral connotation. Furthermore, superfoods are often perceived as “good foods for health” even if consumers lack the specific nutritional knowledge of superfoods to make such judgments. Moreover, previous literature suggests that the attribute “healthy” (which may be the main characteristic attributed to superfoods) implicitly hints at specific discourses of the “submerged iceberg of moral values” (van Leeuwen 2007), page 97.”

To develop a framework to include moral aspects in consumers' dealing with evidence, some importance aspects of moral psychology development are briefly resumed. The importance of moral aspects for human beings was present in the treatment by the father of classical economics, Adam Smith, who identified sympathy as the core element in the explanation of

moral judgement (Smith 1759). As described by Graham et al. (2013), the field of modern moral psychology was founded by Kohlberg (1969), who identified justice as the only one moral mental system. Therefore Kohlberg (1969) was considered as a monist moral psychologist. Gilligan (1982) criticized the monism of Kohlberg, arguing that there were two moral mental systems, justice and care. Later Kohlberg et al. (1983) acknowledged that Gilligan (1982) was right. This dualistic approach reached general consensus among moral psychologists, such as Turiel (1983). Later Shweder (1990) and Shweder et al. (1997) called for a broader pluralism of morality and identified three categories: Autonomy, Community and Divinity. Differently, Fiske (1991) proposed four moral relational models: Communal Sharing, Authority Ranking, Equality Matching, and Market Pricing. Based on this background, Haidt and Joseph (2004), as reviewed by Graham et al. (2013), tried to build a more comprehensive psychological theory, proposing five moral social receptors, defined as moral foundations: Care/harm, Fairness/cheating, Loyalty/betrayal, Authority/subversion, and Purity/Sanctity/degradation. The works of Haidt and Joseph (2004), Graham et al. (2013) together with the works of Haidt (2001) and Haidt and Graham (2007) contribute to form the body of the Moral Foundations Theory (MFT).

The MFT assumes that the moral foundations have an intuitive nature (Haidt 2001; Haidt and Bjorklund 2008; Haidt and Joseph 2004; Graham et al. 2013) and for this reason this dissertation includes the MFT as a psychological element that may explain consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food. Indeed, given this situation of uncertainty, consumers may not form their attitudes and behavior towards food totally rationally but also based on intuitive and non-cognitive elements such as moral values. Furthermore, the MFT has been used in several interesting empirical applications in the context of food consumption (Goddard et al. 2019; Backer and Hudders 2015; Minton et al. 2019; Jonge and van Trijp 2013; Jonge and van Trijp 2014; Jonge et al. 2015; Mäkineniemi et al. 2013; Vainio and Mäkineniemi 2016b; Watkins et al. 2016a).

In the context of this dissertation, another moral framework is the concept of moral intensity, as developed by Jones (1991) through the Issue-Contingent Model of Ethical Decision Making. The author proposed that every specific issue can be represented by its moral intensity and that the intensity is likely to vary from issue to issue. Furthermore, Jones (1991) identified that moral intensity have six components: magnitude of consequences, social consensus, probability of effect, temporal immediacy, proximity, and concentration of effect. The work of Jones (1991) has been continued by various scholars, such as Singhapakdi et al. (1996), Frey (2000), and McMahon and Harvey (2006). One interesting application of the moral intensity concept is related to the empirical application carried out by Mäkineniemi and Vainio (2013), who investigated the role of consumers' perceived moral intensity for the specific issue of climate change in the context of climate friendly food choices. Regarding specific issues of food consumption, in this context of contested nutritional, environmental and ethical evidence regarding food, for consumers it may be difficult to be sure what constitutes a healthy diet and they may have moral concerns for the issue of unhealthy diets. For this reason, and inspired by the work of Mäkineniemi and Vainio (2013), this dissertation includes the concept of moral intensity in relation to the specific issue of unhealthy diets as a psychological element in this analysis of consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food.

1.2 Objectives and Structure of the dissertation

This dissertation aims to explore consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food through a conceptual and empirical analysis and it is composed of three essays.

First, Essay I develops a conceptual framework for consumers' interpretation of contested nutritional evidence. It explores the role of the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) for the judgement of information about food and nutrition. The essay starts

with an historical overview of existing nutritional evidence and provides arguments on why nutritional evidence of foods is a contested issue. It explores a particular example of contested nutritional evidence, the case of superfoods, showing that superfoods are also an example of contested environmental and ethical evidence. Then, in order to explore consumers' interpretation of contested nutritional evidence, the essay defines the terms of consumers' interpretation and consumers' beliefs according to the multiattribute model of Fishbein (1963) and according to the means-end-chain theory (Gutman 1982). Essay I argues that consumers may not form their beliefs, attitudes and finally acceptance or non-acceptance of superfoods totally rationally on scientific attributes, as expected by neo-classical economics, but rather through heuristic information processes linked to psychological values that consumers hold. Essay I argues that moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) may be important to explain consumers' interpretation of contested nutritional evidence of superfoods. It develops a conceptual framework arguing that consumers form their beliefs, attitudes and finally acceptance or non-acceptance of the nutritional evidence about superfoods through heuristic processes moderated by moral values. Furthermore, Essay I extends this conceptual framework by arguing that cultural development also may play a role in shaping the influence of moral values on consumers' interpretation of contested nutritional evidence at the example of superfoods. This role of cultural development suggested at the conceptual level by Essay 1 motivated the development of the empirical cross-cultural studies described below.

Drawing upon the background provided by Essay I, Essay II is an empirical large-scale cross-cultural analysis of German and Canadian consumers' interpretation (defined as attitudes) of contested nutritional evidence. Essay II argues that in this context of contested nutritional evidence, consumers' nutritional knowledge (subjective and objective) may be important in influencing nutritional attitudes and that it may be difficult for consumers to be sure what con-

stitutes a healthy diet. Furthermore, consumers may have moral concerns for the issue of unhealthy diets, which can also affect nutritional attitudes. For these reasons, the research question of Essay II aims to investigate the influence of nutritional knowledge and moral concerns for the issue of unhealthy diets on nutritional attitudes. Since the issue of unhealthy diets can be considered a specific moral issue, Essay II turns to the role of moral intensity. As mentioned previously, Jones (1991) proposed the every specific issue can be represented by its moral intensity and that the intensity is likely to vary from issue to issue. Various scholars, such as Singhapakdi et al. (1996), Frey (2000), and McMahon and Harvey (2006), developed and used moral intensity scales at the general level. Inspired by the empirical moral intensity scale developed by Mäkineniemi and Vainio (2013) for the specific issue of climate change, Essay II develops a moral intensity scale for the specific issue of unhealthy diets. Essay II presents a cross-cultural analysis of the influence of subjective nutritional knowledge, objective nutritional knowledge, and the moral intensity of concerns for the issue of unhealthy diets on nutritional attitudes through linear regressions. Results suggest that nutritional attitudes are influenced by nutritional knowledge and moral concerns for the issue of unhealthy diets in both countries.

Essay III then looks at the food choice of consumers in the context of contested nutritional, environmental and ethical evidence from an empirical perspective through a large-scale cross-cultural analysis of Canadian and German consumers. To do so, Essay III explores the influence of evidence contestation on consumer behavior, in the form of food choices. Food labels and an information treatment present different degrees of evidence to consumers in a discrete choice experiment which include labels on organic production, the Nutri-Score, and the Fairtrade label. These food quality labels are chosen because they represent a possibility, but not a certainty, to provide more informed environmental, nutritional and ethical evidence to consumers. Based on the conceptual framework of Essay I, the research question of Essay III investigates the influence of moral values, as defined by the MFT (Haidt 2001; Haidt and

Graham 2007; Graham et al. 2013) on consumers' preferences and WTPs for food quality labels. Through mixed logit models and subsequent estimations, the influences of information and moral values on consumers' preferences and WTPs for the food quality labels are estimated. Results suggest that the provision of information with moral connotations and moral values play a role in both countries in influencing consumers' preferences for food quality labels of the superfood quinoa.

2 Exploring Consumers' Interpretation of Contested Nutritional Evidence: The Relevance of the Moral Foundations Theory (Essay I)¹

Abstract

This chapter develops a conceptual framework to analyze consumers' decision-making about healthy eating when the scientific basis concerning the healthiness of food is perceived as weak. It establishes a new theoretical approach using the example of superfoods. "Superfood" is a marketing term used to promote foods for their exceptional nutritional characteristics held to be beneficial for health. The chapter builds on the observation that nutritional science is a comparatively young science that is often criticized for methodological weaknesses and the involvement of the food industry. This context affords an exemplary opportunity to study the role of alternative evidence practices challenging the use of scientific evidence as a foundation for consumers' decisions. The traditional rational model of consumer decision-making may not be appropriate for studying consumer choices in this context. Instead, a psychological model taking into account the cognitive limitations in consumers' decision-making is needed. Pelli and Roosen highlight the importance of moral foundations theory in the investigation of consumers' interpretation of contested nutritional evidence. In their chapter, the authors show that this theory offers a valuable framework and conceptualize a model that establishes testable hypotheses on the role of moral foundations in the interpretation of nutritional evidence.

¹ Essay I is an earlier draft of the publication: Pelli, Edoardo Maria; Roosen, Jutta (2023): Exploring Consumers' Interpretation of Contested Nutritional Evidence. The Relevance of the Moral Foundations Theory. In Karin Zachmann, Mariacarla Gadebusch Bondio, Saana Jukola, Olga Sparschuh (Eds.): Evidence Contestation: Dealing with Dissent in Knowledge Societies. New York: Routledge, pp. 281–302.
<http://dx.doi.org/10.4324/9781003273509-16>

2.1 Introduction

In 1977, the Select Committee on Nutrition and Human Needs to the United States Senate published the *Dietary Goals for the United States*. (U.S. Senate. Select Committee on Nutrition and Human Needs 1977). In its recommendation to limit the consumption of red meat and dairy products, it was met with controversy by the food industry. Changes in those goals reduced the dietary recommendation to the level of nutrient composition of energy intake, that is they then recommended how much energy was to be taken from carbohydrates, sugars, fat and protein. *Dietary Goals* was followed by *The Surgeon General's Report on Nutrition and Health*, (U.S. Department of Health, Education and Welfare. Public Health Service. Office of the Assistant Secretary for Health and Surgeon General 1979) which recognized the relationship between nutritional problems and overconsumption as well as imbalances of dietary intake. What had been a problem of scarcity before World War II had become an issue of food affluence by the 1970s. (Etilé 2011). This presented a major shift from addressing deficiencies in single nutrients. (McGinnis and Nestle 1989). The resulting changes in nutrition recommendations illustrate well why exploring consumers' interpretation of nutritional evidence is relevant. It still holds true that variations in nutritional needs between different people make it impossible to define simple nutritional standards. (U.S. Department of Health, Education and Welfare. Public Health Service. Office of the Assistant Secretary for Health and Surgeon General 1979). Recommended daily allowances can be calculated for different population groups but have limited effectiveness in terms of guiding consumers' food choices.

Nutritional sciences are a relatively young scientific discipline. While dietetic nutrition knowledge existed in ancient Greece in the form of nutrition guidelines for a good life, a natural science-based approach to nutrition only emerged in the 19th century. (Barlösius 2016). At that time, food security and safety were the focus of concern. The primary preoccupation was with the provision of sufficient energy, considered not only the foundation of life but also a

means of avoiding social unrest.²Over time, scientific advances made it possible to describe nutrition in more refined terms, focusing not only on energy but also on the supply of various nutrients. For example, the first vitamin was scientifically described less than a century ago in 1926. (Mozaffarian et al. 2018). Until approximately the 1990s, nutritional science research and recommendations were devoted to identifying key nutrients (such as vitamins, carbohydrates, fats) and the specific effect of single nutrients on human health. (Mozaffarian et al. 2018). The consequence of this was that governments developed the recommended dietary allowances for each nutrient, advising a minimum intake of “good” nutrients (such as vitamins, minerals and proteins) and reduction of “bad” nutrients (mostly fats and sugars). (Mozaffarian et al. 2018). However, the scientific evidence and efficacy of this approach has been contested since the 1980s, when it was discovered that the effects on human health may be determined less by single nutrients than by the complexity of dietary patterns. This led to the development of nutrition pyramids, as developed in the United States and Germany. (Barlösius 2016). This gradual shift in scientific knowledge shows that the evidence in the field of nutritional sciences is still controversial, as evident in the ongoing debates among scientists on the possible relationships among foods, nutrients and human health. (Mozaffarian et al. 2018).

In fact, results from studies supporting these new approaches have become available only recently, and many scientists criticize the relatively weak evidence existing between nutrition and health as it refers to single foods or nutrients. (Mozaffarian et al. 2018). Part of the debate among the scientific community originates from the fact that randomized control trials

² The Committee on World Food Security defined food security as follows: “Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.”, Food and Agriculture Organization (FAO). Committee on World Food Security. 2009. Food security is commonly described as resting on the three pillars of availability, access and utilization. Sufficient availability and utilization was for long concerned with sufficiency of energy provision (calories). This was also what governments were concerned with up to the mid-20th century. Nutrition policies related to assuring sufficient access to energy from food and were deemed important to maintain the work forces, and the armed forces, see also Barlösius 2016 In recent times, other aspects of accessibility and healthfulness have been added to the conceptualization and measurement of food security. A prime example is the use of dietary diversity indicators, see Barrett 2010. Therefore, organizations of the United Nations now mostly speak of “malnutrition in all its forms” when referring to food insecurity, see Food and Agriculture Organization (FAO), International Fund for Agricultural Development (FAD), United Nations Children’s Fund (UNICEF), World Food Programme (WFP), World Health Organization 2021.

(RCTs) are often considered the highest source of scientific evidence in the context of evidence-based medicine. (Katz et al. 2019). Therefore, the quality of nutritional studies is often evaluated with tools that confine the concept of quality within the realm of RCTs. However, RCTs are not always suitable or possible. While RCTs are easier to conduct when assessing the short-term effects of nutrients on human health, (Bengoetxea and Todt 2021) they are not appropriate when establishing the long-term and lifestyle effects of nutrients, for practical, ethical and methodological reasons. (Jukola 2019). This is why evidence for the latter is based on observational and cohort studies. (Jukola 2019). In order to study the issue of nutritional evidence, it is important to recognize both the complexity and controversy involved. As is often the case at the scientific frontier, established scientific knowledge is thrown into question by new research results. Furthermore, nutritional evidence is a contested issue because the food industries provide substantial funding for nutritional research to universities and to nutritional and health institutions, leading to conflicts of interest and the so-called funding effect. (Nestle 2020). This effect relates to the risk that scientific studies funded by the food industry tend to lead to results that support the sponsors' interests.

The complexity and ambiguity in the field of nutritional sciences creates confusion among consumers, also because the simple provision of evidence on what constitutes healthy eating seems insufficient to convince them to change their current behaviors. (Mozaffarian et al. 2018). The behavioral impact of nutrition advice remains limited although findings from the nutritional sciences receive a lot of public attention and media coverage, where contested nature of nutritional evidence is also a factor propagating the confusion among consumers. Nutritional information is often sourced from incomplete and contradictory scientific studies. (Oreskes 2019). In fact, the media often report results from contradictory studies that link several types of foods to specific health effects, such as the controversial debate regarding the possible relationship between consuming (red) meat and developing cancer in recent years. Furthermore, newspapers are under pressure to maximize their readership while journalists

often do not have the time and the scientific skills to evaluate scientific studies critically.

(Ladher 2016).

Given that nutritional evidence is in trouble, the objective of this essay is to develop a conceptual framework to study how consumers deal with contested nutritional evidence. We refer to consumers as independent individuals that build their own evidence practices regarding food and nutrition. (Hassauer and Roosen 2020). As such, they are users but not passive recipients of scientific evidence. The maintained hypothesis of our theoretical reasoning is that evidence in the field of nutrition is controversial and contested for many reasons, and it may therefore be difficult for consumers to base their views regarding their eating behavior on scientific evidence alone. Our hypothesis is that consumers form their attitudes toward nutritional evidence not fully rationally on scientific evidence and knowledge, but that this process is influenced by non-epistemic values through heuristic information processes. In this context, psychological approaches can be useful in developing the conceptual framework and deriving testable hypotheses. Our approach identifies one specific category of values following the moral foundations theory (MFT). The theory assumes that intuitive judgments guide the evaluation of objects and behavior, which we hold to be applicable in the context of consumers' food decision-making. These decisions and evaluations often occur in low involvement situations so that an intuitive approach seems particularly useful. This chapter develops a moral foundation approach to study consumers' interpretation of contested nutritional evidence. We present a theoretical exploration of consumers' interpretation of contested nutritional evidence, highlighting the importance of MFT as part of this process. We introduce an example where nutritional evidence is contested: Namely the phenomenon of the so-called superfoods. Here we show that from a theoretical perspective, considering the difficulty of basing their views on nutritional evidence, consumers may not judge the nutritional aspects of foods completely rationally, as suggested by neoclassical economic models. We therefore propose that individuals base their perceptions of nutritional aspects of foods on more intuitive and heuristic processes,

largely driven by moral values. In this context, we explore the MFT and demonstrate in-depth how this theory fits into our theoretical framework. We do so via a series of four theoretical examples. Finally, we summarize our theoretical framework and explain how the issue of contested nutritional evidence relates to the wider discussion on contested evidence in this volume.

2.2 The Contested Nutritional Evidence for Superfoods

The current marketing trend for the so-called superfoods is especially characterized by contested nutritional evidence. Superfood is a marketing term used to promote several foods for their presumed exceptional nutritional characteristics and benefits for health, despite lacking and/or controversial scientific evidence. (Bassaganya-Riera et al. 2021). Superfoods are mostly exotic fresh produce coming from the Global South and also consumed in the Global North, where they represent a current important marketing trend, (Mintel Press Office 2016) although there is legally no regulated definition of the term superfoods worldwide. (Harvard T.H. Chan School of Public Health). Prime examples of these superfoods include, among others, avocado, quinoa, chia seeds, acai berries, goji berries and maca root. These superfoods, which for centuries were consumed only by the local communities in the Global South, have recently been in increasing demand among consumers in the Global North. (Andrango and Blare 2020). Studies that have measured the health benefits of superfoods (considered by Bassaganya-Riera et al. 2021 as belonging to the broad category of functional foods) often have limited evidence from human trials. Bassaganya-Riera et al. (2021) remark that it is important to have complementary studies on humans, that is both interventional RCTs and observational nutritional epidemiological studies. This need for complementarity is confirmed also by Katz et al. (2019), who showed that the relative primacy in adjudicating medical evidence often attributed to RCTs does not always represent the case. As mentioned in the Introduction, while for studies on short-term effects of nutrients on human health RCTs are easier

to conduct, for studies on long-term and lifestyle effects of nutrients on human health RCTs are not applicable. In these latter cases, observational nutritional epidemiology is necessary. Taking this general argument back to our specific case of superfoods, we can infer that the complementarity of evidence is urgently needed. To measure a short-term effect of superfoods on health (e.g. the reduction in cholesterol level by the healthy fatty acids contained in avocado), a RCT would be applicable. However, to establish a long-term effect (e.g. the relationship between avocado consumption and the prevention on the development of several non-communicable diseases), a RCT would not be appropriate and observational nutritional epidemiology would be needed. However, evidence coming from complementary approaches to human studies is lacking, and this underlines the contested and controversial nature of nutritional evidence with regard to superfoods and health.

Avocado is held to possess numerous nutritional and health benefits, such as antioxidant capacities. (Bhuyan et al. 2019). Acai (Andrango et al. 2020a) and goji berries (Ma et al. 2019) are also said to possess high levels of antioxidants. Regarding chia seeds and quinoa, their presumed health benefits are due to the high level of proteins. Last but not least, maca root is considered beneficial for health due to its high levels of vitamins and minerals. (Andrango et al. 2020b) However, as mentioned previously, the scientific evidence for the nutritional and health benefits of these so-called superfoods is generally still limited and contested.

Furthermore, despite the presumed nutritional benefits, the consumption of superfoods is linked to several environmental and socio-economic issues. A prime example is the case of avocado, which has become a very trendy superfood worldwide. In Mexico, the main producing country, avocado production has led to the problem of severe water depletion. (Sommaruga and Eldridge 2021). Even beyond Mexico, the study carried out by Sommaruga and Eldridge (2021), page 50, considering global avocado production in 2018, indicated that: “Globally, around 6.96 km³ of water is used or the equivalent of around 2.82 million Olympic size swimming pools (assuming a volume of 2500 m³ each) for avocado production in 2018”.

In addition, avocado production has several socio-economic consequences. For example, as more land is devoted to avocado production for export, food insecurity has risen in some regions of Mexico. Stimulated by the increasing international demand, avocado production often replaces subsistence crops. These socio-economic and environmental aspects of superfoods are not only related to the primary production and the environment but also have ethical implications across the agri-food supply chain: consumers at the end of the chain may have strong concerns about the harm done to the environment and producers in the Global South. Another example related to the possible negative environmental impact is the case of quinoa produced in the coastal area of Peru. Here the use of pesticides has intensified together with the expansion of quinoa production. The rise of pesticide use may hamper Peruvian quinoa's export to the Global North, due to possible lacks in meeting the requirements of international pesticide residue limits. (Andrango et al. 2020b). The situation exemplifies the fact that the controversy around excess/inappropriate pesticide use in the Global South is still present today, even if the major controversy on this issue took place in the 1970s–1980s, as described in Chapter 8 of this volume. The concern over the excessive use of pesticides in the Global South among environmentalists was a critique of previous established scientific evidence, which justified the use of pesticides for economic and agricultural productivity reasons. These concerns were expressed in scientific arguments together with their moral implications. In the case of quinoa, the excessive use of pesticides in the Global South demonstrates that even nowadays the environmental evidence regarding some superfoods may be contested and may provoke moral concerns. In fact, nowadays consumers in the Global North may feel ethical concerns about the negative conditions of the environment related to their consumption choices and the negative implications for the populations in the Global South living in the production areas where these products are cultivated.

Another feature that makes superfoods a very interesting case study for contested nutritional evidence relates to the fact that superfoods are heavily promoted in the media for their presumed nutritional and health benefits. One of the extreme examples of this phenomenon is the promotion of the nutritional and health benefits of some superfoods (such as acai berries) by the famous TV-host Oprah Winfrey. (MacGregor et al. 2021). This advancement of superfoods by influencers and the media not only has marketing but also ethical implications for promoters and consumers. With influencers and media providing incomplete and inaccurate information, consumers may perceive the misinformation as unfair and misleading.

Given all these multiple facets, we explore consumers' interpretation of contested nutritional evidence using the example of superfoods. Nutritional evidence is contested, and neither actors in public policy making nor individual consumers can rely on a strong evidence base for their decision-making.

2.3 The Need for Psychological Approaches to Study Consumers' Interpretation of Contested Nutritional Evidence

To explore theoretical approaches for studying consumers' interpretation of contested nutritional evidence, it is important to define the concepts of consumer beliefs and consumer attitude. A consumer belief about an object can be defined as the perceived probability that an object is associated with another concept. For example, a possible belief is that superfoods (the object) are healthy (the other concept). Furthermore, the cognitive, affective and behavioral consumer interpretation of an object is considered in relation to a consumer's attitude. According to the multi-attribute attitude model, the consumer attitude about an object can be defined as a function of all consumer beliefs about the object and the evaluative aspects of those beliefs. Mathematically it is possible to define a consumer attitude toward an object as:

$$\sum_{i=1}^N B_i a_i$$

where

B_i = belief “ i ” about the object,

a_i = evaluative aspects of B_i ,

N = the number of beliefs. (Fishbein 1963)

Further research on the concept of beliefs was developed in the context of the means-end-chain theory. This theory assumes that beliefs are part of a hierarchical evaluation and relate the object of evaluation to a chain of other concepts, i.e. attributes, consequences and values. (Gutman 1982). In their empirical study on beliefs, Grunert and Bech-Larsen presented a framework linking the concepts of beliefs, means-end-chain theory and the choice option attractiveness, where the latter can be considered a synonym of attitude. (Grunert and Bech-Larsen 2005) The research aim of their study was to understand empirically whether the attractiveness of or the attitude toward a choice option can be explained by attributes only, or whether beliefs linking the choice attributes to consequences and values improve their explanatory power. From the results of this study, obtained through a specific methodological procedure (the laddering method), Grunert and Bech-Larsen (2005), page 237, write : “We have concluded that beliefs linking the product to constructs of higher levels of abstraction – consequences and values – improve the explanation of choice option attractiveness beyond the explanation achieved by beliefs linking the product to attributes only”. These results are in line with the results of a previous empirical study, obtained through the same methodological procedure. (Perkins and Reynolds 1988). It indicated that values had significant explanatory power in explaining product preference beyond the explanatory power provided only by attributes and consequences. The term used in this study, namely product preference, could be considered a synonym of product acceptance. In conclusion, both empirical studies suggest

that values linked to a product may be very important because they explain how the concrete attributes of a product influence consumers' beliefs and consequently attitudes and finally determine consumer acceptance or non-acceptance of the product. This insight is especially relevant in our research context because the nutritional evidence of superfoods is scarce and consequently it is difficult for consumers to judge the scientific nutritional attributes of superfoods. Consumers may interpret the superfoods and form their beliefs not fully rationally based on scientific attributes and their consequences but founded on abstract values linked to these attributes through heuristic information processes.

The strictly economic rational model grounded in neoclassical economics, where the consumer tries to maximize utility through a strictly rational judgment of the quality aspects of food products, is not sufficient to study the topic of consumers' attitudes toward nutritional evidence for superfoods. Instead, a psychological model is needed that takes into account consumer strategies for dealing with incomplete knowledge such as heuristic information processing and values.³ This entails the following questions: Which type of psychological model would be appropriate? Which kinds of values may be more appropriate to explain, through heuristic information processes, consumers' beliefs and consequently attitudes and acceptance with regard to the nutritional evidence of superfoods? We provide answers to these questions in the next section.

³ The relevance of rational choice to decision-making where a consumer maximizes utility subject to a budget constraint has been questioned in consumer behavior research. The idea of *homo economicus* dates back to John Stuart Mill (1806–1873) who describes a hypothetical, self-interested individual seeking to maximize individual utility, see Abländer and Nutzinger 2008. Rational utility maximization requires complete knowledge of all options available and the consequences of these options. In 1957, Herbert A. Simon published his book *Simon 1957* where he criticized that this *homo economicus* ignores insights from psychology and conceived a cognitively limited agent. This idea of bounded rationality translates this idea of *homo economicus* to one that considers effort in information access in its rational choice, see Wheeler 2020. The roles of imperfect information, biases and heuristics in information processing and decision-making have led to a rich literature in economic psychology and behavioral economics. A history on the development of behavioral economics is provided by Heuvelink 2014.

2.4 The Contribution of the Moral Foundation Theory to Investigating Consumers' Interpretation of Contested Nutritional Evidence

Moral values can be important moderators in explaining consumer beliefs, and consequently attitudes and acceptance or non-acceptance with regard to the nutritional evidence for foods, through heuristic information processes. In fact, in this context of uncertainty around the nutritional aspects of foods, several types of foods are often considered “good foods for health” or “bad foods for health”, and these definitions may have a strong moral connotation. Furthermore, superfoods are often perceived as “good foods for health” even if consumers lack the specific nutritional knowledge of superfoods to make such judgments. Moreover, van Leeuwen (2007), page 97, suggests that the attribute “healthy” (which, according to us, is the main characteristic attributed to superfoods) implicitly hints at specific discourses of the “submerged iceberg of moral values”.

We conjecture that moral values can act as moderators for interpreting scientific knowledge and we consider MFT as a promising and comprehensive psychological theory that is appropriate to studying consumers' interpretation of nutritional evidence. The first instantiations of MFT go back to Haidt (Haidt 2001) and Haidt and Graham. (Haidt and Graham 2007). We introduce the theory here as described by Graham et al. (2013). MFT was developed to give an answer to the question of the origins of morality. Graham et al. (2013), page 56, ask: “Where does morality come from? Why are moral judgments often so similar across cultures, yet sometimes so variable? Is morality one thing, or many? MFT was created to answer these questions”. Of course, MFT was born in the context of an earlier extensive and significant literature on moral development as summarized in Graham et al. (2013). The development of modern moral psychology started from the work of Kohlberg (1969), who assumed that there was only one moral foundation, namely the concept of justice. Kohlberg (1969) has thus been considered a monist moral psychologist. Gilligan (1982) later criticized Kohlberg on the grounds that women's morality presents two moral values, i.e. not only the concept of justice

but also the concept of care. Kohlberg et al. (1983) accepted Gilligan's view and this dualistic approach (justice and care) has gained general consent among moral psychologists, e.g. Turiel (1983). The assumption that morality relates only to individuals and how individuals establish relationships between one another was challenged by Shweder (1990), who supported the idea of a broader pluralism, using the example of a non-western culture, i.e. India, where it was evident that morality relates not only to individuals but also to collective phenomena such as groups, organizations, rules and cultural inheritances and religious beliefs. (Shweder et al. 1997). Shweder et al. (1997) introduced the idea that across cultures human beings are constituted by three moral aspects: Autonomy (which refers to moral characteristics such as care and justice), community (which refers to moral characteristics such as loyalty, obligation and respect) and divinity (which refers to spiritual and moral characteristics such as purity and sanctity). In relation to this categorization of explicit moral discourse by Shweder et al. (1997), Fiske (1991) claimed that moral evaluations were based on four relational models: "Communal Sharing, Authority Ranking, Equality, Matching, and Market Pricing". Jonathan Haidt (one of the authors of MFT) tried to combine the theories of Shweder and Fiske but it was difficult to merge two different perspectives (the manifestly moral discourse of Shweder and the concept of interpersonal relationships in Fiske). Haidt and Joseph (2004) set out to construct a more comprehensive theory.

Taking a pluralistic approach, Graham et al. (2013) asked themselves: How many basic elements of morality can be identified and what are these basic elements of morality? To elaborate the answer to this question, building on the work of Haidt and Joseph (2004), the Graham et al. (2013), page 60, interestingly used the metaphor of food taste:

"The human tongue has five discrete taste receptors (for sweet, sour, salt, bitter, and umami). Cultures vary enormously in their cuisines, which are cultural constructions shaped by historical events, yet the world's many cuisines must ultimately please tongues equipped with just five innate and universal taste receptors. What are the best candidates for being the innate and universal 'moral taste receptors' upon which the

world's many cultures construct their moral cuisines? What are the concerns, perceptions, and emotional reactions that consistently turn up in moral codes around the world, and for which there are already-existing evolutionary explanations?"

As an answer to this metaphorical question, Graham et al. (2013), based on the work of Haidt and Joseph (2004), describe five basic elements of morality or five moral values, which they defined as the five moral foundations: Care/harm; fairness/cheating; loyalty/betrayal; authority/subversion; purity/sanctity/degradation.

Care/harm refers to the preoccupation with taking care of others or for feeling compassion for people who have been caused harm. The authors give the example of mothers (not only humans but also other mammals) who are very concerned to take care of and nurture their offspring. Another example given by the authors is the compassion for victims. Fairness/cheating relates to the feeling of being honest or dishonest with other people. An example would be the perceived accuracy of media in reporting news. Readers may feel that the media are fair and report the news accurately, or that the media are cheating and they report false news, perhaps because of a conflict of interests. Loyalty/betrayal refers to the level of loyalty between individuals. An example would be a loyal friend who helps you when needed, while a disloyal friend does not. Authority/subversion refers to the obedience or disobedience to authority. An example could be citizens who trust and obey legislators who make the laws and citizens who do not obey the laws. Purity/sanctity/degradation refers to feelings of delight or disgust. An example could be a delight with foods that are perceived as nutritious and safe, and disgust for foods that are perceived as unhealthy and unsafe (e.g. contaminated by pathogens).

Let us now briefly examine the assumptions that sustain this theory and the development of the moral foundations. Firstly, these foundations, as described by Graham et al. (2013), page 61, are considered to be innate in the "first draft of the moral mind", conceived and organized in advance of experience. However, despite this nativist approach, the authors believe that they are shaped differently for each individual according to their different experiences and cultural learnings, and through the process of cultural development.

Another important aspect that characterizes the moral foundations, as conceived by the authors, relates to the concept of intuitionism. Moral judgments (motivated through the moral foundations) happen quickly and intuitively, while the moral reasoning comes after the moral judgment, as a support and a justification for the moral judgment. This concept was developed through the social intuitionism model (SIM). (Haidt 2001). We will come back to this concept later when we show how these concepts relate to our conceptual framework explaining consumers' judgment of superfoods.

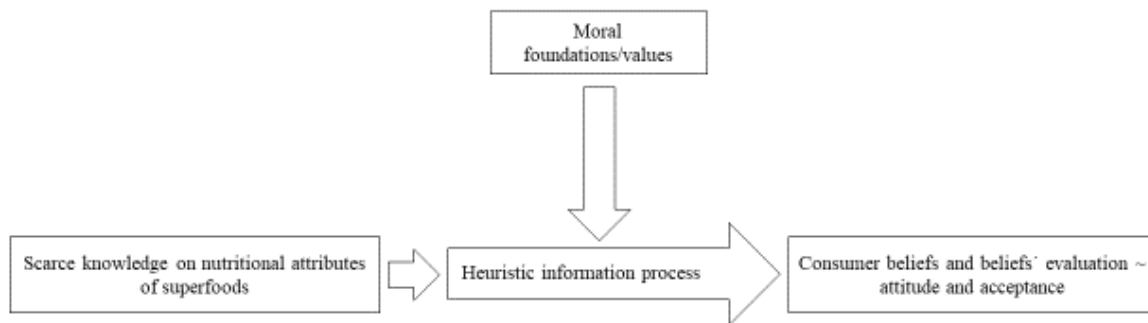
Furthermore, Graham et al. (2013) have always welcomed the possibility that the moral values could exceed five, being open to any update and testing of the theory. In fact, many methods have been developed to test MFT. The concepts have been developed in a method-theory co-evolution: The theory can inspire new methods to test the theory, while at the same time the results from the application of methods can inspire the further development of the theory itself. Furthermore, this theory has been applied within the field of social psychology. Graham et al. (2013) claim that it should also be applied beyond this field and there have indeed been such applications. In fact, Graham et al. (2013) believe that MFT is a practical theory that may prove useful in many fields. This theory is thus in perpetual evolution, to be updated and in development, and thus particularly suitable for research that is highly cross-disciplinary. We believe that our conceptual model, which crosses different disciplines, i.e. economics, psychology and food and nutritional sciences, can contribute on updating and developing the theory. In fact, our application of MFT to food consumption and particularly nutritional evidence covers a new and interesting area. Moreover, although it is a relatively new field, there have been already very interesting empirical applications of MFT to food consumption. Given the importance of these empirical applications of MFT to food consumption, we briefly review some of those studies here.

One study found that respondents with stronger agreements on care and fairness statements were more likely to purchase environmentally sustainable dairy products and pork from swine

raised with limited antibiotic usage. They were also more inclined to vote for stricter livestock environmental standards and disease protocols. (Goddard et al. 2019). Another study found that the agreement with care was positively correlated with the likelihood of being vegetarian rather than flexitarian, while the agreement with authority was positively correlated with the likelihood of being a full-time meat eater rather than a flexitarian. (Backer and Hudders 2015). Furthermore, another study revealed that the importance of the moral value of purity mediated a positive relationship between religiosity and diet-minded food consumption, which can be considered a diet based on foods free from fats, sugars or allergens. (Minton et al. 2019).

Although these studies apply MFT to the study of consumers' attitudes toward food consumption, the relationship between MFT and nutritional evidence has not yet been fully investigated with the explicit acknowledgment that nutritional evidence is a contested issue. We therefore develop a conceptual framework to explain how the MFT can contribute to understanding consumers' attitudes toward contested nutritional evidence using the example of the superfoods. Our conceptual framework is displayed in Figure 1.

Figure 1: Conceptual framework.



As we can see from Figure 1, our theoretical assumptions consist in the following process:

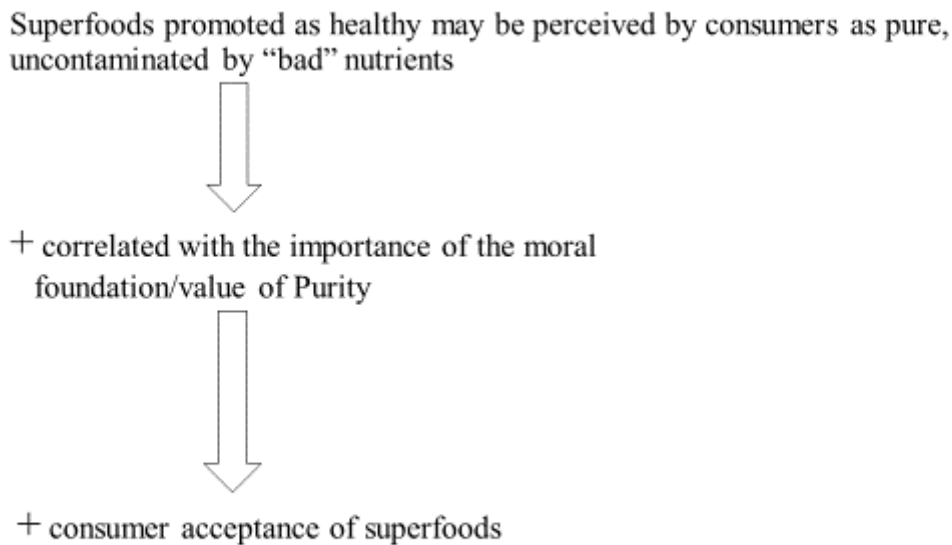
Consumers have scarce knowledge about the scientific nutritional attributes of superfoods because the nutritional evidence for superfoods is limited and controversial and consumers lack the expertise to judge the nutritional properties. Given this scarce knowledge, consumers form their beliefs and consequently their attitudes and acceptance of the nutritional evidence for superfoods through a heuristic information process moderated by the moral values that consumers hold. This means that consumers base their beliefs and consequently attitudes and acceptance or non-acceptance of superfoods by relying on moral values linked to superfoods rather than on scientific nutritional attributes and information.

MFT is particularly suited to studying consumers' attitudes toward nutritional evidence of superfoods. In fact, foods promoted as healthy are generally perceived to have strong moral connotation, e.g. "good foods" which are free from "bad nutrients or additives". In addition, van Leeuwen (2007), page 97, suggests that the attribute "healthy" implies specific discourses about moral values.

These moral values somehow substitute the needs of consumers for nutritional evidence in order to form their attitudes. Therefore, consumers bypass the issue of nutritional evidence by referring to moral values. As such, consumers are not actively engaging in evidence critique by questioning specific methods and results in the nutritional sciences. Rather, they are developing their own intuitive judgments about the benefits of foods. By doing so, they participate in the de-stabilization of the evidence at the interface of science and public. At the same time, consumers use these intuitive judgments to re-stabilize their every day practices in the face of contested nutritional evidence.

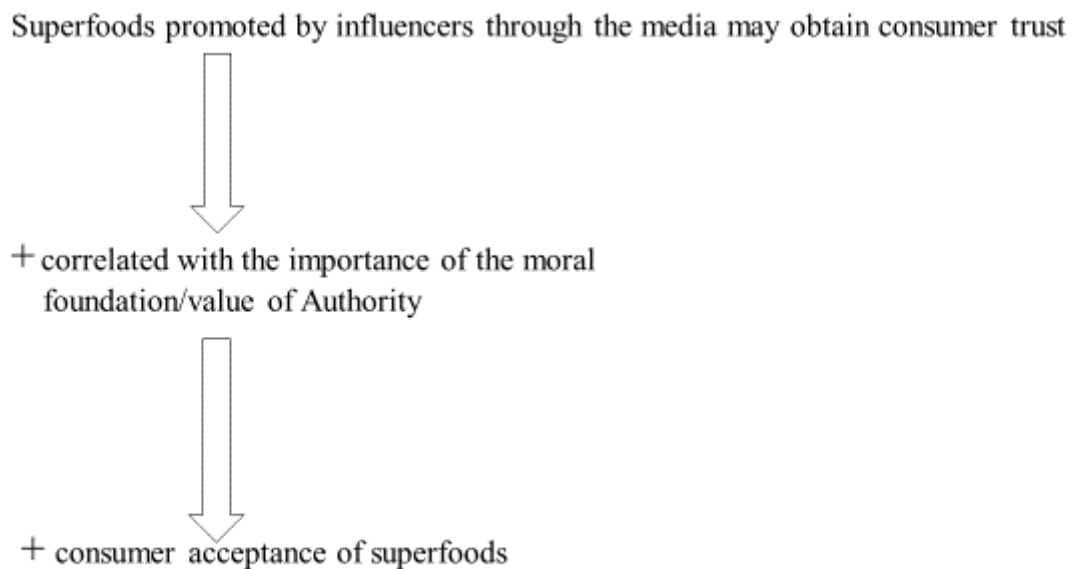
We now present two more possible examples of how consumers' beliefs (and consequently attitudes and acceptance) with regard to the nutritional evidence of superfoods may be moderated by specific moral values as defined by MFT. The first example, displayed in Figure 2, relates to how consumers may form their beliefs (and consequently attitude and acceptance) with regard to the presumed healthiness of superfoods.

Figure 2: Possible relationship between the attribute: “healthy” and the moral foundations/values.



We can interpret Figure 2 as follows: Superfoods are presented as healthy to consumers, who cannot judge this attribute “healthy” because of the lack of sufficient nutritional knowledge and expertise. Therefore, consumers may accept this attribute “healthy” not based on its scientific meaning but based on the association to a concept of a “good” and “pure” food free from “bad nutrients”, which may be positively correlated to the importance of moral foundation of purity/sanctity/degradation. Therefore, through a heuristic information perception process moderated by the moral foundation of purity/sanctity, consumers may form their beliefs and consequently attitudes toward and acceptance of superfoods. Namely, the more consumers are attached to the moral value of purity/sanctity, the more consumers may perceive and accept superfoods as healthy foods. The second example relates to the consumers’ trust on influencers who promote superfoods through the media and this example is displayed in Figure 3.

Figure 3: Possible relationship between the specific role of communication of some influencers and moral foundations/values.



The conceptual framework illustrated in Figure 3 can be interpreted as follows. “Pseudo-scientific” authorities (MacGregor et al. 2021), such as influencers, may promote superfoods as healthy through the media and consumers may trust them. This trust may lead consumers to think that influencers are role-model authorities and there may be a positive correlation between trust and the moral foundation of authority. Therefore, through a heuristic information process moderated by the moral foundation of authority, consumers may form their beliefs about superfoods promoted as healthy by the influencers. The more consumers trust influencers and the more consumers are attached to the moral foundation of authority, the more consumers may perceive and accept superfoods as healthy foods. Furthermore, the correlation between authority and trust can be observed in the previous literature, where authority, even though not addressed specifically within the MFT, is linked to the recommendations of role models (influencers). (Boer and Aiking 2021). The meaning of the term influencer as part of

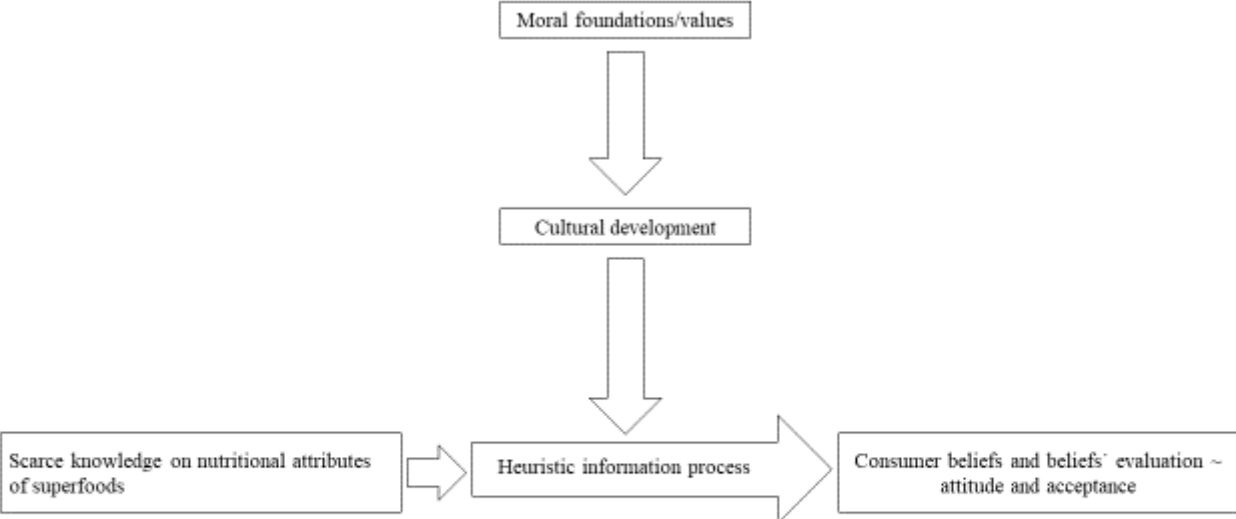
the role of authority may itself imply that influencers are able to sway consumer decisions because consumers trust them.

After these examples, we want to discover in more detail why the MFT is very suited for our conceptual framework. Our conceptual framework is based on the idea that, given that the nutritional evidence for superfoods is scarce, consumers form their beliefs and consequently their attitudes and acceptance or non-acceptance of superfoods not completely rationally based on scientific attributes, but by the moderation of moral values linked to superfoods, through a heuristic information process. The authors of MFT explicitly state that moral values are activated intuitively and based on heuristic information processes, rather than evoked rationally. Haidt and Bjorklund (2008), page 188, modified from Haidt (2001), explain this through the development of the SIM:

“the sudden appearance in consciousness, or at the fringe of consciousness, of an evaluative feeling (like–dislike, good–bad) about the character or actions of a person, without any conscious awareness of having gone through steps of search, weighing evidence, or inferring a conclusion.”

From this quote, we see that our conceptual framework perfectly fits with MFT, also because both MFT and our conceptual framework assume that moral judgments are intuitive and do not weigh the evidence in a computational manner. In our case, the nutritional evidence for superfoods cannot be weighted because it is contested and scarce and therefore difficult for consumers to assess. The moral foundations serve as a guideline to assessing the value of acceptability of superfoods. Moreover, in this quote, we can see that the explicit moral judgments are expressed through words such as “good” or “bad”, which are the ones also pertinent to our conceptual framework, such as “good food for health”. For these reasons, we think that the MFT contributes substantially to our conceptual framework. Lastly, MFT acknowledges the fact that cultural development plays a role in shaping the innate moral values of consumers, therefore we can extend our conceptual framework to include the concept of cultural development, as displayed in Figure 4.

Figure 4: Extension of the conceptual framework through the role of cultural development.



The conceptual framework displayed in Figure 4 can be interpreted as follows. As in the previous conceptual framework (Figure 1), consumers, who have scarce knowledge of nutritional evidence and the scientific nutritional attributes of superfoods, form their beliefs and consequently their attitudes and acceptance or non-acceptance with regard to superfoods via the moderation of the moral values, through a heuristic information process. The difference in our new conceptual framework (Figure 4) is that the moderating role of moral values is shaped and affected by cultural development. Hence, cultural development also has a role in forming consumers’ beliefs and consequently attitudes and acceptance with regard to superfoods. For example, in a culture where environmental impact has a great importance for consumers, this cultural attitude would reinforce the concept of care for the environment and therefore it could decrease consumers’ acceptance of superfoods, the production of which is associated with negative environmental impact. On the other hand, in a culture where environmental impact has not gained yet the attention of consumers, this cultural attitude would not reinforce the

concept of care for the environment and therefore it would not decrease consumers' acceptance of superfoods whose production has a negative environmental impact. With this last conceptual framework, we conclude our development of the theoretical approach. This theoretical development has shown that MFT can contribute substantially to the exploration of consumers' attitudes toward contested nutritional evidence.

2.5 Conclusion

In this chapter, we have explored the role that MFT can play in attempts to explain consumers' strategies with respect to "re-stabilizing" the contested nature of evidence coming from the nutritional sciences. By applying MFT to the study of consumers' attitudes toward nutritional evidence about superfoods, it seems that we have served our theoretical hypothesis that consumers face scarce nutritional evidence. Therefore, their attitudes will not be based on scientific claims (of which consumers have scarce knowledge), but on heuristic information processes linked to moral values. Furthermore, we base our theoretical framework on the SIM developed by Haidt and Bjorklund (2008), which posits that initial moral judgments are rather intuitive and driven by heuristic processes than fully rational ones.

This volume is concerned with different situations in which scientific evidence is contested and therefore subjected to processes of de-stabilization and re-stabilization. Our case of nutritional evidence represents an interesting although slightly different aspect of these processes. Evidence in the field of nutrition is contested because corporate funding may bias research (Nestle 2020) and methodological challenges lead to sometimes contradictory and conflicting results, thus increasing the confusion among the general public and consumers. Particularly for the case of superfoods, the health benefits conferred on these products are built on contradictory studies and often lack the evidence coming from human clinical trials. (Bassaganya-Riera et al. 2021). This phenomenon of controversial evidence is further amplified to consumers through the widespread and often inaccurate coverage and promotion of the presumed

health benefits by the media, advertising and influencers. (Ladher 2016; MacGregor et al. 2021). Therefore, consumers bridge the lack of nutritional evidence by using intuitive judgments based on moral values in order to form their beliefs, attitudes and acceptance of superfoods.

3 Investigating the influence of nutritional knowledge and moral concerns on nutritional attitudes: a quantitative study in Germany and Canada (Essay II)⁴

Abstract

Nutritional evidence is a contested issue. The nutritional sciences are a young scientific discipline in continuous evolution and the media often communicate inaccurately controversial nutritional information to consumers. In this context of uncertainty, it may be difficult for consumers to base their choice of a healthy diet on scientific evidence. In addition, they may have moral concerns when choosing their diet. For these reasons, the objective of this research is to investigate the influence of nutritional knowledge and moral concerns for the issue of unhealthy diets on consumers' nutritional attitudes across two countries, Germany and Canada. We conducted a large-scale survey in both countries where we measured consumers' subjective nutritional knowledge, objective nutritional knowledge, moral concerns for the issue of unhealthy diets and nutritional attitudes. We measured the moral concerns for the issue of unhealthy diets in relation to the concept of moral intensity, according to the Issue-Contingent Model of Ethical Decision Making developed by Jones (1991). After conducting a factor analysis of the dimensions of moral intensity for the issue of unhealthy diets and obtaining the moral intensity factors, we performed a series of linear regression analysis to identify the impact of subjective nutritional knowledge, objective nutritional knowledge and moral intensity factors (our independent variables) on two aspects of nutritional attitudes (each one considered as the dependent variable of the respective regression). Results suggest that nutritional

⁴ Essay II is a working paper draft co-authored by Ellen W. Goddard and Jutta Roosen. An earlier version of the survey development was presented at a Brown Bag Seminar at the Department of Resource Economics and Environmental Sociology (REES) at University of Alberta, in Edmonton, Canada, on June, 26th, 2022. Available at <https://alesevents.ualberta.ca/events/rees-brown-bag-seminar-edoardo-pelli/>

attitudes are influenced by nutritional knowledge and moral concerns for the issue of unhealthy diets.

Keywords: nutritional evidence; nutritional knowledge; nutritional attitudes; moral intensity.

3.1 Introduction

Even if scientific consensus has been reached within the scientific community for some issues, complexity is part of the scientific progress (Mozaffarian et al. 2018). For example, Light et al. (2022) highlights that scientific consensus exists on several issues such as the effect of the human activity on climate change (Anderegg et al. 2010; Core Writing Team et al. 2015) and the safety of genetically modified foods (American Association for the Advancement of Science 2012; European Commission, Directorate-General for Research and Innovation 2010). Still these topics are highly debated within society.

Within science, the field of nutritional sciences is particularly complex. Nutritional sciences are a surprisingly young scientific discipline. Even if nutrition has been studied for centuries (Mozaffarian et al. 2018) and nutritional guidelines were developed in ancient Greece (Barlösius 2016), a natural science-based approach to nutritional sciences has only been developed from the 19th century (Barlösius 2016). Being a young discipline, nutritional sciences are in continuous evolution, and established scientific knowledge is questioned by new results and discoveries. For these reasons, nutritional evidence is still contested and controversial. Most of the nutritional discoveries took place in the 20th and 21st centuries. (Mozaffarian et al. 2018). For example, the first vitamin was isolated in 1926, just about a century ago. In the first half of the 20th century, the concern was on vitamin discoveries: vitamins were isolated and vitamin deficiencies were addressed in order to prevent vitamin deficiency diseases. In this context, the US National Nutrition Conference for Defense in 1941 announced the first Recommended Daily Allowances (RDA) (Carpenter 1941), which were following a reductionist approach based on a recommended micronutrient (especially vitamin) intake, not considering the complexity of dietary patterns. Such a reductionist approach continued from the 1950s to the 1990s when fats, sugars and proteins were the focus of concern: excess of sugars and fats as well as deficiency of proteins, the so-called “protein gap” (the latter only until

1975), were associated with the development of human diseases. So before the 1990s the focus of concern was based on a minimum intake of “good” nutrients (mostly vitamins and proteins) and on a maximum intake of “bad” nutrients (mostly fats and sugars), not considering the complexity of dietary patterns. However, this dominant approach has been contested from the 1980s and onwards. Thanks to more complex nutritional studies, it was discovered that the effects on human health depends more on the complexity of dietary patterns, rather than on single nutrients deficiencies/excess. This situation further exemplifies that nutritional evidence is controversial as these new results have become available only recently and gave rise to the ongoing open debates among scientists on the possible relationships between foods, nutrients and human health (Mozaffarian et al. 2018).

Moreover, nutritional evidence of foods is contested because the food industry funds substantial nutritional research, leading to conflict of interests (Nestle 2020). Furthermore, there is substantial inaccurate communication of nutritional sciences by the media and journalists, who don't have the skills to critically judge nutritional studies. (Ladher 2016). These patterns are evident, for example, in the recent debates about consuming (red) meat and likelihood of developing cancer (Ladher 2016). These debates grew in the context of the assessments of the cancerogenicity of red and processed meat by the International Agency for Research on Cancer (IARC) of the World Health Organization (WHO). According to the International Agency for Research on Cancer (IARC), World Health Organization (WHO) (October, 26th, 2015) and the International Agency for Research on Cancer (IARC), World Health Organization (2018), red meat was evaluated as being probably cancerogenic to humans (supported by limited scientific evidence in humans), and processed meat was evaluated as being cancerogenic to humans (supported by sufficient scientific evidence in humans). More specifically, as stated in the International Agency for Research on Cancer (IARC), World Health Organization (WHO) (2018), page 3:

“The consumption of processed meat was associated with small increases in the risk of cancer in the studies reviewed. In those studies, the risk generally increased with the amount of meat consumed. An analysis of data from 10 studies estimated that every 50 gram portion of processed meat eaten daily increases the risk of colorectal cancer by about 18%. The cancer risk related to the consumption of red meat is more difficult to estimate because the evidence that red meat causes cancer is not as strong. However, if the association of red meat and colorectal cancer were proven to be causal, data from the same studies suggest that the risk of colorectal cancer could increase by 17% for every 100 gram portion of red meat eaten daily.”

These findings are supported also by the report from the World Cancer Research Fund (WCRF)/ American Institute for Cancer Research (2018), that found “probable” evidence that consumption of red meat increases the risk of colorectal cancer and “convincing” evidence that the consumption of processed meat increases the risk of colorectal cancer. Similarly, as reviewed by the World Health Organization (2023), excess of consumption of red meat and processed meat is associated with increased risks in non-communicable diseases, such as cancer, cardiovascular disease, and type 2 diabetes, and high temperature cooking of meat produces harmful compounds for health; furthermore, consumption of meat has a negative environmental impact. However, as reviewed by World Health Organization (2023), consumption of red meat (unlike processed meat) presents several health benefits, such as richness in bioavailable vitamins and minerals and other essential compounds necessary for growth, development and good health, and support to the delivery of essential nutrients at important stages of life; furthermore, red meat is a high-quality source of proteins, containing all essential amino acids.

In this multi-faced context regarding the healthiness of meat, the German Nutrition Society (Deutsche Gesellschaft für Ernährung e. V., DGE) released the new German Food-Based Dietary Guidelines (FBDG) in March, 5th, 2024, advising to increase the consumption of plant-based foods and to decrease the consumption of animal-based foods (such as meat and dairy products) even more than before. They argued that the consumption of animal-based foods has a negative impact on the environment and that the high consumption of meat is associated with higher risks of developing certain diseases (Deutsche Gesellschaft für Ernährung e. V.

(DGE) March, 5th, 2024). It is advised to consume mainly plant-based foods in order to eat healthy and to reduce the negative impact on the environment. Particularly, it is suggested that a healthy and environmentally sustainable diet consists of more than $\frac{3}{4}$ of plant-based food and less than $\frac{1}{4}$ of animal-based foods. (Deutsche Gesellschaft für Ernährung e. V. (DGE) March, 5th, 2024).

Similarly, the Canadian Dietary Guidelines for Health Professionals and Policy Makers (Health Canada 2019a) and the Canadian Healthy Eating Recommendations (Health Canada 2019b) suggest to increase the consumption of plant-based foods (including consuming more often plant-based protein foods among all protein foods) and to reduce the consumption of processed food such as processed meats. Furthermore, the Canadian Dietary Guidelines for Health Professionals and Policy Makers (Health Canada 2019a) explain that consumers are exposed to changes and often conflicting information about healthy eating through marketing and media and that in this complex environment it may be difficult for consumers to make healthy eating choices.

This situation of evolving dietary guidelines directed towards more plant-based and less meat-based diets (Deutsche Gesellschaft für Ernährung e. V. (DGE) March, 5th, 2024; Health Canada 2019a, 2019b), of trade-offs between health benefits and risks of consuming meat (World Health Organization 2023), and of conflicting nutritional information to which consumers are exposed (Ladher 2016; Health Canada 2019a) may also create confusion among consumers. It shows that nutritional evidence of foods is a contested issue. In this context, it is important to explore consumers' attitudes because attitudes towards 'rights' and 'wrongs' with regard to eating may influence healthy eating behavior and prevent or increase the risks of diet-related diseases. The possibility that attitudes predict eating behavior and dietary quality has been empirically supported by various studies (Cooke and Papadaki 2014; Hearty et al. 2007; Biloft-Jensen et al. 2009). Based on the abovementioned importance, this study aims to explore further consumers' nutritional attitudes and their possible determinants.

In addition to attitudes, the review carried out by Spronk et al. (2014) shows that previous literature has considered objective nutritional knowledge being possibly directly related to dietary intake. Particularly, Spronk et al. (2014) reviewed 29 studies that examined the relationship between objective nutritional knowledge and dietary intake. Most of the studies (65.5%) reviewed show significant but weak associations between objective nutritional knowledge and dietary intake, while the remaining studies (34.5%) reviewed by Spronk et al. (2014) show no significant associations between objective nutritional knowledge and dietary intake. Most of the studies investigated the relationship between objective nutritional knowledge and dietary intake through correlations; however, one study reviewed by Spronk et al. (2014), namely the study carried out by Sharma et al. (2008), analyzed the relationship between objective nutritional knowledge and dietary intake through a more advanced statistical technique (regression analysis) and found that objective nutritional knowledge was a predictor for eating behavior for all food groups except fruit and vegetables. Interestingly, Wardle et al. (2000) found, through regression analysis, that objective nutritional knowledge was a predictor of intake of fat, fruit and vegetables (stronger for fruit and vegetables than for fat), even if the observed correlations between the two constructs were not high. In this context, Wardle et al. (2000) suggest that using more sophisticated statistical techniques (namely, regression analyses) to investigate the relationship between objective nutritional knowledge and dietary intake may reveal that objective nutritional knowledge is an important predictor of dietary intake, even if the observed correlations between the constructs are not high or not statistically significant. Moreover, Wardle et al. (2000) suggest that regression analyses provide more accurate evaluations of the relationships between the constructs in comparison to correlations, because regression analyses assess the effect size rather than only strength of association.

In this context, the study carried out by Cooke and Papadaki (2014) investigated the relationship between objective nutritional knowledge, nutritional attitudes towards healthy eating, nutritional label use, and dietary quality. Particularly, Cooke and Papadaki (2014) tested through

several regression models whether objective nutritional knowledge and attitudes predict nutritional label use separately, whether objective nutritional knowledge and attitudes predict dietary quality separately, whether objective nutritional knowledge and attitudes predicted dietary quality whilst controlling for nutritional label use, whether nutritional label use predicted dietary quality, and whether nutritional label use predicted dietary quality whilst controlling for objective nutritional knowledge and attitudes. They found that objective nutritional knowledge and attitudes significantly and positively predicted nutritional label use separately, objective nutritional knowledge and attitudes significantly and positively predicted dietary quality separately, objective nutritional knowledge and attitudes significantly and positively predicted dietary quality whilst controlling for nutritional label use, nutritional label use significantly and negatively predicted dietary quality not independently but only when controlled for objective nutritional knowledge and attitudes. From these findings we can see that objective objective nutritional knowledge and nutritional attitudes can be predictors of dietary quality (and of nutritional label use). As we will discuss later, what is not investigated in the study of Cooke and Papadaki (2014) is whether objective nutritional knowledge can be a predictor of nutritional attitudes and whether subjective nutritional knowledge can be another predictor of nutritional attitudes. In contrast to the results of the regression analyses, the preliminarily performed Pearson's bivariate correlations between objective nutritional knowledge, attitudes, nutrition label use and dietary quality show some positive but low significant correlations at the 0.01 alpha level (Cooke and Papadaki 2014). Significant correlations were observed between objective nutritional knowledge and attitudes, objective nutritional knowledge and nutritional label use, attitudes and nutritional label use, and attitudes and dietary quality. In contrast to the results of the regression analyses, correlations between objective nutritional knowledge and dietary quality and between nutritional label use and dietary quality were not significant. Among the significant correlations at the 0.01 alpha level, the highest was the correlation between objective nutritional knowledge and nutritional attitudes (0.212). This result

of Cooke and Papadaki (2014) suggests that the relationship between objective nutritional knowledge and nutritional attitudes should be further explored. Indeed, Cooke and Papadaki (2014) performed only correlations between objective nutritional knowledge and nutritional attitudes and did not test through a more advanced statistical technique (namely, regression analysis) whether objective nutritional knowledge predicted nutritional attitudes toward healthy eating. Indeed, it seems that this specific direction has not been investigated much in the literature, even if, for example, Misra (2007), showed that attitudes towards food labels mediated the relationship between objective knowledge and label reading behavior. Further research should test through regression analysis whether objective nutritional knowledge predicts nutritional attitudes toward healthy eating, which then may be determinants of dietary quality (Cooke and Papadaki 2014) and consequently help in preventing diet-related diseases.

As discussed also by Scalvedi et al. (2021) and by Verbeke (2008), when investigating the relationship between nutritional knowledge, nutritional attitudes and nutritional behavior, it is important to consider, in addition to the measure of objective nutritional knowledge, the measure of subjective nutritional knowledge, as these measures may both be determinant of nutritional attitudes and nutritional behavior. In this context, Jeruszka-Bielak et al. (2018) found that subjective nutritional knowledge about healthy food and healthy eating predicted nutritional attitudes. In a different setting, namely in the context of fish consumption, Pieniak et al. (2006) found that subjective knowledge about fish was a better predictor of consumers' fish consumption in comparison to the objective knowledge about fish. Similarly, in the context of consumption of organic vegetables, Pieniak et al. (2010) found that subjective knowledge about organic vegetables was an important direct predictor of organic vegetables consumption, while objective knowledge about organic vegetables predicted organic vegetables consumption only indirectly through subjective knowledge and general attitudes towards

organic vegetables consumption. Furthermore, both subjective knowledge about organic vegetables and objective knowledge about organic vegetables were predictors of general attitudes towards organic vegetables. In the context of acceptance of genetically modified foods, House et al. (2004) found that subjective knowledge of genetically modified foods was a significant determinant of consumers' willingness to accept genetically modified foods, while objective knowledge of genetically modified foods was not related to it. In the context of olive oil consumption, Gámbaro et al. (2013) found that subjective knowledge of olive oil showed a greater explanatory capacity for olive oil consumption than objective knowledge of olive oil, while both types of knowledge strongly influenced olive oil consumption.

In addition to knowledge, in this context of uncertainty around nutritional evidence, consumers may use alternative judgement beyond their assessments of scientific evidence when forming nutritional attitudes. Moreover, in this situation of uncertainty, it may be difficult for consumers to be sure what constitutes a healthy diet and consumers may have moral concerns for the issue of unhealthy diets. Therefore, we think it is important to explore the role of the moral concerns that consumers have with regard to unhealthy diets. Since healthy/unhealthy eating is a specific issue, we employ here a concept of morality that refers to specific moral issues, that is the concept of moral intensity. Jones (1991) established the concept of moral intensity with the Issue-Contingent Model of Ethical Decision Making. It suggests that every specific issue can be represented by its moral intensity and that the intensity is likely to vary from issue to issue. Jones (1991) identified six components: the magnitude of consequences, the social consensus, the probability of effect, the temporal immediacy, the proximity, and the concentration of the effect. The concept of moral intensity has been applied to various issues, including animal welfare (Bennett and Blaney 2002; Bennett et al. 2002) and climate change related to food consumption (Mäkineniemi and Vainio 2013). Inspired by the application of Mäkineniemi and Vainio (2013) on climate change, we applied the concept of moral intensity to

the issue of unhealthy diets. To the best of our knowledge, our work is the first application in this specific direction.

Based on this background and literature review, the objective of our research is to investigate the influence of subjective nutritional knowledge, objective nutritional knowledge and moral intensity on nutritional attitudes.

3.2 Material and methods

The survey used for this research included nutritional attitudes questions, subjective nutritional knowledge questions, objective nutritional knowledge questions, questions on moral intensity for the issue of unhealthy diets, and socio-demographic questions.

3.2.1 Data

Data were collected through an online survey in August and September 2022 with a sample of 1811 people in Germany and 1596 people in Canada. Respondents were recruited using an online-access panel. The German sample was quota sampled according to gender, age, education, income, region and household number. For the Canadian sample we did not implement quotas and this is a limitation of our study. The duration of the survey was approximately 15 minutes.

3.2.2 Survey development

The survey instrument was developed in English and translated to German. When possible existing translations were used, in other cases the translation was done and verified by a second native German speaker.

3.2.2.1 Nutritional attitudes

We selected two nutritional attitudes measures from the work carried out by Cooke and Papadaki (2014), which was based on the work of Kearney et al. (2001). The attitudes were measured on a 5-points Likert scale. The original scale of Kearney et al. (2001) and Cooke and Papadaki (2014) contained three measures. Based on the importance of the content, we selected two measures: (1) Conscious effort to eat healthily and (2) not to make any effort to change the diet as it is considered to be healthy enough. The nutritional attitudes questions are displayed in section 3.5.1 in the appendix.

3.2.2.2 Subjective and objective nutritional knowledge

For subjective knowledge measures, we relied on the measures of the work carried out Scalvedi et al. (2021), which was based on the work of Gámbaro et al. (2013). The scale consists of three items. The original 7-points Likert scale was adjusted to a 5-points Likert scale, in order to be consistent with the nutritional attitudes scale. The subjective nutritional knowledge questions are displayed in section 3.5.2 in the appendix.

Regarding the measurement of objective nutritional knowledge, the General Nutrition Knowledge Questionnaire (GNKQ) developed by Parmenter and Wardle (1999) has become a standard valid instrument to measure objective nutritional knowledge. However, as argued by Koch et al. (2021), it is too long to be used as one of the many instruments of a large-scale survey. The questionnaire developed by Dickson-Spillmann et al. (2011), tested in a Swiss sample, provides a shorter efficient alternative with only twenty items and showed good internal reliability and validity when compared to the GNKQ developed by Parmenter and Wardle (1999). Furthermore, this questionnaire by Dickson-Spillmann et al. (2011) developed subscales for both procedural objective nutritional knowledge and declarative objective nutritional knowledge. Procedural objective nutritional knowledge refers to knowledge on skills and strategies, “knowing how”, while declarative objective nutritional knowledge refers to

factual knowledge, “knowing what”. The questionnaire developed by Dickson-Spillmann et al. (2011) was implemented in a German sample by Koch et al. (2021) who made some adjustments to the questionnaire. For example, Koch et al. (2021) theoretically distinguished not only between procedural knowledge and declarative knowledge, but also between declarative knowledge on nutrients and knowledge on calories. Hence, Koch et al. (2021) used three different subscales: one scale for procedural knowledge, one scale for declarative knowledge on nutrients and one scale for declarative knowledge on calories, thereby distinguishing the three different types of objective nutritional knowledge in their analysis. For these reasons, we based our objective nutritional knowledge measures on the questionnaire of Koch et al. (2021). It was originally composed by twenty items: Seven items measured procedural objective nutritional knowledge, seven items measured declarative objective nutritional knowledge on nutrients and six items measured declarative objective nutritional knowledge of calories. To further reduce the length of our questionnaire, we selected three items for each type of objective nutritional knowledge based on the relevance of the content. Survey respondents were prompted to answer true, false, or I don’t know. The objective nutritional knowledge questions are displayed in section 3.5.3 (table 4) in the appendix.

3.2.2.3 Measure of moral intensity for the issue of unhealthy diets

From the moral intensity model of six categories (magnitude of consequences, social consensus, probability of effect, temporal immediacy, proximity, and concentration of effect) developed by Jones (1991), Singhapakdi et al. (1996) developed a 6-item moral intensity scale, with one item for each moral intensity category. Based on this work, Frey (2000) developed a twelve-items moral intensity scale, with two items for each moral intensity category. McMahon and Harvey (2006) analyzed the factor structure of the scales developed by Singhapakdi et al. (1996) and Frey (2000). The moral intensity scales developed and analyzed by Singhapakdi et al. (1996), Frey (2000) and McMahon and Harvey (2006) measured the

moral intensity for each category at the general level. Based on the general moral intensity scales of Singhapakdi et al. (1996), Frey (2000) and McMahon and Harvey (2006), Vainio and Mäkineniemi (2016a) developed a 18-item moral intensity scale specific for the issue of climate change. Inspired by this climate change-specific moral intensity scale, we developed a 7-item moral intensity scale (selecting the items based on the relevance of the content) specific for the issue of unhealthy diets, including all the six categories of moral intensity. Like the scale developed by Vainio and Mäkineniemi (2016a), we implemented a 7-points Likert scale.

3.2.3 Data analysis

For the objective nutritional knowledge questions (the answer could be true, false or I don't know), we calculated the score for each participant for each question with 1 point if the answer was correct and with 0 point if the answer was incorrect or if the participant selected "I don't know". We calculated objective nutritional knowledge in the dimensions of procedural objective nutritional knowledge, declarative objective nutritional knowledge on nutrients, and declarative objective nutritional knowledge on calories where each participant could get a minimum of 0 points and a maximum of 3 points.

For the questions on moral intensity for the specific issue of unhealthy diets, we recalculated the score for the items with a reversed coding. Since the original structure of the six categories of moral intensity is generally not confirmed in the literature (Mäkineniemi and Vainio 2013; McMahon and Harvey 2006; Ng et al. 2009), we conducted an exploratory factor analysis through the Maximum Likelihood Method with orthogonal Varimax rotation following Mäkineniemi and Vainio (2013) in order to find the underlying moral intensity factors of our moral intensity scale. We found a two-factor solution. To obtain the factor scores, we choose the Anderson-Rubin method, which guarantees that the factor scores are uncorrelated and

standardized, so that the mean of each factor tends to 0 and the standard deviation of each factor is equal to 1 (Field 2018). Given that our purpose is to use the two factors as explanatory variables in regressions, it is important that the two factors are uncorrelated.

To estimate the impact of subjective nutritional knowledge, objective nutritional knowledge (specified as procedural knowledge, declarative knowledge on nutrients and declarative knowledge on calories) and moral intensity factors (our independent variables) on two nutritional attitudes (each one considered as the dependent variable of the respective regression) we conducted linear regression analysis.

3.3 Results

3.3.1 Socio-demographic characteristics

An overview of the socio-demographic characteristics for each country is provided in section 3.5.4 (tables 5 and 6) in the appendix.

Even with the implemented quotas for the German sample, we can observe some differences between the various distributions of the sample respect to the population, particularly regarding age and household size.

For Canada we did not implement quotas for participants and there are some differences between the various distributions of the sample respect to the population. In particular, the gender distribution of the sample is very different compared to the gender distribution of the population, which is around 50% for males and females. This is a limitation of our study. However, evidence from another large-scale survey in Canada suggest that the majority of people that are the household's main grocery shopper is disproportionately female (Doucette 2022). Therefore, without implementing quotas, more females than males may have been attracted to the content of this survey.

3.3.2 *Factor analysis*

The content of the moral intensity categories and the results of their factor analysis are shown in table 1. Respondents were asked to evaluate each item of the moral intensity categories by answering to the question: “Please identify how strongly you agree with the following statements:” through a 7-point Likert scale: 1 (strongly disagree); 2 (disagree); 3 (somewhat disagree); 4 (neither agree or disagree); 5 (somewhat agree); 6 (agree); 7 (strongly agree). For both Germany and Canada, we obtained a two-factor solution for the moral intensity of unhealthy diets based on eigenvalues, scree plots, and interpretability. The temporal immediacy, concentration of effects and probability of effect loaded in the first factor and the proximity of effect and magnitude of consequences items loaded in the second factor. The item: “Social consensus” was removed from the analysis because its removal increased substantially the reliability in both countries. Based on the content of the categories present in each factor, we named the first factor “Prediction and concentration of effects” and the second factor “Proximity and seriousness of effects”. Our results are different from previous results. Namely, McMahon and Harvey (2006) analyzed the factor structure of the scales developed by Singhapakdi et al. (1996) and Frey (2000) and they obtained a three-factor solution, with the magnitude of consequences, probability of effect, and temporal immediacy items loading on the first factor, the proximity of effect items loading on the second factor, and the social consensus items loading on the third factor. Mäkineniemi and Vainio (2013) obtained a three-factor solution, with concentration of effect, magnitude of consequences, probability of effect, and temporal immediacy items loading in the first factor, social consensus items loading in the second factor and proximity of effect items loading in the third factor. These different results may have been caused by the fact that we selected only some of the items used by Mäkineniemi and Vainio (2013). In addition, our items were based on a different and new topic, namely the concept moral intensity for the specific issue of unhealthy diets, and not to the concept of moral intensity for climate change for Mäkineniemi and Vainio (2013) or the concept of moral

intensity at the general level of McMahon and Harvey (2006). In both countries, we had two factors that exceeded the eigenvalue of 1. The Kaiser–Mayer–Olkin value was 0.741 for Germany and 0.710 for Canada. The Bartlett’s Test of Sphericity was statistically significant for both countries (p -value < 0.001). These results indicate that the factor analysis was appropriate for the data. The final Cronbach’s alpha of the two factors are acceptable for both countries.

Table 1: Factor analysis of the moral intensity dimensions

	Germany		Canada	
	Prediction and con- centration of effects	Proximity and seri- ousness of effects	Prediction and con- centration of effects	Proximity and seri- ousness of effects
Temporal immediacy: Unhealthy diets and unhealthy foods are not likely to cause harm in the near future ^a	0.814		0.807	
Concentration of Effects: The harmful effects of unhealthy diets and unhealthy foods will be concentrated on a small number of people ^a	0.750		0.699	
Probability of Effect: It is unlikely that unhealthy diets and unhealthy foods will cause any harm ^a	0.738		0.858	
Proximity of Effect a: The harmful effects of unhealthy diets and unhealthy foods will affect people close to me		0.856		0.688
Proximity of Effect b: The harmful effects of unhealthy diets and unhealthy foods will affect the nearby environment		0.910		0.643
Magnitude of consequences: The negative consequences of unhealthy diets and unhealthy foods will be very serious		0.502		0.702
<i>Cronbach's alpha^b</i>	<i>0.824</i>	<i>0.811</i>	<i>0.832</i>	<i>0.716</i>

^a: Reversed coded items; ^b based on standardized items. The excluded item was Social consensus: Most people would disagree about the right way to act regard to unhealthy dietary behavior

3.3.3 Descriptive statistics and correlations

Descriptive statistics of the main variables for both countries are displayed in table 2.

Indeed, regarding subjective nutritional knowledge, we looked at the correlations between the three subjective nutritional knowledge questions and they were presenting often high correlations with correlation coefficients often higher than 0.5 (Field 2018). The correlations of the

three subjective nutritional knowledge questions for both countries are displayed in section 3.5.5 (tables 7 and 8) in the appendix. Therefore, as done in Scalvedi et al. (2021), we decided to combine them into one item, by taking the average of the scores of the three items. We used the combined average subjective nutritional knowledge as a variable in the regressions. Furthermore, in section 3.5.5 (tables 9 and 10) in the appendix, the correlations of the variables of the two regressions are provided. As can be seen, the explanatory variables in both countries are correlated with each other, but not highly although almost always statistically significant. The lack of high levels of correlation among the explanatory variables may suggest that we should not have problems of multicollinearity in the regressions. Correlations between the explanatory variables and the dependent variables of the two regressions are often significant but not large, except for medium to high effects for the correlations between subjective knowledge and each of two nutritional attitudes.

Table 2: Descriptive statistics

Variable	Mean (Std. dev.)	Min	Max	Mean (Std. dev.)	Min	Max
Nutritional attitude 1: I make conscious efforts to try and eat a healthy diet	3.737 (.893)	1	5	3.645 (.979)	1	5
Nutritional attitude 2: I don't need to make changes to my diet as it is healthy enough	3.025 (.925)	1	5	2.876 (1.06)	1	5
Subjective nutritional knowledge	2.802 (.928)	1	5	3.08 (.865)	1	5
Procedural objective nutritional knowledge	2.015 (1.015)	0	3	1.683 (1.116)	0	3
Declarative objective nutritional knowledge on nutrients	1.258 (.866)	0	3	1.265 (.926)	0	3
Declarative objective nutritional knowledge on calories	1.702 (1.026)	0	3	1.415 (.986)	0	3
Prediction and concentration of effects (moral intensity factor_unhealthy diets)	0 (1)	-3.554	2.038	0 (1)	-2.518	1.735
Proximity and seriousness of effects (moral intensity factor_unhealthy diets)	0 (1)	-3.325	2.341	0 (1)	-3.655	2.021
Number of observations	1811			1596		

3.3.4 Linear regressions

We estimated the impact of subjective nutritional knowledge, the three dimensions of objective nutritional knowledge, and moral intensity factors on the two nutritional attitudes: (1) Conscious effort to eat healthily and (2) not to make any effort to change the diet as it is considered to be healthy enough. The results of the regression analyses are displayed in table 3.

Table 3: Linear regression results

Variables	Nutritional attitude 1: I make conscious efforts to try and eat a healthy diet		Nutritional attitude 2: I don't need to make changes to my diet as it is healthy enough	
	Germany	Canada	Germany	Canada
Subjective nutritional knowledge	0.508*** (0.0205)	0.460*** (0.0261)	0.430*** (0.0231)	0.492*** (0.0294)
Procedural objective nutritional knowledge	0.0350* (0.0188)	0.0957*** (0.0220)	-0.0823*** (0.0212)	-0.0728*** (0.0248)
Declarative objective nu- tritional knowledge on nutrients	-0.0300 (0.0216)	0.00118 (0.0250)	0.00150 (0.0244)	-0.0489* (0.0282)
Declarative objective nu- tritional knowledge on calories	0.00271 (0.0187)	0.0762*** (0.0240)	-0.0395* (0.0211)	-0.0122 (0.0270)
Prediction and concentra- tion of effects (moral in- tensity factor_unhealthy diets)	0.0867*** (0.0183)	0.133*** (0.0234)	-0.0129 (0.0206)	-0.117*** (0.0263)
Proximity and serious- ness of effects (moral in- tensity factor_unhealthy diets)	0.0283 (0.0181)	0.137*** (0.0221)	-0.142*** (0.0204)	-0.144*** (0.0249)
Constant	2.275*** (0.0647)	1.958*** (0.0890)	2.052*** (0.0730)	1.561*** (0.100)
Number of observations	1,811	1,596	1,811	1,596
R ²	0.303	0.261	0.174	0.200

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Firstly, we describe the similarities between Germany and Canada. In both countries, the subjective nutritional knowledge has a positive effect on the nutritional attitude: “I make conscious efforts to try and eat a healthy diet” which is as expected. In both countries the subjective knowledge has also a positive effect on the nutritional attitude: “I don't need to make

changes to my diet as it is healthy enough” which may be also quite intuitive: people that think to know more about nutrition may think that their diet is healthy enough. Regarding objective nutritional knowledge, in both countries procedural objective nutritional knowledge has a positive effect on the attitude: “I make conscious efforts to try and eat a healthy diet”. This result is interesting since it means that knowing more about how to eat determines to make more of a conscious effort and try and eat a healthy diet. On the other hand, in both countries procedural objective nutritional knowledge has a negative effect on the attitude: “I don’t need to make changes to my diet as it is healthy enough”. This result is interesting since it means that people with less knowledge on how to eat think nevertheless that their diet is healthy enough, maybe by being superficial. On the other hand, people with more knowledge on how to eat healthily may think that their diet is not healthy enough, maybe because of the discrepancy between their normative nutritional behavior (what they should eat) and their actual nutritional behavior. Regarding moral intensity, in both countries the moral intensity factor: “Prediction and concentration of effects” has a positive effect on the nutritional attitude “I make conscious efforts to try and eat a healthy diet”. This is expected because people that are more morally concerned about the issue unhealthy diets may be more conscious in their efforts to try to eat healthily. Furthermore, in both countries the moral intensity factor: “Proximity and seriousness of effects” has a negative effect on the nutritional attitude: “I don’t need to make changes to my diet as it is healthy enough”. This result is also interesting: people that are less morally concerned about the issue of unhealthy diets may think that their diet is healthy enough and people that are more morally concerned about the issue of unhealthy diets may think that their diet is not healthy enough.

Now we describe the differences between Germany and Canada. In Canada, unlike in Germany, the declarative objective nutritional knowledge on calories has positive effect on the attitude: “I make conscious efforts to try and eat a healthy diet”. This result is interesting since it means that people that know more about calories make more conscious efforts to try and eat

a healthy diet. Regarding objective nutritional knowledge in Germany, the declarative objective nutritional knowledge on calories has a negative effect on the attitude: "I don't need to make changes to my diet as it is healthy enough". This is interesting because people who know more about calories may not think that their diet is healthy enough (maybe because of discrepancy between their normative nutritional behavior (what they should eat) and the actual nutritional behavior) and people with less knowledge on calories may think that their diet is healthy enough (maybe because they don't estimate correctly the caloric quantity and the healthiness of their diet). On the other hand, in Canada the declarative objective nutritional knowledge on nutrients (and not on calories) has a negative effect on the nutrition attitude that "I don't need to make changes to my diet as it is healthy enough". This is interesting because people who know more about nutrients may not think that their diet is healthy enough (maybe because of discrepancy between their normative nutritional behavior (what they should eat) and the actual nutritional behavior) and people with less knowledge on nutrients may think that their diet is healthy enough (maybe because they don't estimate correctly the nutrient quality and healthiness of their diet). Regarding moral intensity, in Canada we observe more effects of the two dimensions of moral intensity on the two attitudes. Particularly in Canada, both the moral intensity factors "Prediction and concentration of effects" and "Proximity and seriousness of effects" have a positive effect on the nutritional attitude: "I make conscious efforts to try and eat a healthy diet" (in Germany only the moral intensity factor: "Prediction and concentration of effects" positively influences this attitude). This result makes stronger in Canada respect to Germany the possible pattern that people that are more morally concerned about the issue unhealthy diets may be more conscious in their efforts to try to eat healthily. Furthermore, in Canada, both the moral intensity factors "Prediction and concentration of effects" and "Proximity and seriousness of effects" have a negative effect on the attitude "I don't need to make changes to my diet as it is healthy enough" (in Germany only the moral intensity factor "Proximity and seriousness of effects" negatively influences this attitude).

This result suggests that in Canada is stronger the effect that people who are less more morally concerned about the issue of unhealthy diets think that their diet is healthy enough and people that are more morally concerned about the issue of unhealthy diets think that their diet is not healthy enough.

3.4 Discussion

Our research question aimed to estimate the impact of subjective nutritional knowledge, objective nutritional knowledge (specified as procedural knowledge, declarative knowledge on nutrients and declarative knowledge on calories) and moral intensity factors (our independent variables) on two measures of nutritional attitudes, each one considered as the dependent variable of the respective regression. Results suggest that nutritional attitudes are influenced by nutritional knowledge and moral intensities, as we found various significant results in both countries.

Regarding subjective nutritional knowledge, we always found, through regression analysis, a positive and significant effect of subjective knowledge on both nutritional attitudes in both countries (in this case supported by medium to high correlations). This is in line with the finding of Jeruszka-Bielak et al. (2018), who found that subjective nutritional knowledge about healthy food and healthy eating positively and significantly influenced nutrition-related attitudes. Similarly, the findings of Pieniak et al. (2006), Pieniak et al. (2010), House et al. (2004) and Gámbaro et al. (2013) found in different contexts that food-related subjective knowledge significantly predicted food consumption, generally more as compared to food-related objective knowledge. In our situation, we can similarly argue for both countries that subjective nutritional knowledge predicted nutritional attitudes more than the three different types of objective nutritional knowledge because the coefficients of the influence of subjective nutritional knowledge on nutritional attitudes were always significant (unlike the coefficients on the influence of the three different types of objective nutritional knowledge).

Nevertheless, regarding the effect of objective nutritional knowledge on nutritional attitudes, we indeed found some significant results, showing that objective nutritional knowledge can be a predictor of nutritional attitudes. It appears that this specific effect of objective nutritional knowledge on nutritional attitudes has not been investigated in the literature extensively with advanced statistical techniques such as regression analysis. In this context, Cooke and Papadaki (2014) analyzed the correlations between objective nutritional knowledge, attitudes, nutrition label use and dietary quality and found some significant but low correlations, such as the correlation between nutritional knowledge and nutritional attitude (the strongest among their significant correlations) and the correlation between nutritional attitudes and dietary quality. Furthermore, some correlations such as the correlations between objective nutritional knowledge and dietary quality were not significant. In contrast to the results from the correlations, Cooke and Papadaki (2014) found through regression analysis that objective nutritional knowledge and nutritional attitudes were predictor of dietary quality separately. However, Cooke and Papadaki (2014) did not analyze through regression analysis whether objective nutritional knowledge is a predictor of nutritional attitudes. Our research contributes in this direction, showing, through regression analysis that objective nutritional knowledge can be a predictor of nutritional attitudes. In this context, our research extend the suggestion of the study carried out by Wardle et al. (2000). As outlined in the introduction, Wardle et al. (2000) found, through regression analysis, that objective nutritional knowledge was a predictor of dietary intake, even if the observed correlations between the two constructs were present but not high. Indeed, Wardle et al. (2000) argue that using more sophisticated statistical techniques (namely, regression analyses) to investigate the relationship between objective nutritional knowledge and dietary intake may reveal that objective nutritional knowledge is an important predictor of dietary intake. Our results extend the suggestion of Wardle et al. (2000) to the exploration of the relationship between objective nutritional knowledge and nutritional attitudes:

we found through regression analysis some significant results on the effect of objective nutritional knowledge on nutritional attitudes, even if the observed correlations between the constructs were low.

In addition to knowledge, we argue in this context of uncertainty around nutritional evidence that consumers may form their nutritional attitudes also through non-cognitive processes. Indeed, in this situation of uncertainty, it may be difficult for consumers to be sure what constitutes a healthy diet and consumers may have moral concerns for the issue of unhealthy diets. Therefore, we consider important to explore the role of the moral concerns that consumers have with regard to unhealthy diets, basing our research on the moral intensity concept developed by Jones (1991) and developing our moral intensity scale specific for the issue of unhealthy diets, inspired by the moral intensity scale specific for climate change developed by Mäkineniemi and Vainio (2013). As in the studies carried out by Mäkineniemi and Vainio (2013), McMahon and Harvey (2006) and Ng et al. (2009), the original six-items structure of moral intensity was not confirmed in our study: in our case, our factor analysis revealed two factors. Our results confirm the relevance for the specific topic of nutrition of the moral intensity concept developed by Jones (1991), as we found that the moral intensity factors for the specific issue of unhealthy diets significantly influenced nutritional attitudes in both countries, showing that moral intensity for the issue of unhealthy diets can be a predictor of nutritional attitudes.

Synthetically, in this path from nutritional knowledge to nutritional attitudes, our research contributes on investigating the influence of subjective nutritional knowledge, objective nutritional knowledge and moral intensity for the issue of unhealthy diets on nutritional attitudes. Our results show that subjective knowledge, objective knowledge and moral intensity for the issue of unhealthy diets can be predictors of nutritional attitudes. We believe that it is relevant

to investigate the determinants of nutritional attitudes as nutritional attitudes in turn may influence dietary quality (Cooke and Papadaki 2014) and consequently the likelihood of helping to prevent diet-related diseases.

Regarding the limitations for our study, there are some differences in several sociodemographic variables of the Canadian sample with respect to the Canadian population. In particular, the gender distribution of Canadian the sample is very different from the gender distribution of the population. However, we do not pretend to be necessarily representative of populations, we aim to present results we have obtained of two large scale samples of two different countries, Canada and Germany.

Finally, we should recall the originality of our study: to the best of our knowledge, our study is the first that developed a moral intensity scale for the specific issue of unhealthy diets, inspired by the moral intensity scale for the specific issue of climate change developed by Mäkineniemi and Vainio (2013) and based on the moral intensity concept developed by Jones (1991). Furthermore, to the best of our knowledge, our study represents the first attempt to measure the influence of consumers' moral intensity for the specific issue of unhealthy diets, together with subjective and objective nutritional knowledge, on nutritional attitudes.

3.5 Appendix

3.5.1 *Nutritional attitudes questions*

Nutritional attitudes toward food. Adapted from Cooke and Papadaki (2014) and Kearney et al. (2001). 5 point Likert scales.

1. Please identify frequency of behavior:

I make conscious efforts to try and eat a healthy diet

1= never; 2= rarely; 3= sometimes; 4= often; 5= most of the time

2. Please identify how strongly you agree with the following statement:

I don't need to make changes to my diet as it is healthy enough

1= strongly disagree; 2= disagree; 3= neither agree or disagree; 4= agree; 5= strongly agree

3.5.2 *Subjective nutritional knowledge questions*

Adapted from Scalvedi et al. (2021). Scalvedi et al. (2021) used a 7 point Likert scale. We reduced and changed to: 5 point Likert scale.

Please identify how strongly you agree with the following statements:

People I know consider me a nutrition expert

Compared to most other people, I know many things about the nutritional properties of foods

I know pretty well how to evaluate foods and their nutritional properties

1= strongly disagree; 2= disagree; 3= neither agree or disagree; 4=agree; 5= strongly agree

3.5.3 Objective nutritional knowledge questions

Some questions selected from Koch et al. (2021) (Germany) based on Dickson-Spillmann et al. (2011) (Germany)

Table 4: Objective nutritional knowledge questions

Please identify whether the following statements are true or false or whether you do not know.	
	Correct answer
Procedural nutritional knowledge (0-3 points)	
A balanced diet implies eating all foods in the same amounts	False
For healthy nutrition, dairy products should be consumed in the same amounts as fruit and vegetables	False
To eat healthily, you should eat less fat. Whether you also eat more fruit and vegetables does not matter	False
Declarative nutritional knowledge on nutrients (0-3 points)	
Fruit muesli contains more fiber than cornflakes	True
The health benefit of fruit and vegetables lies alone in the supply of vitamins and minerals	False
Dairy products contain more saturated fats (fatty acids) than do vegetable oils	True
Declarative nutritional knowledge on calories (0-3 points)	
Bacon contains more calories than ham	True
Fat contains fewer calories than the same amount of fiber	False
The same amount of sugar and fat contains equally many calories (Declarative nutrition knowledge on calories)	False

3.5.4 Socio-demographic characteristics

Table 5: Germany – Socio-demographic characteristics; n=1811

	Sample in percent	Population in percent ^a
<i>Gender</i>		
Male	50.08	49.26
Female	49.75	50.74
Other	0.17	n.a
<i>Age</i>		
18-19 (0-19 for population)	1.76	18.8
20-39	36.89	24.5
40-59	41.47	27.3
60-69 (60-79 for population)	19.88	22.2
More than 69 (more than 69 for population)	0.0	7.2
<i>Education</i>		
No degree/No degree yet	0.39	8.62
School certificate below High School diploma	58.03	54.89
High school diploma or higher	40.91	36.50
Others	0.66	n.a.
<i>Income</i>		
Less than 2000 Euro	23.91	33.32
Between 2000 and 4000 Euro	43.95	39.71
Between 4000 and 5000 Euro	19	10.83
5000 Euro or more	13.14	16.12
<i>Region</i>		
Baden-Württemberg	12.81	13.37
Bayern	16.01	15.85
Berlin	4.47	4.45
Brandenburg	3.09	3.05
Bremen	0.77	0.81
Hamburg	2.43	2.24
Hessen	7.68	7.58
Mecklenburg-Vorpommern	1.71	1.93
Niedersachsen	9.99	9.65
Nordrhein-Westfalen	21.65	21.50
Rheinland-Pfalz	4.91	4.93
Saarland	1.27	1.18
Sachsen	4.86	4.84
Sachsen-Anhalt	2.37	2.59
Schleswig-Holstein	3.53	3.50
Thüringen	2.43	2.52

Household number

1	20.38	41.1
2	37.16	33.6
3	20.82	11.9
4	16.68	9.6
5 or more	4.97	3.8

^aGender, data from 31/12/2022 <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Bevoelkerungsstand/Tabellen/liste-zensus-geschlecht-staatsangehoerigkeit.html#616584>; Age, data from 2022 <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Bevoelkerungsstand/Tabellen/liste-altersgruppen.html#249808>;

Education (2022 Microcensus) <https://www-genesis.destatis.de/genesis//online?operation=table&code=12211-0100&bypass=true&levelindex=0&levelid=1714570676690#abreadcrumb>; Income (2022 Microcensus) <https://www-genesis.destatis.de/datenbank/beta/statistic/12211/table/12211-0300>; Region (2022) <https://www-genesis.destatis.de/genesis//online?operation=table&code=12411-0021&bypass=true&levelindex=0&levelid=1714582245193#abreadcrumb>; Household number (2022 Microcensus) <https://www.destatis.de/EN/Themes/Society-Environment/Population/Households-Families/Tables/households.html#fussnote-1-595646>

Table 6: Canada – Socio-demographic characteristics (n=1596)

	Sample in percent	Population in percent ^a
<i>Gender</i>		
Male	38.85	49.27
Female	58.40	50.73
Other	0.56	n.a.
I prefer not to answer	2.19	n.a.
<i>Age</i>		
17-19	2.95	3.98
20-29	24.00	15.33
30-39	20.43	16.67
40-49	16.48	15.60
50-59	13.68	16.63
60-69	13.66	15.85
70-79	7.02	10.30
80-89	1.63	4.52
90-99	0.06	1.08
100 and above	0.13	0.04
<i>Education</i>		
Elementary school (No certificate, diploma or degree for population)	1.75	16.2
Secondary school (high school)	27.01	26.7
Technical school, business school or community college (Diploma below Bachelors' Degree for population)	28.57	30.5
University degree (Bachelors' Degree for population)	34.02	17.5
Postgraduate degree (including PhD or Masters)	8.65	9.1
<i>Income^b</i>		
\$24,999 or less	18.12	2.23
\$25,000 to \$34,999	11.22	2.75
\$35,000 to \$44,999	10.09	5.41
\$45,000 to \$54,999 (\$45,000 to \$59,999 for population)	14.98	9.11
\$65,000 to \$79,999 (\$60,000 to \$79,999 for population)	16.68	13.66
\$80,000 to \$99,999	12.85	13.53
\$100,000 to \$119,999 (\$100,000 to \$124,999 for population)	7.77	14.68
\$120,000 or more (\$125,000 or more for population)	8.28	38.63
<i>Region^c</i>		
Maritimes	7.28	5.15
Quebec	12.30	22.23
Ontario	47.62	38.91
Manitoba	5.83	3.62

Saskatchewan	3.89	3.02
Alberta	10.54	11.61
British Columbia	12.30	13.8
Yukon, Northwest Territories or Nunavut	0.25	0.33
Newfoundland and Labrador	0.00	1.36

Household size

1	23.43	29.3
2	35.03	34.2
3	18.48	14.7
4	14.72	13.4
5 or more	8.34	8.4

^aGender Census 2021 (Total Population, including institutional residents)

<https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810002201>; Age Census 2021 (for population age 17 and older, including institutional residents) <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810002201>; Education Population aged 15 years and over in private households, 2021 Census — 25% Sample data <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810038401>; Income 2020 (Economic families in private households, based on Census 2021) <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810007701>; Population by region, October 1st 2022, based on 2021 Census [https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901&cubeTimeFrame.start-](https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901&cubeTimeFrame.start-Month=10&cubeTimeFrame.startYear=2022&cubeTimeFrame.endMonth=10&cubeTimeFrame.endYear=2022&referencePeriods=20221001%2C20221001)

[Month=10&cubeTimeFrame.startYear=2022&cubeTimeFrame.endMonth=10&cubeTimeFrame.endYear=2022&referencePeriods=20221001%2C20221001](https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901&cubeTimeFrame.start-Month=10&cubeTimeFrame.startYear=2022&cubeTimeFrame.endMonth=10&cubeTimeFrame.endYear=2022&referencePeriods=20221001%2C20221001); Household size: Census 2021

[https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?LANG=E&GENDER-](https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?LANG=E&GENDER-list=1,2,3&STATISTIClist=4&HEADERlist=3&SearchText=Canada&DGUIDlist=2021A000011124)

^b n=1595, ^c n=1594

3.5.5 Correlations

Table 7: Germany – Correlations of the subjective nutritional knowledge questions

Pairwise correlations			
Variables	(1)	(2)	(3)
(1) subjective nutritional knowledge 1: People I know consider me a nutrition expert	1.000		
(2) subjective nutritional knowledge 2: Compared to most other people, I know many things about the nutritional properties of foods	0.643***	1.000	
(3) subjective nutritional knowledge_3: I know pretty well how to evaluate foods and their nutritional properties	0.569***	0.807***	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 8: Canada – Correlations of the subjective nutritional knowledge questions

Pairwise correlations			
Variables	(1)	(2)	(3)
(1) Subjective nutritional knowledge 1: People I know consider me a nutrition expert	1.000		
(2) Subjective nutritional knowledge 2: Compared to most other people, I know many things about the nutritional properties of foods	0.559***	1.000	
(3) Subjective nutritional knowledge 3: I know pretty well how to evaluate foods and their nutritional properties	0.444***	0.626***	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 9: Germany – Correlations of the variables of the regressions

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Nutritional attitude 1: I make conscious efforts to try and eat a healthy diet	1.000							
(2) Nutritional attitude 2: I don't need to make changes to my diet as it is healthy enough	0.425***	1.000						
(3) Average subjective nutri- tional knowledge	0.538***	0.369***	1.000					
(4) Procedural objective nutri- tional knowledge	0.162***	-0.043*	0.188***	1.000				
(5) Declarative objective nutri- tional knowledge on nutrients	0.114***	0.046*	0.223***	0.226***	1.000			
(6) Declarative objective nutri- tional knowledge on calories	0.178***	0.042*	0.294***	0.263***	0.263***	1.000		
(7) Prediction and concentra- tion of effects (moral intensity factor_unhealthy diets)	0.110***	-0.038*	0.012	0.256***	0.121***	0.141***	1.000	
(8) Proximity and seriousness of effects (moral intensity fac- tor_unhealthy diets)	0.144***	-0.078***	0.210***	0.123***	0.119***	0.101***	0.000	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 10: Canada – Correlations of the variables of the regressions

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Nutritional attitude 1: I make conscious efforts to try and eat a healthy diet	1.000							
(2) Nutritional attitude 2: I don't need to make changes to my diet as it is healthy enough	0.220***	1.000						
(3) Average subjective nutri- tional knowledge	0.421***	0.383***	1.000					
(4) Procedural objective nutri- tional knowledge	0.194***	-0.158***	-0.023	1.000				
(5) Declarative objective nutri- tional knowledge on nutrients	0.168***	-0.035	0.172***	0.286***	1.000			
(6) Declarative objective nutri- tional knowledge on calories	0.212***	-0.047*	0.120***	0.358***	0.335***	1.000		
(7) Prediction and concentra- tion of effects (moral intensity factor_unhealthy diets)	0.113***	-0.223***	-0.191***	0.385***	0.124***	0.161***	1.000	
(8) Proximity and seriousness of effects (moral intensity fac- tor_unhealthy diets)	0.262***	-0.058**	0.238***	0.102***	0.166***	0.179***	0.000	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Which is the role of moral values on German and Canadian consumers' preferences and WTPs for food quality labels? (Essay III)⁵

Abstract

Our research objective is to empirically test whether moral values, as conceived by the Moral Foundations Theory (MFT), may be important in determining German and Canadian consumers' preferences and willingness to pay for the organic, Nutri-Score and Fairtrade labels for the example of a specific “superfood”, quinoa. We chose these food quality labels because they represent a possibility, but not a certainty, to provide more informed nutritional, environmental and ethical evidence to consumers. We combined the Moral Foundations Questionnaire (MFQ), developed by the founders of the MFT, with a hypothetical discrete choice experiment on quinoa with the three food quality labels, price and no-buy option as attributes. Furthermore, we also provided half of the sample with an information treatment on the controversial nutritional, environmental and ethical evidence of the “superfood” quinoa. We implemented a simple mixed logit model with only the attributes and the information treatment interacted with each attribute. Then, we implemented a more complex mixed logit model with each of the five moral foundation components interacted with each attribute. From this model,

⁵ Essay III is a working paper draft co-authored by Ellen W. Goddard, Malte Oehlmann, and Jutta Roosen. An earlier version of the survey development was presented at a Brown Bag Seminar at the Department of Resource Economics and Environmental Sociology (REES) at University of Alberta, in Edmonton, Canada, on June 26, 2022. Available at <https://alesevents.ualberta.ca/events/rees-brown-bag-seminar-edoardo-pelli/>. The results of the pre-study were presented at the Annual Meeting of the Agricultural and Applied Economics Association (AAEA) in Anaheim, CA, United States, July 31st-August 2nd, 2022, and with a different focus at the online Annual Meeting of the Canadian Agricultural Economics Society (CAES), August 9th-11th, 2022, and at the Conference: “Evidence Regime(s) in Contemporary Knowledge Societies”, organized by the German Research Foundation (DFG) Research Group 2448, in Munich, Germany, in April, 25th-28th, 2023. Preliminary results of the study were presented at the Annual Meeting of the Canadian Agricultural Economics Society (CAES) - Western Agricultural Economic Association (WAEA), in Whistler, BC, Canada, July 17th-20th, 2023.

we calculated the Willingness to Pay (WTPs) in Euros (for Germany) and in Canadian dollars (for Canada), by dividing the sample in two groups for each moral foundation: a group with a low score for the foundation and a group with the high score for the foundation. Our results suggest that moral values play a role in both countries, as we found significant interactions of the moral values with the attributes and differences in the WTPs between people with high scores and people with low scores for each moral foundation.

Key words: moral values; food quality labels; discrete choice experiment; consumers' preferences and WTPs

4.1 Introduction

The Moral Foundations Theory (MFT) (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) is a psychological theory that argues that all individuals have five innate moral foundations: care/harm, fairness/cheating (individualizing moral foundations) and loyalty/betrayal, authority/subversion and purity/sanctity/degradation (binding moral foundations). These foundations are then shaped differently by culture and experience for each individual. The moral foundations can be defined as the “psychological foundations” upon which cultures construct their moralities (Graham et al. 2011).

Moral values/foundations as conceived by the MFT have been important in determining consumers’ attitudes towards food consumption, as explained by Pelli and Roosen (2023). There have been several important empirical studies on moral values as conceived by the MFT and food consumption. Goddard et al. (2019) analyzed the relationship between moral foundations of consumers and evaluation of credence attributes in livestock production in Canada. They found that respondents with stronger agreement with the individualizing moral foundations (care/harm and fairness/cheating) were more likely to buy environmentally sustainable milk and yogurt and pork from pigs raised with reduced antibiotic use, as compared to respondents with lower agreement on the individualizing moral foundations. Furthermore, they found that respondents with stronger agreement on the individualizing moral foundations were more likely to vote in favor of stricter livestock environmental standards and disease protocols. Jonge and van Trijp (2013) and Jonge and van Trijp (2014) developed an animal-welfare specific moral foundation scale. De Backer and Hudders (2015) found: that every increase in one’s belief that human suffering (care/harm) must be avoided corresponds to a significant and large increase in the probabilities of being vegetarian rather than flexitarian; that an increase in one’s belief that respect for status is important (authority/subversion) corresponds to a significant increase in the possibilities to be a full-time meat eater rather than a flexitarian. Minton et al. (2019) found that the moral foundation of purity/sanctity/degradation mediates

the relationship between religiosity and diet-minded food consumption (e.g. gluten-free, fat-free, sugar-free foods) and that the moral foundation of care/harm is unrelated to religiosity but significantly related to sustainable-minded food consumption (e.g. local and organic foods). Finally, Pelli and Roosen (2023) developed a conceptual framework where they show the importance of the MFT in explaining consumers' interpretation of contested nutritional evidence.

The example of contested nutritional evidence chosen by Pelli and Roosen (2023) relates to the current marketing trend of the so-called superfoods. Superfood is a marketing term to define any food which is claimed to possess nutritional properties which are beneficial for health, although with contested and limited scientific evidence (Bassaganya-Riera et al. 2021; Pelli and Roosen 2023) and without a regulated definition of the term superfoods worldwide (Harvard T.H. Chan School of Public Health; Fernández-Ríos et al. 2022). Superfoods are mostly vegetable produce and seeds (such as avocado and quinoa) coming from the Global South and also consumed in the Global North, where they represent an important marketing trend (Mintel Press Office 2016). The theoretical framework of Pelli and Roosen (2023) suggests that in the context of contested nutritional evidence and scarce knowledge consumers may not be able to evaluate the nutritional aspects of superfoods fully rationally, as expected by neoclassical economics. Instead, a psychological model may be needed that takes into account strategies that deal with incomplete knowledge, such as heuristic information processing and values. Pelli and Roosen (2023) argue that moral values as conceived by the Moral Foundation Theory (MFT) (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) can be important in determining consumers' attitudes and preferences towards nutritional aspects of superfoods because in this context of uncertainty around nutritional aspects of superfoods, these foods are considered and claimed to be "good foods for health" or "bad foods for health" and these terms may have a strong moral connotation. Furthermore, previous literature suggests that the attribute "healthy" hints at specific discourses of the "submerged iceberg of

moral values” (van Leeuwen 2007). In this context, the conceptual framework developed by Pelli and Roosen (2023) assumes that consumers have scarce knowledge on the nutritional attributes of superfoods because the nutritional evidence of superfoods is contested and consumers don’t have the expertise to judge nutritional properties. Therefore, consumers may form their beliefs and consequently their attitudes and acceptance of the nutritional evidence for superfoods not completely rationally, as expected by neoclassical economics, but through heuristic information processes moderated by the moral values that consumers embrace. Therefore, consumers may base their beliefs and consequently attitudes and acceptance or non-acceptance of superfoods by relying on moral values linked to superfoods rather than on scientific nutritional attributes and information.

Based on this conceptual framework, we aim to investigate empirically the importance of moral values on food preferences in the context of a particular superfood. In this context, we aim to explore not only contested nutritional evidence, but also contested environmental and ethical evidence. In fact, beyond the contested nutritional evidence of superfoods, the production of superfoods in the Global South may generate several environmental and ethical issues (such as excessive use of pesticides, water depletion and unclear conditions of producers/laborers involved in the superfoods production in the Global South) (Magrach and Sanz 2020). Therefore, superfoods are an example of contested nutritional, environmental and ethical evidence.

We chose a specific example of these superfoods for our case study, quinoa, which is a pseudo-cereal grain mostly produced in the Andean regions of South America (Peru, Bolivia and Ecuador). Traditionally consumed in the area of the Andes by the indigenous and the poor, quinoa has been promoted as a superfood since the 1980s in the Global North for its presumed nutritional benefits, due to its high level of proteins and by being a gluten-free product (Andrango and Blare 2020; Andrango et al. 2020a; Andrango et al. 2020b). Neverthe-

less, this is not without contested nutritional evidence, because of the heavy marketing campaigns. Beyond its presumed nutritional benefits, quinoa presents environmental and ethical issues. Regarding the environmental issues, there has been an intensification of the use of pesticides for quinoa production and its expansion in the coastal area of Peru. This rise in the utilization of pesticides is a harm to the environment and may threaten the export of conventional quinoa to the Global North, due to the possible problems in meeting the requirements of international pesticides residue limits (Andrango et al. 2020b). Furthermore, regarding organic quinoa, Andean producers need an internationally recognized certification following accepted standards in order to export organic quinoa to the European Union, the United States, and Canada. This requirement may be difficult to meet as the certification process is long and expensive (Andrango et al. 2020b). Regarding ethical issues, quinoa producers are often small-scale farmers who deliver their quinoa to large intermediaries, who then handle the export. Therefore, quinoa producers may have little power to negotiate profitable prices. These problematic production practices of quinoa may also prevent producers from using the Fairtrade label (Andrango et al. 2020b). Therefore, quinoa is an example of a superfood that carries contested nutritional, environmental, and ethical evidence and consumers may have moral concerns about this contested evidence, such as about the harm to the environment and the unclear conditions of quinoa producers in the regions of the Global South where quinoa is produced.

In this context, we identify three food quality labels that could help to support better nutritional, environmental and ethical evidence of superfoods and in particular of quinoa. We identified the following labels that can possibly achieve this goal, (although not without controversies, as we will explain later):

The organic label: as suggested by Andrango et al. (2020b), with the concept of product cycle, the market for organic quinoa in Europe and North America is in its growth stage, compared

to the mature stage of the market for conventional quinoa. This label could provide consumers with better environmental evidence for quinoa.

The Nutri-Score label (Julia and Hercberg 2017; Temmerman et al. 2021): given that quinoa bears the best nutritional score (A), this label could provide to consumers better nutritional evidence about quinoa.

The Fairtrade label: this label aims to support benefits to quinoa producers and quinoa agricultural workers. This label could provide consumers with better ethical evidence for quinoa.

The organic, Nutri-Score and Fairtrade labels were chosen also because of their importance and because of some related controversies involved, as explained below.

Organic is a well-known growing trend worldwide (Trávníček et al. 2023), including in the two countries which are the focus of our study, Germany and Canada. In fact, these two countries are respectively the second (Willer et al. 2023) and the fifth (Loftsgard 2023) largest markets for organic food. Although organic agriculture is supposed to be more environmentally friendly than conventional agriculture, the environmental impact of organic agriculture has been controversial and discussed in the scientific community for many years (Debuschewitz and Sanders 2022).

Nutri-Score is considered to be a possible useful tool to guide consumers to more informed, healthier purchasing decisions in Europe (Temmerman et al. 2021), but recent literature suggest that there is limited and insufficient scientific evidence to support the use of Nutri-Score as an efficient public health tool. More research is needed to prove or disprove the efficiency of Nutri-Score in helping consumers to make healthier food choices (Peters and Verhagen 2024). In this context, we included Nutri-Score in our research, in order to see the effect of

this label on consumers' choices, also because Nutri-Score is currently presented as the system of choice in seven European countries (Peters and Verhagen 2024), including Germany. In Canada, the Nutri-Score label is not present in the market, but the Nutri-Score's classification of different food groups has been found to be consistent with Canada's 2019 Food Guidelines (Ahmed et al. 2020). A more recent study carried out by Lee et al. (2023) discusses the 2022 Canada mandatory front-of-pack labelling (FOPL) in comparison to other dietary index systems including the Nutri-Score. However, the Canada mandatory FOPL are not mandatory yet, as the food industry has been given until January 1, 2026 to implement them. Therefore also in Canada the issue of mandatory FOPL is highly important and Nutri-Score has been discussed in the Canadian scientific community (Ahmed et al. 2020; Lee et al. 2023). For this reason, it is relevant to use Nutri-Score in a hypothetical food choice experiment also for Canada. Nutri-score gives a score to each specific food based on the presence of "unfavorable contents" (energy, total sugars, saturated fatty acids and salt), and on the presence of "favorable contents" (fruits, vegetable and nuts, proteins and fiber) (Julia and Hercberg 2017). The score ranges from -15 (most healthy) to +40 (least healthy). Then the score assigned is reduced to five color-coded categories of nutritional quality, ranging from dark green (A) to red (E), with A being the most healthy category and E the least healthy category (Julia and Hercberg 2017; Temmerman et al. 2021). This is not without further controversy, as Nutri-Score evaluates the nutritional aspects of each single specific food product, and it does not take into account the complex effects of food dietary patterns, which, as explained by Mozaffarian et al. (2018), are more important in determining human health.

Fairtrade is considered to be an important sustainability standard for products coming from the Global South, such as quinoa, potentially improving the conditions of smallholder farmers and farm laborers in the Global South. However, some literature suggests that it is not always the case, as Fairtrade standards may be difficult to monitor in certified small farms (Meemken et al. 2019)

After this introduction, we outline our research objective. Inspired by the work of Pelli and Roosen (2023) and considering, together with contested nutritional evidence, also contested environmental and ethical evidence, our research objective is to empirically test whether moral values, as conceived by the MFT, and the exposure to information on the contested nutritional, environmental and ethical evidence of a specific superfood, quinoa, may be important in determining German and Canadian consumers' preferences and willingness to pay (WTP) for the organic, Nutri-Score and Fairtrade labels for the superfood quinoa.

The remainder of the paper will proceed as follows: we present our research design including the material and methods of our study; then we present the results; finally, we present the discussion and the conclusions of our study.

4.2 Material and methods

The survey used for this paper consists of the following parts: moral foundations' measures, a discrete choice experiment and socio-demographic questions.

4.2.1 Data

Data were collected through an online survey in August and September 2022 with a sample of 1811 people in Germany and with a sample of 1597 people in Canada. The duration of the survey was approximately 25 minutes. Respondents were recruited using an online-access panel. The German sample was quota sampled according to gender, age, education, income, region, and household size. For the Canadian sample we did not implement quotas and this is a limitation of our study. Before the survey, we did a pre-test with a sample of 168 people in Germany and 568 people in Canada.

4.2.2 Survey development

The survey instrument was developed in English and translated to German. When possible existing translations were used, in other cases the translation was done and verified by a second native German speaker.

4.2.2.1 Moral foundations' measures

The authors of the MFT developed a Moral Foundation Questionnaire (MFQ) (Graham et al. 2008; Graham et al. 2011) to quantitatively measure people's moral foundations measured by the moral relevance statements. These gauge the individual differences in the range of concerns that people consider morally relevant, as explained by Graham et al. (2011). The moral foundations questions consist of Likert-scale questions and they are displayed in section 4.5.1 in the appendix. The MFQ measures the score of the five foundations: care/harm, fairness/cheating (which are the individualizing moral foundations), and loyalty/betrayal, authority/subversion and purity/sanctity/degradation (which are the binding moral foundations).

4.2.2.2 Discrete choice experiment

The survey included a discrete choice experiment. The choice experiment focused on the choice of two options of quinoa plus a no-buy option and contained four attributes: organic label, Nutri-Score label, Fairtrade label and price.

For the levels of price, we looked at the average market price of quinoa in German and Canadian in online and physical grocery stores. For the German pre-study, which was conducted earlier, we put our estimated average market price in the middle of the price range. Since we realized that the maximum of the range did not cut off the demand, for the Canadian pre-study we put our estimated average market price as the minimum of the range and then we increased up to a maximum price that should cut off demand: this system worked better. Therefore, in the survey, our estimated average market price was put as the minimum price of the

range and then the prices were increased up to a maximum price that should be the price that cut off the demand.

In table 11 the attributes and attribute levels of the choice experiment are described.

Table 11: Attributes and attribute levels

Attributes	Levels
Organic label	Present/Absent
Nutri-Score label	Present/Absent
Fairtrade label	Present/Absent
Price	Germany: 4.69 €- 5.69 €- 6.69 €- 7.69 € Canada: \$ 4.73- \$ 5.73- \$ 6.73- \$ 8.73

In tables 12 and 13 the example of a choice set for each country is shown.

Table 12: Example of a choice set for Germany









	Option A	Option B	Option C
Organic		No label	I would not purchase either of the options A or B
Nutri-Score A		No label	
Fairtrade			
Price	2.69 €	4.69 €	

Table 13: Example of a choice set for Canada

	Option A	Option B	Option C
Organic		No label	I would not purchase either of the options A or B
Nutri-Score A		No label	
Fairtrade			
Price	\$ 4.73	\$ 6.73	

The choice experiment was based on an orthogonal fractional factorial design. The design comprises four blocks with 8 choice sets per block. The orthogonal fractional factorial design was run in SAS and the resulting choice sets were organized so each set of 8 choices contained all levels of the attributes. Each participant was randomly assigned to one of the blocks, therefore each participant completed 8 choice sets.

All respondents were provided with the following preliminary information about quinoa and the organic, Nutri-Score and Fairtrade labels (we show here the English version that we used for the Canadian sample):

Quinoa is a pseudocereal crop and it is usually cooked and then eaten combined with other foods (e.g. a salad, a soup, a porridge’s breakfast ect.) Quinoa is a food product that belongs to the broad category of superfoods. Superfoods is a term used to define any type of food with nutritional characteristics which are presumed to be beneficial for human health, despite lacking and incomplete scientific evidence. Typically, these products are vegetable or other produce coming from developing countries, especially South America. In the following you have to choose several times between two packages of 450 g of white quinoa, imported from South America. The packs differ in terms of different labels and prices. Make your product selection as you would in a grocery store. You also have the possibility of choosing neither option.

The labels are:

Organic label: The product has been produced according to the Canadian organic standards.



Nutri-Score label: Nutri-Score is a label that evaluates the nutritional quality of a food product based on its nutritional composition. The label ranges from A to E, with A being the best score and E the worst score respectively for nutritional quality.



Fairtrade label: The Fairtrade standards are designed to support the sustainable development of small producer organizations and agricultural workers in the Global South. They incorporate a holistic blend of social, economic, and environmental criteria.



Then, only half of the respondents were provided also with an information treatment the con-
tested nutritional, environmental and ethical evidence of the superfood quinoa.

The information treatment used in the study was (we show here the English version that we
used for the Canadian sample):

Quinoa is a crop traditionally cultivated in the Andean regions of South America (such as Peru). In recent times, quinoa consumption has become heavily marketed in developed countries, such as Europe and North America. Quinoa consumption is associated with beneficial health properties due to its high level of proteins and by being a gluten-free product. Furthermore, both conventional and organic quinoa are available for purchase, while both present some environmental and socio-economic issues. In order to sell their organic quinoa, Andean producers need a costly international certification, and this requirement may limit their export opportunities. As an example, for conventional quinoa, grown in the coastal area of Peru, the use of pesticides is intensive and this may hamper the export to some developed countries. Moreover, quinoa producers are often small-scale farmers who deliver their quinoa to large intermediaries, who then handle the export. Therefore, quinoa producers may have little power to negotiate profitable prices.

4.2.3 Data analysis

Choice experiments are consistent with random utility theory (Mc Fadden 1974) and Lancasterian consumer theory (Lancaster 1966). Choice experiments traditionally were analyzed using the (Mc Fadden 1974) multinomial logit model, which assumes that preferences are homogeneous among consumers. To overcome this limitation, we analyzed our choice experiment data with the mixed logit model (random parameter logit model), which takes into account consumers' preference heterogeneity (van Loo et al. 2011; Jaeger and Rose 2008). The first model, the baseline, consisted in a mixed logit model with the attributes and also with also the interaction of the information treatment with each attribute. In the mathematical notation we refer to Kemper et al. (2018) and to He et al. (2020):

$$U_{ijt} = \beta_0 \text{none}_{ijt} + \beta_1 \text{price}_{ijt} + \beta_2 \text{organic}_{ijt} + \beta_3 \text{nutriscore}_{ijt} + \beta_4 \text{fairtrade}_{ijt} + \beta_5 \text{organic_treatment}_{ijt} + \beta_6 \text{nutriscore_treatment}_{ijt} + \beta_7 \text{fairtrade_treatment}_{ijt} + \varepsilon_{ijt}$$

where i is the individual respondent, j refers to the options available (option A, option B and the no-buy option) in choice set t .

The no-buy option (none), the organic, Nutri-Score and Fairtrade labels and the treatment effect were all dummy-coded (0 if absent; 1 if present). The price variable is a continuous variable assuming one of the four experimentally designed price levels. As explained by He et al. (2020), page 363: " ε_{ijt} is the unobservable stochastic error, which is usually assumed to be distributed independently and identically with the Gumbel distribution."

The parameter for the price was set as a random parameter following a lognormal distribution, as explained by Hole (2007). This more realistic with the typical variability of price for different respondents. The sign of the coefficient of the price should be restricted to be only negative and the log-normal distribution provides this possibility. Indeed, a log-normal coefficient

is positive for all individuals, thus a negative price coefficient for all individuals can be obtained by entering the price attribute multiplied by -1 in the model (Hole 2007). The other attributes (organic, Nutri-Score and Fairtrade labels and the no-buy option) were treated as random parameters, following a normal distribution. Previous literature suggests that this type of model specification provides very efficient estimates (He et al. 2020; Balcombe et al. 2009). Finally, a mixed logit model with also the interaction of each moral foundation measure with each attribute of the choice experiment was carried out, in order to investigate the effect of moral foundations on consumers' preferences for the organic, Nutri-score and Fairtrade labels:

$$\begin{aligned}
U_{ijt} = & \beta_0 none_{ijt} + \beta_1 price_{ijt} + \beta_2 organic_{ijt} + \beta_3 nutriscore_{ijt} + \beta_4 fairtrade_{ijt} + \\
& \beta_5 organic_treatment_{ijt} + \beta_6 nutriscore_treatment_{ijt} + \beta_7 fairtrade_treatment_{ijt} + \\
& \beta_8 care_organic_{ijt} + \beta_9 fairness_organic_{ijt} + \beta_{10} loyalty_organic_{ijt} + \\
& \beta_{11} authority_organic_{ijt} + \beta_{12} purity_organic_{ijt} + \beta_{13} care_nutriscore_{ijt} + \\
& \beta_{14} fairness_nutriscore_{ijt} + \beta_{15} loyalty_nutriscore_{ijt} + \beta_{16} authority_nutriscore_{ijt} + \\
& \beta_{17} purity_nutriscore_{ijt} + \beta_{18} care_fairtrade_{ijt} + \beta_{19} fairness_fairtrade_{ijt} + \\
& \beta_{20} loyalty_fairtrade_{ijt} + \beta_{21} authority_fairtrade_{ijt} + \beta_{22} purity_fairtrade_{ijt} + \varepsilon_{ijt}
\end{aligned}$$

Also, in this model the information treatment was interacted with the attributes, to see the effect of information on contested nutritional, environmental and ethical evidence on consumers' preferences for the organic, Nutri-Score and Fairtrade labels. We did not interact the information treatment with the moral foundations because the information treatment on contested evidence already contained moral concerns on nutritional, environmental and ethical aspects of quinoa which may influence the preference for the organic, Nutri-Score and Fairtrade labels. Therefore, interacting the information treatment with the moral foundations

may be redundant. Indeed, the moral foundations may be triggered by both the moral foundations measure and by the information treatment. Therefore, by interacting the treatment with the moral foundations we may incur in double-counting of the moral foundations. As in the simple mixed logit model, the price, organic, Nutri-score, Fairtrade labels and the no-buy option are treated as random parameters and they are all normally distributed except the parameter for the price which is log-normally distributed as suggested by Hole (2007). For both models, we used 1000 Halton draws.

After the mixed logit models, we calculated the willingness to pay (WTPs) of the participants for the organic, Nutri-Score and Fairtrade labels. For each moral foundation we used a mean split of the sample, calculating the WTPs of the participants with low scores and high scores of each moral foundation. The WTP for each attribute (organic, Nutri-Score and Fairtrade labels) is defined as the coefficient of the respective attribute and its interactions with information treatment and the moral foundations foundation divided by the coefficient of the price. To obtain the price coefficient to be used in the WTP equation, we needed to re-transform the negative price coefficient from the lognormal distribution to the normal distribution, as explained by Hole (2007).

The WTP for each attribute is defined as:

$$WTP_{organic} = - \frac{(\beta_{organic} + \beta_{organic_treatment} * treatment + \beta_{care_organic} * care + \beta_{fairness_organic} * fairness + \beta_{loyalty_organic} * loyalty + \beta_{authority_organic} * authority + \beta_{purity_organic} * purity)}{(-1 * \exp((Mean)_{\beta}(price) + 0.5 * (SD)_{\beta}(price)^2))}$$

WTP_{nutriscore}

$$= - \frac{(\beta_{nutriscore} + \beta_{nutriscore_treatment} * treatment + \beta_{care_nutriscore} * care + \beta_{fairness_nutriscore} * fairness + \beta_{loyalty_nutriscore} * loyalty + \beta_{authority_nutriscore} * authority + \beta_{purity_nutriscore} * purity)}{(-1 * \exp((Mean)_{\beta}(price) + 0.5 * (SD)_{\beta}(price)^2))}$$

WTP_{fairtrade}

$$= - \frac{(\beta_{fairtrade} + \beta_{fairtrade_treatment} * treatment + \beta_{care_fairtrade} * care + \beta_{fairness_fairtrade} * fairness + \beta_{loyalty_fairtrade} * loyalty + \beta_{authority_fairtrade} * authority + \beta_{purity_fairtrade} * purity)}{(-1 * \exp((Mean)_{\beta(price)} + 0.5 * (SD)_{\beta(price)}^2))}$$

4.3 Results

4.3.1 Socio-demographic characteristics

Section 4.5.2 (tables 18 and 19) in the appendix provides an overview of the socio-demographic characteristics for each country.

For Germany we implemented quotas on the sample (based on the German population) for gender, age, education, income, region and household number, even if there are some differences between the various distributions of the sample respect to the population, especially regarding age and household size.

For Canada we did not implemented quotas for participants and there are some differences between the various distributions of the sample respect to the population. In particular, the gender distribution of the sample is very different than the gender distribution of the population, which is around 50% for males and females. This is a limitation of our study. However, evidence from another large-scale survey in Canada suggest that the majority of people that are the household's main grocery shopper is disproportionately female (Doucette 2022). Therefore, without implementing quotas, more females than males may have been attracted to the content of this survey.

4.3.2 Descriptive statistics of the moral foundations

The descriptive statistics of the moral foundations for each country are displayed in table 14.

As we can see, there are no large differences between the German and Canadian average scores of the moral foundations, although in the Canadian sample it seems to be more variability between respondents as the standard deviations are higher.

Table 14: Descriptive statistics of the moral foundations

Variables (3 items per variable)	Germany			Canada		
	Obs	Mean	Std. dev	Obs	Mean	Std. dev
Care	1811	14.224	2.669	1597	12.750	3.501
Fairness	1811	13.911	2.741	1597	12.885	3.454
Loyalty	1811	11.626	2.602	1597	11.216	3.416
Authority	1811	11.462	2.789	1597	11.356	3.216
Purity	1811	10.824	2.886	1597	11.038	3.502

4.3.3 Mixed logit models

In table 15 the simple and the complex mixed logit models are provided.

Table 15: Mixed logit models

Simple mixed logit model				
VARIABLES	Germany		Canada	
	Mean	SD	Mean	SD
Organic	1.197*** (0.0758)	1.141*** (0.0753)	0.938*** (0.0641)	1.020*** (0.0619)
Nutriscore	1.054*** (0.0679)	1.074*** (0.0659)	0.875*** (0.0557)	0.843*** (0.0556)
Fairtrade	1.525*** (0.0835)	1.399*** (0.0763)	0.627*** (0.0592)	0.893*** (0.0608)
None	-4.288*** (0.180)	3.555*** (0.177)	-2.462*** (0.120)	2.116*** (0.154)
Price	-0.101***	0.550***	-1.234***	0.770***

	(0.0310)	(0.0257)	(0.0546)	(0.0596)
organic_treatment	0.207**		0.0515	
	(0.104)		(0.0886)	
nutriscore_treatment	-0.0113		-0.175**	
	(0.0934)		(0.0775)	
fairtrade_treatment	0.121		0.180**	
	(0.114)		(0.0834)	
Log likelihood	-10116.692		-10735.306	
LR chi2(df=5)	7704.38		3864.57	
Prob > chi2	0.0000		0.0000	
AIC (df=13)	20259.38		21496.61	
BIC (df=13)	20372.22		21607.81	
Observations	43,464	43,464	38,328	38,328

Complex mixed logit model with the moral foundations interacted with the attributes

VARIABLES	Germany		Canada	
	Mean	SD	Mean	SD
Organic	0.978***	-1.121***	0.161	1.003***
	(0.330)	(0.0773)	(0.194)	(0.0616)
Nutriscore	1.132***	1.072***	-0.174	0.772***
	(0.299)	(0.0651)	(0.166)	(0.0566)
Fairtrade	0.703**	1.331***	-0.134	0.814***
	(0.351)	(0.0782)	(0.179)	(0.0614)
None	-4.284***	3.703***	-2.498***	2.136***
	(0.191)	(0.226)	(0.120)	(0.154)
Price	-0.106***	0.546***	-1.237***	0.814***
	(0.0329)	(0.0489)	(0.0548)	(0.0485)
organic_treatment	0.198*		0.0450	
	(0.103)		(0.0883)	
nutriscore_treatment	-0.0334		-0.174**	
	(0.0936)		(0.0756)	
fairtrade_treatment	0.105		0.170**	
	(0.111)		(0.0813)	
care_organic	0.00740		0.0246	
	(0.0287)		(0.0201)	
fairness_organic	0.0479*		0.0606***	
	(0.0261)		(0.0204)	
loyalty_organic	0.0266		-0.0157	
	(0.0275)		(0.0200)	
authority_organic	-0.106***		0.00526	
	(0.0257)		(0.0207)	
purity_organic	0.0322		-0.0160	
	(0.0234)		(0.0188)	
care_nutriscore	-0.00855		0.0546***	
	(0.0261)		(0.0172)	
fairness_nutriscore	-0.0165		0.0770***	
	(0.0236)		(0.0173)	
loyalty_nutriscore	-0.0156		-0.00949	
	(0.0246)		(0.0170)	
authority_nutriscore	0.0121		0.0130	
	(0.0228)		(0.0181)	
purity_nutriscore	0.0300		-0.0598***	

	(0.0210)	(0.0161)
care_fairtrade	0.0500	0.0636***
	(0.0306)	(0.0185)
fairness_fairtrade	0.109***	0.0863***
	(0.0281)	(0.0189)
loyalty_fairtrade	-0.0429	-0.0592***
	(0.0292)	(0.0185)
authority_fairtrade	-0.0689**	-0.00842
	(0.0276)	(0.0191)
purity_fairtrade	-0.00950	-0.0333*
	(0.0253)	(0.0173)
Observations	43,464	38,328
Log likelihood	-10084.439	-10642.534
LR chi2(df=5)	7694.94	3938.49
Prob > chi2	0.0000	0.0000
AIC (df=28)	20224.88	21341.07
BIC (df=28)	20467.91	21580.58

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.3.3.1 Simple mixed logit model

Results displayed in table 15 show, as expected, that for both Germany and Canada the organic, Nutri-Score and Fairtrade labels have positive and significant coefficients. This means that consumers prefer more a product with those labels rather than a product without, and this result is expected since these labels represent a possibility to provide better environmental (organic label), nutritional (Nutri-Score label) and ethical (Fairtrade label) evidence. The price coefficient is negative as expected and significant for both countries, as is the coefficient of the no-buy option. For Germany we found a positive effect of the information treatment on the organic label (even when the organic_treatment coefficient is summed with the organic coefficient), meaning that receiving the treatment increases participants' preference for the organic label. This can be explained by the content of our information treatment. We explained that producers of organic quinoa that want to export in Europe need a costly international organic certification and that often they are not able to meet this requirement because of an ex-

cessive use of pesticides, especially in Peru. Therefore, it makes sense that consumers who receive the treatment increase their preferences for the organic label, because they understood from the treatment that if organic quinoa from South America met the EU requirements and could enter the European Union, then it is safe, of higher quality, and without an excessive use of pesticides. In Canada we found a negative effect of the treatment on the Nutri-Score label (although not when the Nutri-Score_treatment coefficient is summed with the Nutri-Score coefficient). This may be explained by the fact that in our treatment we underlined that quinoa is heavily marketed in the Europe and North America for its presumed nutritional benefits. Because of this heavy marketing, consumers may believe less in the promoted nutritional benefits of the Nutri-Score label. For Canada we found also a positive effect of the treatment on the Fairtrade label (even when the Fairtrade_treatment coefficient is summed with the Fairtrade coefficient). This result would suggest that consumers who read the information treatment about the ethical and socio-economic issues of quinoa production in the Global South (e.g. low bargaining power of quinoa producers) may consider the Fairtrade label as a way to solve this problem and to support quinoa producers in the Global South.

4.3.3.2 Complex mixed logit model with the moral foundations interacted with the attributes

Results displayed in table 15 show that the organic, Nutri-Score and Fairtrade labels have positive and statistically significant coefficients in Germany. This means that consumers prefer more a product with those labels rather than a product without. These results are quiet realistic because these labels may represent a possibility to provide better environmental (organic), nutritional (Nutri-Score) and ethical (Fairtrade) evidence. On the other hand, in Canada we did not detect any effect of the organic, Nutri-Score and Fairtrade labels on consumers' preferences since the coefficients are not statistically significant. The price coefficient in both countries is negative and statistically significant, which is expected by economic theory. The no-buy option coefficient is also negative and statistically significant in both countries and this

result show that consumers prefer to buy quinoa with/without the food quality labels rather than not buying quinoa at all.

Regarding our information treatment, we detected an effect of the treatment on the organic label in Germany. The `organic_treatment` coefficient (even when summed with the organic coefficient) is positive and statistically significant, meaning that receiving the treatment increases participants' preference of the organic label. This can be explained by the content of our information treatment: we explained that producers of organic quinoa that want to export in Europe need a costly international organic certification and that often they are not able to meet this requirement because of an excessive use of pesticides, especially in Peru. Therefore, it makes sense that consumers who receive the treatment increase the preference for the organic label, because they understood from the treatment that if organic quinoa from South America meet the EU requirements and enter in the European Union is safe, of higher quality and without an excessive use of pesticides. In Germany we did not detect an influence of the treatment on the Nutri-Score and Fairtrade labels. In Canada we detected an effect of the treatment on the Nutri-Score and Fairtrade labels. The `Nutri-Score_treatment` coefficient is negative and statistically significant (even when summed with the Nutri-Score coefficient), meaning that the people who receive the treatment have a lower preference for the Nutri-Score label. This may be explained by our information treatment because we wrote that quinoa is heavily marketed as a healthy product and this marketing aspect may induce consumers to criticize the purported nutritional and health benefits of quinoa. Furthermore, in Canada the `Fairtrade_treatment` coefficient is positive and statistically significant (even when summed with the Fairtrade coefficient), meaning that people who receive the treatment have an increased preference for the Fairtrade label. This may be explained by our treatment since we wrote that quinoa producers in South America are usually small-scale farmers who deliver to large intermediaries that then handle the export. Therefore, quinoa producers may have little bargaining power to negotiate profitable prices. In this context, a Fairtrade label may be

considered by consumers who read the treatment as a way to foster a fairer trade and to support the small-scale producers of quinoa in South America.

Regarding moral foundations, we can see in both countries various effects. In Germany, we can see a positive effect of fairness/cheating on evaluation of the organic label. This suggests that people that value fairness may prefer the organic label and this may be explained by the fact that the organic label carries the benefit of fair sustainable environmental practices. Furthermore, we have a negative effect of authority/subversion on the organic label. One possible explanation could be that people who value authority and tradition (a relationship between authority and tradition have been found by van Leeuwen 2007; Boer and Aiking 2021) may fear the novelty of the organic label compared to conventional food. We then have a positive effect of fairness/cheating on the Fairtrade label, which is quite intuitive, and also a negative effect of authority/subversion on the Fairtrade label: this effect it is interesting and one possible explanation could be that people who value authority and tradition may fear the novelty and the cultural distance of a product that, carrying the Fairtrade label, comes from far away. In Canada, we found also various effects of the moral foundations. As in Germany, we found a positive effect of fairness/cheating on the organic label, which could be important for the same reasons mentioned for Germany. We found a positive effect of care/harm and fairness/cheating on the Nutri-Score label and this result may suggest that consumers who value care and fairness may be concerned with the nutritional properties of food and may consider the Nutri-Score label as an assurance for assessing the quality of the nutritional aspects of foods. Then we found a negative effect of purity/sanctity/degradation on the Nutri-Score label, which is difficult to explain. And also we found a negative effect of loyalty/betrayal on the Fairtrade label. This result is interesting since it may suggest that consumers who value loyalty may be loyal to local foods and would not like to consume a product that, carrying the Fairtrade label, comes from far away and it is not local. Furthermore, we found a negative effect of purity/sanctity/degradation on the Fairtrade label. This result is really interesting and

not easy to explain: it means that people that value purity have a decreased preference for the Fairtrade label. This may suggest that these consumers consider a product with the Fairtrade label to be “unpure”, because it comes from far away, it is not local.

These results suggest that several moral foundations as well as the information treatment play a role on consumers’ preferences for the organic, Nutri-Score and Fairtrade labels in Germany and in Canada.

4.3.4 Willingness to Pay (WTPs)

After the mixed logit model we calculated the WTPs of the participants for Germany and Canada. We calculated the WTPs for the organic, Nutri-Score and Fairtrade labels for each foundation, dividing the sample in two groups of each foundation: a group with a low score of the foundation and a group of high score of the foundation, as shown in the tables 16-17 and in the figures 5-10.

Table 16: WTPs for the German sample

	Organic_Mean (SD)	Nutri-Score_Mean (SD)	Fairtrade_Mean (SD)
WTP_average	1.228 (0.641)	0.995 (0.574)	1.517 (0.824)
WTP_lowcareharm	1.176 (0.642)	1.022 (0.566)	1.365 (0.807)
WTP_highcareharm	1.275 (0.636)	0.970 (0.581)	1.654 (0.816)
WTP_lowfairnesscheating	1.099 (0.648)	1.038 (0.572)	1.244 (0.794)
WTP_highfairnesscheating	1.309 (0.622)	0.968 (0.574)	1.689 (0.796)
WTP_lowloyaltybetrayal	1.219 (0.642)	0.988 (0.581)	1.570 (0.827)
WTP_highloyaltybetrayal	1.235 (0.639)	1.001 (0.568)	1.474 (0.819)
WTP_lowauthoritysubversion	1.558 (0.835)	0.959 (0.579)	1.655 (0.910)
WTP_highauthoritysubversion	1.949 (0.783)	0.903 (0.566)	2.075 (0.818)
WTP_lowpuritydegradation	1.212 (0.638)	0.942 (0.563)	1.567 (0.803)
WTP_highpuritydegradation	1.241 (0.643)	1.037 (0.580)	1.477 (0.839)

Table 17: WTPs for the Canadian sample

	Organic_Mean (SD)	Nutri-Score_Mean (SD)	Fairtrade_Mean (SD)
WTP_Mean	2.416 (1.574)	2.027 (1.419)	1.823 (1.433)
WTP_lowcareharm	1.954 (1.477)	1.361 (1.313)	1.211 (1.355)
WTP_highcareharm	2.785 (1.553)	2.559 (1.268)	2.311 (1.300)
WTP_lowfairnesscheating	1.905 (1.471)	1.227 (1.285)	1.108 (1.298)
WTP_highfairnesscheating	2.790 (1.542)	2.612 (1.212)	2.345 (1.295)
WTP_lowloyaltybetrayal	2.279 (1.568)	1.813 (1.483)	1.810 (1.537)
WTP_highloyaltybetrayal	2.559 (1.568)	2.251 (1.312)	1.836 (1.316)
WTP_lowauthoritysubversion	2.397 (1.576)	1.959 (1.423)	1.476 (1.425)
WTP_highauthoritysubversion	2.207 (1.567)	1.628 (1.478)	2.160 (1.298)
WTP_lowpuritydegradation	2.340 (1.584)	1.997 (1.518)	1.819 (1.524)
WTP_highpuritydegradation	2.500 (1.559)	2.061 (1.301)	1.828 (1.325)

Figure 5: WTPs of the organic label for the German sample

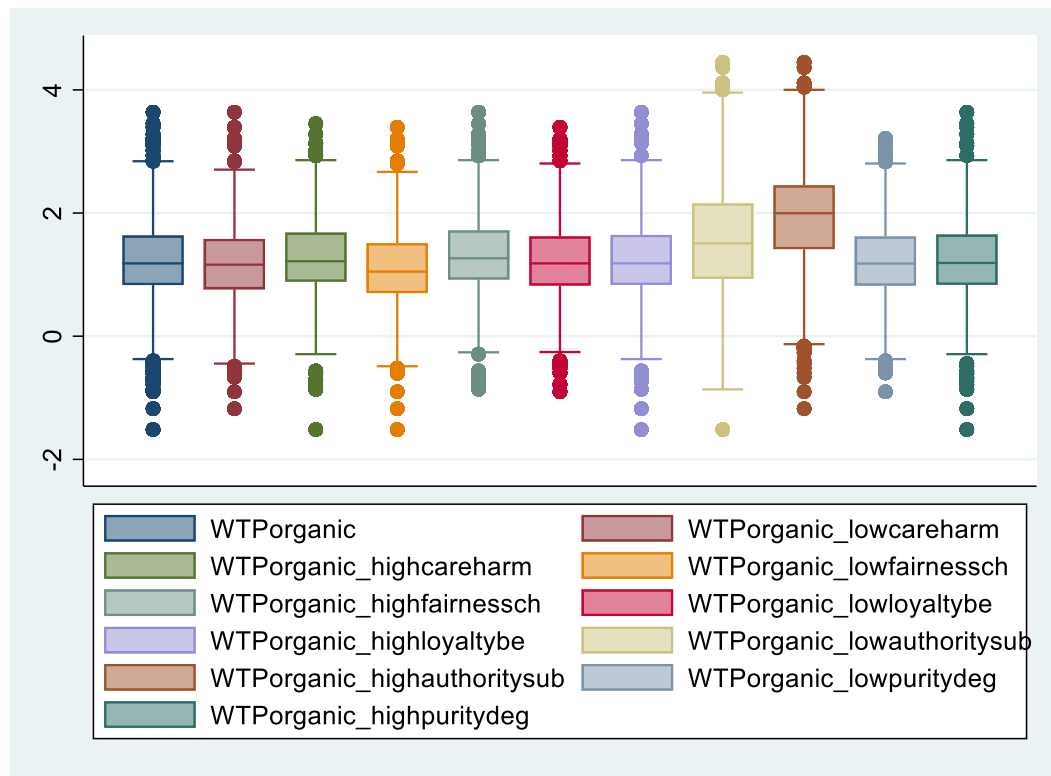


Figure 6: WTPs of the Nutri-Score label for the German sample

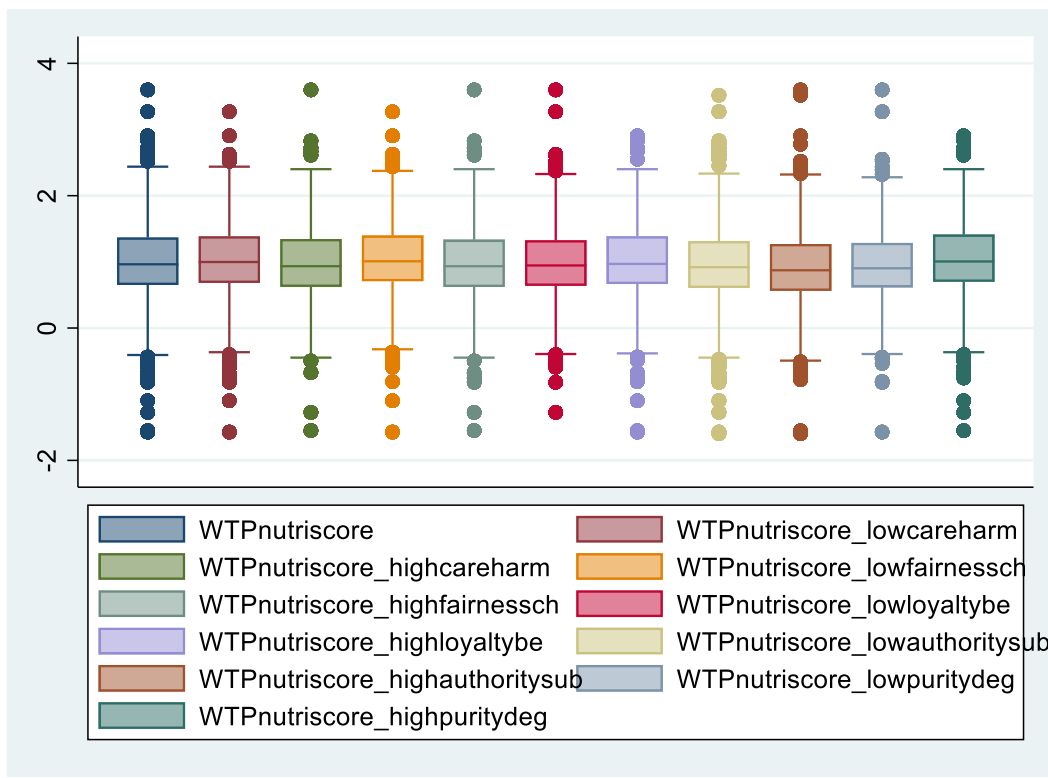


Figure 7: WTPs of the Fairtrade label for the German sample

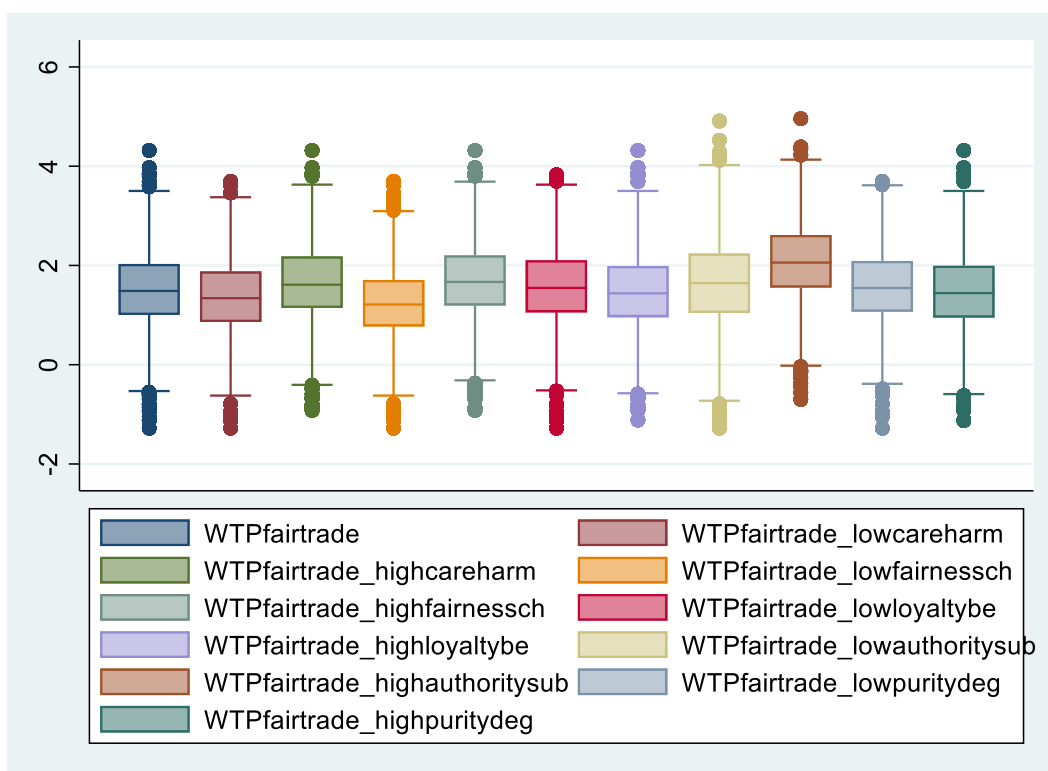


Figure 8: WTPs of the organic label for the Canadian sample

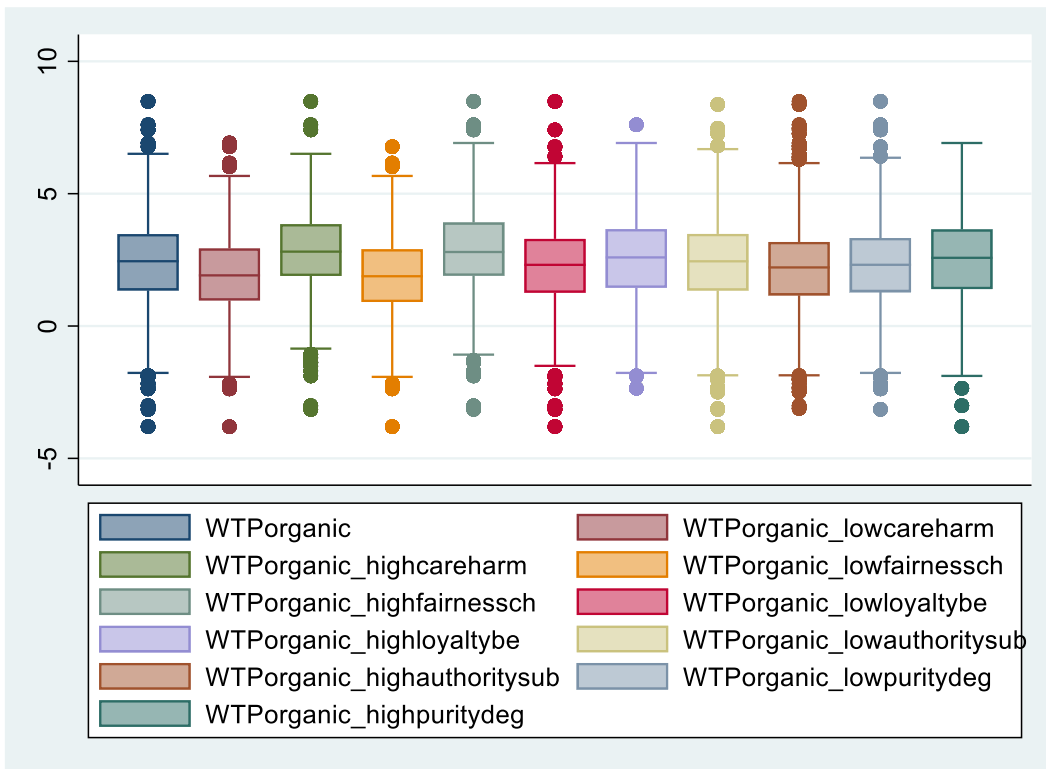


Figure 9: WTPs of the Nutri-Score label for the Canadian sample

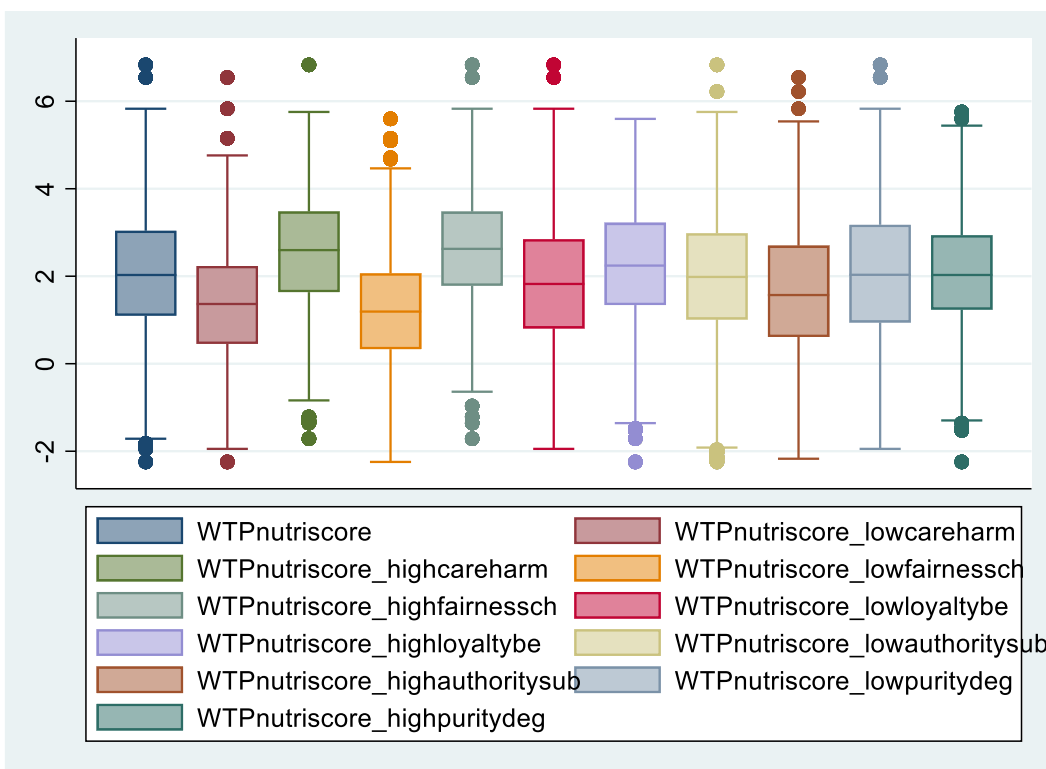
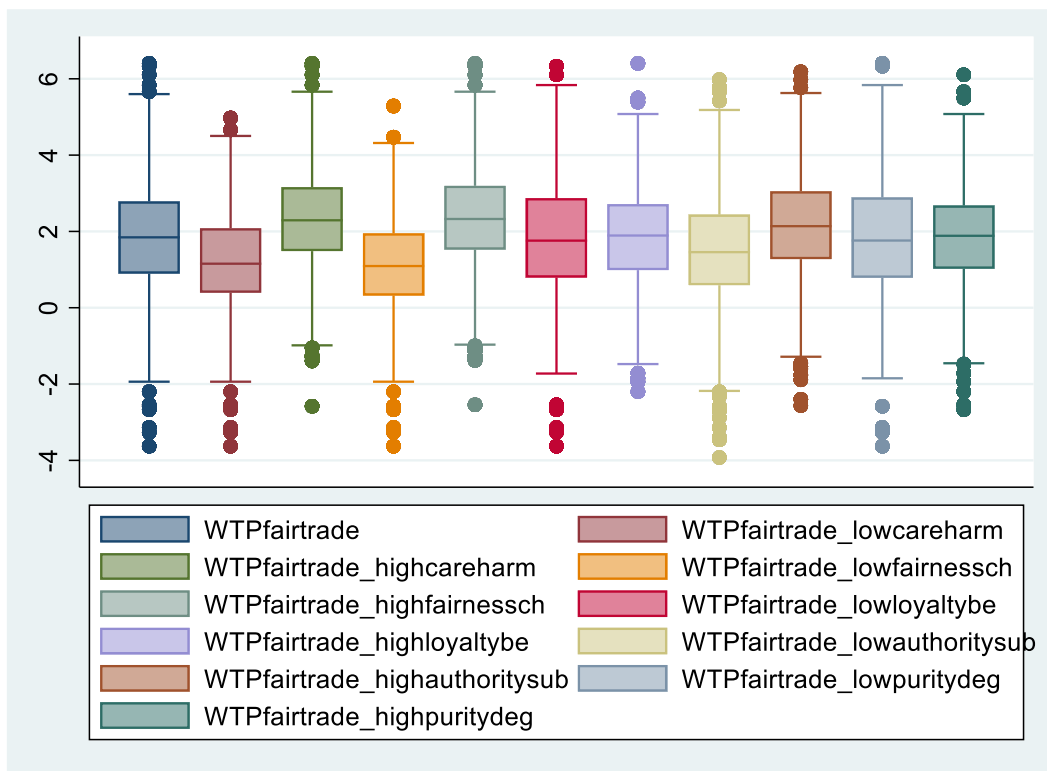


Figure 10: WTPs of the Fairtrade label for the Canadian sample



From table 16 and figure 5, we can see that we have all positive WTPs for the organic label in Germany for all the foundations and there is not so much variability between the WTPs, except for the fact that for the WTPs for the organic label, people with high authority/subversion have slight higher WTPs than people with low authority/subversion. The result for these WTPs for the organic label is in contradiction with our results in the mixed logit model where authority had a negative effect on the preference for the organic label. However, a possible explanation of this result for the WTPs for organic label would be that people that value more authority may consider the organic label as a point of reference for food quality standards and therefore they are willing to pay more for that label. For the WTPs for the Nutri-Score label in Germany, we can see from table 16 and figure 6 that we do not have so much variability in WTPs. For the WTPs for the Fairtrade label in Germany, we can see from table 16 and figure 7 that, for the foundations care/harm, fairness/cheating and authority/subversion, consumers

with high scores of these foundations have higher WTPs for the Fairtrade label than the consumers with low scores of these foundations. For care/harm and fairness/cheating it is quite intuitive. However, it is quite surprising for authority/subversion and this result is in contradiction from the results of the mixed logit model. However, a possible explanation would be that consumers who value authority more may consider the Fairtrade label as a point of reference for fair trade standards and they are willing to pay more for that label.

For Canada, for the organic label, we have all positive values and we can see from table 17 and figure 8 that: people with high care/harm have higher WTPs for the organic label than people with low care/harm; people with high fairness/cheating have higher WTPs for the organic label than people with low fairness/cheating. These results are interesting since it means that people with high care/harm and high fairness/cheating, who may care about the environment and of fair production practices, consider the organic label as an assurance for those standards and therefore they are willing to pay more for the organic label. For the WTPs for the other foundations for the organic label there is not so much variability. For the WTPs for the Nutri-Score label in Canada, we can see from table 17 and figure 9 that we have all positive values and we can see that people with high care/harm have higher WTPs for the Nutri-Score label than people with low care/harm; people with high fairness/cheating have higher WTPs for the Nutri-Score label than people with low fairness/cheating. These results are interesting since people with high care/harm and high fairness/cheating, who may care more about the nutritional aspects of foods and of fair production practices, may consider the Nutri-Score label as an assurance to those practices. For the other foundations there is not so much variability in Canada. For the WTPs for the Fairtrade label in Canada, we can see from table 7 and figure 10 that we have all positive values and we can see that people with high care/harm have higher WTPs for the Fairtrade label than people with low care/harm. Also, we can observe that people with high fairness/cheating have higher WTPs for the Fairtrade label than people with low fairness/cheating. These results are interesting since people with high

care/harm and high fairness/cheating, who may care and value more fair trade standards, may be willing to pay more for the Fairtrade label as an assurance for those standards. For the other foundations there is not so much variability in Canada.

4.4 Discussion

Our research question aims to discover whether moral values influence consumers' preferences and willingness to pay (WTPs) for the organic, Nutri-Score and Fairtrade labels. What we found is that moral values do play a role.

In the German sample we found that fairness/cheating has a positive effect on the preference for the organic and Fairtrade labels and that authority/subversion has a negative effect on the preference for the organic and Fairtrade labels.

In the Canadian sample we found that fairness/cheating has a positive effect on the preference for the organic, Nutri-Score and Fairtrade labels, that care/harm has a positive effect on the preference for the Nutri-Score and Fairtrade labels, that purity/sanctity/degradation has a negative effect on the preference for the Nutri-Score and Fairtrade labels, and that loyalty/betrayal has a negative effect on the preference for the Fairtrade label.

For the German sample, high scores of authority/subversion contribute to higher WTPs for the organic label and high scores of care/harm, fairness/cheating and authority/subversion contribute to higher WTPs for the Fairtrade label.

For the Canadian sample, high scores of care/harm and fairness/cheating contribute to higher WTPs for the organic, Nutri-Score and Fairtrade labels.

We now compare our findings with the previous literature on moral values and food consumption. We found a positive effect of fairness/cheating on the organic label for both Germany and Canada. Our finding is different from Minton et al. (2019), that found that care/harm was related to sustainable-minded food consumption (e.g. local and organic foods). However, we do have a relationship with care/harm and the organic label in our WTPs in

Canada (not in Germany) where consumers with a high score of care/harm have higher WTPs for the organic label respect to consumers with a low score of care/harm. These results are also in line also with the results of Goddard et al. (2019). Goddard et al. (2019) found, in a Canadian sample, that respondents with stronger agreement on the individualizing moral foundations of care/harm and fairness/cheating are more likely, compared to respondents with lower agreement on the individualizing moral foundations, to buy improved environmentally sustainable milk/yogurt and pork from pigs that are raised with reduced antibiotic use and more likely to vote in favor of stricter livestock environmental standards and disease protocols.

An important feature of the Canadian sample is that the coefficients of the organic, Nutri-Score and Fairtrade labels are statistically significant in the simple mixed logit model, but they become insignificant when we add to the model the interaction of the moral foundations with the attributes. This suggests that the moral foundations may represent a latent explanatory power and indeed we have more effects of the moral foundations on the organic, Nutri-Score, and Fairtrade labels in Canada in comparison to Germany. In fact, in Canada we detected effects of moral foundations on the Nutri-Score label: a positive effect of care/harm on the Nutri-Score label and a negative effect of purity/sanctity/degradation on the Nutri-Score label. The negative effect of purity/sanctity/degradation on the Nutri-Score label may be difficult to explain: maybe consumers who care about nutritious foods that are pure, free from “bad nutrients” may fear the Nutri-Score label given that it is a novelty as it is not yet present in the Canadian market. Furthermore, these results are related to the results of Minton et al. (2019), who found that purity/sanctity/degradation mediates the relationship between religiosity (the third statement on the moral foundation of purity/sanctity/degradation refers to God) and diet-minded food consumption (nutritious foods such as gluten-free, fat-free, sugar-free foods). In contrast to Canada, in Germany we did not find effects of the moral foundations on the Nutri-Score label. This is confirmed by the WTPs. In Germany we do not have variability

on the WTPs for the Nutri-Score label between low and high scores of each moral foundation. In Canada, high scores of care/harm and fairness/cheating contribute to higher WTPs for the Nutri-Score label. For both Canada and Germany, we found various effects of moral foundations on the Fairtrade label. In Germany we found a positive effect of fairness/cheating and a negative effect of authority/subversion; in Canada we found a positive effect of care/harm and fairness/cheating and a negative effect of loyalty/betrayal and purity/sanctity/degradation. These results are in part confirmed by the WTPs for the Fairtrade label (high score of care/harm and fairness/cheating contributes to higher WTPs in Germany and Canada) but not in the case of authority/subversion. In fact, in Germany, high scores of authority/subversion contribute to higher WTPs for the Fairtrade label, while in the mixed logit model we found a negative effect of authority/subversion on the Fairtrade label.

Regarding the limitations for our study, there are some differences between the various distributions of the Canadian sample respect to Canadian the population. In particular, the gender distribution of the Canadian sample is very different from the gender distribution of the Canadian population. However, we do not pretend to be necessarily representative of populations, we aim to present results we have obtained of two large scale samples of two different countries, Canada and Germany.

To the best of our knowledge this is the first study that analyze the importance of moral foundations for consumers' preferences and WTPs for the organic, Nutri-Score and Fairtrade labels in Germany and Canada and, while there are various similarities with the literature, our study is novel within the field of moral values and food consumption.

4.5 Appendix

4.5.1 Moral Foundations Questionnaire (MFQ) (Graham et al. 2008; Graham et al. 2011)

When you decide whether something is right or wrong, to what extent are the following considerations relevant to your thinking? Please rate each of the following sentences according to this scale:

1= not at all relevant (this consideration has nothing to do with my judgments of right and wrong);

2= not very relevant;

3= slightly relevant;

4= somewhat relevant;

5= very relevant;

6= extremely relevant (this is one of the most important factors when I judge right and wrong)

Whether or not someone suffered emotionally (Care/Harm 1)

Whether or not someone cared for someone weak or vulnerable (Care/Harm 2)

Whether or not someone was cruel (Care/Harm 3)

Whether or not some people were treated differently than others (Fairness/Cheating 1)

Whether or not someone acted unfairly (Fairness/Cheating 2)

Whether or not someone was denied his or her rights (Fairness/Cheating 3)

Whether or not someone's action showed love for his or her country (Loyalty/Betrayal 1)

Whether or not someone did something to betray his or her group (Loyalty/Betrayal 2)

Whether or not someone showed a lack of loyalty (Loyalty/Betrayal 3)

Whether or not someone showed a lack of respect for authority (Authority/Subversion 1)

Whether or not someone conformed to the traditions of society (Authority/Subversion 2)

Whether or not an action caused chaos or disorder (Authority/Subversion 3)

Whether or not someone violated standards of purity and decency (Purity/Sanctity/Degradation 1)

Whether or not someone did something disgusting (Purity/Sanctity/Degradation 2)

Whether or not someone acted in a way that God would approve of (Purity/Sanctity/Degradation 3)

4.5.2 Socio-demographic characteristics

Table 18: Germany – Socio-demographic characteristics

	Sample in percent	Population in percent ^a
<i>Gender</i>		
Male	50.08	49.26
Female	49.75	50.74
Other	0.17	n.a
<i>Age</i>		
18-19 (0-19 for population)	1.76	18.8
20-39	36.89	24.5
40-59	41.47	27.3
60-69 (60-79 for population)	19.88	22.2
More than 69 (more than 69 for population)	0.0	7.2
<i>Education</i>		
No degree/No degree yet	0.39	8.62
School certificate below High School diploma	58.03	54.89
High school diploma or higher	40.91	36.50
Others	0.66	n.a.
<i>Income</i>		
Less than 2000 Euro	23.91	33.32
Between 2000 and 4000 Euro	43.95	39.71
Between 4000 and 5000 Euro	19	10.83

5000 Euro or more	13.14	16.12
<i>Region</i>		
Baden	12.81	13.37
-Württemberg		
Bayern	16.01	15.85
Berlin	4.47	4.45
Brandenburg	3.09	3.05
Bremen	0.77	0.81
Hamburg	2.43	2.24
Hessen	7.68	7.58
Mecklenburg-Vor-	1.71	1.93
pommern		
Niedersachsen	9.99	9.65
Nordrhein	21.65	21.50
-Westfalen		
Rheinland-Pfalz	4.91	4.93
Saarland	1.27	1.18
Sachsen	4.86	4.84
Sachsen-Anhalt	2.37	2.59
Schleswig-Holstein	3.53	3.50
Thüringen	2.43	2.52
<i>Household size</i>		
1	20.38	41.1
2	37.16	33.6
3	20.82	11.9
4	16.68	9.6
5 or more	4.97	3.8

^aGender, data from 31/12/2022 <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Bevoelkerungsstand/Tabellen/liste-zensus-geschlecht-staatsangehoerigkeit.html#616584>; Age, data from 2022 <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Bevoelkerungsstand/Tabellen/liste-altersgruppen.html#249808>; Education (2022 Microcensus) <https://www-genesis.destatis.de/genesis//online?operation=table&code=12211-0100&bypass=true&levelindex=0&levelid=1714570676690#abreadcrumb>; Income (2022 Microcensus) <https://www-genesis.destatis.de/datenbank/beta/statistic/12211/table/12211-0300>; Region (2022) <https://www-genesis.destatis.de/genesis//online?operation=table&code=12411-0021&bypass=true&levelindex=0&levelid=1714582245193#abreadcrumb>; Household number (2022 Microcensus) <https://www.destatis.de/EN/Themes/Society-Environment/Population/Households-Families/Tables/households.html#fussnote-1-595646>

Table 19: Canada – Socio-demographic characteristics (n=1597)

	Sample in per- cent	Population in percent ^a
<i>Gender</i>		
Male	38.82	49.27
Female	58.42	50.73
Other	0.56	n.a.
I prefer not to an- swer	2.19	n.a
<i>Age</i>		
17-19	2.94	3.98
20-29	23.98	15.33
30-39	20.48	16.67
40-49	16.45	15.60
50-59	13.65	16.63
60-69	13.64	15.85
70-79	7.01	10.30
80-89	1.63	4.52
90-99	0.06	1.08
100 and over	0.13	0.04
<i>Education</i>		
Elementary school (No certificate, di- ploma or degree for population)	1.75	16.2
Secondary school (high school)	27.05	26.7
Technical school, business school or community college (Diploma below Bachelors' Degree for population)	28.55	30.5
University degree (Bachelors' Degree for population)	34	17.5
Postgraduate de- gree (including PhD or Masters)	8.64	9.1
<i>Income^b</i>		
\$24,999 or less	18.17	2.23
\$25,000 to \$34,999	11.22	2.75
\$35,000 to \$44,999	10.09	5.41
\$45,000 to \$54,999 (\$45,000 to \$59,999 for popu- lation)	14.97	9.11

\$65,000 to \$79,999 (\$60,000 to \$79,999 for popu- lation)	16.67	13.66
\$80,000 to \$99,999	12.84	13.53
\$100,000 to \$119,999 (\$100,000 to \$124,999 for popu- lation)	7.77	14.68
\$120,000 or more (\$125,000 or more for population)	8.27	38.63
<i>Region^c</i>		
Maritimes	7.27	5.15
Quebec	12.29	22.23
Ontario	47.59	38.91
Manitoba	5.83	3.62
Saskatchewan	3.95	3.02
Alberta	10.53	11.61
British Columbia	12.29	13.8
Yukon, Northwest Territories or Nu- navut	0.25	0.33
Newfoundland and Labrador	0.00	1.36
<i>Household size</i>		
1	23.42	29.3
2	35	34.2
3	18.47	14.7
4	14.72	13.4
5 or more	8.39	8.4

^aGender Census 2021 (Total Population, including institutional residents)

<https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810002201>; Age Census 2021 (for population age 17 and older, including institutional residents) <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810002201>; Education Population aged 15 years and over in private households, 2021 Census — 25% Sample data <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810038401> ; Income 2020 (Economic families in private households, based on Census 2021) <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810007701> ; Population by region, October 1st 2022, based on 2021 Census <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901&cubeTimeFrame.startMonth=10&cubeTimeFrame.startYear=2022&cubeTimeFrame.endMonth=10&cubeTimeFrame.endYear=2022&referencePeriods=20221001%2C20221001> ; Household size: Census 2021

<https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?LANG=E&GENDER-list=1,2,3&STATISTIClist=4&HEADERlist=3&SearchText=Canada&DGUIDlist=2021A000011124>;
^bn=1596; ^c n=1955

5 Discussion and Conclusion

The purpose of this dissertation was to conduct a conceptual and empirical economic analysis of consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food. This dissertation has shown that evidence is contested in the context of science in general (Light et al. 2022; Zachmann et al. 2023), in the food domain, and in the case of superfoods in particular (Pelli and Roosen 2023; Mozaffarian et al. 2018; Nestle 2020; Ladher 2016).

In this context of uncertainty regarding nutritional, environmental and ethical evidence regarding food, consumers may not act totally rationally, as expected by neoclassical economics, but psychological aspects may be important and useful in explaining better and in a more realistic way consumers' attitudes and behavior. Particularly, moral aspects are important in our context. As argued in the introduction of this dissertation, consumers are placed in situations of contested nutritional, environmental and ethical evidence regarding food, such as the heavy marketing campaigns of superfoods, the issue of unhealthy diets and the negative environmental impacts of superfoods production and the unclear conditions of farmers and laborers involved in the superfoods production in the Global South. Therefore, consumers may have moral concerns for this contested nutritional, environmental and ethical evidence. For these reasons, moral aspects are included in this analysis on consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food at the conceptual level and at the empirical level, with two large-scale cross-cultural empirical studies in Germany and Canada.

Essay I explores at the conceptual level the role of psychological aspects in explaining consumers' interpretation of contested nutritional evidence for the case of superfoods. In the con-

text of contested nutritional evidence of superfoods and scarce knowledge on the scientific attributes of superfoods, consumers may not form their beliefs, attitudes and finally acceptance or non-acceptance of superfoods totally rationally on scientific attributes, as expected by neoclassical economics, but rather through heuristic information processing linked to psychological values that consumers hold. Therefore, Essay I argues that the strictly rational model, based on neoclassical economics, is not sufficient to explain consumers' interpretation of contested nutritional evidence of superfoods; rather a psychological model is needed that account for consumers' psychological values.

More specifically, Essay I motivates the importance of moral values as conceived by the Moral Foundation Theory (MFT) (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) in explaining consumers' interpretation of contested nutritional for the case of superfoods. Indeed, as discussed by Pelli and Roosen (2023), page 288:

"[...] in this context of uncertainty around the nutritional aspects of foods, several types of foods are often considered "good foods for health" or "bad foods for health", and these definitions may have a strong moral connotation. Furthermore, superfoods are often perceived as "good foods for health" even if consumers lack the specific nutritional knowledge of superfoods to make such judgments. Moreover, previous literature suggests that the attribute "healthy" (which, according to us, is the main characteristic attributed to superfoods) implicitly hints at specific discourses of the "submerged iceberg of moral values" (van Leeuwen 2007)."

In this context, Pelli and Roosen (2023), page 291-292, develop a conceptual framework on the importance of the moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) in influencing consumers' interpretation of contested nutritional evidence at the example of superfoods, where they argue that:

"Consumers have scarce knowledge about the scientific nutritional attributes of superfoods because the nutritional evidence for superfoods is limited and controversial and consumers lack the expertise to judge the nutritional properties. Given this scarce knowledge, consumers form their beliefs and consequently their attitudes and acceptance of the nutritional evidence for superfoods through a heuristic information process moderated by the moral values that consumers hold. This means that consumers base their beliefs and consequently attitudes and acceptance or non-acceptance of superfoods by relying on moral values linked to superfoods rather than on scientific nutritional attributes and information."

Furthermore, Pelli and Roosen (2023), page 292, argue that: “MFT is particularly suited to studying consumers’ attitudes toward nutritional evidence of superfoods. In fact, foods promoted as healthy are generally perceived to have strong moral connotation, e.g. “good foods” which are free from “bad nutrients or additives”.” In this context, it is interesting to discuss the conceptual example on the possible relationship between the attribute: “healthy” of superfoods and the moral foundations of purity/sanctity presented by Pelli and Roosen (2023), page 292-293:

“Superfoods are presented as healthy to consumers, who cannot judge this attribute “healthy” because of the lack of sufficient nutritional knowledge and expertise. Therefore, consumers may accept this attribute “healthy” not based on its scientific meaning but based on the association to a concept of a “good” and “pure” food free from “bad nutrients”, which may be positively correlated to the importance of the moral foundation of purity/sanctity/degradation. Therefore, through a heuristic information perception process moderated by the moral foundation of purity/sanctity, consumers may form their beliefs and consequently attitudes toward and acceptance of superfoods. Namely, the more consumers are attached to the moral value of purity/sanctity, the more consumers may perceive and accept superfoods as healthy foods.”

From a conceptual level, the importance of moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) on food consumption have been discussed also by Lusk et al. (2014). Lusk et al. (2014) discuss the role of moral foundations as conceived by the MFT in influencing new food technology aversion among consumers, arguing that the most important moral foundation in the context of food technology aversion is purity/sanctity. Particularly they specify a possible hypothesis on this topic, as stated by Lusk et al. (2014), page 388: “moral judgments are evoked, and a food technology is perceived as unnatural or impure”. This conceptual example is interesting also when compared to the conceptual example on the possible relationship between the attribute: “healthy” of superfoods and the moral foundations of purity/sanctity, developed by Pelli and Roosen (2023). Indeed, according to Pelli and Roosen (2023), superfoods are presented (by marketing campaigns) to consumers as “healthy” and this may trigger the moral foundations of purity/sanctity and consumers may believe, through an intuitive heuristic information process moderated by the

moral value of purity/sanctity, that superfoods are “pure”, “free from bad nutrients”, and in the context of being superfoods “natural” foods, without the intervention of technology. Therefore, superfoods may be perceived and accepted as “healthy” by consumers. However, the scientific evidence on the health benefits of superfoods is scarce and contested (Pelli and Roosen 2023; Bassaganya-Riera et al. 2021). On the other hand, as discussed by Lusk et al. (2014) food produced with new technology may trigger moral values and consumers may believe, also here through an intuitive process shaped by the moral value of purity/sanctity, that the new food technology is “unnatural or impure” and thus consumers may reject the new food technology. However, also here the scientific evidence on the negative effects of new food technologies may be scarce and contested. (Lusk et al. 2014). These two examples suggest at the conceptual level that the moral value of purity may guide intuitively consumers’ to believe in and accept “natural” and “healthy” foods such as a superfoods (Pelli and Roosen 2023) and to reject “artificial” foods developed by new technologies, which are perceived as “unnatural or impure” (Lusk et al. 2014). Furthermore, it is important to note that the scientific evidence regarding the healthiness of superfoods on one end (Pelli and Roosen 2023; Bassaganya-Riera et al. 2021) and the risks of the new food technologies on the other hand (Lusk et al. 2014), may be scarce and contested. In this context, consumers’ judgements of superfoods as “healthy” and “pure, free from bad nutrients” (Pelli and Roosen 2023) and of new food technologies as “unnatural or impure” (Lusk et al. 2014) are not based totally rationally on scientific evidence (which is contested and scarce), but on intuitively through the moral values that consumers hold and that are associated with the different types of food.

At this point it may be interesting to touch upon an extension of the conceptual framework of Pelli and Roosen (2023). This extension of the conceptual framework argues that cultural development plays a role in shaping the influence of moral values on consumers’ beliefs and acceptance. This is in line with the importance of cultural development in shaping the innate human moral values as conceived by the MFT (Graham et al. 2013). This importance of cultural

development contributed to the idea of investigating the role of culture on the influence of moral aspects on consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food, by conducting two empirical cross-cultural studies in two different countries, Germany and Canada (Essay II and Essay III).

Indeed, Essay II and Essay III included moral aspects in the context of food consumption because they can explain better an empirical economic analysis of consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food, taking the possibility of including psychological aspects in economic analyses if useful in explaining better human attitudes and behavior, as suggested by Thaler (2016).

Given that the results of Essay II and Essay III have been already discussed and compared with the respective specific literature, here a more general synthesis and discussion of Essay II and Essay III is carried out, particularly discussing the differences in the results between the German sample and the Canadian sample, in order to understand the role of culture on the influence of moral aspects on consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food.

Essay II focuses on the issue of consumers' interpretation (defined as attitudes) of contested nutritional evidence, drawing upon the background of Essay I. In the context of contested nutritional evidence, Essay II argues that consumers' nutritional knowledge (both subjective and objective) may be important in influencing nutritional attitudes, that it would be difficult for consumers to be sure to follow a healthy diet and that consumers may have moral concerns for the issue of unhealthy diets, which can also influence nutritional attitudes. For the moral concerns for the specific issue of unhealthy diets, Essay II refers to a concept related to specific moral issues, the concept of moral intensity developed by Jones (1991) and continued by various scholars, such as Singhapakdi et al. (1996), Frey (2000) and McMahon and Harvey (2006), who developed and used moral intensity scales at the general level. Inspired by the empirical moral intensity scale developed by Mäkinen and Vainio (2013) for the specific

issue of climate change, Essay II developed a moral intensity scale specific for the issue of unhealthy diets. In this context, Essay II conducted an analysis on the influence of moral intensity, subjective nutritional knowledge and objective nutritional knowledge on nutritional attitudes, through regression analyses. The results, already discussed in Essay II, suggest that moral intensity (together with subjective and objective nutritional knowledge) plays a role in influencing nutritional attitudes. Particularly in Canada there is a stronger influence of moral intensity on nutritional attitudes, in comparison to Germany, as shown by more statistically significance results. The pattern of a greater effect in Canada in comparison to Germany of moral aspects on consumers will be seen also in Essay III.

Essay III, drawing upon the background on contested evidence presented, expands the issue of evidence contestation for the topic of contested nutritional, environmental and ethical evidence at the example of a specific superfood, quinoa. In this context, drawing upon the conceptual framework presented by Essay I, Essay III conduct an empirical economic analysis with a large-scale survey in Germany and Canada on the influence of moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) on consumers' use (defined as behavior, in particular choices: preferences and WTPs) of three food quality labels (organic, Nutri-Score and Fairtrade labels) of the specific superfood quinoa. These labels are chosen because they represent a possibility, although not a certainty, to provide consumers with more environmental, nutritional and ethical evidence. The methodology consisted in a combination of responses from the Moral Foundations Questionnaire (MFQ) (Graham et al. 2008; Graham et al. 2011) with a hypothetical discrete choice experiment on quinoa with the three food quality labels, price and no-buy option as attributes. Half of the sample has been also provided with an information treatment on the controversial nutritional, environmental and ethical evidence of the "superfood" quinoa. This methodology is an empirical application of behavioral economics, defined by Thaler (2016), page 1577, as: "[...] mixture of psychology and economics [...]". In fact, in the analysis of Essay III, in order to provide a

more complete and multifaceted overview on consumers' choices for three food quality labels, standard economic variables (price and the other attributes) of the choice experiment, which is consistent with consistent with random utility theory (Mc Fadden 1974) and Lancasterian consumer theory (Lancaster 1966), are combined with the psychological moral variables of the MFQ (Graham et al. 2008; Graham et al. 2011), thus accounting for both the economic and psychological aspects related to consumers' choices. The results, obtained through mixed logit models, and already discussed in Essay III, suggest that the information treatment influenced consumers' preferences for only the organic label in Germany and for both the Nutri-Score and Fairtrade labels in Canada, thus suggesting that the exposure to information on contested nutritional, environmental and ethical evidence of quinoa, which have moral connotations, influenced Canadian consumers more than German consumers. Furthermore, the results show that moral values play a role in influencing consumers' preferences and WTPs for the organic, Nutri-score and Fairtrade labels in both countries. Particularly, a stronger influence of moral values in Canada in comparison to Germany is observed. Indeed, for Germany, moral values influenced consumers' preferences and WTPs only for the organic and Fairtrade labels, while in Canada moral values influenced consumers' preferences and WTPs for all the three food quality labels (organic, Nutri-Score and Fairtrade labels).

It is interesting that the greater influence of moral values as defined by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) on Canadian consumers in comparison to German consumers regarding the choices for the food quality labels in Essay III is combined with the greater importance for Canadian consumers respect to German consumers of the moral intensity on nutritional attitudes in Essay II. It is interesting that two different moral scales, across the process of consumers' decision making, from nutritional attitudes to food choice, have a similar effect in Canada respect to Germany. Furthermore, specifically about nutritional aspects of foods, it may be possible to infer that Canadian consumers may be more morally sensitive. Indeed, Canadian consumers, in comparison to German consumers, present

greater influence of moral intensity on nutritional attitudes. Furthermore, Canadian consumers, unlike German consumers, present the influence of moral values as defined by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) on the choices for the Nutri-Score label. Particularly, it would be relevant to compare the possible effects detected in Essay III of the moral value of purity on Nutri-Score (The Nutri-Score label on quinoa has an A score, which means that quinoa belongs to the category of the healthiest food, according to the Nutri-Score evaluation) in Canada and Germany respect to the conceptual framework on the relationship between the attribute: “healthy” of superfoods and the moral value of purity as conceived by Pelli and Roosen (2023). Indeed, at the empirical level, through Essay III, we did not find the hypothesized positive relationship with the moral foundation of purity and a healthy attribute (in the case of Essay III being the Nutri-Score) of a superfood (in the case of Essay III being quinoa), as it is conceived in the conceptual framework of Pelli and Roosen (2023). Indeed, for the German sample in Essay III we did not find a significant effect of the moral foundation of purity on consumers’ preferences for the presence of the Nutri-Score label on quinoa, while for the the Canadian sample we even found a negative effect of the moral foundation of purity on consumers’ preferences for the presence of the Nutri-Score label on quinoa. The difference of these empirical results in Essay III respect to the related conceptual framework of Pelli and Roosen (2023) may have the following explanations. In Germany, on the other hand, Nutri-Score is so stabilized in the German market that consumers may not feel moral questions related to Nutri-Score. On the other hand, in Canada, the Nutri-Score label is not present yet in the Canadian market, although it has been already discussed by the Canadian scientific community (Ahmed et al. 2020; Lee et al. 2023). In this context, Canadian consumers may feel more negative rather than positive moral concerns related to Nutri-Score, since it may represent a novelty and fear for them.

Taken together all these considerations, and also based on the conceptual framework on the role of culture conceived by Pelli and Roosen (2023), these findings from Essay II and Essay

III suggest empirically that culture may play a role on the influence of moral aspects on consumers' use and interpretation of contested nutritional, environmental and ethical evidence. Through this study, an economic analysis on consumers' use and interpretation of contested nutritional, environmental and ethical evidence regarding food has been conducted, showing that evidence is contested in science in general and in the food domain in particular. Taking the suggestion of Thaler (2016), psychological aspects were included in the economic analysis in order to have a more complete understanding of the issue. Through Essay 1, the topic of contested nutritional evidence is explored at the example of superfoods and from a conceptual level this dissertation has shown the importance of moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) in explaining consumers' interpretation of contested nutritional evidence and the importance of cultural context in this process. Then in Essay II this dissertation delved more into the issue of consumers' interpretation (defined as attitudes) toward contested nutritional evidence and showed empirically through a cross-cultural comparison between German and Canadian consumers that moral concerns for the issue of unhealthy diets, defined according to the concept of moral intensity developed by Jones (1991), play a role, together with subjective and objective nutritional knowledge, in influencing consumers' nutritional attitudes, as statistically significance results were detected in both countries. Then, through Essay III the issue is expanded considering the topic of consumers' use of contested nutritional, environmental and ethical evidence at the example of a specific superfood, quinoa. Building on the conceptual framework of Pelli and Roosen (2023), an economic analysis has been conducted on the relevance of moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) and of provision of information on contested nutritional, environmental and ethical evidence of quinoa, which has moral connotation, on consumers' use (defined as behavior, in particular choices: preference and WTPs) of the organic, Nutri-Score and Fairtrade labels of the superfood quinoa, through the combination of the MFQ (Graham et al. 2008; Graham et al. 2011) with a discrete choice

experiment. The results suggest that moral values as conceived by the MFT and information on contested nutritional, environmental and ethical evidence of quinoa, which has moral connotations, play a role in influencing consumers' choices and WTPs of the organic, Nutri-Score and Fairtrade labels of the superfoods quinoa. Observing both Essay II and Essay III, moral aspects influenced more Canadian consumers' respect to German consumers' attitudes and behavior and Canadian consumers seem to be more morally sensitive to nutritional issues than German consumers. Furthermore, in Essay III the provision of information on contested nutritional, environmental and ethical evidence of quinoa (which have moral connotations) to consumers has a greater impact on food choices of Canadian consumers respect to German consumers. The findings are in line with the concept explained by Graham et al. (2013) that moral aspects, particularly moral values as conceived by the MFT, are shaped differently and matter differently across different cultures. The findings show empirically that culture may play a role on the influence of moral aspects on consumers' interpretation and use of contested nutritional, environmental and ethical evidence regarding food.

As limitations to this study, as already mentioned, there are some differences between the various distributions of the samples in comparison to the population. In particular, the gender distribution of the Canadian sample is very different from the gender distribution of the Canadian population. However, the aim of this study is not to be necessarily representative of population, but to show results of two cross-cultural large-scale samples from two different countries, Canada and Germany. Another limitation regards Essay III, where in the Canadian sample the coefficients of the label attributes (organic, Nutri-Score and Fairtrade) are significant only in the simple mixed logit models, not in the models with the moral foundations interacted with the attributes. Therefore, the finding that moral foundations and information treatment influence more Canadian consumers' than German consumers' preference and WTPs for the organic, Nutri-Score and Fairtrade labels (supported by statistically significant results) can also be questioned.

However, taking together all the results, this study has made an original contribution to the field of behavioral economics, particularly showing from conceptual and empirical perspectives the importance of psychological moral aspects in explaining consumers' attitudes and behavior in the context of contested scientific evidence regarding food and in the context of different cultures.

Further research should continue to incorporate psychological aspects into empirical economic analysis of food consumption because, as suggested by Camerer and Loewenstein (2004), page 3: "Behavioral economics increases the explanatory power of economics by providing it with more realistic psychological foundations" and, as suggested by Thaler (2016), it is useful to incorporate psychological factors into economic analysis as they can improve the prediction of human attitudes and behavior.

As mentioned previously, various studies already investigated the influence on psychological moral aspects, particularly related to moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) and related to the concept of moral intensity developed by Jones (1991), on food consumption related to various issues, such as for diet-minded and sustainably-minded foods (for example, Minton et al. 2019), for sustainable consumption (for example, Watkins et al. 2016b), for environmental sustainability and antibiotic use in livestock production (for example, Goddard et al. 2019), for animal welfare (for example, Backer and Hudders 2015, Jonge and van Trijp 2013, Jonge and van Trijp 2014, Jonge et al. 2015 Bennett and Blaney 2002; Bennett et al. 2002) and for climate change (for example, Mäkinemi and Vainio 2013 and Vainio and Mäkinemi 2016a). Most of these studies are based on contexts of single countries. Further research should investigate the influence of moral aspects, particularly related to moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) and to the concept of moral intensity developed by Jones (1991), on food consumption across different countries, in order to understand the role of culture on the influence of moral aspects on food consumption. In fact, for example,

our cross-cultural study found that culture play a role on the influence of both the moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) and moral aspects related to the concept of moral intensity developed by Jones (1991), on food consumption. Also, the study of Mäkineniemi et al. (2013), who conducted a cross-cultural study among Finnish, Danish and Italian consumers on moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) and food consumption, also found relevant differences on the endorsement of moral values as conceived by the MFT across countries.

Moreover, further research should continue to examine the importance of psychological variable such as moral aspects, especially related to moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013), on consumers' attitudes and behavior towards new food technologies, which may be controversial and can generate relevant moral issues for consumers, as suggested by Lusk et al. (2014). Lusk et al. (2014) argued from a conceptual level that in the context of food technology aversion the most important moral foundation of the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) would be purity/sanctity. Particularly the specific hypothesis developed by Lusk et al. (2014), page 388, states: "moral judgments are evoked, and a food technology is perceived as unnatural or impure". Interestingly this hypothesis has been recently supported by the cross-cultural empirical study conducted by Wilks et al. (2024), on the influence of moral values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013) and US and German consumers' attitudes towards the technology of cultured meat. It was found that, as stated by Wilks et al. (2024): "[...] the moral foundation of purity uniquely predicted, and was correlated with, negative attitudes toward cultured meat in all studies—though this pattern was much stronger in participants from the United States than those from Germany." This finding suggest that further research is needed on the influence of moral psychological aspects, espe-

cially related to values as conceived by the MFT (Haidt 2001; Haidt and Graham 2007; Graham et al. 2013), on consumers' attitudes and behavior towards new food technologies, in cross-cultural contexts.

References

- Ahmed, Mavra; Dickinson, Kacie; Vergeer, Laura; Mulligan, Christine; Franco-Arellano, Beatrix; Julia, Chantal; L'Abbé, Mary (2020): Evaluating the Consistency of the French Nutri-Score Front-of-Pack Scoring System with Canadian Dietary Guidelines. In *Current Developments in Nutrition* 4, nzaa064_001. DOI: 10.1093/cdn/nzaa064_001.
- American Association for the Advancement of Science (2006): Statement on the Teaching of Evolution. American Association for the Advancement of Science (AAAS).
- American Association for the Advancement of Science (2012): Statement by the AAAS Board of Directors on labeling of genetically modified foods. American Association for the Advancement of Science (AAAS).
- Anderegg, William R. L.; Prall, James W.; Harold, Jacob; Schneider, Stephen H. (2010): Expert credibility in climate change. In *Proceedings of the National Academy of Sciences of the United States of America* 107 (27), pp. 12107–12109. DOI: 10.1073/pnas.1003187107.
- Andrango, Graciela; Blare, Trent (2020): Functional Foods: Fad or Path to Prosperity? In *Choices* 35 (Quarter 4), pp. 1–2.
- Andrango, Graciela; Blare, Trent; Hareau, Guy (2020a): Functional Foods: Fad or Path to Prosperity? Data Visualization. In *Choices* 35 (Quarter 4), pp. 1–2.
- Andrango, Graciela; Johnson, Amy; Bellemare, Marc F. (2020b): Quinoa Production and Growth Potential in Bolivia, Ecuador, and Peru. In *Choices* 35 (Quarter 4), pp. 1–10.
- Angner, Erik; Loewenstein, George (2012): Behavioral Economics. In Dov M. Gabbay, Paul Thagard, John Woods, Uskali Mäki (Eds.): *Philosophy of Economics*. 1st: Elsevier Science & Technology (Handbook of the Philosophy of Science Series, 13), pp. 641–689.
- Aßländer, Michael S.; Nutzinger, Hans G. (2008): John Stuart Mill. In Heinz D. Kurz (Ed.): *Klassiker des ökonomischen Denkens*. München: Verlag C.H. Beck.
- Backer, Charlotte J. S. de; Hudders, Liselot (2015): Meat morals: relationship between meat consumption consumer attitudes towards human and animal welfare and moral behavior. In *Meat science* 99, pp. 68–74. DOI: 10.1016/j.meatsci.2014.08.011.
- Balcombe, Kelvin; Chalak, Ali; Fraser, Iain (2009): Model selection for the mixed logit with Bayesian estimation. In *Journal of Environmental Economics and Management* 57 (2), pp. 226–237. DOI: 10.1016/j.jeem.2008.06.001.
- Barlösius, Eva (2016): *Soziologie des Essens: Eine sozial- und kulturwissenschaftliche Einführung in die Ernährungsforschung*. Weinheim: Beltz Juventa.
- Barrett, Christopher B. (2010): Measuring Food Insecurity. In *Science* 327 (5967), pp. 825–828. DOI: 10.1126/science.1182768.
- Bartlett, Christopher; Sterne, Jonathan; Egger, Matthias (2002): What is newsworthy? Longitudinal study of the reporting of medical research in two British newspapers. In *BMJ (Clinical research ed.)* 325, pp. 81–84. DOI: 10.1136/bmj.325.7355.81.
- Bassaganya-Riera, Josep; Berry, Elliot M.; Blaak, Ellen E.; Burlingame, Barbara; Le Coutre, Johannes; van Eden, Willem et al. (2021): Goals in Nutrition Science 2020-2025. In *Frontiers in Nutrition* 7, Article 606378. DOI: 10.3389/fnut.2020.606378.

- Bengoetxea, Juan; Todt, Oliver (2021): Decision-Making in the Nutrition Sciences: A Critical Analysis of Scientific Evidence for Assessing Health Claims. In *Manuscrito - Rev. Int. Fil. Campinas* 44 (3), pp. 42–69. DOI: 10.1590/0100-6045.2021.v44n3.jb.
- Bennett, Richard; Blaney, Ralph (2002): Social consensus, moral intensity and willingness to pay to address a farm animal welfare issue. In *Journal of Economic Psychology* 23 (4), pp. 501–520. DOI: 10.1016/S0167-4870(02)00098-3.
- Bennett, Richard M.; Anderson, J.; Blaney, Ralph P.J. (2002): Moral Intensity and Willingness to Pay Concerning Farm Animal Welfare Issues and the Implications for Agricultural Policy. In *J Agric Environ Ethics* 15, pp. 187–202. DOI: 10.1023/A:1015036617385.
- Bhuyan, Deep Jyoti; Alsherbiny, Muhammad A.; Perera, Saumya; Low, Mitchell; Basu, Amrita; Devi, Okram Abemsana et al. (2019): The Odyssey of Bioactive Compounds in Avocado (*Persea americana*) and Their Health Benefits. In *Antioxidants* 8 (10). DOI: 10.3390/antiox8100426.
- Biltoft-Jensen, Anja; Groth, Margit V.; Matthiessen, Jeppe; Wachmann, Henrik; Christensen, Tue; Fagt, Sisse (2009): Diet quality: associations with health messages included in the Danish Dietary Guidelines 2005, personal attitudes and social factors. In *Public health nutrition* 12 (8), pp. 1165–1173. DOI: 10.1017/S1368980008003662.
- Boer, Joop de; Aiking, Harry (2021): Favoring plant instead of animal protein sources: Legitimation by authority, morality, rationality and story logic. In *Food Quality and Preference* 88, p. 104098. DOI: 10.1016/j.foodqual.2020.104098.
- Camerer, Colin F.; Loewenstein, George (2004): Behavioral Economics: Past, Present, Future. In Colin F. Camerer, George Loewenstein, Matthew Rabin (Eds.): *Advances in Behavioral Economics*. Princeton and Oxford, New York: Princeton University Press and Russell Sage Foundation (The Routledge Series in Behavioral Economics), pp. 3–51.
- Carpenter, Rowena S. (1941): National Nutrition Conference for Defense. In *The Scientific Monthly* 53 (1), pp. 87–91.
- Cooke, Rachel; Papadaki, Angeliki (2014): Nutrition label use mediates the positive relationship between nutrition knowledge and attitudes towards healthy eating with dietary quality among university students in the UK. In *Appetite* 83, pp. 297–303. DOI: 10.1016/j.appet.2014.08.039.
- Core Writing Team; Pachauri, Rajendra K.; Mayer, Leo (Eds.) (2015): *Climate change 2014. Synthesis report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*. Geneva, Switzerland: Intergovernmental Panel on Climate Change (IPCC).
- Curtis, Philip G.; Slay, Christy M.; Harris, Nancy L.; Tyukavina, Alexandra; Hansen, Matthew C. (2018): Classifying drivers of global forest loss. In *Science* 361 (6407), pp. 1108–1111. DOI: 10.1126/science.aau3445.
- Debuschewitz, Emil; Sanders, Jörn (2022): Environmental impacts of organic agriculture and the controversial scientific debates. In *Org. Agr.* 12, pp. 1–15. DOI: 10.1007/s13165-021-00381-z.

DeStefano, Frank; Price, Cristofer S.; Weintraub, Eric S. (2013): Increasing exposure to antibody-stimulating proteins and polysaccharides in vaccines is not associated with risk of autism. In *The Journal of pediatrics* 163 (2), pp. 561–567. DOI: 10.1016/j.jpeds.2013.02.001.

Deutsche Gesellschaft für Ernährung e. V. (DGE) (March, 5th, 2024): Gut essen und trinken – DGE stellt neue lebensmittelbezogene Ernährungsempfehlungen für Deutschland vor. Die Deutsche Gesellschaft für Ernährung e. V. (DGE) hat die lebensmittelbezogenen Ernährungsempfehlungen (Food-Based Dietary Guidelines, FBDG) für Deutschland überarbeitet. Bonn. Available online at <https://www.dge.de/presse/meldungen/2024/gut-essen-und-trinken-dge-stellt-neue-lebensmittelbezogene-ernaehrungsempfehlungen-fuer-deutschland-vor/>, checked on August, 18th, 2024.

Dickson-Spillmann, Maria; Siegrist, Michael; Keller, Carmen (2011): Development and validation of a short, consumer-oriented nutrition knowledge questionnaire. In *Appetite* 56 (3), pp. 617–620. DOI: 10.1016/j.appet.2011.01.034.

Doucette, Jeff (2022): Who Is The Primary Grocery Shopper In Canada? Endcaps and Insights, Field Agent Canada. Available online at <https://www.fieldagentcanada.com/blog/who-is-the-primary-shopper#:~:text=Females%20have%20the%20highest%20likelihood,from%20ages%2018%20to%2076>, checked on August, 18th, 2024.

Etilé, Fabrice (2011): Food Consumption and Health. In Jayson L. Lusk, Jutta Roosen, Jason F. Shogren (Eds.): *The Oxford Handbook of the Economics of Food Consumption and Policy*. Oxford: Oxford University Press, pp. 716–746.

European Commission, Directorate-General for Research and Innovation (2010): A decade of EU-funded GMO research. (2001 - 2010). Luxemburg: Publication Office of the European Union. Available online at <https://op.europa.eu/en/publication-detail/-/publication/d1be9ff9-f3fa-4f3c-86a5-beb0882e0e65/language-en>, checked on August, 18th, 2024.

Fernández-Ríos, Ana; Laso, Jara; Hoehn, Daniel; Amo-Setién, Francisco José; Abajas-Bustillo, Rebeca; Ortego, Carmen et al. (2022): A critical review of superfoods from a holistic nutritional and environmental approach. In *Journal of Cleaner Production* 379, p. 134491. DOI: 10.1016/j.jclepro.2022.134491.

Field, Andy (2018): *Discovering Statistics Using IBM SPSS Statistics*. 5th Edition. Los Angeles, London, New Delhi, Singapore, Washington DC, Melbourne: SAGE.

Fishbein, Martin (1963): An Investigation of the Relationships between Beliefs about an Object and the Attitude toward that Object. In *Human Relations* 16 (3), pp. 233–239.

Fiske, Alan P. (1991): *Structures of social life: The four elementary forms of human relations: Communal sharing, authority ranking, equality matching, market pricing*. New York: Free Press.

Food and Agriculture Organization (FAO), International Fund for Agricultural Development (IFAD), United Nations Children’s Fund (UNICEF), World Food Programme (WFP), World Health Organization (2021): *The State of Food Security and Nutrition in the World 2021. Transforming food systems for food security, improved nutrition and affordable healthy diets for all*. Rome: Food and Agriculture Organization (FAO).

Food and Agriculture Organization (FAO). Committee on World Food Security. (2009): *Reform of the Committee on World Food Security*. Food and Agriculture Organization (FAO).

Available online at <https://www.fao.org/4/k7197e/k7197e.pdf>, checked on August, 20th, 2024.

Frey, Bernhard F. (2000): The Impact of Moral Intensity on Decision Making in a Business Context. In *Journal of Business Ethics* 26, pp. 181–195. DOI: 10.1023/A:1006139124110.

Funk, Cary; Rainie, Lee; Smith, Aaron; Olmstead, Kenneth; Duggan, Maeve; Page, Dana (2015): Public and scientists' views on science and society. Pew Research Center. Available online at <https://www.pewresearch.org/science/2015/01/29/public-and-scientists-views-on-science-and-society/>, checked on August, 18th, 2024.

Gámbaro, Adriana; Ellis, Ana C.; Prieto, Víctor (2013): Influence of Subjective Knowledge, Objective Knowledge and Health Consciousness on Olive Oil Consumption—A Case Study. In *Food and Nutrition Sciences* 04 (04), pp. 445–453. DOI: 10.4236/fns.2013.44057.

Gilligan, Carol (1982): *In a Different Voice: Psychological Theory and Women's Development*. Cambridge, MA: Harvard University Press.

Goddard, Ellen; Muringai, Violet; Boaitey, Albert (2019): Moral foundations and credence attributes in livestock production: Canada. In *JCM* 36 (3), pp. 418–428. DOI: 10.1108/JCM-02-2018-2550.

Graham, Jesse; Haidt, Jonathan; Koleva, Sena; Motyl, Matt; Iyer, Ravi; Wojcik, Sean P.; Ditto, Peter H. (2013): Chapter Two - Moral Foundations Theory: The Pragmatic Validity of Moral Pluralism. In *Advances in Experimental Social Psychology* 47, pp. 55–130. DOI: 10.1016/B978-0-12-407236-7.00002-4.

Graham, Jesse; Haidt, Jonathan; Nosek, Brian (2008): The Moral Foundations Questionnaire. Available online at <https://moralfoundations.org/questionnaires/>, checked on August, 18th, 2024.

Graham, Jesse; Nosek, Brian A.; Haidt, Jonathan; Iyer, Ravi; Koleva, Spassena; Ditto, Peter H. (2011): Mapping the moral domain. In *Journal of personality and social psychology* 101 (2), pp. 366–385. DOI: 10.1037/a0021847.

Grunert, Klaus G.; Bech-Larsen, Tino (2005): Explaining choice option attractiveness by beliefs elicited by the laddering method. In *Journal of Economic Psychology* 26 (2), pp. 223–241. DOI: 10.1016/j.joep.2004.04.002.

Gust, Deborah; Weber, Deanne; Weintraub, Eric; Kennedy, Allison; Soud, Fatma; Burns, Adam (2008): Physicians Who Do and Do Not Recommend Children Get All Vaccinations. In *Journal of Health Communication* 13 (6), pp. 573–582. DOI: 10.1080/10810730802281726.

Gutman, Jonathan (1982): A Means-End Chain Model Based on Consumer Categorization Processes. In *Journal of Marketing* 46 (2), pp. 60–72. DOI: 10.1177/002224298204600207.

Haidt, Jonathan (2001): The Emotional Dog and Its Rational Tail: A Social Intuitionist Approach to Moral Judgment. In *Psychological Review* 108 (4), pp. 814–834. DOI: 10.1037/0033-295X.108.4.814.

Haidt, Jonathan; Bjorklund, Fredrik (2008): Social intuitionists answer six questions about moral psychology. In Walter Sinnott-Armstrong (Ed.): *Moral psychology, Vol. 2: The cognitive science of morality: Intuition and diversity*. Cambridge, MA: The MIT Press, pp. 181–217.

Haidt, Jonathan; Graham, Jesse (2007): When Morality Opposes Justice: Conservatives Have Moral Intuitions that Liberals may not Recognize. In *Social Justice Research* 20 (1), pp. 98–116. DOI: 10.1007/s11211-007-0034-z.

Haidt, Jonathan; Joseph, Craig (2004): Intuitive Ethics: How Innately Prepared Intuitions Generate Culturally Variable Virtues. In *Daedalus* 133 (4), pp. 55–66. Available online at <http://www.jstor.org/stable/20027945>.

Harvard T.H. Chan School of Public Health: Superfoods or Superhype? Available online at <https://www.hsph.harvard.edu/nutritionsource/superfoods/>, checked on August, 18th, 2024.

Hassauer, Christine; Roosen, Jutta (2020): Toward a conceptual framework for food safety criteria: Analyzing evidence practices using the case of plant protection products. In *Safety Science* 127, Article 104683, pp. 1–17. DOI: 10.1016/j.ssci.2020.104683.

He, Chenyi; Shi, Lijia; Gao, Zhifeng; House, Lisa (2020): The impact of customer ratings on consumer choice of fresh produce: A stated preference experiment approach. In *Canadian J Agri Economics* 68 (3), pp. 359–373. DOI: 10.1111/cjag.12222.

Health Canada (2019a): Canada's food guide - Canada's Dietary Guidelines. for Health Professionals and Policy Makers. Ottawa. Available online at <https://food-guide.canada.ca/en/guidelines/>, checked on August, 18th, 2024.

Health Canada (2019b): Canada's food guide - Healthy eating recommendations. Ottawa. Available online at <https://food-guide.canada.ca/en/healthy-eating-recommendations/>, checked on August, 18th, 2024.

Hearty, A. P.; McCarthy, S. N.; Kearney, J. M.; Gibney, M. J. (2007): Relationship between attitudes towards healthy eating and dietary behaviour, lifestyle and demographic factors in a representative sample of Irish adults. In *Appetite* 48 (1), pp. 1–11. DOI: 10.1016/j.appet.2006.03.329.

Heukelom, Floris (2014): Behavioral Economics: A History. New York: Cambridge University Press (Historical Perspectives on Modern Economics).

Hole, Arne Risa (2007): Fitting mixed logit models by using maximum simulated likelihood. In *The Stata Journal* 7 (3), pp. 388–401. DOI: 10.1177/1536867X0700700306.

House, Lisa; Lusk, Jayson; Jaeger, Sara; Traill, W. Bruce; Moore, Melissa; Valli, Carlotta et al. (2004): Objective and Subjective Knowledge: Impacts on Consumer Demand for Genetically Modified Foods in the United States and the European Union. In *AgBioForum* 7 (3), pp. 113–123.

International Agency for Research on Cancer (IARC), World Health Organization (2018): Red Meat and Processed Meat. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Lyon: International Agency for Research on Cancer (IARC).

International Agency for Research on Cancer (IARC), World Health Organization (WHO) (October, 26th, 2015): IARC Monographs evaluate consumption of red meat and processed meat. Lyon. Available online at <https://www.emro.who.int/noncommunicable-diseases/highlights/red-and-processed-meats-cause-cancer.html>, checked on August, 18th, 2024.

International Agency for Research on Cancer (IARC), World Health Organization (WHO) (2018): Q&A on the carcinogenicity of the consumption of red meat and processed meat.

Lyon. Available online at https://www.iarc.who.int/wp-content/uploads/2018/11/Monographs-QA_Vol114.pdf, checked on August, 18th, 2024.

International Labour Organization; Free Walk; International Organization for Migration (2022): Global estimates of modern slavery. Forced labour and forced marriage. Geneva: International Labour Office.

International Labour Organization; United Nations Children's Fund (2021): Child labour. Global estimates 2020, trends and the road forward. New York: International Labour Organization (ILO) and United Nations Children's Fund (UNICEF).

Jaeger, Sara R.; Rose, John M. (2008): Stated choice experimentation, contextual influences and food choice: A case study. In *Food Quality and Preference* 19 (6), pp. 539–564. DOI: 10.1016/j.foodqual.2008.02.005.

Jeruszka-Bielak, Marta; Kollajtis-Dolowy, Anna; Santoro, Aurelia; Ostan, Rita; Berendsen, Agnes A. M.; Jennings, Amy et al. (2018): Are Nutrition-Related Knowledge and Attitudes Reflected in Lifestyle and Health Among Elderly People? A Study Across Five European Countries. In *Frontiers in physiology* 9, Article 994, pp. 1–13. DOI: 10.3389/fphys.2018.00994.

Jones, Thomas M. (1991): Ethical Decision Making by Individuals in Organizations: An Issue-Contingent Model. In *Academy of Management Review* 16 (2), pp. 366–395. DOI: 10.2307/258867.

Jonge, Janneke de; van der Lans, Ivo A.; van Trijp, Hans C.M. (2015): Different shades of grey: Compromise products to encourage animal friendly consumption. In *Food Quality and Preference* 45, pp. 87–99. DOI: 10.1016/j.foodqual.2015.06.001.

Jonge, Janneke de; van Trijp, Hans (2014): Heterogeneity in consumer perceptions of the animal friendliness of broiler production systems. In *Food Policy* 49, pp. 174–185. DOI: 10.1016/j.foodpol.2014.07.008.

Jonge, Janneke de; van Trijp, Hans C. M. (2013): The impact of broiler production system practices on consumer perceptions of animal welfare. In *Poultry science* 92 (12), pp. 3080–3095. DOI: 10.3382/ps.2013-03334.

Jukola, Saana (2019): On the evidentiary standards for nutrition advice. In *Studies in history and philosophy of biological and biomedical sciences* 73, pp. 1–9. DOI: 10.1016/j.shpsc.2018.05.007.

Julia, Chantal; Hercberg, Serge (2017): Nutri-Score: Evidence of the effectiveness of the French front-of-pack nutrition label. In *Ernaehrungs Umschau international* 12. DOI: 10.4455/eu.2017.048.

Kahneman, Daniel; Tversky, Amos (1979): Prospect Theory: An Analysis of Decision under Risk. In *Econometrica* 47 (2), pp. 263–292. DOI: 10.2307/1914185.

Katona, George (1953): Rational behavior and economic behavior. In *Psychological Review* 60 (5), pp. 307–318. DOI: 10.1037/h0060640.

Katz, D. L.; Karlsen, M. C.; Chung, M.; Shams-White, M. M.; Green, L. W.; Fielding, J. et al. (2019): Hierarchies of evidence applied to lifestyle Medicine (HEALM): introduction of a strength-of-evidence approach based on a methodological systematic review. In *BMC medical research methodology* 19, Article 178. DOI: 10.1186/s12874-019-0811-z.

- Kearney, J. M.; Gibney, M. J.; Livingstone, B. E.; Robson, P. J.; Kiely, M.; Harrington, K. (2001): Attitudes towards and beliefs about nutrition and health among a random sample of adults in the Republic of Ireland and Northern Ireland. In *Public health nutrition* 4 (5A), pp. 1117–1126. DOI: 10.1079/phn2001193.
- Kemper, Nathan P.; Popp, Jennie S.; Nayga, Rodolfo M.; Kerr, J. Brinck (2018): Cultural worldview and genetically modified food policy preferences. In *Food Policy* 80, pp. 68–83. DOI: 10.1016/j.foodpol.2018.09.003.
- Koch, Franziska; Hoffmann, Ingrid; Claupein, Erika (2021): Types of Nutrition Knowledge, Their Socio-Demographic Determinants and Their Association With Food Consumption: Results of the NEMONIT Study. In *Frontiers in Nutrition* 8, p. 630014. DOI: 10.3389/fnut.2021.630014.
- Kohlberg, Lawrence (1969): Stage and sequence: The cognitive-developmental approach to socialization. In David A. Goslin (Ed.): *Handbook of socialization theory and research*. Chicago: Rand McNally, pp. 347–480.
- Kohlberg, Lawrence; Levine, Charles; Hwer, Alexandra (Eds.) (1983): *Moral Stages: A Current Formulation and a Response to Critics*. Basel, New York: Karger (Contributions to human development, 10).
- Ladher, Navjoyt (2016): Nutrition science in the media: you are what you read. In *BMJ (Clinical research ed.)* 353, i1879. DOI: 10.1136/bmj.i1879.
- Lancaster, Kelvin J. (1966): A New Approach to Consumer Theory. In *Journal of Political Economy* 74 (2), pp. 132–157.
- Lee, Jennifer J.; Ahmed, Mavra; Julia, Chantal; Ng, Alena Praneet; Paper, Laura; Lou, Wendy Y.; L'Abbé, Mary R. (2023): Examining the diet quality of Canadian adults and the alignment of Canadian front-of-pack labelling regulations with other front-of-pack labelling systems and dietary guidelines. In *Frontiers in public health* 11, p. 1168745. DOI: 10.3389/fpubh.2023.1168745.
- Light, Nicholas; Fernbach, Philip M.; Rabb, Nathaniel; Geana, Mugur V.; Sloman, Steven A. (2022): Knowledge overconfidence is associated with anti-consensus views on controversial scientific issues. In *Science Advances* 8 (29), Article eabo0038. DOI: 10.1126/sciadv.abo0038.
- Loftsgard, Tia (2023): Canada. In Helga Willer, Bernhard Schlatter, Jan Trávníček (Eds.): *The World of Organic Agriculture Statistics and Emerging Trends 2023*. Frick and Bonn: Research Institute of Organic Agriculture and FiBL, pp. 299–301.
- Lusk, Jayson L.; Roosen, Jutta; Bieberstein, Andrea (2014): Consumer Acceptance of New Food Technologies: Causes and Roots of Controversies. In *Annu. Rev. Resour. Econ.* 6 (1), pp. 381–405. DOI: 10.1146/annurev-resource-100913-012735.
- Ma, Zheng Feei; Zhang, Hongxia; Teh, Sue Siang; Wang, Chee Woon; Zhang, Yutong; Hayford, Frank et al. (2019): Goji Berries as a Potential Natural Antioxidant Medicine: An Insight into Their Molecular Mechanisms of Action. In *Oxidative medicine and cellular longevity*, Article 437397, pp. 1–9. DOI: 10.1155/2019/2437397.

- MacGregor, Casimir; Petersen, Alan; Parker, Christine (2021): Promoting a healthier, younger you: The media marketing of anti-ageing superfoods. In *Journal of Consumer Culture* 21 (2), pp. 164–179. DOI: 10.1177/1469540518773825.
- Magrach, Ainhoa; Sanz, María José (2020): Environmental and social consequences of the increase in the demand for ‘superfoods’ world-wide. In *People and Nature* 2 (2), pp. 267–278. DOI: 10.1002/pan3.10085.
- Mäkineniemi, Jaana-Piia; Pirttilä-Backman, Anna-Maija; Pieri, Michelle (2013): The Endorsement of the Moral Foundations in Food-Related Moral Thinking in Three European Countries. In *J Agric Environ Ethics* 26 (4), pp. 771–786. DOI: 10.1007/s10806-012-9401-3.
- Mäkineniemi, Jaana-Piia; Vainio, Annukka (2013): Moral intensity and climate-friendly food choices. In *Appetite* 65, pp. 54–61. DOI: 10.1016/j.appet.2013.01.026.
- Mandler, Michael (1999): Introduction: The Transformation of Economic Theory. In Michael Mandler (Ed.): *Dilemmas in Economic Theory: Persisting Foundational Problems of Microeconomics*. 1st. United Kingdom: Oxford University Press, pp. 3–15.
- Matrajt, Laura; Leung, Tiffany (2020): Evaluating the Effectiveness of Social Distancing Interventions to Delay or Flatten the Epidemic Curve of Coronavirus Disease. In *Emerging infectious diseases* 26 (8), pp. 1740–1748. DOI: 10.3201/eid2608.201093.
- Mayo Clinic Staff (2023): How well do face masks protect against COVID-19? Available online at <https://www.mayoclinic.org/diseases-conditions/coronavirus/in-depth/coronavirus-mask/art-20485449>, checked on August, 18th, 2024.
- Mc Fadden, Daniel (1974): Conditional logit analysis of qualitative choice behavior. In Paul Zarembka (Ed.): *Frontiers in econometrics*. New York: Academic Press, pp. 105–142.
- McGinnis, J. Micheal; Nestle, Marion (1989): The Surgeon General's Report on Nutrition and Health: policy implications and implementation strategies. In *The American journal of clinical nutrition* 49 (1), pp. 23–28. DOI: 10.1093/ajcn/49.1.23.
- McMahon, Joan M.; Harvey, Robert J. (2006): An Analysis of the Factor Structure of Jones' Moral Intensity Construct. In *Journal of Business Ethics* 64, pp. 381–404. DOI: 10.1007/s10551-006-0006-5.
- Meemken, Eva-Marie; Sellare, Jorge; Kouame, Christophe N.; Qaim, Martin (2019): Effects of Fairtrade on the livelihoods of poor rural workers. In *Nature Sustainability* 2, pp. 635–642. DOI: 10.1038/s41893-019-0311-5.
- Mintel Press Office (2016): Super growth for “super” foods: New product development shoots up 202% globally over the past five years. Available online at <https://www.mintel.com/press-centre/super-growth-for-super-foods-new-product-development-shoots-up-202-globally-over-the-past-five-years/>, checked on August, 18th, 2024.
- Minton, Elizabeth A.; Johnson, Kathryn A.; Liu, Richie L. (2019): Religiosity and special food consumption: The explanatory effects of moral priorities. In *Journal of Business Research* 95, pp. 442–454. DOI: 10.1016/j.jbusres.2018.07.041.
- Misra, Ranjita (2007): Knowledge, attitudes, and label use among college students. In *Journal of the American Dietetic Association* 107 (12), pp. 2130–2134. DOI: 10.1016/j.jada.2007.09.001.

Mozaffarian, Dariush; Rosenberg, Irwin; Uauy, Ricardo (2018): History of modern nutrition science—implications for current research, dietary guidelines, and food policy. In *BMJ (Clinical research ed.)* 361, Article k2392, 1-6. DOI: 10.1136/bmj.k2392.

National Center for Complementary and Integrative Health (NCCIH), National Institutes of Health (NIH), U.S. Department of Health & Human Services (2021): Homeopathy: What You Need To Know. Available online at <http://www.nccih.nih.gov/health/homeopathy>, checked on August, 18th, 2024.

National Health and Medical Research Council (2015): NHMRC Information Paper: Evidence on the effectiveness of homeopathy for treating health conditions. Canberra: Australian Government- National Health and Medical Research Council. Available online at <https://www.nhmrc.gov.au/about-us/resources/homeopathy#block-views-block-file-attachments-content-block-1>, checked on August, 18th, 2024.

Nestle, Marion (2020): Conflicts of Interests in Food and Nutrition Research. In Alan M. Goldberg, Cara Wychgram (Eds.): *Feeding the World Well. A Framework for Ethical Food Systems*. Baltimore: John Hopkins University Press, pp. 89–97.

Ng, Jeanette; White, Gregory P.; Lee, Alina; Moneta, Andreas (2009): Design and Validation of a Novel New Instrument for Measuring the Effect of Moral Intensity on Accountants' Propensity to Manage Earnings. In *J Bus Ethics* 84 (3), pp. 367–387. DOI: 10.1007/s10551-008-9714-3.

Oreskes, Naomi (2019): *Why Trust Science?* Princeton: Princeton University Press.

Parmenter, Kathryn; Wardle, Jane (1999): Development of a general nutrition knowledge questionnaire for adults. In *European Journal of Clinical Nutrition* (53), pp. 298–308. DOI: 10.1038/sj.ejcn.1600726.

Pelli, Edoardo Maria; Roosen, Jutta (2023): Exploring Consumers' Interpretation of Contested Nutritional Evidence. The Relevance of the Moral Foundations Theory. In Karin Zachmann, Mariacarla Gadebusch Bondio, Saana Jukola, Olga Sparschuh (Eds.): *Evidence Contestation: Dealing with Dissent in Knowledge Societies*. New York: Routledge, pp. 281–302.

Perkins, W. Steven; Reynolds, Thomas J. (1988): The Explanatory Power of Values in Preference Judgements: Validation of the Means-End Perspective. In *Advances in Consumer Research* 15 (1), pp. 122–126.

Peters, Stephan; Verhagen, Hans (2024): Publication bias and Nutri-Score: A complete literature review of the substantiation of the effectiveness of the front-of-pack logo Nutri-Score. In *PharmaNutrition*, p. 100380. DOI: 10.1016/j.phanu.2024.100380.

Pieniak, Zuzanna; Aertsens, Joris; Verbeke, Wim (2010): Subjective and objective knowledge as determinants of organic vegetables consumption. In *Food Quality and Preference* 21 (6), pp. 581–588. DOI: 10.1016/j.foodqual.2010.03.004.

Pieniak, Zuzanna; Verbeke, Wim; Bruns, Karen; Olsen, Svein Ottar (2006): Consumer knowledge and interest in information about fish. In J.B. Luten, C. Jacobsen, K. Bekaert, A. Saebø, J. Oehlenschläger (Eds.): *Seafood research from fish to dish. Quality, safety and processing of wild and farmed seafood*. Leiden: Wageningen Academic, pp. 229–239.

Rainie, Lee; Funk, Cary; Kennedy, Brian; Anderson, Monica; Duggan, Maeve; Olmstead, Kenneth et al. (2015): *An Elaboration of AAAS Scientists' Views*. Pew Research Center.

Available online at <https://www.pewresearch.org/science/2015/07/23/an-elaboration-of-aaas-scientists-views-2/>, checked on August, 18th, 2024.

Scalvedi, Maria Luisa; Gennaro, Laura; Saba, Anna; Rossi, Laura (2021): Relationship Between Nutrition Knowledge and Dietary Intake: An Assessment Among a Sample of Italian Adults. In *Frontiers in Nutrition* 8, p. 714493. DOI: 10.3389/fnut.2021.714493.

Sellare, Jorge; Börner, Jan; Brugger, Fritz; Garrett, Rachael; Günther, Isabel; Meemken, Eva-Marie et al. (2022): Six research priorities to support corporate due-diligence policies. In *Nature* 606, pp. 861–863. DOI: 10.1038/d41586-022-01718-8.

Sharma, Shreela V.; Gernand, Alison D.; Day, R. Sue (2008): Nutrition knowledge predicts eating behavior of all food groups except fruits and vegetables among adults in the Paso del Norte region: Qué Sabrosa Vida. In *Journal of nutrition education and behavior* 40 (6), pp. 361–368. DOI: 10.1016/j.jneb.2008.01.004.

Shweder, Richard A. (1990): In Defense of Moral Realism: Reply to Gabennesch. In *Child Development* 61 (6), pp. 2060–2067. DOI: 10.2307/1130859.

Shweder, Richard A.; Much, Nancy C.; Mahapatra, Manamohan; Park, Lawrence (1997): The “Big Three” of Morality (Autonomy, Community, Divinity) and the “Big Three” Explanations of Suffering. In Allan M. Brandt, Paul Rozin (Ed.): *Morality and Health*. 1st. New York: Routledge, pp. 119–169.

Simon, A. Herbert (Ed.) (1957): *Models of Man*. New York: John Wiley.

Simon, Herbert A. (1955): A Behavioral Model of Rational Choice. In *The Quarterly Journal of Economics* 69 (1), pp. 99–118.

Singhapakdi, Anusorn; Vitell, Scott J.; Kraft, Kenneth L. (1996): Moral intensity and ethical decision-making of marketing professionals. In *Journal of Business Research* 36 (3), pp. 245–255. DOI: 10.1016/0148-2963(95)00155-7.

Smith, Adam (1759): *The Theory of Moral Sentiments*. The Glasgow Edition of the works and correspondence of Adam Smith. Edited by David D. Raphael, Alec L. Macfie. Indianapolis: Liberty Fund, Inc.

Sommaruga, Ruben; Eldridge, Honor May (2021): Avocado Production: Water Footprint and Socio-economic Implications. In *EuroChoices* 20 (2), pp. 48–53. DOI: 10.1111/1746-692X.12289.

Spronk, Inge; Kullen, Charina; Burdon, Catriona; O'Connor, Helen (2014): Relationship between nutrition knowledge and dietary intake. In *The British journal of nutrition* 111 (10), pp. 1713–1726. DOI: 10.1017/S0007114514000087.

Temmerman, Joyce de; Heeremans, Eva; Slabbinck, Hendrik; Vermeir, Iris (2021): The impact of the Nutri-Score nutrition label on perceived healthiness and purchase intentions. In *Appetite* 157, p. 104995. DOI: 10.1016/j.appet.2020.104995.

Thaler, Richard H. (1980): Toward a positive theory of consumer choice. In *Journal of Economic Behavior and Organization* 1 (1), pp. 39–60. DOI: 10.1016/0167-2681(80)90051-7.

Thaler, Richard H. (1985): Mental Accounting and Consumer Choice. In *Marketing Science* 4 (3), pp. 199–214.

- Thaler, Richard H. (2016): Behavioral Economics: Past, Present, and Future. In *American Economic Review* 106 (7), pp. 1577–1600. DOI: 10.1257/aer.106.7.1577.
- The Nobel Prize in Physics (2011). Available online at <https://www.nobelprize.org/prizes/physics/2011/press-release/>, checked on August, 18th, 2024.
- Trávníček, Jan; Schlatter, Bernhard; Dietemann, Lauren; Helga; Willer (2023): The World of Organic Agriculture 2023: Summary. In Helga Willer, Bernhard Schlatter, Jan Trávníček (Eds.): *The World of Organic Agriculture Statistics and Emerging Trends 2023*. Frick and Bonn: Research Institute of Organic Agriculture and FiBL, pp. 20–29.
- Turiel, Elliot (1983): *The development of social knowledge: Morality and convention*. Cambridge, England: Cambridge University Press.
- Tversky, Amos; Kahneman, Daniel (1974): Judgment under Uncertainty: Heuristics and Biases. In *Science* 185 (4157), pp. 1124–1131. DOI: 10.1126/science.185.4157.1124.
- U.S. Department of Health, Education and Welfare. Public Health Service. Office of the Assistant Secretary for Health and Surgeon General (1979): *Healthy People. The Surgeon General's Report on Health Promotion and Disease Prevention*. U.S. Government Printing Office. Washington DC.
- U.S. Senate. Select Committee on Nutrition and Human Needs (1977): *Dietary goals for the United States*. U.S. Government Printing Office. Washington DC.
- Vainio, Annukka; Mäkinen, Jaana-Piia (2016a): How Are Moral Foundations Associated with Climate-Friendly Consumption? In *J Agric Environ Ethics* 29 (2), pp. 265–283. DOI: 10.1007/s10806-016-9601-3.
- Vainio, Annukka; Mäkinen, Jaana-Piia (2016b): How Are Moral Foundations Associated with Climate-Friendly Consumption? In *J Agric Environ Ethics* 29 (2), pp. 265–283. DOI: 10.1007/s10806-016-9601-3.
- van Leeuwen, Theo (2007): Legitimation in discourse and communication. In *Discourse & Communication* 1 (1), p. 97. DOI: 10.1177/1750481307071986.
- van Loo, Ellen J.; Caputo, Vincenzina; Nayga, Rodolfo M.; Meullenet, Jean-Francois; Ricke, Steven C. (2011): Consumers' willingness to pay for organic chicken breast: Evidence from choice experiment. In *Food Quality and Preference* 22 (7), pp. 603–613. DOI: 10.1016/j.foodqual.2011.02.003.
- Verbeke, Wim (2008): Impact of communication on consumers' food choices. In *Proceedings of the Nutrition Society* 67 (3), pp. 281–288. DOI: 10.1017/S0029665108007179.
- Wardle, Jane; Parmenter, Kathryn; Waller, Jo (2000): Nutrition knowledge and food intake. In *Appetite* 34 (3), pp. 269–275. DOI: 10.1006/appe.1999.0311.
- Watkins, Leah; Aitken, Robert; Mather, Damien (2016a): Conscientious consumers: a relationship between moral foundations, political orientation and sustainable consumption. In *Journal of Cleaner Production* 134, pp. 137–146. DOI: 10.1016/j.jclepro.2015.06.009.
- Watkins, Leah; Aitken, Robert; Mather, Damien (2016b): Conscientious consumers: a relationship between moral foundations, political orientation and sustainable consumption. In *Journal of Cleaner Production* 134, pp. 137–146. DOI: 10.1016/j.jclepro.2015.06.009.

- Wheeler, Gregory (2020): Bounded Rationality. In Edward N. Zalta (Ed.): The Stanford Encyclopedia of Philosophy. Stanford: Metaphysics Research Lab, Stanford University.
- Wilks, Matti; Crimston, Charlie R.; Hornsey, Matthew J. (2024): Meat and morality: The moral foundation of purity, but not harm, predicts attitudes toward cultured meat. In *Appetite* 197, Article 107297. DOI: 10.1016/j.appet.2024.107297.
- Willer, Helga; Schlatter, Bernhard; Trávníček, Jan; Schaack, Diana (2023): Organic Farming and Market Development in Europe and the European Union. In Helga Willer, Bernhard Schlatter, Jan Trávníček (Eds.): *The World of Organic Agriculture Statistics and Emerging Trends 2023*. Frick and Bonn: Research Institute of Organic Agriculture and FiBL, pp. 235–264.
- World Cancer Research Fund (WCRF)/ American Institute for Cancer Research (2018): Continuous Update Project Expert Report. Meat, fish and dairy products and the risk of cancer. Available online at <https://www.wcrf.org/diet-activity-and-cancer/risk-factors/meat-fish-dairy-and-cancer-risk/>, checked on August, 18th, 2024.
- World Health Organization (2023): Red and processed meat in the context of health and the environment: many shades of red and green. Geneva. Available online at <https://www.who.int/publications/i/item/9789240074828>, checked on August, 18th, 2024.
- Zachmann, Karin; Jukola, Saana; Sparschuh, Olga; Bondio, Mariacarla Gadebusch (2023): Introduction: Evidence Critique and Contestation as a Challenge in Academia and Society. In Mariacarla Gadebusch Bondio, Karin Zachmann, Saana Jukola, Olga Sparschuh (Eds.): *Evidence Contestation: Dealing with Dissent in Knowledge Societies*. New York: Routledge, pp. 1–29.