TECHNISCHE UNIVERSITÄT MÜNCHEN

TUM School of Management

Sustainable consumption: Three empirical studies on consumer decision-making

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

Vorsitz: Prof. Dr. Hanna Hottenrott

Prüfende der Dissertation:

1. Prof. Dr. Alwine Mohnen
2. Prof. Dr. Isabell M. Welpe

Die Dissertation wurde am 10.11.2023 bei der Technischen Universität München eingereicht und durch die TUM School of Management am 15.03.2024 angenommen.

Acknowledgements

The first memorable moment at the chair was when I met my later mentor Prof. Dr. Andreas Ostermaier in his office, and we had a short conversation about research and life at the Chair of Corporate Management. It was this very warm and supportive feeling that I had during this conversation and all the ones that followed with the rest of the team that made me very sure that this was exactly the team and the place where I wanted to start this doctoral journey. It was also precisely this team that always supported me and helped me find my way, even in phases when I hardly knew which direction to take. Especially Nevena, Martina, Hanna, Andreas, thank you for all your support, for the moments when we were laughing about our everyday highlights and lowlights, and especially for helping me to regain my motivation and self-confidence when I felt lost. Karina, Katharina, you have been fantastic colleagues and next door office mates, as has the entire Chair of Corporate Management team, including our secretaries Renate, Tzepei and Ania. Renate, also for your support during my job search, (literature) recommendations and advice on various topics - thank you!

I would like to express my deepest gratitude to my supervisor, Prof. Dr. Alwine Mohnen, for giving me the opportunity, freedom, and confidence to find my way and my research topic, and for guiding and supporting me through all stages of this dissertation with her patience, experience and knowledge. Dear Alwine, in our first conversation you said that you especially love to see doctoral students at the beginning of their doctoral journey, to accompany them on their way and to see their progress until they leave the chair as truly resilient adults, prepared with quite a comprehensive toolkit for whatever challenges may come their way. Thank you for giving me the opportunity to add so many skills to my toolbox, it is a gift I can build on for the rest of my life.

I would also like to thank Prof. Dr. Isabell M Welpe for serving as my second examiner and Prof. Dr. Hanna Hottenrott for chairing my dissertation committee.

To all the students and student assistants I have had the pleasure of working with, and especially to those I have had the privilege of assisting with their final theses, thank you for your trust and the time we spent working on your topics and projects. I have learned a lot from you.

From the TUM community, I would particularly like to thank Dr. Sabrina Eisele, who was a great help to me during my job application phase by helping me to connect with the TUM network and putting me in touch with my mentor, Gerald Bürkle. Dear Gerald, without you I would have been much less optimistic about this job search challenge, thank you for calming me down when I started to panic.

Ela, Iudita, Tommi, Kathrin, Katrin, Heike and Riccardo, thank you for accompanying me on this journey with so much perseverance as friends.

Nicole, thank you for making my new life in Landshut feel like home.

Julia, thank you so much for your friendship, your motivation, support and encouragement whenever I needed it, no matter what time of day and no matter how weird the idea.

Finally, my deepest and most sincere thanks go to my family - I could never have undertaken this journey without your unconditional support. Alexander, Raphaela, for everything we have gone through as siblings during this time, knowing that we have each other, no matter how big the challenge, is a fact that means everything to me.

Liebe Mama, lieber Papa, danke, dass Ihr mir diesen Weg ermöglicht habt, mich auf diesem Weg so unerschütterlich begleitet habt und bis heute immer da seid, wenn ich alleine nicht weiterkomme. Lieber Papa, Du hast uns als Kinder immer ermutigt, das zu tun, was uns am meisten Freude bereitet. Das größte Dankeschön dafür, dass wir mit dieser Freiheit und der Gewissheit eures Rückhalts unseren Weg gehen dürfen.

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List of abbreviations

BMEL	Bundesministerium für Ernährung und Landwirtschaft (Federal Ministry of Food and Agriculture)
BMUV (until 2021 BMU)	Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz (Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection)
BMWi	Bundesministerium für Wirtschaft und Energie (Federal Ministry for Economic Affairs and Energy)
BReg	Die Bundesregierung (The Federal Government)
CBC	Choice-based Conjoint
EC	European Commission
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
IRI	Information Resources GmbH
GfK	Gesellschaft für Konsumforschung
GHG	Greenhouse Gas
IIA	Independence of Irrelevant Alternatives
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
MNL	Multinomial Logit
NFC	Near Field Communication
OECD	Organisation for Economic Co-operation and Development

OLS	Ordinary Least Squares
PDO	Protected Designation of Origin
PGI	Protected Geographical Indication
QR	Quick Response
RPL	Random Parameter Logit
RUT	Random Utility Theory
SAPEA	Science Advice for Policy by European Academies
SDG	Sustainable Development Goal
WTP	Willingness-to-pay
UN	United Nations
ZOIB	Zero-One-Inflated Beta

Abstract

This dissertation consists of three essays that use three empirical studies to contribute to the scientific literature on sustainable consumer behavior. Each of these essays addresses a sub-goal of Sustainable Development Goal 12, responsible consumption and production. Essay I looks at food traceability from a consumer perspective. The results show that consumers who have no contact with farmers in particular perceive a food traceability system as beneficial, as do consumers who frequently buy local food. The second essay explores to what extent consumers value increased transparency for food of local origin and which information channels shape consumers' views on food production. Finally, essay III examines whether highlighting the local origin of a suboptimal food product can serve as a valuable complementary strategy to increase consumers' willingness to purchase suboptimal local food products and thus contribute to reducing food waste at retailers. A better understanding of how consumers make their food choices and the factors that influence them in their decision-making is essential to progress towards a responsibly consuming and producing society.

Kurzfassung (German abstract)

Die vorliegende Dissertation besteht aus drei Essays, die anhand von drei empirischen Studien einen Beitrag zur wissenschaftlichen Literatur über nachhaltiges Konsumentenverhalten leisten. Essay I beschäftigt sich mit der Rückverfolgbarkeit von Lebensmitteln aus Konsumentensicht. Die Ergebnisse zeigen, dass insbesondere Verbraucher, die keinen Kontakt zu Landwirten haben, ein System zur Rückverfolgbarkeit von Lebensmitteln als nützlich empfinden, ebenso wie Verbraucher, die häufig regionale Lebensmittel kaufen. Der zweite Essay geht der Frage nach, inwiefern Konsumenten bei Lebensmitteln regionaler Herkunft eine erhöhte Transparenz hinsichtlich der Herkunftsangabe schätzen und welche Informationskanäle die Sichtweise von Verbrauchern auf die Lebensmittelproduktion prägen. Zuletzt untersucht Essay III, inwieweit die Hervorhebung der regionalen Herkunft eines suboptimalen Lebensmittelprodukts als sinnvolle ergänzende Strategie dienen kann, um die Bereitschaft zum Kauf suboptimaler lokaler Lebensmittelprodukte zu erhöhen und somit zur Reduzierung der Lebensmittelverschwendung im Einzelhandel beizutragen. Ein besseres Verständnis dafür, wie Verbraucher ihre Entscheidungen treffen und welche Faktoren ihr Entscheidungsverhalten beeinflussen ist essenziell, um auf dem Weg zu einer verantwortungsvoll konsumierenden und produzierenden Gesellschaft voranzukommen.

1 Introduction

1.1 Striving for sustainability: Behavioral economics insights as guiding principles

"Agenda 2030 can only be accomplished if we understand the habits and behaviors that prevent our societies from fully achieving sustainable development."
(UNEP - UN Environment Programme, 2017)

The resilience of our planet is limited. If we want to continue living well and enable future generations to do so, we urgently need to change our consumption and production techniques. This applies in particular to our private lifestyle, hence, our personal consumption behavior (The Federal Government [BReg], 2019b). There is also great agreement on this at the international level, which is formally expressed with the adoption of the Sustainable Development Goals (SDGs). This dissertation is about one of these goals - responsible consumption and production.

SDG 12, the goal of responsible consumption and production is one of the 17 global SDGs that the 193 member states of the United Nations (UN), in their role as international community, agreed upon with the adoption of the 2030 Agenda for Sustainable Development in 2015. It is based on the ten-year framework on sustainable consumption and production patterns adopted at the World Summit in Rio de Janeiro back in 2012 (BReg, 2019b; United Nations [UN], n.d.).

According to the German Federal Government (BReg, 2019b, 2021b), important sub-goals of SDG 12 include:

- Achieve sustainable management and efficient use of natural resources by 2030
- Halving food waste by 2030

- Encourage companies to produce more sustainably and to include sustainability disclosures in their reporting
- Raising consumers' awareness of sustainable consumption and providing relevant information to them
- Introducing sustainable practices in public procurement

Sustainable consumption and sustainable production are thus "two sides of the same coin" (BReg, 2021b). However, transforming our way of living towards sustainable lifestyle is one of the biggest, probably even the most critical challenge we are facing and where we urgently must make progress in the upcoming years.

Within the European Union (EU) the political framework to address this challenge is the European Green Deal. The framework has the ambitious goal of transforming the EU into an innovative, resource-efficient and competitive economy (European Commission [EC], n. d.–a).

Regarding this dissertation's focus on sustainable food consumption the European Green Deal declares not less than making European food "the global standard for sustainability" (Riccaboni et al., 2021, p. 102). This goal shall be achieved based on an integrated approach covering all aspects of the food supply chain (Riccaboni et al., 2021), from farm to fork. Accordingly, this approach is called farm-to-fork strategy. Addressing comprehensively the challenges associated with sustainable food systems, the farm-to-fork strategy takes into account the complex network in which the healthiness of people, societies, and the planet are interconnected. For the European Commission (EC) it is an integral part to achieve the UN SDGs (EC, 2021).

In this dissertation, essay I and II address the farm-to-fork strategy's aim of promoting sustainable food consumption and facilitating the shift to healthy, sustainable diets (EC, n. d.–b). Both studies focus on increased transparency and traceability of food products, which is consistent with the strategy's goal of providing consumers with more and more transparent information about food products (EC, n. d.–b). In contrast, essay III with its topic of preventing local food waste can be classified under the food waste prevention pillar of the farm-to-fork strategy (EC, n. d.–b).

The policy frameworks outlined above serve as guidelines for the shift toward greater sustainability in all our actions. However, to surmount this challenge, it is essential to understand human behavior and to identify and address the main factors that influence people's consumption and decision-making. This is because only by understanding how people make decisions and what factors influence their decision-making process, we can identify the most crucial, impactful points where changing the prevailing status quo will have the greatest leverage to make our consumption and production techniques more sustainable. Yet, understanding human behavior requires insights from various field of research, therefore, an interdisciplinary approach is paramount (D. Enste & Potthoff, 2021).

One area of research that contributes to a better understanding of human behavior is behavioral economics, since its main interest is precisely to understand human decision-making. Therefore it uses elements of economics and combines them with insights from psychology, neuroscience, and sociology (Lavecchia et al., 2016). Consequently, unlike neoclassical economists who base their analyses on the "homo economicus", behavioral economists assume a "homo heuristicus" (D. Enste & Potthoff, 2021). In fact, research from behavioral scholars like Kahneman and Tversky (1979; 1974, 1981) has shown that human behavior and decision-making often deviate substantially from the assumptions on which the homo economicus is based on and are rather influenced by heuristics and cognitive biases (D. Enste & Potthoff, 2021). Today, the literature knows plenty of examples where individuals do not decide entirely rationally and do not exclusively act based on their self-interested utility maximization. Instead, what can be observed are individuals who are guided by emotions in their decision-making and make mistakes in information intake or processing; hence, they are far from the kind of bias free person envisioned by neoclassical scholars (D. Enste & Potthoff, 2021). Still, although using heuristics can lead to biased judgments and decisions, deviating from what would objectively be considered optimal, heuristics are still valuable.

Heuristics are beneficial because they help reduce complexity in decision-making and avoid mental overload (Beck, 2014, pp. 25–100). People are using them because their cognitive skills, their capacity to absorb and process information, is limited (D. Enste & Potthoff, 2021; Simon, 1982). In particular if individuals decide on low-involvement goods, such a food products, applying mental shortcuts and rules of thumb is very

common (Beatty & Smith, 1987; S. Chen & Chaiken, 1999; Holmes et al., 2013; Tanner et al., 2019; Verbeke, 2005; Verbeke & Ward, 2006) as they help consumers to decide quickly, without spending too much time on researching and analyzing product information (D. Enste & Potthoff, 2021). However, based on this knowledge of the decision-making process and the associated biases, it is also possible to use insights from behavioral economics to identify approaches to improve this process (Wellbrock & Ludin, 2021). In the context of this dissertation, this means that behavioral economics can provide empirical evidence on when and under which conditions individuals feel encouraged to behave sustainably and consume responsibly, but also which factors hinder acting sustainably.

In short, the insights of the behavioral economics literature, which are complemented by the three essays in this dissertation, are so valuable because they empirically show promising paths to more responsible consumption and production behavior, but they also identify some dead ends. Consequently, applying insights of behavioral economics in policy as complementary interventions, together with classical political steering instruments such as laws and regulations, can help to "ensure that policies reflect real needs and behaviors for greater impact and effectiveness" (OECD, 2019, p. 3).

- How can people be encouraged to consume more responsibly?
- What is the best message to motivate consumers to buy suboptimal local food in supermarkets?
- Is there a better way to promote suboptimal local food than highlighting price discounts?
- How can retailers, food manufacturers, and policymakers meet consumers' increasing need for information about food products?
- How great and how substantial is consumers' need for information about (local) food products?
- Of what importance is the traceability of (local) food products to consumers?

This dissertation will respond to these questions in three different essays and give suggestions and recommendations on how behavioral economics concepts such as

framing, signaling, cue utilization, and principal-agent theory can be leveraged to promote responsible consumption and environmentally conscious decision-making. In this way, it aims to stimulate and provide input to the current discussion on how to improve current food consumption policies and retail practices, ultimately contributing to the achievement of SDG 12.

Why this dissertation focuses on food and the consumer perspective

There are several reasons why this dissertation's focus is on food. Firstly, according to a recent study by Crippa et al. (2021) in 2015, food-systems emissions amounted 18 Gt CO_2 equivalent per year globally, making up 34% (range 25% to 42%, 95% confidence interval) of total greenhouse gas (GHG) emissions. Moreover, agricultural activities consume roughly 70% of the global freshwater. With regard to Europe, households are responsible for nearly 20% of total CO_2 emissions, with food consumption being among the biggest sources contributing to these 20%[1] (Gwozdz et al., 2020; Kalbar et al., 2016; Steen-Olsen & Hertwich, 2015). Thus, changing food consumption patterns can substantially help reducing private households CO_2 emissions (Gwozdz et al., 2020). Finally, since the world population will continue to grow in the coming decades, it is projected that demand for food will rise by 50% until 2050. This increase will have a significant impact on the environment and biodiversity as well as on GHG emissions (Intergovernmental Panel on Climate Change [IPCC], 2019; Science Advice for Policy by European Academies [SAPEA], 2021). In other words, according to the projection by Clark et al. (2020), it is very likely that food-related emissions alone will cause our planet to exceed the 1.5 degree Celsius limit, as agreed upon in the Paris Agreement, in 30 to 40 years (Fountain, 2020; updated 2021, October 26).[2] In consequence, given the urgency of

1 Other big sources contributing to these 20% of total CO2 emissions are personal transport, thermal energy use, electricity, housing as well as consumption of other goods and services (Gwozdz et al., 2020).

2 This forecast is based on the assumption of an increasing world population with changing diets and consumption patterns due some countries increasing prosperity (Fountain, 2020; updated 2021, October 26).

the problem, the far-reaching importance of food consumption to human well-being, and the strong impacts on natural resources and the environment, food consumption and how to rapidly transform current unsustainable food practices is an area of major interest (Futtrup et al., 2021).

Regarding the different food system actors, the dissertation focuses on consumers in the decision-making phase while food-shopping. This is because first of all consumers decisions strongly influence retailers' decisions and in consequence the food product offer and business practices of all other food practitioners (Giménez et al., 2021). Second, so far sustainability considerations are primarily pushed by consumers in the food system, making them the main drivers of behavioral change towards a world consuming and producing more responsibly (Asioli et al., 2020).

1.2 Theoretical framework

This dissertation uses as theoretical foundation agency theory, signaling and cue utilization theory as well as framing theory. Although distinct theories, they have in common that they examine how individuals make decisions and how information and the way that information is presented influence these decisions. A consumer's choice of a food product is one of these decision-making situations.

This section provides an overview on the literature related to the essays presented in this dissertation. Starting with agency theory, it is shown how the first two studies are embedded in this strand of the scientific literature followed by giving a summary of the signaling and cue utilization theory. Afterwards, the framing strategy and especially the attribute framing approach are outlined, as they form the theoretical basis of the third essay in this dissertation.

1.2.1 Agency theory

1.2.1.1 Why agency theory

The reason why principal-agency theory is explained as first theoretical framework in this chapter is that all three essays of this dissertation are taking as starting point for the motivation of the respective research questions the problem of information asymmetry that exists between food consumers and retailers, respectively food producers. Information asymmetry is at the core of principal-agent theory. In the food retailing context, most often consumers are ascribed the role of principals, and retailers or producers the role of the agent (Eisenhardt, 1989). Meaning, consumers delegate the responsibility for product delivery to retailers or food producers. As only the agents, i.e., retailers and producers, know the true quality of a food product, information asymmetry arises between the two parties. This information imbalance between these two parties is also known as principal-agent problem.

Essays I and II of this dissertation draw, albeit indirectly, on the concept of agency theory by addressing the prevailing information asymmetry between consumers and food producers. The focus of both essays is to assess the extent to which granting consumers (digital) access to more food product information can mitigate information asymmetry, and thus, in perspective, address the challenges associated with the consumer-producer relationship caused by growing alienation. Moreover, essay II examines the perceived value of providing additional information about food products as a means of reducing information asymmetry by consumers.

1.2.1.2 Principles of agency theory

The origins of agency theory go back to the 1960s and early 1970s when economists were strongly engaged in researching risk sharing among individuals or groups (Eisenhardt, 1989; Hakansson & Arrow, 1972; R. Wilson, 1968). According to these scholars, the risk

sharing problem occurs when the cooperating parties have different attitudes toward risk (Eisenhardt, 1989).

Agency theory extended the risk sharing literature by the agency problem which arises when the goals of cooperating parties differ and whenever one party (the principal) depends on another party (the agent) to undertake some action on the principal's behalf (Bergen et al., 1992; Eisenhardt, 1989; M. C. Jensen & Meckling, 1976), hence, when there is to some degree uncertainty involved (Pavlou et al., 2007). Only shortly after its original formulation, the principal-agent theory was also extended to markets of imperfect information (Akerlof, 1970; Rothschild & Stiglitz, 1976; Michael Spence, 1973). In order to describe the underlying relationship, the theory usually uses the metaphor of a mutually agreed upon contract (Eisenhardt, 1989; M. C. Jensen & Meckling, 1976) and employment relationships as the typical example to illustrate the two problems agency theory is concerned with: adverse selection and moral hazard (Bergen et al., 1992; Eisenhardt, 1989; Pavlou et al., 2007; X. Wu et al., 2021). Even if Arrow (1985) introduced the more descriptive terms hidden information for adverse selection, and hidden action for moral hazard, which are nowadays as well commonly used by scholars (Bergen et al., 1992; Pavlou et al., 2007), this dissertation stays with the original terms, adverse selection and moral hazard. Both are explained in the following.

Adverse selection

Adverse selection refers to the problem that agents may simply misrepresent their abilities or skills to principals (Eisenhardt, 1989), but describes also the phenomenon if principals make wrong decisions because agents hide information (Yoo et al., 2015). As only the agent has the private (hidden) information about his or her true quality (Akerlof, 1970), the resulting information asymmetry between the two parties makes it difficult for the principal to differentiate between the "cherry" (high quality) agents and the "lemon" (low quality) agents (R. Wilson, 1968). Recruitment is a very typical setting for this problem. As the principal is usually unable to completely verify the skills and abilities an agent claims to possess during the recruitment process but also while the agent is working, adverse selection may arise (Eisenhardt, 1989). To solve the principal's dilemma of

adverse selection, the literature suggests screening agents, examining agents' signals, and allowing agents to self-select (Bergen et al., 1992; Pavlou et al., 2007).

Moral hazard

Moral hazard describes the problem that the agent simply does not invest the agreed effort (Eisenhardt, 1989) or pursues hidden actions for monetary gain at the principal's expense (M. C. Jensen & Meckling, 1976; Yoo et al., 2015). The problem arises because a principal is unable to control and monitor an agent's behavior entirely (Yoo et al., 2015). Literature suggest to solve the moral hazard problem using signals, incentives, bonding or behavior and performance monitoring (Yoo et al., 2015).

Adverse selection and moral hazard have in common that they are information problems, resulting from the fact that principal and agent are two self-interested parties with usually incongruent goals (Pavlou et al., 2007). Employment relationships of heirs to family businesses are one of the rather few examples where the goals of the agent and principal tend to be congruent; similarly, the assumption of incongruent goals can be relaxed in highly socialized or clan-oriented businesses or in settings where self-interest makes way for selfless behavior (Eisenhardt, 1989; Ouchi, 1979; Perrow, 1986). However, while adverse selection is a pre-contractual problem (Akerlof, 1970), moral hazard is a problem arising post-contractually (Pavlou et al., 2007; Rothschild & Stiglitz, 1976). Thus, although the problems are concurrent, they are still to be distinguished (Pavlou et al., 2007). This is because even if the principal succeeds in overcoming the adverse selection problem by selecting a high quality agent, the principal could still face moral hazard if the agent subsequently decides not to invest the agreed-upon effort (Pavlou et al., 2007). Consequently, one must account for both problems to fully understand agency problems (Pavlou et al., 2007).

Agency relationships can be found in many different settings ranging from a macrolevel perspective such as regulatory policy to research questions focusing on a microlevel

perspective (Eisenhardt, 1989). In other words, according to Pavlou et al. (2007) and Milgrom and Roberts (1991) principal-agent structures can be applied to all transactional exchanges that take place in a socio-economic system in which opportunism, asymmetric information, and bounded rationality are present. Meanwhile, especially for describing relationships in an organizational setting, agency theory has been widely applied, such as for studying compensation (Conlon & Parks, 1990; Eisenhardt, 1985), acquisition and diversification strategies (Amihud & Lev, 1981), board relationships (Fama & Jensen, 1983; Kosnik, 1987), ownership and financing structures (A. Agrawal & Mandelker, 1987; M. C. Jensen & Meckling, 1976), vertical integration (Anderson, 1985) and innovation (Zenger, 1994). But also applying the principal-agent structure to spot market exchanges (Akerlof, 1970), insurance-clients relationships (Rothschild & Stiglitz, 1976) and research questions in the field of information systems (Bahli & Rivard, 2003; Keil et al., 2000; Pavlou & Gefen, 2004, 2005; Pavlou et al., 2007) contributed to significant enhancements of the agency theory (Pavlou et al., 2007). Finally, for marketing a very good summary of representative agency applications is given by Bergen et al. (1992).

The two lines of agency theory

This dissertation focuses on consumer-seller-relationships, respectively consumer-producer-relationships, as one concrete field of application of principal-agent research. Still, for the sake of completeness the second branch along which agency theory has developed, positivist agency theory, shall be shortly depicted in the following as well (Eisenhardt, 1989; M. C. Jensen, 1983).

Positivist agency theory mainly deals with designing suitable intraorganizational governance and control mechanisms that solve the agency problem (Bergen et al., 1992). According to M. C. Jensen (1983) positivist researchers investigate “why certain contractual relations arise” (M. C. Jensen, 1983, p. 326). The positivist branch basically distinguishes between two governance and control mechanisms, outcome-based contracts and information systems, being both considered effective in containing agent opportunism (Eisenhardt, 1989).

In contrast to the positivist agency theory, principal-agent research focuses on the general theory of the principal-agent relationship, which is applicable in a vast variety of relationships, such as, for instance, lawyer-client, buyer-supplier or employer-employee relationships (Harris & Raviv, 1978). What is characteristic of its formal theory is the meticulous specification of assumptions, followed by logical deduction and mathematical proof (Eisenhardt, 1989).

Despite their differences, the two streams of agency theory are not opposing, rather they complement each other (Eisenhardt, 1989): Positivist theory points out different contract alternatives, while principal-agent theory identifies which contract is most efficient in a given setting, for example, with different levels of outcome uncertainty, risk aversion, and information (Eisenhardt, 1989). The two streams also share common assumptions about people, organizations and information (Eisenhardt, 1989), and have a common unit of analysis, the contract between the principal and the agent.

Application of the principal-agent theory to buyer-seller relationship

The principal-agent theory has also been frequently applied to buyer-seller relationships (e.g., Bergen et al., 1992; Dimoka et al., 2012; D. P. Mishra et al., 1998; Pavlou et al., 2007; Singh & Sirdeshmukh, 2000; X. Wu et al., 2021; Yoo et al., 2015). In most cases buyers are viewed as the principals and sellers as agents. The rationale behind is that buyers (principals) delegate the delivery responsibility to sellers (agents), who generally possess more information about their characteristics, products and practices (Pavlou et al., 2007). Yet, in many cases it would be possible to have the reversed perspective (e.g., Rothschild & Stiglitz, 1976).

Still, assigning the role of the agent to the seller, one can simplistically distinguish between two types of sellers - "cherry" type sellers, who are most likely to deliver a high quality product as promised, reliably and on time, and "lemon" type sellers, who will most likely keep their private information to themselves and deliver products of inferior quality (Pavlou et al., 2007). As buyers are unable to fully control and monitor a seller’s behavior, uncertainty arises since they cannot necessarily distinguish among these two types of

sellers and the respective product quality delivered (Dimoka et al., 2012; X. Wu et al., 2021). Consequently, also buyer-seller relationships face the challenge to solve the agency problems of adverse selection and moral hazard (Dimoka et al., 2012; Pavlou et al., 2007). Applied to this context, adverse selection occurs at the pre-contractual stage, if sellers misrepresent their true quality and/or the true quality of their products (Pavlou et al., 2007). Moral hazard refers to the post-contractual phase, if sellers evade their responsibility, breach contracts or commit fraud, as well as reduce the promised quality of the product offering (Pavlou et al., 2007).

Operationalization of agency theory in this dissertation

While not explicitly employing principal-agent theory, essay I effectively addresses this information asymmetry between consumers and food producers. The essay examines the potential of a traceability system accessible to consumers to mitigate information asymmetry, and for what types of consumers such a system might be a particularly appropriate tool for reducing this information asymmetry. This is due to recent advancements in IoT technologies, such as near field communication (NFC) tags and quick response (QR) codes, which are making it increasingly easy for retailers and food producers to provide consumers with access to supply chain information. By reducing information asymmetry related to food quality, which currently leaves consumers uncertain about their food choices, this traceability system aims to bridge the gap between consumers and retailers, respectively food producers (Kim & Woo, 2016; X. Wu et al., 2021; Yoo et al., 2015). Consequently, essay I pursues the overarching goal of assessing the extent to which the principal-agent problem between consumers and retailers as well as food producers can be alleviated through the implementation of a food traceability system.

Building on this, essay II focuses on a specific local food product, fresh blueberries, and examines the extent to which consumers value receiving detailed information about the product's local origin, a credence attribute that cannot be verified by consumers even after purchase. Although labels are currently used by retailers and manufacturers to overcome this information asymmetry regarding the true local origin of products, consumers are

increasingly skeptical of them, not only because both private and third-party labels coexist in a wide variety of ways, but also because the use of a private label leaves retailers and food manufacturers some room for interpretation of local (Isabel Sonntag et al., 2023; Rossi & Rivetti, 2022). Therefore, in the search for an alternative solution for local origin labeling, it could be considered to place the information directly on the food or to provide consumers with a digital access point to the exact origin information. Essay II consequently examines how this alternative solution of providing detailed origin information is perceived by consumers and how it helps to reduce the information asymmetry between consumers and food producers with respect to the credence attribute of local origin. Ultimately, consumers may also perceive the introduction of food traceability, whether it is local or non-local, as a signal of product quality.

1.2.2 Signaling theory and cue utilization theory

1.2.2.1 Why signaling and cue utilization theory

One of the solutions proposed to reduce the information asymmetry between consumers and retailers or producers at the pre-purchase stage is using signaling. By using signals, such as logos, labels or certificates, retailers and producers convey information to potential consumers. Foremost economists use signaling theory to see to which extent the sending of a (high quality) signal, e.g. by retailers or producers, can help consumers to assess a food product's quality via serving as an inferential information that allows to reduce consumers' perceived information asymmetry as unlike retailers or food producers, they lack substantive information on food product quality (Connelly et al., 2011; Grunert, 2005; Treiblmaier & Garaus, 2023). According to Kirmani and Rao (2000) signaling is most useful for products whose quality is unknown before buying the product. This is the case for experience products, to which belong also suboptimal food products regarding, for instance, their taste and freshness, as investigated in essay III of this dissertation. Furthermore, this also applies for food products with are characterized mainly by credence attributes, such as local food products as researched in essay II of this

dissertation, because credence attributes such as local origin are even not verifiable after product purchase.

Still, which signals a consumer actually uses in his or her food choice ultimately depends on individual preferences. However, if the research focus switches from how information is conveyed via signals and what characteristics a signal must have to be considered reliable for inferring product quality, to how a signal is used by consumers in their decision-making process to judge the quality of the product or the seller, and particularly how multiple signals are weighted by consumers in their product choices, then we move from signaling theory to cue utilization theory (Cox, 1962; Olson & Jacoby, 1972; Purohit & Srivastava, 2001; Slovic & Lichtenstein, 1971).

Cue utilization theory is mostly applied in marketing, including food marketing (e.g., Monroe & Dodds, 1988; Rao & Monroe, 1989; Richardson et al., 1994). The idea behind this theory is that consumers make decisions using quality cues, i.e. pieces of information, to assess the quality of a food product as the true quality of the food product is unknown to them, resulting from the asymmetric information relationship between food consumers and food retailers respectively producers (e.g., Monroe & Dodds, 1988; Rao & Monroe, 1989; Richardson et al., 1994). The critical assumption of cue utilization theory is that it depends on the individual consumer how the different quality cues are weighted and which cues they actually use when judging on a food product's quality. It is argued that the reason for this selective approach is that consumers' cognitive and time resources are limited.

Essay II of this dissertation makes use of cue utilization theory as the essay puts the credence attribute local product origin in the focus of the study and investigates which particular information details on product origin are utile for consumers in their function as information cues. Nevertheless, despite essay II relies on cue utilization, signaling theory is also explained here because because first, the terms "product quality signal" and "product quality cue" are often used interchangeably (Helm & Mark, 2007). There are even studies at the intersection of marketing and information systems literature that combine signaling and cue utilization theories in their research (B. Shao et al., 2021; Treiblmaier & Garaus, 2023; X. Wu et al., 2021). The second argument is that both theories study essentially the same problem, namely how to overcome consumers'

purchase uncertainty about the actual quality of a product, which results from consumers inferior information position in comparison to retailers and food producers (Grunert, 2005). What differs, however, is the perspective from which the information asymmetry problem is predominantly studied, as well as some assumptions. In cue utilization theory the perspective is clearly more on the consumer. The theories' assumptions are explained in more detail in the following section 1.2.2.

1.2.2.2 Signaling theory

The agency problems of adverse selection and moral hazard result in consumers perceived uncertainty regarding food products[3]. Yet, literature on agency theory argues as well, that consumers uncertainty perception can be alleviated with the help of information signals and incentives (Dimoka et al., 2012; Pavlou et al., 2007; Michael Spence, 1973). While incentives are used as a mechanism to reduce potential moral hazard resulting from a seller's postcontractual behavior, signaling is used to understand how sellers and buyers solve the precontractual problem of adverse selection, that is, information asymmetries about latent and unobservable product quality (Connelly et al., 2011; M. C. Jensen & Meckling, 1976; Kirmani & Rao, 2000). Since the essays in this dissertation all focus only on product selection, i.e., the precontractual phase before purchase, we focus solely on signaling and cue utilization theory. Both theories, albeit from different perspectives, explore how to solve the problem of adverse selection in a buyer-seller relationship.

In general, signals are things that agents do that are visible to principals and are used to communicate with them (Michael Spence, 2002). An essential characteristic of agents is

3 For consumers this perceived uncertainty can be due to seller as well as product related factors (Pavlou et al., 2007). Meaning, there exist sellers as well as products of high and low quality. And although both these sources of consumers' perceived uncertainty can be analyzed separately (see Dimoka et al., 2012), in this section no explicit distinction is made between these two closely interrelated concepts (Mavlanova et al., 2016; Pavlou et al., 2007). This is because this section aims to illustrate the basic idea of the signaling mechanism to overcome the overall degree of consumers' perceived uncertainty as illustrative as possible, and therefore forgoes unnecessary complexity.

that they differ in quality. For illustrative purposes, a distinction is usually made between high quality agents and low quality agents (Connelly et al., 2011; Kirmani & Rao, 2000). However, since only agents know their own true quality and are thus in a dominant information position (B. Shao et al., 2021), both types of agents can signal that they are of high quality (Dimoka et al., 2012; Kirmani & Rao, 2000; Pavlou et al., 2007). Principals who do not have information about the true quality of agents consequently face the dilemma of figuring out which agent is actually high quality and which one is just pretending to be high quality when in fact it is only a low quality agent (Pavlou et al., 2007). Therefore, in order to differentiate themselves from low quality agents, it makes sense for high quality agents to invest in signals (Kirmani & Rao, 2000; Michael Spence, 1973). The important property of signals is that they are alterable (Michael Spence, 1973). To be effective, meaning for high quality agents to benefit from their investment in signals by successfully differentiating themselves from low quality agents, information signals must be observable, clear, credible, and differentially costly (Rao & Monroe, 1989; Rao & Ruekert, 1994).

Here, the most important property of efficacious signals is differently costly (Dimoka et al., 2012). Signal costs are at the core of signaling theory, so that some refer to it as the "theory of costly signaling" (Bliege Bird & Smith, 2005; Connelly et al., 2011). To function as an effective signal for high quality agents to communicate their superior quality to principals, the signal must induce signaling costs. In other words, in a buyer-seller relationship, the following relationship must hold: For high quality sellers investing in a signal must result in a payoff A such as A > B. Payoff B being the payoff for high quality sellers without signaling. By contrast, at the same time for a low quality seller the payoff C in case of signaling must be less than in case of not signaling and receiving payoff D. If A > B and C < D holds (separating equilibrium), high quality sellers are motivated to invest in signaling, while for low quality sellers it is the opposite case. The separating equilibrium enables that buyers can correctly distinguish between high and low quality sellers. In this case information signals assist buyers assess the true value of a product whose quality cannot be observed, such as credence attributes, and whose value is uncertain, as for second-hand products (Crawford & Sobel, 1982; Dimoka et al., 2012). Yet, if both types of sellers benefit from signaling because the payoff relationships look like this: A > B and C > D (pooling equilibrium), buyers are unable to distinguish between

high and low quality sellers. To avoid such a pooling equilibrium, signaling costs are crucial (Connelly et al., 2011; Kirmani & Rao, 2000).

Still, to be a useful quality signal for buyers to distinguish between high and low quality products, the signal must not only be costly and observable, but also reliable (Connelly et al., 2011). Signal reliability, sometimes also meant by signal credibility, describes the extent to which the seller is honest that the product actually has the unobservable quality that is being signaled and the extent to which the signal is correlated with the unobservable quality (Busenitz et al., 2005; Connelly et al., 2011; Davila et al., 2003; Sanders & Boivie, 2004). In short, signal reliability combines the constructs of signal honesty and signal fit (Connelly et al., 2011).

Especially for products with credence attributes, the reaction of buyers to such quality signals strongly depends on the verifiability (proofing signal fit) as well as on the party verifying the quality signal (Bai et al., 2013; Mavlanova et al., 2016). In this context, trust in the quality standard certifying entity is key (signal honesty) (Majer et al., 2022; Moussa & Touzani, 2008). According to the literature, buyers or consumers in general particularly trust third-party organizations and government institutions to verify a quality standard for credence attributes, although preference heterogeneity exists (Innes & Hobbs, 2011; Majer et al., 2022; Thøgersen & Nielsen, 2016).

1.2.2.3 Cue utilization theory

Activities that sellers undertake, or instruments that sellers use, to reduce information asymmetries and the associated customer risk are generally described as signaling mechanisms (Helm & Mark, 2007). Studies based on signaling theory thereby often take the analysis perspective of the seller to investigate a signal's effectiveness. However, just because sellers send information signals or make them searchable for buyers does not guarantee that buyers may identify all publicly available information signals (Dimoka et al., 2012). Reasons can be information search costs, but also because they might assess information signals differently due to information processing costs (Purohit & Srivastava,

2001) or because they limit themselves to information signals that are most relevant for them at the expense of ignoring others (Dimoka et al., 2012; Slovic & Lichtenstein, 1971).

Cue utilization theory, on the other hand, places more the consumer at the center of the analysis. The theory addresses the question how consumers make a purchase-decision when they do not know the true quality of a product (X. Wu et al., 2021). According to the theory, products have a set of cues that consumers then use to infer product quality (Cox, 1962; Kukar-Kinney & Xia, 2017; Olson & Jacoby, 1972; X. Wu et al., 2021). Yet, these multiple cues do not work in a merely additive way (Akdeniz et al., 2013; Kukar-Kinney & Xia, 2017; Q. Wang et al., 2016). The extent to which consumers use a particular cue to judge the quality of a product depends on its diagnosticity and the availability of other cues (Purohit & Srivastava, 2001; B. Shao et al., 2021; Slovic & Lichtenstein, 1971). Diagnosticity comprises (1) the predictive value of the cue, which indicates how well the cue predicts actual product quality, and (2) the confidence value of the cue, which indicates the degree to which consumers feel confident that they can use the cue correctly (B. Shao et al., 2021; X. Wu et al., 2021). In addition, studies generally distinguish between intrinsic and extrinsic cues. Intrinsic cues are product attributes that are related to the functions of the product and therefore cannot be changed or experimentally manipulated without also altering the physical characteristics of the product itself (Olson & Jacoby, 1972). By contrast, extrinsic cues are product-related attributes that are not part of the physical product, such as price, brand, packaging, or traceability codes (Olson & Jacoby, 1972; Richardson et al., 1994). To assess the quality of a food product, consumers may use, for example, color, price, brand, packaging, as well as traceability information (X. Wu et al., 2021). Research shows that intrinsic cues are generally given more weight because they are considered more diagnostic and useful for evaluating product quality (Rao & Monroe, 1988; Szybillo & Jacoby, 1974). However, when intrinsic cues are scarce and not easily obtained (Maheswaran, 1994; Miyazaki et al., 2005; Zeithaml, 1988), consumers judge product quality based on extrinsic quality cues (S. Mishra et al., 2020; Sabri et al., 2020).

Essay II of this dissertation examines the relevance of traceability information as an extrinsic quality cue for (local) food products.

Local food origin – a credence attribute traceability systems can make verifiable

Credence qualities are becoming increasingly important for food products (Grunert, 2005). The credence quality attribute “from local origin” is a very good example of this. Before just as after purchasing the local food product, consumers can hardly ascertain this quality attribute. Dimoka et al. (2012) argue that product uncertainty is an information problem that can be reduced for basically all products using digital diagnostic product descriptions. Digital diagnostic product descriptions are product descriptions that buyers find helpful in evaluating a product based on the digitally provided textual, visual, and multimedia information about the product. Consequently, offering a digital diagnostic product description should also be able to alleviate the product uncertainty often perceived by consumers when purchasing food products with credence attributes, such as local food products. Information about a food product that is captured by a traceability system and made available to consumers via a traceability code can be understood as such digital diagnostic product description. In recent years, product traceability codes have emerged as an interesting new quality cue for purchasing decisions (B. Shao et al., 2021), allowing consumers to assess a product’s (credence) quality attributes, such as "local origin," prior to purchase, but also after purchase. As with other signals, sellers set up traceability systems to reduce information asymmetry by disclosing their private information. Consumers in turn use this information as a quality cue which assists them in their food product quality assessment (Grunert, 2005; Thøgersen & Zhou, 2012; X. Wu et al., 2021).

Application of signaling and cue utilization theory in this dissertation

Essay II applies cue utilization theory to local food products. The theory provides the theoretical basis to investigate which information parts regarding local product origin consumers value most, meaning, which information cues about local food origin are most relevant for consumers. Therefore, two of the three elements of diagnostic product descriptions listed by Dimoka et al. (2012) that are also common in offline and brick-and-mortar grocery stores, textual and visual descriptive elements, are examined. It is asked

to what extent these two elements in particular a) can function as signals or quality cues, and b) are relevant in the purchase decision to mitigate product uncertainties with respect to the credence attribute "from local origin".

1.2.3 Framing

1.2.3.1 Why framing

Unlike signaling and cue utilization theory, which focus on which types of signals or cues can be used by retailers, food producers, and consumers to signal or assess food quality, respectively, framing focuses on how the information that the signals and cues are intended to convey is presented and how this way of presentation affects consumers' assessments of food quality. Hence, framing focuses on how consumers as signal receivers and product cue users, interpret and respond to the information conveyed via a signal or cue depending on the way the information is presented. In simple terms, framing posits that individuals are influenced by the context (reference frame) and language used to present the information. Framing can consequently impact individuals' attitude, beliefs as well as decision-making.

In essay III of this dissertation, three different message frames are used to investigate the extent to which these frames can increase the purchase probability of local dairy products that are two days before their best-before date. This allows to determine the most effective attribute framing approach for suboptimal local dairy products to further reduce food waste at the retail level. The principles of framing and attribute framing in specific are outlined in section 1.2.3.

1.2.3.2 Principles of framing

From a broad range of literature we know that even if alternatives being quantitively and practically equivalent, people do not always evaluate them as equally advantageous

(Levin et al., 1987). It is rather the opposite. Since people are susceptible to biased decision-making, their evaluations of options are quite responsive on how an information is framed (Kahneman & Tversky, 1979). Framing means using "different but objectively equivalent descriptions of the same problem" (Levin et al., 1998, p. 150). Consequently, in order to disclose information to consumers one can make use of framing which then results in differences in consumer responses (e.g., evaluation of the relative attractiveness of the item under study) depending on the framing employed. Tversky and Kahneman (1981) introduced the term "framing" by using their renowned "Asian disease" problem[4]. The problem describes the effect that whether the same situation is presented in a positive

4 The "Asian Disease Problem" refers to a decision problem in which study participants are confronted with a scenario about the outbreak of a hypothetical disease. Specifically, the problem is outlined as follows:

There is a disease, called "Asian Disease," that is expected to take the lives of 600 infected people. Decision makers are facing one of two choice frames in which they have to decide between two different intervention programs to respond to this disease. In one frame, the positive frame, decision makers must choose between program A, which saves 200 lives, and program B, which has a one-third chance of saving 600 lives and a two-thirds chance of saving none. In contrast, in the second frame, the negative frame, decision makers must choose between program C, in which 400 people die, and program D, in which the probability that nobody dies is one-third and the probability that 600 people die is two-thirds (Bless et al., 1998; Diederich et al., 2018; Druckman, 2001).

The problem suggests that when decision alternatives focus on people's survival or gain (positive framing), decision makers are more likely to choose the certain alternative, program A (risk-averse decision). However, this preference reverses when the decision alternatives focus on people's deaths or losses (negative framing). In this case, study participants are more likely to choose the uncertain alternative, program D (risk-seeking decision) (Bless et al., 1998; Otterbring et al., 2021). However, in both frames, the two program alternatives, A versus B and C versus D, have the same expected value of people dying or being saved, respectively. Because decision makers in this scenario reverse their decision preference depending on the framing, this is an example of how the normative model is violated (Bless et al., 1998). Rather, the finding that decision makers tend to behave risk-averse when a problem is framed as a gain and risk-seeking when the problem is framed as a loss is at the core of prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981). Since, according to prospect theory, the slope of the value function is steeper for losses than for gains, the chance of saving an additional 400 people in the risky program alternative is greater when the outcome is stated in terms of deaths than in terms of lives saved (Bless et al., 1998). The Asian disease problem is therefore one of the most frequently cited examples to illustrate the relevance of prospect theory in explaining human decision-making (Bless et al., 1998).

or negative frame has an influence on decision-maker's preferences. The researchers explain this effect by referring to their in 1979 introduced prospect theory (Kahneman & Tversky, 1979). While positive framing emphasizes benefits, negative framing focuses on losses. Thus, according to prospect theory, when considering benefits, decision-makers tend to minimize risks (show risk-aversion), whereas when considering losses, they tend to eliminate the losses even if the costs are high (behave risk-seeking) (Gamliel & Herstein, 2012; Kahneman & Tversky, 1979; Tversky & Kahneman, 1981). In the following years, the Asian disease problem and the observed framing effect have been replicated many times, albeit with some differences in effect sizes and identifying some boundary conditions in some of the adaptions (Bless et al., 1998; Bohm & Lind, 1992; Fagley & Miller, 1990; Im & Chen, 2022; Kühberger, 1998; Miller & Fagley, 1991).

Today, the literature knows numerous examples of the framing effect in various research areas, including closely related fields such as human judgment and decision-making (Gamliel & Kreiner, 2013; Kreiner & Gamliel, 2018; Leong et al., 2017), but also in more remote research areas such as educational psychology, health care (N. Agrawal & Duhachek, 2010; Banks et al., 1995; Block & Keller, 1995; Howard & Salkeld, 2009; Krishnamurthy et al., 2001; Levin et al., 1988; Maheswaran & Meyers-Levy, 1990; Marteau, 1989; Menon et al., 2002; Meyerowitz & Chaiken, 1987; Rothman et al., 1993; Steffen et al., 1994), economics (Bartikowski & Berens, 2021; Duan et al., 2022; Dunegan, 1993; Gächter et al., 2009; Levin et al., 1998; O'Clock & Devine, 1995) and consumer marketing (Ayadi & Lapeyre, 2016; Isaac & Poor, 2016; Levin & Gaeth, 1988; H.-F. Lin & Shen, 2012; M. C. Olsen et al., 2014; Tu et al., 2013; C.-S. Wu & Cheng, 2011; Y. Zhang & Buda, 1999).

Being a cognitive bias, the framing effect prevents individuals from optimal decision-making (Nam et al., 2021) by adopting heuristic principles ("cognitive short-cuts") that simplify the complex task of decision-making (Tversky & Kahneman, 1981). Consequently, there is also a stream of literature which attempts to find strategies to reduce or even eliminate the framing effect for practical purpose (Cheng & Wu, 2010; Gamliel & Kreiner, 2013; Kreiner & Gamliel, 2018; Nam et al., 2021; C.-S. Wu & Cheng, 2011). For instance, in their experiments on Internet buyers' attitude and purchase intention, Cheng and Wu (2010) could induce a debiasing effect on study participants with the help of warning messages.

In their seminal paper Levin et al. (1998) introduced one of the most popular ways to categorize the different framing approaches, based on their operational definitions, their typical results and their underlying processes (Levin et al., 2002). According to the authors one can distinguish between risky choice framing, attribute framing and goal framing (Levin et al., 1998). In the following, a short definition is given for each of them. However, within this dissertation, only the attribute framing approach is of relevance. Therefore, in terms of the underlying processes, only the attribute framing explanatory approaches are presented.

1.2.3.3 Risky choice framing

Starting point for risky choice framing is that decision-makers have to make a choice under uncertainty. The most famous example for this framing approach is the Asian disease problem (Tversky & Kahneman, 1981). Based on the prospect theory (Kahneman & Tversky, 1979), Tversky and Kahneman (1981) showed that in decision settings where uncertainty is present, choices between to alternative actions reverse, depending on whether the potential gain (positive framing) or the potential loss (negative framing) with each alternative is stressed (e.g., the opportunity to save 90 out of 100 lives vs. the risk of losing 10 out of 100 lives), although they have equal expected value (Levin & Gaeth, 1988; Samson, 2021). Positive framing (representing gains) encourages risk aversion, negative framing (representing losses) by contrast supports risk seeking, as the results from Tversky and Kahneman (1981) show and several replications and its variations (Miller & Fagley, 1991; Sieck & Yates, 1997).

1.2.3.4 Goal framing

This framing approach refers to framing the goal of an action or behavior regarding either the advantages (positive consequences) of doing a certain action, or the (equivalent) disadvantages (negative consequences) of not doing a certain action (H.-H. Lin & Yang, 2014). With some exceptions, most studies found that people are more likely to act when

confronted with the negative consequences of not performing an action, compared to highlighting the positive consequences when acting (Gamliel & Herstein, 2012; Ganzach & Karsahi, 1995). In the healthcare domain, for example, Meyerowitz and Chaiken (1987) find that in comparison to positive framing, negative framing results in more powerful persuasion regarding breast self-examination leading to a more positive attitude towards the behavior, behavioral intention and behavior as such. Banks et al. (1995) observed similar framing effects regarding the probability for women to obtain a mammogram.

1.2.3.5 Attribute framing

Considered being the simplest framing approach, attribute framing manipulates a single attribute of an object or event and is basically about describing a situation in one of the two logically equivalent ways, positive or negative, or success versus failure rates (Levin et al., 1998; H.-H. Lin & Yang, 2014). One of the most famous studies on attribute framing was conducted by Levin and Gaeth (1988) in which study participants evaluated the quality of ground beef described as "75 percent lean" (positive attribute frame) more favorable than labelling the same product as "25 percent fat" (negative attribute frame). Research results from various fields show that in general, positively framed messages yield more favorable evaluations of the item under study than negatively framed ones (Dunegan, 1993; Howard & Salkeld, 2009; Kreiner & Gamliel, 2018; C.-S. Wu & Cheng, 2011; Y. Zhang & Buda, 1999). According to a meta-analysis by Freling et al. (2014), the mean attribute framing bias thereby has a medium effect size of about half a standard deviation.

Attribute framing moderators

Regarding the frame as such, Levin et al. (1986) found that attribute framing effects are less pronounced at the extremes but occur increasingly in the intermediate probability range (Beach et al., 1996; Levin et al., 1986). Janiszewski et al. (2003) argue that framing

effects also depend on the familiarity with a frame, meaning how much experience a consumer has with similar framed products. It also depends on the range and scope of reference values used by the decision-maker to evaluate attribute information (Janiszewski et al., 2003). In case evaluators have expert status regarding an attribute's distribution, Leong et al. (2017) could show in their experiments that the framing effect diminishes. Also some individual-level differences moderate the framing effect (Wong et al., 2020). The literature lists, for instance, an individuals' level of involvement (Maheswaran & Meyers-Levy, 1990; Rothman et al., 1993), and an attribute's salience for a decision-maker (Braun et al., 1997). By manipulating a frame's salience Braun et al. (1997) could illustrate that if an attribute has differential relevance to consumers this also influences the framing effect. Put differently, the more salient the attribute that is framed is for the respective decision-maker and thus for the respective evaluation task, the greater the framing effect (Braun et al., 1997). From studies conducted by Gamliel et al. (2016) and Peters et al. (2006) we can as well infer that individuals with high numeracy seem to be more resistant to framing effects.

Topics involving issues of strongly held attitudes, such as abortion decisions (Marteau, 1989), are also less susceptible to framing effects just as when decision-makers make judgements of personal relevance (Levin et al., 1988; Schneider, 1995; Sniezek et al., 1990). Moreover, Davis and Bobko (1986) could show that when individuals feel high levels of responsibility in the decision-making process, then the framing effect reduces in size. In a recent study, Nam et al. (2021) highlight the role of cultural background in determining whether the framing effect is driven by the favorable (unfavorable) evaluation of positively (negatively) framed information. While overall Nam et al. (2021) corroborate previous studies that positively framed information resulted in more favorable product evaluations, independent of any cultural aspects, the framing effect's derivation differs by cultures.

The last group of framing effect moderators to be mentioned at this point is related to the thought process. Therein, one stream of literature investigates the role of attention. Basically one can distinguish between two different attention mechanisms leading to framing bias (Kreiner & Gamliel, 2018): divided attention (Yechiam & Hochman, 2013, 2014) and unbalanced attention focus (Kreiner & Gamliel, 2018; Levin et al., 1998; Mandel, 2008). Likewise, it has been argued that the framing effect occurs due to a lack

of attention and thus, might be attenuated or even disappear if decision-makers were encouraged to think more carefully about their choices (Sieck & Yates, 1997; S. M. Smith & Levin, 1996; Takemura, 1994) or have to provide a rationale for their decision (Miller & Fagley, 1991; Takemura, 1993). Results from Shiv et al. (2004) support this finding. In their experiment the researchers observed that in situations of low processing motivation, negative framing is more (less) effective than positive framing when the level of processing opportunity is low (high). Kreiner and Gamliel (2018) illustrate in their experiments that by manipulating decision-makers' attention, thereby shifting their attention from the explicit framed information to the complementary, implicit information entailed in a message frame, the attribute framing bias could be eliminated in the explicit attention manipulation and diminished in the implicit attention manipulation. Finally, Wong et al. (2020) focus on contexts that deal with the framing and communication of reduced negative attributes (e.g., "20 percent less plastic packaging used"). The researchers show that also a consumer's mindset (incremental vs. entity) influences as a moderator valence-consistent evaluation shifts, hence, whether framing and communication of reduced negative attributes leads to consumers' unfavorable responses. In case a consumer adopts an incremental mindset communicating reduced negative attributes results in more favorable product evaluations, consumers with an entity mindset, however, evaluated the products less positive. This is due to the fact that consumers with an incremental mindset are encouraged to focus on the trend of attribute improvement rather than its negative nature (Wong et al., 2020).

Mechanism behind attribute framing

Levin et al. (1998) stress that the three different types of framing are governed by different processes that are independent from each other and therefore should be examined separately to avoid unnecessary complexity and confusion that might results from their unique characteristics (Freling et al., 2014; Levin et al., 2002). Since this dissertation only makes use of attribute framing, only the functionality of attribute framing is explained at this point.

Unlike for risky choice framing and goal framing, the basic mechanism for attribute framing is conceptually distinct from the one derived from prospect theory (Levin et al., 2002; Levin et al., 1998). This is because in attribute framing (a) only a single feature or characteristic on the item under study is framed instead of framing each of the alternatives in an independent choice set and (b) this type of framing does not imply any manipulation of risk. Attribute framing does not require from decision-makers to make a discrete choice between opposing courses of action that are usually expressed by probabilities (Levin et al., 1998). Rather, the interest is in how the framing of a deterministic product feature affects the consumer's overall judgment of the product (Levin et al., 1998). In essay three, the focus is also on examining how the framing of the deterministic food product characteristic of suboptimality affects consumers' purchase probability and their overall evaluation of product quality. Specifically, the study examines the extent to which highlighting the attribute of local product origin can further increase consumers' willingness to purchase compared to highlighting the cost advantage of the suboptimal product or the fact that purchasing such a product can help reduce food waste.

According to Levin et al. (2002; 1998) "*positive labels tend to evoke positive associations while negative labels tend to evoke negative associations. When these associations are then mapped onto bipolar response scales, positive labels lead to more favorable responses than negative labels" (Levin et al., 2002, p. 413).*

It is therefore hypothesized that the attribute framing effect results from the activation of either positive or negative associations, as the way an attribute is framed has an influence on how information is encoded and represented in the associative memory. The difference in representation in the associative memory is thus seen as the cause of the valence-consistent shifts in the respondents' answers, that is, in the attractiveness ratings of the item under study (Levin & Gaeth, 1988). In their well-known example, Levin and Gaeth (1988) could for example show that consumer rated beef described as being 80% lean healthier than the same beef described as being 20% fat, although the two beef descriptions are objectively equivalent. A more recent eye-tracking study by Jain et al. (2020) also supports the valence shift-based explanation, but also extends it. Jain et al. (2020) demonstrate in a series of studies that the attention-comparison based account, a comparison with the most available standard to evaluators, can explain why the use of

more disfluent, hard to process frames, such as non-round numbers, leads to lower evaluations of an object or situation of interest in positive as well as negative frames.

A second explanation on how attribute framing functions is given by the priming literature (Jain et al., 2020; Putrevu, 2014). In general, a prime affects whether positively or negatively valenced knowledge is accessed while making evaluations (Jain et al., 2020; Wyer & Srull, 1989). Since the framed attribute acts like an immediate prime, a stimulus, which sets the "evaluative tone" (Levin & Gaeth, 1988, p. 166), this ultimately determines whether the information provided by the attribute is evoking positive or negative associations in the memory among respondents during the exposure with the object of interest (Levin & Gaeth, 1988).

Thirdly, in their meta-analysis Freling et al. (2014) applied construal level theory to explain attribute framing effects. The authors find that attribute framing is most effective when there is a congruence between a frame's construal level (the degree of perceived abstractness that the object or situation to be evaluated has for a person) and an evaluator's psychological distance (any dimension that affects how distant the person feels from the framed object or situation). Freling et al. (2014) conclude that this congruence, and not only the valence of a frame, is driving attribute framing effects (Jain et al., 2020).

Another competing explanation for the attribute framing effect is given by the query theory. It is based on the idea that the way a decision scenario or choice is framed influences the order in which the decision-maker retrieves supporting evidence (Hardisty et al., 2010). Because according to the theory the starting query frame generates more retrievals, the different query orders lead to different balances of evidence, with the framing direction (positive or negative) of the initial query dominating the overall evaluation (Leong et al., 2017).

Finally, apart from the so far presented explication mechanisms which all have in common that their view attribute framing effects as irrational biases (Leong et al., 2017) an alternate rational approach to attribute framing focuses on the information content of frames (McKenzie & Nelson, 2003; Sher & McKenzie, 2006, 2012). According to proponents of this approach, logically equivalent frames can implicitly impart different information (Leong et al., 2017). This means that beyond a frame's literal content, it

might also “leak” (Leong et al., 2017, p. 1147) further relevant information. The following example should help with understanding:

If ground beef is described as "75% lean", a person is most likely to think it is good because ground beef is generally considered less lean. Thus, the high evaluation in a positive frame ("lean") reflects comparison with an inferior inferred reference point. In contrast, describing ground beef as "25% fat" will most likely lead people to think it is bad because ground beef is generally considered less fat. Consequently, in this negative frame ("fat"), individuals' low evaluations reflect their comparison to a superior inferred reference point (Leong et al., 2017).

Attribute framing effects can therefore be the result of the different inferences drawn by individuals who have been exposed to different frames which affected the reference point they used to compare or evaluate the item under study (Leong et al., 2017). In two experiments Leong et al. (2017) could establish this causal link between inference-making and the framing effect. That is, on the one hand, frame-dependent inferences are sufficient to observe an attributional framing effect, on the other hand, if inferences are probably weaker or absent because of expertise, framing effects are also weaker or absent (Leong et al., 2017).

Application of attribute framing in this dissertation

Essay III of this dissertation makes use of framing to stimulate consumers purchase intention for suboptimal local food products and to positively influence these products’ quality evaluation. Therefore, three different message frames are used to investigate the extent to which these frames can increase the purchase probability of local dairy products that are two days before their best-before date. Each of these message frames highlights a different advantage for consumers when deciding against the optimal and in favor of the suboptimal products: price saving, food waste reduction, avoidance of wasting local food products. This allows to determine the most effective attribute framing approach for suboptimal local dairy products to further reduce food waste at the retail level.

1.2.4 Overall remark

Overall, agency theory, signaling theory, cue utilization theory, and framing theory provide complementary insights into how consumers make their food choices, how they use product and seller information to do so, and how the presentation of that information can influence these food choices. These insights are valuable to the essays in this dissertation in several ways - in motivating the research questions of the three essays, in developing their hypotheses, and in integrating the essays' findings into the overall larger theoretical context in the discussion sections.

1.3 Research questions

As outlined in chapter 1.1, the overarching goal of this dissertation is to infer to what extent the behavioral economics' more sophisticated understanding of human decision-making can be instrumentalized to promote more responsible food consumption, improve food consumption policies and retailer practices, and thus contribute to the achievement of SDG 12. The dissertation includes three separate studies that address different topics in the literature on sustainable, herein defined as local, food consumption.

1.3.1 Essay I

Since consumers also themselves can influence what kind of food is produced (and how) and where it comes from, it is important that they have access to clear information to make informed choices (EC, 2020). According to the EC’s farm-to-fork strategy, “consumers should be empowered to choose sustainable food and all actors in the food chain should see this as their responsibility and opportunity” (EC, n. d.–b, p. 4).

However, the reality in Europe so far paints more of the following picture: Information about the environmental and social aspects of a supply chain is not available (BReg, 2019a), or is not considered credible by consumers, especially in the food sector (Creydt & Fischer, 2019; Pfeiffer et al., 2021; A. Zhang et al., 2020). There is still a large information asymmetry between consumers and producers. This makes it difficult for consumers to make decisions based on comprehensive and transparent information. Yet, to achieve consumer empowerment in the future and improve the accessibility of food information, the EC is also focusing on providing information through digital means. One such digital solution is the envisioned digital product passport (BReg, 2021a; Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection [BMUV], 2022; Götz et al., 2021). Another example are food traceability codes accessible via mobile phones, which are already quite widespread in Asian countries. In European countries, however, this type of information provision for food products is still in its infancy (Chrysochou et al., 2009; Götz et al., 2021; Kim & Woo, 2016; Yuan et al., 2020; A. Zhang et al., 2020).

Research on food traceability systems started around the turn of the millennium. In one of the very early research articles Giraud and Amblard (2003) found that it was very hard for consumers to grasp the idea behind food traceability systems and to describe them. However, studies published a few years later show that meanwhile consumers have started linking food traceability with food safety and quality (Giraud & Halawany, 2006; van Rijswijk et al., 2008). It has been found that product traceability can enhance consumers' confidence in the overall food system, foremost if it helps to credibly assure product quality (Hobbs et al., 2005; Verbeke & Ward, 2006; A. Zhang et al., 2020).

Drivers that make food traceability systems increasingly necessary include not only safety, quality, efficiency and legal requirements, but also consumer satisfaction and sustainability (Islam & Cullen, 2021). Meaning, as the public in general is more educated and since consumers are more aware of food safety issues, they request for more comprehensive traceability information on their food from food producers to be satisfied. For sustainability linked credence attributes such traceability systems have moreover the advantage that they make these credence attributes verifiable and thereby help companies eventually to prevent being accused of greenwashing (Islam & Cullen, 2021). At the same time, consumers and the community are seen as the primary beneficiaries of traceability

systems, as they help consumers build trust and improve their confidence in the food system (Islam & Cullen, 2021). Eventually, food traceability systems help consumers to make more informed purchase decisions (Islam & Cullen, 2021).

Assisting consumers in making better-informed purchasing decisions is a particularly strong argument for using traceability systems for meat products. One reason for this is that there have been a number of meat product scandals in recent years (Cicia & Colantuoni, 2010; Islam & Cullen, 2021; Michelle Spence et al., 2018). As a result, there has been quite some research in the meat sector to explore consumer preferences and willingness to pay for product labels which assure product quality through product traceability (Cicia & Colantuoni, 2010; Dickinson & Bailey, 2002; Hobbs et al., 2005). From these studies, one finding is that traceability is becoming increasingly important for meat products (Cicia & Colantuoni, 2010). A second interesting finding is that traceability of products, especially for Europeans, is also linked to on-farm traceability or traceability to the origin and producer of a product (Cicia & Colantuoni, 2010; Menozzi et al., 2015; Michelle Spence et al., 2018). However, the vast majority of food traceability studies have their thematic focus on food safety and quality, and risk mitigation (Aung & Chang, 2014; M.-F. Chen, 2008; Cicia & Colantuoni, 2010; Matzembacher et al., 2018; Treiblmaier & Garaus, 2023; Yoo et al., 2015; A. Zhang et al., 2020). A comprehensive review of traceability systems in the food supply chain focusing on safety and quality is provided by Aung and Chang (2014). Although the article addresses a more technically savvy readership, one of its findings is that most research on traceability systems stops at the retail level, even though a positive consumer perception of these systems and willingness to use them are essential prerequisites to make these systems push a new level of supply chain visibility (Aung & Chang, 2014).

M.-F. Chen and Huang (2013) adopt this consumer perspective in their study. They empirically demonstrate that food traceability systems can reduce consumers' perceived uncertainty by reducing consumers' information asymmetry and fear of seller opportunism, thereby increasing their purchase intention (M.-F. Chen & Huang, 2013). The authors also find that product involvement functions as a moderator in such a way that the higher the product involvement, and the more a traceability system helps to reduce an individual's perceived product uncertainty, the higher the purchase intention (M.-F. Chen & Huang, 2013). Also focusing on consumers, Yoo et al. (2015) develop a

technology acceptance model for food traceability systems in their empirical study by combining variables from the principal-agent theory and the technology acceptance model. Again, the study centers on the reduction of food risk perception by consumers. The results show that consumers' trust in sellers plays an essential role in their purchase intention, as well as in their willingness to pay a price premium for traceable products. Surprisingly, as trust in sellers increases, positively influencing the purchase intention, the intention to actually use a traceability system decreases (Yoo et al., 2015). Meaning, when consumers have more trust in the food seller or traceability system provider, they are more likely to purchase a product without necessarily using the traceability system that gives access to food-related information. Therefore, to increase the purchase of risky products, the authors conclude that it is beneficial for sellers to implement a traceability system, but they should not expect consumers to actually use it, as the implementation of the systems as such can be understood as an assuring product quality signal that promotes the purchase decision (Yoo et al. 2015). Finally, in a very recent study, Treiblmaier and Garaus (2023) also take the perspective of "stopping food fraud" and explore how blockchain technology can be used to signal quality in the food supply chain and how this affects consumer purchase intention. A boundary condition they identify is brand familiarity. That is, while for less familiar brands, being able to trace a product using blockchain technology increases perceived quality, this positive influence is not found for well-known brands (Treiblmaier & Garaus, 2023).

What becomes evident from the existing literature on traceability systems is that especially recent studies have been carried out mainly in Asian countries (see, for instance, M.-F. Chen & Huang, 2013; Yoo et al., 2015; Kim & Woo, 2016; Yuan et al., 2020 and X. Wu et al., 2021). There are much fewer studies from North America (Dickinson & Bailey, 2002; Hobbs et al., 2005; M. L. Loureiro & Umberger, 2007) and Europe, most of which were published several years ago.

In summary, the study results from Europe show the following picture: the definition of food traceability in the different European countries is quite heterogeneous, as is consumer interest in such systems (Giraud & Halawany, 2006; Kehagia et al., 2007). Consumers strongly prefer local products and also expect traceability systems to provide information on product origin to be considered useful (Giraud & Halawany, 2006; Kehagia et al., 2007; Menozzi et al., 2015). In addition, some focus group participants in

the study by Kehagia et al. (2007) expressed a desire for additional information about their food product choices, including information about the farm where the product was produced. In this regard, information should be strictly based on consumer needs and wants, easily accessible, and presented in an understandable way so as not to overwhelm consumers and to increase trust in traceability systems (Giraud & Halawany, 2006; Kehagia et al., 2007; van Rijswijk et al., 2008). Attention also needs to be paid to culture-specific requirements to ensure that consumers consider traceability systems actually valuable (Menozzi et al., 2015; van Rijswijk et al., 2008).

In one of the few recent studies from Europe, Tessitore et al. (2020) used an online survey to examine young consumers' perceptions of food traceability in Italy. The author wanted to find out which components of food traceability systems are most important to these young consumers. Their results show that these young consumers generally perceive food traceability systems as valuable in their purchasing decisions, with information on product origin and health being the most crucial aspects. In addition, as found in other studies, supply chain transparency and product quality control were considered important (Tessitore et al. 2020). At the same time, A. Zhang et al. (2020) argue that given the rapid progress in traceability technology, flanked by increasing consumer demand for more information, which could eventually lead to new government regulations, food traceability from farm to fork will become a reality, creating a new level of transparency in the supply chain (Jouanjean, 2019; Zecca & Rastorgueva, 2016; A. Zhang et al., 2020). And while these latest findings among young consumers suggest a promising future for food traceability systems and show that consumers are open to such new systems, whose idea is also to empower consumers and restore their trust in retailers and producers, overall, there is still surprisingly little insight into consumers' current perceptions and expectations of these systems, despite the great advances in digitization (Aung & Chang, 2014; Chrysochou et al., 2009; Giraud & Halawany, 2006; Kehagia et al., 2007; Matzembacher et al., 2018; van Rijswijk & Frewer, 2012; van Rijswijk et al., 2008; A. Zhang et al., 2020). However, for traceability systems to create a new level of transparency in the supply chain, it is important to ensure that consumers truly perceive them as valuable and want to use them, as only then they are likely to be willing to bear the additional costs associated with implementing traceability systems (A. Zhang et al., 2020). The question therefore arises as to who exactly these consumers are in Europe who

would actually use such a system and how these consumers can be described, who nowadays have a particularly strong need to receive more and more transparent information about their food products. Consequently, essay I aims to contribute closing this research gap by answering the following research questions:

How are food traceability systems perceived by consumers in Germany?

Which factors influence the intention to use them?

Essay I focuses on consumers' perceptions of traceability systems in Germany because, as Yuan et al. (2020) note, results on consumers' perceptions of traceability systems are often quite country-specific. Hence, results of studies on traceability systems conducted in Asian countries (A. Chang et al., 2013; M.-F. Chen & Huang, 2013; Jin et al., 2017; L. Wu et al., 2016; X. Wu et al., 2021; Xu et al., 2019; Yin et al., 2017; Yuan et al., 2020) do not necessarily apply to the European cultural context. Moreover, Germany is the second largest food retail market in Europe after France with sales of 149 billion euros (GfK & IRI, 2022; Hansstein, 2014). Therefore, the consumer perspective of German consumers is not only relevant for retailers and food manufacturers active in the German food market, but also for the EU regarding a successful implementation of its farm-to-fork strategy.

A survey is used to address these research questions. The dependent variable examined was the intention to increase the percentage of traceable products in future food purchases (Choe et al., 2009). Traceability systems were assessed for trust, usefulness in reducing information asymmetry, fear of seller opportunism, and usefulness in reducing perceived purchasing uncertainty (Choe et al., 2009). In addition, survey respondents were asked about their general attitudes toward traceability systems and in relation to food products, as well as their prior experience with such systems. To answer the second research question, respondents also indicated how often they purchase local food, to what extent packaging information is important to them, and whether they have any contact with farmers or people who work on a farm. The questionnaire ended with socio-demographic questions. The dataset included 680 complete observations after 9 data points were excluded during data cleaning. Data collection was conducted in three waves, with the first wave from July to November 2018, the second in January 2020, and the third from

July to August 2020. The analysis controlled for the different waves, but no significant differences were found.

The survey was analyzed using explanatory factor analysis, Mann-Whitney tests, ordinary least squares (OLS) and ordered logistic regressions. Explanatory factor analysis was used to identify the common factors that best explain the structure among the measured variables assessing traceability systems (Watkins, 2018). This was necessary after an initial check on the internal consistency of the constructs using Cronbach's alphas showed them to be of mediocre value despite being taken from the literature (Choe et al., 2009). Mann-Whitney test statistics were used to test for significant differences in respondents' general attitudes towards QR codes/barcodes and towards QR codes/barcodes on food products depending on their prior experience with traceability systems. Multivariate regression models (OLS and ordered logistic regression) were finally used to test the essay hypotheses.

The results of the essay show that QR code scanning rates for food product traceability in Germany need improvement, also due to consumer uncertainty about the code’s purpose. Interestingly, there is a growing interest in traceable food among frequent buyers of local food and among consumers with no personal connection to food production. This aligns with the EC’s objective to help consumers make better informed and sustainable food choices.

The essay updates the European research perspective on consumers' associations with traceability systems, accounting for the major advances in digital services in recent years. It also explores how consumers' personal connections to food production influence their intention to use traceability systems. To promote the adoption of traceability systems, the essay suggests optimizing the shopping environment and packaging, incorporating QR codes into customer loyalty programs, or providing incentives. Overall, the findings help improve the dissemination of food information, empower consumers, and support sustainable food practices in line with policy objectives.

1.3.2 Essay II

The research questions in essay II also deal with the perception of information on food products from the perspective of consumers in Germany. Specifically, they are about the origin of a food product. Consumers in Europe, and in Germany in particular, have a strong preference for local food (Federal Ministry of Food and Agriculture [BMEL], 2022; Kehagia et al., 2007). Thus, they pay close attention to a product's origin when shopping (Bernués et al., 2003; Hansstein, 2014) and are also willing to pay more if a food product comes from "their" region (Grebitus et al., 2013; Lim & Hu, 2013; Printezis et al., 2019; Seitz, 2015).

To date, however, no official definition for the terms "regional food" or "local food" exists neither within the EU nor for Germany (Adams & Salois, 2010; Feldmann & Hamm, 2015; Menapace & Raffaelli, 2016; Mohr & Schlich, 2016). Thus, in many cases, "from local origin" is still a credence attribute that is barely verifiable by consumers (Fernqvist & Ekelund, 2014; Gottschalk & Leistner, 2013; Ngobo, 2011)[5]. According to the German Nutrition Report 2022, though, many consumers would like to see more transparency for food products (BMEL, 2022). This is also due to several food scandals in recent years (Hempel, 2019; Hobbs et al., 2005; Kumpulainen et al., 2018; Verbeke & Ward, 2006), which have caused consumers to demand stricter controls (Zander et al., 2013a), but also more product transparency (Feldmann & Hamm, 2015) and traceability (Hou et al., 2019).

Despite numerous recent publications on consumers' willingness to pay (WTP) for local food (Grebitus et al., 2013; Hou et al., 2019; Lim & Hu, 2013; Printezis et al., 2019; Seitz,

5 An exception are the European geographical indication labels, foremost the quality scheme “PDO – protected designation of origin” that applies for food and wine (European Commission [EC], n.d.–c). Food products that are registered as PDO require that every part of the production, processing and preparation process must take place in the specific region. However, food products with a PDO label or the less strict EU quality scheme of “PGI – protected geographical indication” (EC, n.d.–c) are not covered in this dissertation. This is because these labels are clearly defined by the EU and only apply to certain region-specific food products, being sold over larger distances as well. Meaning, because for food products with a geographical indication from the EU the way of production is officially regulated just as being checked, these products cannot be equated with local food in general (Feldmann & Hamm, 2015).

2015), there is currently a scarcity of research addressing consumers' assessment of transparent, verifiable information regarding the origin of local food. There only exist few studies on consumers' perception of the German "regional window" initiative (Hermanowski et al., 2014; Meyerding et al., 2019; Zander, 2018). However, their results are of limited use in determining the exact utility consumers derive from detailed origin information because they do not distinguish between different information elements.[6] Consequently, as of now, a study examining the actual utility consumers gain from detailed informational elements (e.g., information on the exact place of production, name, picture of the producer) commonly cited as positive aspects or purchase criteria for local food (Grebitus et al., 2013; O'Kane, 2016; Zander, 2018) is lacking. Furthermore, as pointed out in section 1.3.1, despite the increasing digital possibilities, such as blockchain technology, few research studies have looked more deeply into consumers' perceptions of product traceability (A. Chang et al., 2013; M.-F. Chen, 2008; M.-F. Chen & Huang, 2013; M. L. Loureiro & Umberger, 2007; E. S.-T. Wang & Tsai, 2019; Yin et al., 2017), with none of these studies focusing on local food products and more recent European studies are rather lacking (Vriezen et al., 2023)[7].

Tracing local food to its place of origin with the help of, for instance, digital applications could be particularly interesting for young consumers, as they are highly digitally savvy on the one hand, but also pay close attention to product information on the other (ARD & ZDF, 2022a; Blanc et al., 2021; Initiative D21, 2022). And although young consumers,

6 In addition, the product origin information studied in this dissertation differs from the information provided by the regional window for several other reasons. First, products must meet a complicated set of criteria to be labeled with the regional window, and licensing fees must be paid. Second, unlike in essay II of this dissertation, the focus of the regional window is primarily on the place of processing rather than the place of production, which can cause irritation among consumers (Federal Ministry of Food and Agriculture [BMEL], 2021; Zander, 2018). Also, the regional window still does not provide information about the producers behind the product, although this is demanded by some consumers (Zander, 2018). Further, within the regional window scheme there are various options for specifying the region of origin (e.g., county, state or specifying a radius in kilometers), which can also extend beyond federal or state borders, or specifying a major region, leaving plenty of leeway for suppliers (INFO GmbH Markt- und Meinungsforschung, 2021; Zander, 2018).

7 Exceptions are recent studies by Treiblmaier and Garaus (2023) and Tessitore et al. (2020).

i.e., millennials (generation Y) (Kilian et al., 2012) and post-millennials (generation Z) (Seemiller & Grace, 2016), are considered "quintessential consumers" (Kumar & Smith, 2018, p. 213) of local food and their preferences and perceptions are crucial for the food industry and policy makers given their increasing purchasing power (Kumpulainen et al., 2018; Muniady et al., 2014; Savelli et al., 2019), it is still unknown what specific label information about local food actually influences their preference for local food (Blanc et al., 2021; Kymäläinen et al., 2021).

To address this research gap, this study focuses on generations Y and Z. By providing detailed information on local food origin at the farm level, the essay, using a hypothetical and non-hypothetical choice-based conjoint (CBC) experiment, aims to answer the following research questions:

To which degree do young consumers reward increased transparency and in-depth traceability on products of local origin?

What kind of information related to local product origin is of interest to young consumers?

In addition, a closer look is taken at which information channels shape young consumers' perceptions of food production and its producers. To this end, a supplementary survey is conducted in which the young consumers are also asked for a self-assessment of their basic knowledge about food production.

One reason for doing so is that, first, determining which information channels primarily shape consumers' perceptions of food production and its producers allows for a better classification of the results provided for the first two research questions. Beyond that, there is little recent literature on how consumers, and especially young consumers in Germany, perceive food production and the food producers behind their food (Kumpulainen et al., 2018; Pfeiffer et al., 2021; Rübcke von Veltheim et al., 2019; Zander et al., 2013a). Because young consumers in particular have limited direct exposure to food production in their daily lives (Kumpulainen et al., 2018; Shin et al., 2021), but their expectations of food production strongly influence policy makers and the entire food industry, including food producers (Blanc et al., 2021), it is important to understand the

information channels that mainly influence their perceptions. This knowledge will help evaluate the extent to which information provided for local food is considered useful by these young consumers and whether it aligns with young consumers' information expectations.

So, the third research question of essay II is:

Which information channels shape young consumers' perceptions of food production and the producers involved?

Through a comprehensive analysis of young consumers' preferences and information needs regarding the origin of local products, essay III aims to elucidate the extent to which increased transparency and detailed traceability influence their decision-making regarding local food. These findings will enable policymakers to develop targeted information campaigns tailored to this influential consumer group. Consistent with the objectives of the European farm to fork strategy, this will empower young consumers to make better informed food purchasing decisions (European Union [EU], 2020). In addition, the essay will identify whether potential actions are needed to bridge the gap between young consumers and the topic of food production, to ensure long-term social acceptance of food production, and to promote constructive social discourse about its future (Commission on the Future of Agriculture, 2021). Food industry actors can also use these insights to customize their marketing strategies to the specific preferences and expectations of young consumers.

CBC experiments are nowadays quite common in food consumer studies (Printezis et al., 2019). Still, a drawback of hypothetical CBC experiments is, that the choices are not binding and effects from social desirability bias might influence the results (Bazzani et al., 2017; J. Lusk & Shogren, 2007; Murphy et al., 2005; Olesen et al., 2010). To mitigate the hypothetical and social desirability biases, essay II combines hypothetical and non-hypothetical CBC experiments. Non-hypothetical CBC experiments were already applied by several other researchers in the food domain (Alfnes et al., 2006; Olesen et al., 2010; Yue & Tong, 2009). The product used for the CBC experiments were fresh blueberries. The experimental design was guided by the number of product attributes and attribute

levels studied, as well as the number of choice alternatives and choice tasks, and followed a sequential Bayesian approach (Bazzani et al., 2017; Ferrini & Scarpa, 2007; Sandor & Wedel, 2001; Scarpa et al., 2007; Scarpa & Rose, 2008). It was decided to use the sequential Bayesian D-efficient design approach because of its statistical efficiency and thus the greater expected reliability of the estimated model parameters. This is also the reason why the Bayesian D-optimal design approach is gradually becoming more adopted and considered state of the art for food-related CBC experiments (Lizin et al., 2022).

The Bayesian-D-optimal design approach is needed to reduce the number of potential choice tasks that participants are asked to answer to a reasonable number. In general, the combination of all product attributes and attribute levels defines the number of possible choices that participants may face in a choice experiment. For the second essay's study, such a "full", also called "complete" factorial design would have consisted of 48 possible product combinations. To limit the cognitive load on participants and prevent fatigue, however, a smaller number of combinations had to be chosen (Carson & Louviere, 2010; Swait & Adamowicz, 2001). Therefore, *Ngene* software was used to create a D-efficient choice design (Street et al., 2005) that resulted in 16 choice sets presented in randomized order (M. L. Loureiro & Umberger, 2007). For a D-efficient design, prior values for the attributes of interest are needed (Ferrini & Scarpa, 2007). These β-estimates were collected through a pilot study ($N = 40$) (Ferrini & Scarpa, 2007) for which an orthogonal main effects fractional factorial design with zero priors was used (Lizin et al., 2022; Street & Burgess, 2007). Based on the obtained model parameters, the D-optimal design for the main CBC experiments was created.

Upon the respondents' choices, the parameters of a discrete choice model can be estimated. These parameters reflect the values that the study participants assign to the different attribute levels (also known as *part-worths*). This analysis was done using mixed logit models. By this, the limitations of the most basic model, the multinomial logit (MNL) model, for analysing discrete choice data are overcome[8]. An additional argument

8 The limiting assumptions of the MNL model are: (I) the assumption that the error terms are independently and identically distributed (IIA) with a Gumbel (Extreme Value Type I) distribution, imposing homogeneous preferences across respondents, (II) independence of choices, thus decisions are assumed to

to use the more flexible mixed logit models in this study is that several studies have shown that consumers' preferences for local food are best described to be heterogeneous (Bazzani et al., 2017; Gracia et al., 2014; W. Hu et al., 2012; W. Hu et al., 2009). The mixed logit model was estimated by using the Stata module *mixlogit* (Hole, 2007) in the *STATA 13.1* software (StataCorp, 2013). Log-likelihood ratio-test was used to compare the model fits of the different models (Hensher, 2010).

After completing the choice task, the experiment enclosed a questionnaire. It contained questions on the consumers' (local) shopping behavior, on their environmental consciousness and on several socio-demographic details. Descriptive analysis of the responses helped to gain a deeper understanding of consumers' decision-making mechanisms and their underlying psychological principles. Overall, 212 participants took part in the experiment, 63 in the non-hypothetical version and 149 in the hypothetical CBC experiment.

Since the results of the two CBC experiments were in unexpected directions, an additional, supplementary questionnaire survey was conducted in a second step to find possible explanations for them. The questions focused on young consumers' perceptions of agriculture, as well as their knowledge of and touch points with agriculture, and their perception of agriculture as occupational field. The analysis was also mainly descriptive, the sample consisted of 197 survey participants.

1.3.3 Essay III

An important aim of SDG 12 is also to increase the appreciation of food and reduce avoidable food waste. According to SDG sub-target 12.3, food waste and loss should be halved by 2030 (United Nations Environment Programme [UNEP], 2021).

be uncorrelated over time and (III) independence within the alternatives, meaning that the introduction of a new choice alternative does not change the choice probabilities of existing alternatives.

Food that is still edible is often thrown away, both in private households and during production. In numbers, this means that according to the latest Food Waste Index Report 2021, about 931 million tons of food waste were generated in 2019, indicating that about 17 percent of total global food production is wasted (UNEP, 2021). Assuming a global average of 74 kg per capita of wasted food per year (UNEP, 2021), this problem of unconsumed food is estimated to be responsible for 4.4 billion tons of CO_2 equivalent per year (Food and Agriculture Organization of the United Nations [FAO], 2015), which is equivalent to 8 to 10 percent of global greenhouse gas emissions (Mbow et al., 2019; Poore & Nemecek, 2018). At the European level, studies estimate that about 88 million tons of food are wasted annually (EC, 2010).

Food waste is not compatible with the principle of sustainability, as natural resources are used in the production process and are therefore not available for other uses (Dreyer et al., 2019; BReg, 2019b; Filimonau & Gherbin, 2017). Apart from the negative environmental and social impacts, food waste is also a major economic concern (Dreyer et al., 2019; Papargyropoulou et al., 2014; Parfitt et al., 2010). To illustrate, in 2012, the costs generated by food waste in the EU were estimated to be around 143 billion euros (Stenmarck et al., 2016). Germany is projected to have a total food waste reduction potential of 11.9 (±2.4) million tons, of which 6.6 (±1.4) million tons could be avoided or still be consumed (Leverenz et al., 2021).

While it is known that the retail level accounts for a relatively small share of total food waste compared to the consumer level (UNEP, 2021), retailers have a special responsibility. Since their procurement policies and practices, as well as their food waste prevention measures, have an impact beyond their own supply chain stage, they consequently also have a significant influence on how much food waste is generated along the entire supply chain (Aschemann-Witzel et al., 2020; Dreyer et al., 2019; Hooge et al., 2018). Applying more generous optical standards is just one example how retailers can influence food waste downstream the supply chain at the wholesale and producer stage (Aschemann-Witzel et al., 2018).

Also, because retailers are the most visible actors in the supply chain to consumers, their involvement in preventing food waste can influence consumer knowledge and attitudes about food waste and their perception of food as such (Aschemann-Witzel, 2018a;

Aschemann-Witzel et al., 2020). A well-known example of how consumers' perception of suboptimal food could be positively influenced was provided by the French retail chain Intermarché, which advertised its suboptimal products as "inglorious fruits and vegetables" (Aschemann-Witzel, Hooge, et al., 2017). The term *suboptimal food* describes products that differ from their optimal or normal counterpart in terms of 1) appearance (Bunn et al., 1990), 2) expiration of the best-before date, or 3) defects in product packaging (White et al., 2016), while having no drawbacks in terms of safety and intrinsic quality (Aschemann-Witzel et al., 2016; Göbel et al., 2015; Hooge et al., 2017). Meanwhile, other European retailers such as the REWE Group, Lidl, or ALDI SÜD have followed Intermarché's example (ALDI SÜD, n.d.; Pressestelle Lidl Deutschland, 2022; Rewe Group, 2022). However, retailers do not operate in a vacuum. Even if they change their procurement policies in a first step and offer suboptimal food, they are dependent on customer response. That is, whether consumers accept and purchase these suboptimal products (Aschemann-Witzel et al., 2018; Aschemann-Witzel, Jensen, et al., 2017; Quested et al., 2013) ultimately determines whether it makes sense for retailers to continue pursuing these food waste prevention policies and the modifications in their procurement policies.

For this reason, essay III examines to what extent retailers can influence consumers' perception of and willingness to purchase suboptimal food products by promoting these suboptimal products with differently framed messages. The results can be used to derive strategies on how retailers can best market suboptimal food products to consumers to reduce food waste (Aschemann-Witzel et al., 2018).

To motivate consumers to purchase suboptimal food products, previous research shows that price discounts and choosing a compelling product message frame can be effective interventions (Aschemann-Witzel et al., 2018; Hooge et al., 2017). Studies have also shown that to increase consumers' intention to buy suboptimal products, it is effective to adapt the framing of the advertising message to the nature of the suboptimality or to emphasize it in particular (Mookerjee et al., 2021; van Giesen & Hooge, 2019). Surprisingly, however, there is no study in the literature to date that examines the extent to which the likelihood of purchasing suboptimal food products can also be increased by highlighting a product's local origin, an attribute that is often cited as a crucial purchase criterion (Bazzani et al., 2017; Printezis et al., 2019). Yet, a product has this property

regardless of whether it is classified as suboptimal or optimal. Therefore, highlighting this product characteristic should have a similar positive effect on the purchase intention for a suboptimal food product as for its optimal counterpart. Moreover, since studies have already shown that the purchase intention for suboptimal products can be raised by emotional appeals (Grewal et al., 2019; Septianto et al., 2020; X. Shao et al., 2020) and local food products are also often purchased for their emotional value (Shin et al., 2021; van Ittersum, 2001; Verlegh & Steenkamp, 1999), it is interesting to investigate whether the purchase intention of suboptimal local food products can also be increased by emphasizing the product's local origin and thus eventually triggering (positive) emotional associations of consumers with these products (Sheth et al., 1991; van Ittersum, 2001). In this way, the third essay addresses the call of ElHaffar et al. (2020) for a stronger focus on positive emotions and their influence on sustainable shopping behavior in further research.

The first research question that essay III aims to answer is therefore:

To what extent can emphasizing the local origin of a suboptimal food product serve as a viable complementary strategy to increase the willingness to purchase suboptimal local food products and, consequently, help to reduce food waste in the retail sector?

Second, in addition to focusing on the suboptimal local product as such and how it can best be promoted to consumers in order to increase its purchase likelihood and thus reduce food waste, the consumer should also be considered and characterized in more detail, as it is ultimately his or her decision whether to purchase a suboptimal local product.

Given the "suboptimality" characteristic of the local product, it is reasonable to investigate the extent to which consumers' general attitude toward suboptimal food also influences the likelihood of purchasing suboptimal local food (Helmert et al., 2017; Hooge et al., 2017). Moreover, study findings on consumers' understanding and attitude towards the best-before date continue to show a mixed, inconsistent picture. That is, while some studies show that consumers are becoming more relaxed and no longer understand the best-before date as a strict throwaway criterion, others find that consumers still have difficulty interpreting the best-before date correctly (BMEL, 2022; Patra et al., 2020;

Samotyja & Sielicka-Różyńska, 2021). Accordingly, to gain more clarity on how consumers deal with a short best-before date as a (non)purchase criterion, this study also aims to investigate the extent to which the propensity to purchase suboptimal local food depends on consumers' attitude towards the best-before date. Knowing how both, the handling of the best-before date and the attitude towards suboptimal food, influence consumers' purchasing decisions will be useful for both food industry stakeholders and policy makers to determine whether further educational work is needed among consumers regarding the health safety of suboptimal products, respectively products with a short best-before date.

Local food shoppers do so for altruistic as well as self-interested motives (Birch et al., 2018; Carey et al., 2011; Megicks et al., 2012; Weatherell et al., 2003). However, the weighting of altruistic and self-interested motives in influencing local food purchase decisions is less clear. Given that consumers in the literature frequently cite environmental reasons, among other altruistic reasons, for choosing local food products (Dukeshire et al., 2011; Johnston et al., 2011; McEachern et al., 2010; Tregear & Ness, 2005), it is intriguing to find out whether these altruistic reasons are even strong enough to persuade local food shoppers to opt for suboptimal local food products, implying a reduction in food waste, but at the same time also putting environmental reasons in first place as purchasing motives for local products. If this is indeed the case, then promotional campaigns for suboptimal local food could specifically emphasize the altruistic environmental benefits to target this consumer group.

Finally, it is of interest to find out how consumers' own identity influences the probability of buying suboptimal local food products. Specifically, the essay wants to examine if it makes a difference for the purchase probability whether or not a consumer is from the same local origin as the product. This is interesting to investigate because it is known from the literature that consumers who identify more strongly with a place are more supportive of that place in terms of their local food purchasing behavior and efforts to act environmentally friendly (Czarnecki et al., 2021; Daryanto et al., 2020; Memery et al., 2015; Shin et al., 2021). Accordingly, since place attachment develops primarily during childhood (Hay, 1998; Sobel, 1990), essay III examines whether growing up in the same place makes consumers ultimately more likely to purchase even suboptimal products from their childhood place. This would not only support the local community of that

place, but also avoid wasting local resources, resulting in a smaller local carbon footprint and strengthening local sustainability and conservation efforts.

As a second research question it is therefore asked:

What role do consumers' own origin, local food purchasing behavior and consumers' attitudes towards suboptimal food and the best-before date play in this context?

Essay III examines suboptimality, focusing on local dairy products with short best-before dates. This choice is particularly appropriate as German consumers highly value local origin when it comes to dairy products (BMEL, 2020, 2022). The decision to explore products with short best-before dates is driven by the fact that expired food is often cited as a major contributing factor (Garrone et al., 2014; Patra et al., 2020; Samotyja & Sielicka-Różyńska, 2021), particularly in the case of dairy products (Albizzati et al., 2019; Goodman-Smith et al., 2020; Lebersorger & Schneider, 2014; Tesco PLC, 2021).

According to a representative national diary survey on food waste generation in German households, dairy products make up to 9 percent of all food wasted (Herzberg et al., 2020). Yet, when looking at the disposal reasons for dairy products, in 80 percent of the cases it was due to durability (Herzberg et al., 2020). Also at the retail stage studies show that a majority of food is wasted for expiration date reasons (Garrone et al., 2014), especially in case of dairy products (Lebersorger & Schneider, 2014). Analyzing company data records of a food chain in Austria, Lebersorger and Schneider (2014) revealed that 78 percent of dairy products were sorted out only because they exceeded the best-before date. In addition, confusion about the interpretation of date labels remains an important reason for the disposal of "out-of-date" dairy products at the retail and consumption levels (Patra et al., 2020; Samotyja & Sielicka-Różyńska, 2021). As SDG 12 aims to halve food waste by 2030, it is consequently critical to find strategies that help raising consumer acceptance and willingness to purchase dairy products close to their best-before date.

Three different dairy products (fresh milk, cheese and yoghurt) were chosen in order to cover the product category of dairy products as much as possible, but also to be able to analyze the extent to which consumers make a purchase-deciding differentiation within products of this category when considering the best-before date. In other words, it is

thereby possible to find out to what extent consumers may also take into account the fact that different types of dairy products also differ in terms of how long they can still be used after the best-before date has expired if stored correctly (Bundesministerium für Ernährung und Landwirtschaft [BMEL], 2020; Dairy Food Safety Victoria, n. d.; Plasil, 2020; Stefansdottir et al., 2018). Moreover, there are general differences in purchase frequency between these three products (Arbeitsgemeinschaft Verbrauchs- und Medienanalyse, 2020), which could also influence our variable of interest, the purchase probability of the suboptimal product.

Moreover, we focus on the group of younger consumers, i.e. the generation of millennials (generation Y) (Kilian et al., 2012) and post-millennials (generation Z) (Seemiller & Grace, 2016) for several reasons. First, they represent an age group of consumers that is already a critical target group for companies and whose importance will increase in the future (Kumpulainen et al., 2018; Muniady et al., 2014; Savelli et al., 2019). Second, although it has already been noted that these young consumers differ significantly in their characteristics from previous generations (Schlossberg, 2016), their behavior still raises questions (Taken Smith, 2012; Valentine & Powers, 2013). Third, even if these young consumers are particularly concerned about environmental issues (Bucic et al., 2012), in terms of food waste behavior previous studies draw an ambivalent picture (Cicatiello et al., 2019; Graham-Rowe et al., 2014; Hebrok & Boks, 2017; Hooge et al., 2017; Koivupuro et al., 2012; Stancu et al., 2016; Stefan et al., 2013).

A laboratory experiment is used to answer the two research questions raised. One of the four treatments, however, was conducted as an online experiment. This is because its data collection took place during one of the lockdowns to contain the COVID-19 pandemic in Germany, which also prompted the economic laboratory in Munich, where the first three treatments were conducted, to switch from on-site experiments to online experiments. Still, the subject pool from which the study participants were recruited remained the same.

The experimental design is based on the experimental design of Aschemann-Witzel et al. (2018). In the experiment, participants were confronted with a total of three choice sets, each consisting of an optimal and a suboptimal local product alternative, between which they had to choose. The order of the three choice sets was randomized. Within each of

the three choice sets, study participants were asked to rate their likelihood of purchasing the suboptimal product relative to its optimal counterpart (Aschemann-Witzel et al., 2018). The experiment used a between-subjects design with one control group (no message frame for the suboptimal product) and three different treatment groups. The treatment groups differed in the message frame used to promote the suboptimal product (one message frame that emphasized price reduction, one that emphasized food waste prevention, and one that emphasized the local origin of the product).

Non-parametric Mann-Whitney and Kruskal-Wallis tests, as well as OLS, fractional, and zero-one-inflated beta (ZOIB) regression models were used to analyze and compare the effectiveness of the different message frames on the purchase intention of suboptimal local food products. The reason for using fractional and ZOIB regression models was that purchase intention, the dependent variable in the regressions, was measured in percentages. Due to the bounded nature of the dependent variable, using standard OLS regression to examine how a set of explanatory variables affects a response variable is not a good fit because it does not ensure that the predicted values of the dependent fractional variable are within the unit interval (Ramalho et al., 2011). In contrast, fractional as well ZOIB regression models do take into account the specific properties of fractional dependent variables (Ramalho et al., 2011).

For fractional dependent variables a common approach pursued by many authors so far is presented in the seminal paper by Papke and Wooldridge (1996). The authors propose a one-part fractional response model using quasi-likelihood estimation. The advantage of quasi-likelihood estimation is that it is not necessary to know the true distribution of the entire model to get consistent parameter estimates. The approach requires only the correct specification of the conditional mean (StataCorp, 2019a).

Yet, if the data to be analyzed contain a substantial amount of marginal values of zero or one, one should also consider using two-part regression models (Baum, 2008; Ramalho et al., 2011). Two-part models assume a different data generation process for the zeros and ones, for example, when they are of structural nature (Baum, 2008). One such two-part modelling approach is the ZOIB regression model (Attanasi et al., 2016; Ospina & Ferrari, 2010; Ospina & Ferrari, 2012). The ZOIB specification assumes that choices at the extreme values of zero or one are different from choices in the interval of]0,1[

(Licandro & Mello, 2019; Öhler et al., 2019). Applied to the data presented in essay III, this means that ZOIB regression allows the drivers for a purchase probability within the interval of]0,1[to be independent of the drivers for a purchase probability of 1, equal to 100 percent. A Bernoulli distribution is used to model the choice probability at values zero and one (Ospina & Ferrari, 2012), the fractional character of the dependent variable is estimated with a Beta distribution function. Hence, main advantage of the ZOIB regression is that the technique not only considers the fractional character of the dependent variable, but also accounts for the non-symmetrical distribution of the data with clusters of data points at the boundary values (Licandro & Mello, 2019). Still, for comparison and because they are commonly used, essay III also analyzes the dataset with an OLS and a fractional regression specification.

1.4 Methodological approach

Chapter 1.4 reviews the methodological approaches used in the three essays. At the beginning, the relevance, advantages, and disadvantages of surveys are presented. This is followed by a brief description of the pros and cons of laboratory experiments. Finally, a special type of experiment, CBC experiment (also known as discrete choice experiment), is outlined. For all three methodological approaches described, reasons are given as to why they were chosen for the respective essay.

1.4.1 Survey

Surveys are a common research method for studying and descriptively describing attitudes and characteristics of individuals and groups, or for comparing them with each other. Moreover, surveys are one of the most frequently methods to collect primary data (Aaker, 2013).

Surveys in consumer research often aim to measure consumers' attitudes, consumption preferences, shopping habits and routines, and purchase intentions (Konrad, 2010; Mummendey & Grau, 2014). However, as it is particularly for rather abstract concepts difficult to ask consumers about attitudes directly, surveys often try to elicit them indirectly by questioning consumers about their awareness, perception, and knowledge on a variety of aspects related to the more abstract core concept or topic of the survey (Hempel, 2016). In addition, different types of questions can be used, such as rating questions, multiple-choice questions, or statement evaluation tasks (batteries of questions whose statements must be rated) that cover different aspects of the survey research topic (Aaker, 2013). Surveys have as well the advantage that socio-demographic questions can be included, such as questions on respondents' age, education, cultural background or total net income (N. Baur & Blasius, 2014). These questions help to get a better impression of the surveyed sample and to learn about its characteristics, which facilitates to interpret a study's results.

To conduct a survey one can choose between different modes. There are personal interviews (such as face-to-face or telephone interviews), self-administered (e.g., mail or online surveys), but also mixed-mode surveys (de Leeuw et al., 2008). Online surveys are today the most common form of quantitative survey. According to a recent report, they account for 57% (about 12 million) of quantitative surveys in Germany (about 21.2 million) in 2021, compared to 49% (8.3 million) in the year 2020 (Arbeitskreis Deutscher Markt- und Sozialforschungsinstitute e. V [ADM], 2021). The online survey mode was also chosen for this dissertation because of the advantages associated with it, which are briefly listed in the following. It should be noted, though, that most of these online surveys are answered by participants on different devices. So, it is essential to design online surveys as mixed-device questionnaires, as it was done with the surveys of this

dissertation (Föhl & Friedrich, 2022; Silber, H., Weiß, B., Struminskaya, B., & Durrant, G. B., 2018).

Online surveys are first and foremost a cost-effective way of collecting primary data while also reaching respondents who are widely dispersed geographically. The hyperlink to a survey can be published simultaneously on different websites and shared by members with different socio-demographic backgrounds. Consequently, one can reach a very large, but also a very diverse audience, which for this dissertation is desirable since, in general, food consumers are also very heterogeneous (Lizin et al., 2022). Moreover, online surveys allow a fast turnaround with an instantaneous questionnaire delivery from and to participants, who can answer the survey at any point in time, also on their mobile devices. Survey software programs such as *Unipark* (QuestBack GmbH, 2019) and *Qualtics* (Qualtrics, 2020), which were used for this dissertation allow, apart from the mobile device adaptability of the survey, also to use automatically programmed filters, to ensure respondents answering only question relevant for them. The software programs also help to check for item non-response and plausibility, increasing data quality. Potential mistakes due to manual data collection are avoided. Multimedia elements, as used in essay II in this dissertation in form of pictures, however, can be easily displayed and randomized to avoid any order bias. Randomization of the survey questions, respectively the items within a group of questions helps as well to prevent such order bias. Finally, employing the online survey mode for this dissertation is reasonable, especially in essay I, because the research environment is also a digital one. In other words, the research questions explored in essay I assume that respondents generally have the ability to access information provided online. Additionally, the research questions of the supplementary questionnaire of essay II address particularly young consumers in Germany. This target group can be reached very well online, since recent statistics show that in the year 2022, 100 percent of young consumers in Germany are using the Internet with an average daily usage time of 284 minutes (ARD & ZDF, 2022a, 2022c).

1.4.1.1 Survey instrument

A formal and standardized questionnaire was used in both essay I and essay II to conduct the statistical analyses required to answer the essays' research questions. The survey questions were developed in a three-stage process. In a first step, an initial draft of the questions was developed based on general survey best practices (Brace, 2013; Bradburn et al., 2004; Kothari, 2004; Schnell, 2019b; Theobald, 2017) and, as far as available, established, subject-specific scales. All questions had closed format with a pre-defined range of answers and mainly used rating scales (Föhl & Friedrich, 2022; Zikmund, 2010).

Rating scales are used to measure the intensity of attitudes, opinions or behavior in graded form (Möhring & Schlütz, 2019). Although in most cases the rating scale items are not perfectly equidistant, they are commonly considered "quasi-metric" (Völkl & Korb, 2018, p. 20). Interpreting such scales as metric scales, along with using statistical parameters, e.g., the calculation of means, involves a certain degree of error, which, however, is considered negligible under certain conditions, especially in the social sciences and psychology (Borgatta & Bohrnstedt, 1980). Opp and Schmidt (1976) argue that rating scales may be used as metric variables in an analysis if they have at least five expressions and a data set of at least 100 cases is available. Numerous other authors also take a similar position and consider analyses at the metric scale level to be permissible if there are a sufficient number of gradations (Cleff, 2019; Föhl & Friedrich, 2022; Porst, 2014). The questionnaires of this dissertation follow this argumentation.

In a second step, the survey instruments' validity was checked by discussing with subject experts and members of the scientific community. In this phase, it was also done a cognitive pretest (think-aloud technique) for each questionnaire (Schnell, 2019a). Originating from cognitive psychology, think-aloud pretesting requires respondents to say everything that comes to their mind when answering a question (Schnell, 2019a). By doing so, this form of cognitive pretest aims not only to clarify respondents' general strategies in answering a question, but more importantly to uncover the causes of possible response errors in answering the question (Willis, 2004). For many large surveys, cognitive pretesting via think-aloud technique is part of the standard pretest procedure (Lenzner et al., 2015; Schnell, 2019a).

The third and final step was then doing a pilot study for each questionnaire. In the respective first versions, the survey questions were formulated in English language, also because the established scales being used were in English language. Afterwards, the survey items were translated into German for the data collection phase and finally for reporting purposes translated back into English.

The surveys' routing was designed according to recommendations for questionnaire structuring, which ensure that survey participants fill out the questionnaire attentively, completely, that they do not feel overwhelmed, and that order effects are avoided in the question arrangement (Föhl & Friedrich, 2022). Concretely, this means that the main topic of the respective survey was first mentioned on the front page in order to attract attention and generate interest. To facilitate contact with those interested in participating and to build trust, consent to participate was requested in addition to providing information about the general terms and conditions of the survey (expected duration, purpose statement, contact address). The beginning of each survey included simple questions, such as socio-demographic factors, and questions that could be influenced by questions asked later. In the main part, participants were then mainly confronted with item batteries, whose responses served to answer the research questions of the respective essay. Finally, again some socio-demographic characteristics were asked, as well as questions about shopping behavior and food consumption patterns. Finally, respondents were thanked for their participation and given a farewell (Föhl & Friedrich, 2022; Möhring & Schlütz, 2019). For a more precise description of how each questionnaire was conducted, please refer to the respective chapters in the individual essays.

1.4.1.2 Response bias

Surveys are sensitive to response bias, to which belong socially desirable responding, acquiescence bias, guessing or arbitrary responding, rushing through and the tendency to avoid, or prefer extreme response options (Raab-Steiner & Benesch, 2010, pp. 59-62). Response bias means, that survey participants tend towards answering questions in a congruous way, without considering the question’s content.

One observes social desirability bias if a survey respondent answers a question according to what is socially desirable, respectively the cultural norm. By using a self-administered survey mode, the surveys in this dissertation hoped to minimize this bias just as by stressing on the introduction page that the survey is completely anonymous, that data is treated strictly confidential and that there is no right or wrong answer to the posed questions. Self-administered surveys also help to avoid the interviewer bias (N. Baur & Blasius, 2014; Brace, 2013). For horizontal Likert scales to avoid any order effect – respondents' inclination to decide for the left end of a self-completion scale – the dissertation's surveys followed the recommendation by Brace (2013), to put the negative end of the scale to the left side and the positive end to the right side. To reduce respondents' rushing through, guessing or arbitrary responding, the motivation and scientific purpose was emphasized on the introduction page. In addition, the online survey mode allowed to record the response time for each participant which was used during data cleaning to check for response inconsistencies and "click throughs".

Although conducting the surveys online allowed for reaching a wide range of consumers, due to convenience sampling, the surveys in this dissertation are not representative. However, representativeness must not necessarily be an objective of an online survey (Föhl & Friedrich, 2022; Theobald, 2017). Rather, it should be asked whether there are systematic differences between the actual sample and the target population (Föhl & Friedrich, 2022; Theobald, 2017). Dillman and Bowker (2001, p. 164) argue that in case "nearly all members of a [target] population have computers and Internet access, as is already the case for many such groups, coverage is less of a problem". Moreover, the literature also argues that it depends on the specific topic whether a sample is suitable to draw conclusions about the target population (N. von Baur & Florian, 2009; Brenner, 2002). As the research questions of this dissertation focus on:

- technic-savvy consumers which are interested in digital accessible food traceability systems (essay I) and local food traceability (essay II)
- as well as young consumers, i.e. the generation of millennials (generation Y) (Kilian et al., 2012) and post-millennials (generation Z) (Seemiller & Grace, 2016)

applying convenience sampling method and using an online survey is still considered appropriate given its associated benefits, for instance, in terms of reaching cost and time efficiently a broad range of consumers from the target population, as outlined at the beginning of this section. Besides, it is assumed that the samples collected via convenience sampling nevertheless fit the target population of this dissertation quite well (VuMa, 2021c, 2021d). That is, since the dissertation surveys target a particularly Internet-savvy subpopulation due to their focus on young consumers (ARD & ZDF, 2022b, 2022c), the sample and target population should largely correspond, so that coverage problems should be less of a concern (Wagner-Schelewsky & Hering, 2019). In addition, all questionnaires in this dissertation asked for a range of socio-demographic characteristics that allow to draw targeted conclusions according to the respective research question but limited to the sampled subpopulation.

Finally, although it must be recognized that self-selection bias cannot be completely ruled out with convenience sampling, efforts were made to minimize it as much as possible. To reduce self-selection bias in the samples, i.e., to avoid reaching only those consumers who were particularly in favor of or against the respective survey topic, the surveys' cover pages only informed study participants that the studies addressed the general topic of (local) food shopping (Pedersen et al., 2018).

1.4.1.3 Instrument evaluation - quality criteria for survey scales

The quality of empirical research is assessed according to three quality criteria: objectivity, reliability and validity. These three criteria are also used to determine the quality of questionnaires. In the following these three criteria are described in more detail and their relevance and application for questionnaires in general and the questionnaires in this dissertation is laid out in more detail.

Objectivity

The first criterion is objectivity. It means that empirical data collection, analysis, and interpreting the results must always produce the same outcomes, regardless of who performs these tasks (Fantapié Altobelli, 2017; Föhl & Friedrich, 2022). Hence, one distinguishes between three types of objectivity: implementation objectivity, analytic objectivity, and interpretation objectivity (Döring & Bortz, 2016). In general, objectivity as instrument criterion is easier to fulfill in online surveys compared to other survey modes since there is no direct interaction with the researchers. Thus, it can be expected that the results are unaffected by the perspective and behavior of the researchers, which is also assumed for the surveys of this dissertation (Föhl & Friedrich, 2022). In contrast, it is much more difficult to satisfy the instrument criteria of reliability and validity in online surveys.

Reliability

Reliability refers to the overall consistency of a measurement instrument. Meaning, a measure is considered reliable if it produces similar results under consistent conditions (Föhl & Friedrich, 2022; Möhring & Schlütz, 2019). Consequently, given the conditions are the same, repeating a measurement should always yield the same result. In practice, measurement instruments are never perfectly consistent (Föhl & Friedrich, 2022). This is because in many measurement methods in the social sciences, reliability is influenced by situational conditions, the properties of the measurement instrument, and characteristics of the individual person (Sedlmeier & Renkewitz, 2018, p. 81)[9]. All these factors

9 Situational conditions refer to all external circumstances affecting the survey measurement, for instance, distractions or daytime. Since in a self-administered online questionnaire participants decide on their own at which point in time they respond, one cannot control for such external circumstances.

Properties of the measurement instrument means that there might be effects that influence the measurement that are caused by the wording of the questions and response options. Examples are the clarity of the instructions, or in case survey questions lead to learning effects among participants (Brosius et al., 2016). Finally, characteristics of the individual person encompass all factors that influence at individual level the

contribute to measurement inconsistencies, but have nothing to do with the attribute being measured.

As recommendation, though, the reliability of an online questionnaire can be improved by the following points:

- Formulating questions and response options carefully.
- Choosing an appropriate question sequence to mitigate possible influences of certain questions' content on participants' answers.
- Clearly communicating the survey duration and allowing participants to interrupt the survey to help respondents better estimate participation at a certain point in time.

In practice, the reliability of a multi-item scale is assessed by determining the proportion of systematic variation in a scale. For doing so, there exist different approaches: test-retest, alternative-form, and internal consistency methods. Two very common internal consistency methods for measuring the reliability of survey instruments are Cronbach's alpha, as used in the surveys in this dissertation, and composite reliability (Cronbach, 1951). Both measurement scales range between 0 and 1. As a rule of thumb, which is also applied in this dissertation, a value of 0.70 is usually considered reliable (Nunnally, 1975), while for explanatory research the threshold might be also a little bit lower at 0.60 (Malhotra, 2019; R. A. Peterson, 1994). The value of Cronbach’s alpha gives the average of all possible split-half coefficients that result from splitting the scale items in different ways (Malhotra, 2019). Composite reliability is quite similar to Cronbach’s alpha (Netemeyer et al., 2003) and can be understood as being equal to the total sum of true score variance in the multi-item scale relative to the total score variance (Brunner & Süß, 2005).

survey measurement such as an individual’s motivation or emotional strain, fatigue but also level of attention.

Validity

Validity refers to the extent to which a measurement instrument actually measures the construct it is intended to measure (Brosius et al., 2016; Fantapié Altobelli, 2017; Föhl & Friedrich, 2022). Thus, questions in a questionnaire are valid if they measure the constructs and abstract variables that are supposed to be measured. Perfect instrument validity requires that there is no measurement error, neither random nor systematic. A measurement's validity can be assessed based on content validity, criterion validity and construct validity (Malhotra, 2019).

Content validity, also called face validity, is a subjective, although systematic evaluation of how well the question items of a survey scale represent the dimensions of the construct being measured (Q. Hu et al., 2012; Roni & Djajadikerta, 2021). It is generally evaluated based on the literature and by reviews from subject experts (Roni & Djajadikerta, 2021; Straub & Gefen, 2004). Second, criterion validity assesses the extent to which a measurement method for a particular construct corresponds to a second measurement method on the same or a related topic, for instance behavioral intention and actual behavior (Föhl & Friedrich, 2022). Third, construct validity examines the extent to which the underlying theoretical construct is truly captured by the individual items being asked and how the items relate to each other and to other constructs (Föhl & Friedrich, 2022; Möhring & Schlütz, 2019). Assessing construct validity demands having a well-founded theoretical framework defining the nature of the construct being measured, along with a thorough understanding of its interrelationships with other related constructs (Malhotra, 2019).

Relationship between validity, reliability and objectivity

Objectivity and reliability affect validity in such way that if objectivity and reliability are not sufficiently fulfilled, also validity is restricted. Perfect validity thus implies perfect reliability and objectivity. Conversely, however, high objectivity and reliability are not sufficient to ensure high validity, because there can still be a systematic error that distorts

the measurement results (Föhl & Friedrich, 2022; Malhotra, 2019). Objectivity and reliability of a measurement are therefore necessary but not sufficient conditions for validity (Malhotra, 2019).

1.4.1.4 Objectivity, reliability, and validity applied to the survey scales used in this dissertation

Applying the quality criteria of measurement scales to the surveys in this dissertation, the least critical criterion was objectivity. This is because all surveys conducted were set up as self-administered, anonymous questionnaires that allowed no interaction with the study researcher. The only contact option available to study participants was to send an E-mail request to receive more information about the particular study, but this was not used by any of the respondents.

Due to the self-administered design of the surveys, in terms of reliability, it cannot be completely ruled out that the results of the survey measurements have been influenced by situational conditions and respondents' individual characteristics. However, the front page of each survey emphasized, that participants should answer intuitively and fill out the questionnaire thoroughly. Moreover, to the extent that it was feasible to anticipate possible individual characteristics influencing a participant's response, control constructs were included to account for these person-specific characteristics, such as level of attention or personal involvement. These characteristics were identified by reading the relevant literature.

The survey design also carefully followed the recommendations described above regarding the wording of questions and answers and the question ordering, as well as the indication of a realistic time frame for consciously completing the questionnaire (Föhl & Friedrich, 2022). All relevant constructs used in the studies to answer the respective research questions were assessed for their reliability by calculating Cronbach's alpha and applying the threshold level of 0.70 and 0.60, respectively, for more explanatory research constructs (Malhotra, 2019; R. A. Peterson, 1994).

For the third criterion, validity, the content validity of the measurement scales used was ensured by systematically reviewing the respective literature and by discussing with subject experts. Because criterion validity and construct validity are both quite challenging to determine, it is common in empirical research to use already established measurement scales if available, unless the focus of a study is on scale development. Since scale development was not a research focus in any of the essays in this dissertation, the surveys in these essays follow this common practice and likewise use already established constructs as survey measures (Föhl & Friedrich, 2022).

1.4.2 Experiments

1.4.2.1 Conventional laboratory experiments

Until its major breakthrough in 2002, when Vernon Smith received the Nobel Prize together with Daniel Kahneman *"for having established laboratory experiments as a tool in empirical economic analysis, especially in the study of alternative market mechanisms"* (NobelPrize.org, 2002) it took more than 50 years until experimental methods could establish themselves in economics (Friedman & Sunder, 2012). In principle, there are two types of experiments that can be distinguished: laboratory experiments and field experiments (Harrison & List, 2004). Both types of experiment belong to the revealed preference elicitation methods, hence, techniques which use observations on actual choices made by individuals to measure preferences (Hicks, 2002). Since essay II and III of this dissertation are based on "conventional lab experiments" (Harrison & List, 2004, p. 1013), the following paragraphs only focus on this research method.

It was decided against a field experimental design in essay II as well as essay III because field experiments do not allow to control for extraneous or confounding variables as closely as laboratory experiments, which, however, have a strong influence in food shopping decision (Hoyer, 1984; Kalnikaitė et al., 2013). For example, time pressure, the way food is presented, and the arrangement of the products all play a role in food shopping, which are difficult to control in field experiments, whereas this is relatively easy in laboratory experiments (Falk & Fehr, 2003; Silayoi & Speece, 2004; Verbeke, 2005).

Laboratory experiments are today a well-known and widely used quantitative research method (Falk & Fehr, 2003) to elicit consumer preferences. Their benefits are manifold and range from operational to profound theoretical, meaning, content-related aspects. The results of laboratory experiments are obtained quickly, and compared to field experiments, the cost of conducting them is rather low, since one of the main cost components is the participation fees for the experiment participants. As laboratory experiments are often conducted with students, the amount that must be paid as

compensation for their time spent in the experiment (opportunity costs) is still much lower than the amount that would be required to compensate workers with regular employment contracts. Still, though, studies show that the differences in the behavior of different subject pools, for instance, students versus managers, are not fundamental and the qualitative patterns of behavior are quite alike (Åstebro et al., 2015; Cooper et al., 1999; Falk & Fehr, 2003; Fehr & List, 2004). Besides, laboratory experiments allow to observe and control for factors influencing an individual's decision-making that are hard to observe otherwise (Dohmen & Falk, 2011). In essay III of this dissertation, for instance, the person's attitude towards food waste avoidance practices and perception of the expiration date are relevant factors that are measured accordingly, as are individual characteristics such as pro-environmental self-identity and shopping behavior for local food. Using other revealed preference elicitation methods such as field experiments or market data, these factors would be extremely difficult to measure (Breidert et al., 2006).

For Falk and Fehr (2003), the biggest advantage that favors laboratory experiments is control. Control here does not only mean control over disturbing or undesirable environmental factors such as noise or peer pressure. Control also means that laboratory experiments enable to implement "truly exogenous ceteris paribus changes" (Falk & Fehr, 2003, p. 401) and to systematically study their impact on the dependent variable of research interest, but also on the decision environment (Falk & Fehr, 2003). Consequently, provided that a laboratory experiment is properly designed and its data is analyzed correctly, this research method has a high degree of internal validity, which finally allows to test for causality between the independent variables and the depend variable of interest (Falk & Fehr, 2003; Falk et al., 2005; Loewenstein, 1999).

Laboratory experiments are also easy to replicate because experimenters can tightly control the conditions under which experimental data is generated and because they are required to present a detailed experimental design in their studies (Falk & Fehr, 2003). V. L. Smith (1994) cites as further operational advantages that laboratory experiments make it possible to compare different institutional environments, but also to compare different institutions using the same environment, just as they can serve as a testing ground for institutional designs.

The content-based benefits of laboratory experiments relate to the method's potential to explicitly test theories, explore the mechanism behind a phenomenon and the causes or conditions under which a theory might fail, and find empirical regularities that may form the basis for developing new theories (V. L. Smith, 1994). Finally, laboratory experiments enable the evaluation of policy proposals and program evaluations (Falk & Fehr, 2003; V. L. Smith, 1994).

Despite the many advantages laboratory experiments offer, the method is also subject to criticism. Its opponents often argue that the subject pool which is used to collect primary data might be biased since experimental participants are mainly students, thus, the data collected might not be representative (List, 2011). Moreover, it is objected that sample sizes in experiments are often small and participants might take decision too thoughtlessly as the stakes in the experiment are not high enough (Falk & Fehr, 2003). The most serious argument put forward against laboratory experiments is that they lack external validity. Sceptics argue that experiments conducted in the laboratory, thus in an artificial environment, do not capture all the essential conditions that prevail in reality, consequently the results also lack generalizability (Breidert et al., 2006; Falk & Fehr, 2003; Falk & Heckman, 2009; List, 2011). In consumer preference research, for example, this may be that experiment participants do not have to pay for the purchase decisions they make, in other words, their decisions do not have financial consequences (Breidert et al., 2006; Nagle & Holden, 2002). Moreover, participants in a laboratory experiment are aware of the experimental situation. As a result, the purchasing behavior of the experimental participants might be more rational than their usual purchasing behavior in a natural environment (Breidert et al., 2006). This makes it more difficult to predict actual consumer behavior in real decision-making situations (Harrison & List, 2004).

Even if the arguments listed raise legitimate concerns, there are also studies that help to refute these criticisms. In particular, regarding the critique of missing realism, it is helpful to remember that it is precisely this simplification of reality that makes experiments, as well as economic models in general, so valuable, as they help us to better understand the interactions of relevant variables and the mechanism behind their relationships (Falk & Fehr, 2003). To the general criticism of a potential subject pool bias, it can be countered that while there are quantitative differences in the results between different subject pools, studies show that these differences are not fundamental, but rather that the qualitative

behavioral patterns are quite similar (e.g., Cooper et al., 1999; Falk & Fehr, 2003; Fehr & List, 2004). This also applies to differences in the results between laboratory experiments with hypothetical and non-hypothetical purchase decisions. Here, studies have shown that while there may be differences in the absolute level of, for example, willingness to pay or reservation price, the relative importance of certain product attributes is fairly stable, even in monetary terms (Carlsson & Martinsson, 2001; J. L. Lusk & Schroeder, 2004; Printezis et al., 2019; L. O. Taylor et al., 2010). Furthermore, there are also several ex ante and ex post strategies for hypothetical laboratory experiments to minimize or even eliminate hypothetical bias (Blumenschein et al., 1998; Lizin et al., 2022; Loomis, 2014; J. L. Lusk, 2003; Park & MacLachlan, 2008).

In this dissertation, a laboratory experimental design is used in essays II and III for the following reasons: operational aspects, more extensive set of variables that can be collected, and, most importantly, having the possibility to examine the relationship between independent and dependent variable(s) for causality by precisely controlling all potential factors influencing the purchase decisions.

In more detail, the arguments in favor of conducting the experiments in the laboratory were clearly the relatively low costs, consisting mainly of the participation fee, and the rather small amount of time required to conduct a laboratory experiment compared to a field experiment in a real shopping environment, e.g., a supermarket. Far more important, however, were the arguments of being able to tightly control the decision environment and being able to gather additional information about the study participants. Additional variables of interest for essay II included age, frequency of berry consumption, or whether an allergy to berries exists, while constructs and variables such as pro-environmental self-identity, food waste avoidance attitude and local food shopping frequency were important for essay III. Because food purchasing decisions are also often influenced by a variety of situational factors, such as time pressure, noise in form of audible commercials or music in the shopping location, or whether shopping is done in company (Magnier & Schoormans, 2015; Silayoi & Speece, 2004; Verbeke, 2005), conducting the studies for essays II and III in the laboratory had the distinct advantage of being able to exclude these factors and provide the same shopping environment for each study participant.

Furthermore, by holding all other factors constant, the laboratory experimental design allowed essay III to actually examine the relationship between product attribute framing (independent variable) and purchase likelihood (dependent variable) for causality, in other words, how the use of different message frames affects the purchase likelihood of local products close to their best-before date.

To sum up, laboratory experiments allow researchers to closely examine human behavior, ideally controlling for all environmental conditions, personal characteristics, and preferences that might influence an individual's decision-making process (Falk & Fehr, 2003). In this way, laboratory experiments can help create a more realistic picture of human nature in the long run (Falk & Fehr, 2003). Essay II and III of this dissertation make use of these advantages to study young consumers' local food product decisions. Still, since the method, like any other research method, has its weaknesses, laboratory experiments should not be considered as a substitute but as a valuable complement to field experiments (Harrison & List, 2004; List, 2011) but also to more traditional empirical research methods (Falk & Fehr, 2003).

1.4.2.2 Choice-based conjoint (CBC) experiments

A key research interest in consumer marketing is to measure individual preferences. Hensher et al. (2015, p. 1123) define preferences as "forces leading an individual to select one alternative over another." Measuring consumer preferences is rooted in microeconomic theory. Neoclassical economics, a leading stream of research within microeconomics, assumes that consumers have complete and transitive preferences, upon which they make rational decisions. This decision process is in turn considered to follow certain decision rules (Adamowicz et al., 2008), of which utility maximization is one of the most commonly postulated. This decision rule states that consumers act with the aim of maximizing utility. Utility itself, however, is a latent construct. Consequently, the approaches being used to measure consumers' utility of a decision alternative can only

be seen as approximations, depending also on the type of preference elicitation method applied (Voelckner, 2006).

There exist a range of methods to elicit consumer preferences, which can be divided into revealed and stated preference elicitation methods (Voelckner, 2006). The second essay in this dissertation uses a CBC experiment design, which is a stated preference elicitation method that aims to explain heterogeneity in consumer response behavior (Breidert et al., 2006; Louviere, J. J., Hensher, D. A., Swait, J. & Adamowicz, 2010). CBC experiments are a frequently used research method in consumer marketing as well as in transportation research, from which they originated (Davidson, 1973). Of particular relevance to this dissertation are CBC experiments that have been conducted in relation to local food (e.g., Feldmann & Hamm, 2015; Hempel & Hamm, 2016; Printezis et al., 2019).

Like other preference elicitation methods, CBC experiments are based on random utility theory (RUT) and Lancaster's theory of consumer demand. According to the RUT (Thurstone, 1927b) consumers are assumed to aim maximizing their utility with their decisions. Thus, in a choice situation, when a consumer has to decide between two or more alternatives, a consumer is supposed to decide for the alternative which is expected to deliver the highest utility among all the alternatives presented. Until Lancaster's (1966) contribution to consumer theory the assumption prevailed that a product as a whole delivers utility to a consumer. Lancaster (1966), however, devised a new approach which states that not the product itself gives utility, but rather a products' properties and characteristics are important as they are the ones from which consumers derive utility (cf. attribute based utility). Hence, a product's utility can be regarded as an aggregate of the utility of the single product properties and characteristics (Lancaster, 1966). In the choice experiment literature these properties and characteristics are called attributes. These attributes have different levels (e.g., different levels of price) which are systematically varied between alternatives. Choice analysis is thus about estimating the relative utility of the alternatives in a given set of choices.

Since the contribution by Lancaster (1966), choice theory has evolved, i.e., behavioral and psychological perspectives have been integrated beyond pure utility maximization (Adamowicz et al., 2008; Loewenstein, 2000). Yet, even though it is now assumed that preferences are not only predetermined but also result from heuristic rules, decision

context and emotions, it will still take a lot of collaborative research between economists, psychologists and statisticians before choice modelling finally achieves to build behavioral dynamic structural choice models (Adamowicz et al., 2008).

In addition to CBC experiments, there are also traditional conjoint studies. Common to both methods is that they allow to decompose products into attribute levels and to estimate the part-worths for these levels (Breidert et al., 2006). Moreover, both methods provide the flexibility to test new price/product combinations (Breidert et al., 2006). Two major drawbacks of traditional conjoint studies, however, are that participants are typically not asked to decide between product alternatives, nor are they asked whether they would actually purchase a product (Breidert et al., 2006). In a CBC experiment, participants are shown a series of choice scenarios (choice sets). In each of these choice scenarios, they are asked to choose one of the alternatives presented, with each alternative composed of different attribute levels. Accordingly, the distinguishing feature between traditional conjoint studies and CBC experiments is that the latter require participants to choose from a set of product alternatives rather than directly evaluating, ranking, or rating them (Breidert et al., 2006). As a result, CBC experiments are considered to mimic real-world purchase behavior better than traditional conjoint studies (Breidert et al., 2006), but also compared to direct stated preference elicitation methods such as surveys (Breidert et al., 2006). This is because the complexity of the choice task reduces the tendency of consumers to respond in a socially desirable manner (Auger & Devinney, 2007; Breidert et al., 2006). To make the choice scenarios even more realistic, choice sets often include a no-choice alternative that allows participants to indicate that they would not choose any of the presented product alternatives (Breidert et al., 2006).

Despite the advantages of CBC experiments, a major limitation of this method is that, unlike real effort experiments, for example, it is not per se incentive-compatible. That is, although CBC experiments reduce hypothetical bias compared to surveys, they cannot completely eliminate or prevent it in their basic conception (Breidert et al., 2006; Voelckner, 2006). Meanwhile, though, there exist incentive-compatible mechanisms that are used in choice experiments to address precisely this shortcoming (Breidert et al., 2006; Ding, 2007; Ding et al., 2005; Voelckner, 2006). Accordingly, in these incentive-aligned CBC experiments, choosing a product involves a real economic commitment and thus has financial consequences for the study participant (Voelckner, 2006). In practice, this

means that participants in such an incentive-compatible CBC experiment are informed at the beginning of the experiment that their choices are binding, i.e., imply a purchase obligation. This can be done, for example, by randomly selecting one of the choice sets at the end of the experiment and implementing the product decision. If a study participant has decided on a product alternative from this randomly selected choice set, the price for this product is deducted from his or her compensation for participating in the experiment and, in return, he or she receives the product together with the remaining compensation.

In the second essay of this dissertation, a CBC experiment is conducted to find out whether consumers in Germany prefer local food products that provide more information on the product origin beyond just stating "product from local origin". So, the objective is to find out if there is a consumer preference for traceable, local food, and to figure out if customers are also willing to buy such products. To achieve this goal, a partially incentive compatible[10] CBC experiment was used because, compared to other preference elicitation methods, this method allows to elicit consumer preferences for each individual product attribute studied. In this study, these attributes were different information items that describe the product characteristic "from local origin" in more detail, thus making the local origin claim more transparent.

Since a CBC experiment requires participants to make tradeoffs between attributes to determine the alternative that provides them with the highest utility, this method allowed to analyze how participants weight these individual attributes and how these attributes thus contribute to the overall utility (Araña & León, 2009). It was decided to use both a hypothetical and a non-hypothetical "partially real payment" (Voelckner, 2006, p. 147) for the following reasons: First, the non-hypothetical CBC experiment was used to determine a realistic weighting of each product attribute and to avoid hypothetical bias. In addition, Voelckner (2006) has shown that an incentive-compatible CBC experiment works well for inexpensive products, as it is the case for the study in essay II with blueberries as the study subject. However, the sample size was kept rather small to avoid food waste and to limit the logistic burden. Second, the hypothetical CBC experiment

10 Partial incentive compatibility was established by making a randomly selected product choice set binding for a subset of the total sample.

was supplemented to have a sufficiently large total sample size so that the statistical analysis has a solid data base to answer the research questions satisfactorily. Third, because the hypothetical and non-hypothetical CBC experiments are complementary, one can determine whether the results found in the hypothetical CBC are also seen in the non-hypothetical CBC experiment, serving also as a robustness check.

1.5 Results, contributions, and outline of the dissertation

The results of this dissertation's essays help to better understand consumers' (local) food product choice, food shopping behavior and product decision-making by studying the following research questions:

Essay I investigates how food traceability systems are currently perceived by consumers in Germany and how much prior experience with digital traceability systems, interest in product origin information, and personal connection to food production influence usage intentions. Essay II looks at the extent to which consumers honor increased transparency and in-depth traceability of products of local origin, what kind of information about local product origin is of interest to consumers, and which information channels shape consumers' perception of food production and the producers involved. Essay III then examines the degree to which highlighting the local origin of a suboptimal food product can be a useful complementary strategy to increase the willingness to purchase suboptimal local food products and thus contribute to reducing food waste at retailers. Furthermore, the role of consumers' origin, purchasing behavior and consumers' attitudes towards suboptimal food products and the best-before date in this context are explored.

Thereby, the dissertation makes contributions relevant to (a) decision-makers in politics and the food industry and (b) researchers in behavioral science and sustainable food consumption. The essays underscore the importance of adopting a more nuanced understanding of consumer decision-making that goes beyond the assumptions of homo economicus to truly promote more responsible food consumption.

1.5.1 Essay I

Essay I investigates how food traceability systems are perceived by consumers in Germany, exemplary standing for the European food market, where food traceability systems are still a rather unusual information option for consumers.

The essay contributes to the literature by examining food traceability systems from a so far rather neglected perspective - satisfying consumers' increasing information needs.

This is important because consumers are increasingly interested in background information about their food products, such as environmental impact and product origin, but also feel more uncertain about their product choices due to several food scandals in recent years. However, as the information asymmetry between consumers and food producers and retailers is unfortunately more pronounced than ever and continues to grow due to the growing decoupling of consumers' daily lives from agriculture, it is imperative to find workable solutions to overcome this principal-agent problem that also take into account this growing disconnection of consumers from food production. Food traceability systems that can be accessed in real time can be such a solution. Furthermore, resolving the asymmetric distribution of information between consumers and producers is also relevant because empowered, sovereign consumers who consciously choose their food and also consider sustainability-related purchasing criteria are a stated goal of the European Commission's farm-to-fork strategy (EC, n. d.–b). The essay also presents an update to the few previous seminal works on European consumers' associations with food traceability systems, considering the significant advancements in digital services over the past 15 years. That is, while very early research found consumers struggling to grasp the concept of food traceability systems (Giraud & Amblard, 2003; Giraud & Halawany, 2006), the perception of traceability systems among consumers initially evolved to associate food traceability systems with food safety and quality (Hobbs et al., 2005; van Rijswijk et al., 2008; Verbeke & Ward, 2006).

However, the development of traceability systems has now advanced to the point where, while the food safety aspect is still a strong argument for food traceability systems in the

eyes of consumers (Treiblmaier & Garaus, 2023), there is an increasing focus on the argument that these systems can make credibility claims such as local origin or sustainable production verifiable for consumers in real time, for example by simply scanning a QR code with a smartphone (Islam & Cullen, 2021). This new possibility for consumers to verify food supply chains and credibility claims in real time is, of course, largely attributed to the progress in digital technology, such as mobile networks (4G/LTE networks, 5G), smartphone technology, and IoT.

Surprisingly, however, no study has yet been published that takes this development into account for Europe. Nor has it been investigated to what extent consumers in Europe have already gained experience with digitally accessible product information or food traceability systems since the sharp rise in smartphone use in our everyday lives (Ericsson, 2022; Federal Statistical Office of Germany [Statista], 2022a; mpfs, 2022; VuMa, 2021a, 2021b). Similarly, it is still unclear how these experiences affect their future intentions to use food traceability systems. Insights from Asian studies are difficult to transfer to answer these questions, despite the progress made in Europe, because European consumers still use digital services much less than Asian consumers and also have less experience with digital traceability systems (Penco et al., 2020; PWC, 2019).

From an overarching perspective, it is also vital to find ways to provide consumers with more background information about food production in a way that is convenient for them, in order to counteract the increasing polarization of societal debates that are often based on insufficient knowledge (Zukunftskommission Landwirtschaft, 2021). The transparent provision of objective facts and information about agricultural practices, for example via a food traceability system, could thus also promote social acceptance and support for the challenging task of transforming the agricultural sector toward sustainability (Zukunftskommission Landwirtschaft, 2021).

Finally, the study also adds to the existing literature on food traceability systems by exploring how consumers' personal connection to food production influences their intention to use traceability systems to obtain more product information.

The results show that firstly, the influence on one' s future purchase intention of traceable food is greater for self-made experiences with scanning a QR code than for just having a positive attitude towards such traceability systems. Accordingly, for the success of the

digital offensive of the European farm-to-fork strategy this is a crucial point to consider. Second, consumers who frequently buy their food locally show a higher intention to increase the amount of traceable food in future purchases. Hence, for food producers who market their products emphasizing local origin, traceability information could be a valuable product addition, as their primary customer base appreciates more transparent supply chains and being offered a digital information service. Thirdly, especially consumers without a personal connection to agriculture can imagine using a traceability system for their future food purchases. This shows that consumers most detached from food production particularly appreciate having access to insights into food production.

1.5.2 Essay II

The focus of essay II is improved product transparency and traceability of local food, a so far not analyzed topic in the literature on food traceability systems. Moreover, it explores which information channels shape young consumers' perceptions of food production and the producers involved.

The contribution of the second essay is threefold:

First, this is the first study that focuses on products of local origin to study consumers' utility for a transparent, detailed breakdown of local origin labeling. Hence, essay II makes an initial contribution by investigating what utility consumers derive from detailed information about the origin of a local product, thereby also making it traceable. While several papers have recently been published on consumers' WTP for local food products (Grebitus et al., 2013; Hou et al., 2019; W. Hu et al., 2009; Lim & Hu, 2013; Printezis et al., 2019; Seitz, 2015), a study on consumers' utility from a transparent, detailed breakdown of local origin labeling is missing. In addition, to date, few studies have more thoroughly examined consumers' perceptions of product traceability and transparent provision of product information (M.-F. Chen, 2008; M.-F. Chen & Huang, 2013; M. L. Loureiro & Umberger, 2007; E. S.-T. Wang & Tsai, 2019; Yin et al., 2017). With its CBC experiments, essay II helps to fill this knowledge gap by answering the questions of which information parts of the "local origin" claim consumers are really interested in and how

deeply they really want to verify the claim (Zander, 2018). As such, it also addresses the criticism about the lack of transparency many credence claims face (Macready et al., 2020)

Second, the study is an example for combining hypothetical and non-hypothetical CBC experiments. On the one hand, this reduces hypothetical bias and, on the other hand, keeps the experiment logistically feasible without risking any food being wasted. Thirdly, it is one of the few studies on the perception of food producers and agriculture among young consumers in Germany.

The mean estimates of the product attributes *place*, hence detailed production origin, and producer *name* were significantly negative. Thus, knowing the exact place of production of the local product, like knowing the producer's name, had on average a negative effect on respondents' utility. This is in strong contrast to what was expected from the literature.

The results of the mixed logit mean estimates for both the hypothetical and non-hypothetical CBC experiments were highly significant at the significance level (α) of 0.01, except for the attributes *place* and *visual_cue_couple* in the hypothetical, and *non-purchase option* as well as *name* in the non-hypothetical CBC experiment, which were significant at the 1% (*place*, *visual_cue_couple, name*) and 5% level (*non-purchase option*). Moreover, the price attribute was not significant in either experiment. Compared to the neutral producer logo, which served as base category for the product attribute *visual product cue*, pictures of the female producer or producer couple were significantly less preferred by experimental participants. In contrast, the picture of the male producer was significantly more preferred than the neutral logo.

Thus, unlike what was expected from the literature (M.-F. Chen, 2008; M.-F. Chen & Huang, 2013; Yin et al., 2017), these findings cannot prove that consumers derive utility from knowing the exact place of origin, or producer name of a food product. In other words, enhanced product transparency and the ability to trace a local product are not valued significantly positively by the investigated group of young consumers.

To better classify the results and to better understand why only the image of the male producer had a positive part-worth utility for the study participants, a supplementary

questionnaire study was conducted after the two CBC experiments. Again, young consumers of the same age cohort were surveyed, though not identically to the participants in the two CBC experiments.[11]

Taking all the studies and their results together, it appears that what consumers consciously express in a questionnaire does not necessarily correspond to what they unconsciously choose in an incentive-aligned experiment, which is further evidence that humans are more homo heuristicus than homo economicus, still subconsciously guided by stereotypical thinking (D. Enste & Potthoff, 2021).

While the vast majority of survey respondents stated that the gender of the food producer is irrelevant when purchasing local food, the results of the CBC experiments prove the opposite. However, when asked which constellation they have in mind when they picture a farm, most respondents thought of a family farm. Interestingly though, the majority of respondents agreed that society's image of women in agriculture will have to change (for the better) in the future, as will society's view of agriculture as a whole.

In principle, this discrepancy in response behavior between the CBC experiments and the supplementary questionnaire can probably be attributed to the different processing pathways of visual and verbal cues in consumer decision-making. Visual cues are processed quickly and intuitively (system I), whereas verbal cues require cognitive processing (system II). In food shopping, which is characterized by time constraints and low product involvement, automatic processing of visual cues usually predominates, so that it is primarily system 1 that guides decision-making in this context. Consequently, the reason for the disparate responses might be that participants in the CBC experiments

11 Even though the supplementary study used a different sample than the CBC experiments, both samples focused exclusively on young consumers from generations Y and Z. These samples had comparable sociodemographic characteristics such as individuals who grew up on a farm, the size of their childhood home, and the size of their current domicile.

There were, however, significant differences in gender ($p = .0078$), with the additional survey having more female participants, and frequency of buying local food ($p < .001$). Meaning, respondents in the supplementary survey were more likely to purchase local products. However, this difference was primarily due to participants who were buying local food once a month or less frequently. No significant difference was found between the two samples when these cases were excluded ($p = .1102$).

focused on the visual cue of a male producer, driven by their still subconsciously prevailing implicit gender-stereotypic thinking. This result again underscores the influence of heuristics in decision-making. Stereotypical role thinking is much more influential in food purchase decisions than the participants themselves are aware of.

One possible explanation for the fact that providing the name and exact place of origin resulted in significantly negative estimates in the mixed logit model could be that participants either preferred less detailed information or found the information provided too complex, leading them to ignore the cues. This would once again highlight the importance of finding the right balance between overly simple and overly complex product information cues to avoid overwhelming young consumers in particular.

However, the opposite could also be true and help explain the findings. That is, the simplicity of the verbal cues provided may not have satisfied young, informed consumers seeking comprehensive background information for their local food choices, or they may have been uncertain about the credibility of the verbal cues. We know from the literature that social proximity between consumers and producers also influences preferences (Denver et al., 2019; Fernández-Ferrín et al., 2018; Hasanzade et al., 2022; J. D. Jensen et al., 2019; Onozaka et al., 2010; Telligman et al., 2017). Yet, since the distance between the place of origin of the local blueberries used and the place where the CBC experiments were conducted was about 100 km, this distance might have been too great for the study participants to feel socially close, even though most consumers in Germany would consider the product to be within the radius considered a local food (Demmeler; Kögl & Tietze, 2010; Verbraucherzentrale Bundesverband e.V., 2022). Finally, it could simply be because visual product cues have so far been rather underestimated in research on local food origin, while verbal cues have been somewhat overestimated. This would suggest that even in the case of a label for local product origin, it is not necessarily the substantive quality of the label (i.e., the rigor of the certification process and the criteria that must be met), but rather the visual presentation of the label that triggers the purchase decision. Future investigations of these explanatory alternatives through follow-up studies would be recommended to conclusively clarify which line of reasoning is most fitting.

1.5.3 Essay III

Essay III is about the purchase intention for local dairy products 2 days before the expiration of the best-before date. By conducting a laboratory experiment it is analyzed which message framing of these products increases consumer purchase intention most. Dairy products were selected because they are particularly frequently discarded for best-before date reasons, both at retail and at household level. In numbers, this means that Lebersorger and Schneider (2014) found in a study analyzing company records of a grocery chain in Austria , that 78 percent of dairy products were sorted out only because they had exceeded the best-before date. Similarly, another study estimates that retailers, distributors, and consumers are responsible for about 60 million tons of dairy products wasted worldwide (A. S. Gross, 2018).

The first contribution of the study is to investigate to what extent a label highlighting the local origin of a suboptimal product can be a complementary strategy to increase the purchase intention for these products. Although "local origin" is a commonly cited purchase criterion among food shoppers (Bazzani et al., 2017; Printezis et al., 2019), to my knowledge, there is no study in the literature that examines whether highlighting the local product characteristic can have the same positive impact on the purchase intention for a suboptimal food product as for its optimal counterpart. Consequently, the study adds to the existing literature by examining the extent to which food waste prevention practices at the retail level can also benefit from the local food shopping trend. Second, the study provides an update on the importance of the best-before date as a guideline and decision criterion for young German consumers when shopping. Providing an update is of interest because studies show that in recent years, consumers' understanding of the best-before date has increased and it is no longer understood as a purely throwaway criterion (BMEL, 2020; van Boxstael et al., 2014; N. L. W. Wilson et al., 2018). Methodologically, the study can serve as a use case for the ZOIB regression model and illustrate when its model fit is superior for data analysis in comparison to a fractional regression model.

The experimental results show a high propensity to purchase suboptimal dairy products among study participants. However, no significant differences were found between the different label framings in general, except for the price-saving label. With respect to the

price-saving label, though, the origin of the study participants (whether one is from the region of origin of the product or not) influenced the purchase intention and also the evaluation of the product quality. Additionally, participants' attitudes towards food waste and the extent to which they view the best-before date as a guideline for consumption influenced their purchase intention. In contrast, whether someone prioritizes local products when grocery shopping had no effect on the probability to buy local dairy products that are close to their expiration date.

Overall, the results suggest that the use of altruistic message frames cannot additionally increase the purchase probability for local dairy products close to the best-before date. At the opposite, one finds ambiguous results on the probability of choosing the suboptimal local dairy products when a self-centered price message frame is used. That is, emphasizing price savings can also affect the purchase probability and quality perception of suboptimal local dairy products negatively among a subset of consumers.

In summary, the three essays in this dissertation address relevant points on the future of sustainable food consumption and provide new insights that are of interest to all food practitioners and stakeholders working in the field of SDG 12. Altogether, the findings show that to promote more responsible food consumption, it is necessary to address not only the rational, reflective side of consumers, but also that part that is responsible for consumers' intuitive, fast, sometimes almost automatic judgment and decision-making processes (homo heuristicus). Understanding why consumers choose to buy or not to buy a (sub)optimal local food product, as well as how to best target different consumer groups in their product choices, is critical to encouraging consumers to adopt a more sustainable food purchasing behavior and ultimately, as a society, to work towards a more sustainable lifestyle.

This dissertation is structured as follows: After presenting the dissertation's guiding research questions in Chapter 1.3, Chapter 2 answers the research questions of the first essay, titled “Traceability in the eyes of German consumers”. It investigates how food traceability systems are perceived by consumers and which factors influence consumers’ usage intention. The objective of Chapter 3 is to figure out how important local food details are for young consumers when making their purchase decision and to find out to

which degree increased transparency about local product origin is rewarded by them. Accordingly, it is titled “Unraveling the importance of local food details in young consumers' purchasing decisions”. Chapter 4 focuses on preventing food waste at retailers by employing different message frames to increase the likelihood of purchasing suboptimal local foods among consumers. The study is titled “Comparison of the influence of price, local origin, and environmental labels on the willingness to buy suboptimal, local dairy products among young consumers in Germany”. Each essay of the dissertation represents a distinct scientific contribution on its own. Therefore, the chapters are treated as independent studies that have their own introductions, literature overviews, methods, results, discussions, and conclusion sections. The dissertation concludes with Chapter 5, which summarizes the main findings, discusses the overall practical implications, and suggests avenues for future research.

2 Food traceability in the eyes of German consumers (Essay I)[12]

2.1 Introduction

The increasing urbanization of society combined with the globalization of food production has led to consumers losing touch with agriculture and its producers (Autio et al. 2013; Nilsson, Tunçer, and Thidell 2004). Due to this, but also because of serious food scandals in recent years, the food system has a serious image and credibility problem (Creydt and Fischer 2019; Pfeiffer, Gabriel, and Gandorfer 2021; T. Zhang, Grunert, and Zhou 2020). This contrasts with the fact that consumers become increasingly interested in knowing where and how their food is produced (Kraft, Valdés, and Zheng 2018). The consumers' increased information demand is also addressed in the European Commission's farm-to-fork strategy. Accordingly, over the next few years, new (digital) possibilities will be explored to improve people' s access to food information (European Union 2020).

So far, however, there often exists information asymmetry between consumers and producers regarding food product features (Ortega et al. 2011; Tessitore et al. 2020; Zecca and Rastorgueva 2016). Food traceability systems can help reducing information asymmetry by providing transparency on the supply chain and origin of the food products (Anastasiadis, Apostolidou, and Michailidis 2021; Yacoub and Castillo 2022). Apart from the meat industry, though, studies on food traceability systems that investigate the acceptance and usage intention from a consumer perspective are still scarce, especially in the European context (Chrysochou, Chryssochoidis, and Kehagia 2009; Shin, H. Kim, and Severt 2021; Yuan, Shuman Wang, and Yu 2020; T. Zhang, Grunert, and Zhou

12 This essay was presented at the Retaste 2021 Conference, held virtually due to COVID-19 restrictions and organized by Harokopio University and Hellenic Mediterranean University, the 96th Annual Conference 2022 of the Agricultural Economics Society in Leuven, Belgium, and the 32nd World Conference of the International Food and Agribusiness Management Association in San José, Costa Rica.

2020). Besides, another reason that calls for updating consumer perceptions of traceability systems is that it has been quite a while since the seminal works on food traceability systems were published in Europe (Kehagia et al. 2007; Chrysochou, Chryssochoidis, and Kehagia 2009; van Rijswijk et al. 2008; Giraud and Halawany 2006). Digital services have made huge progress in the last 15 years. The perception consumers have today of a traceability system as a digital information service is probably quite different from previous studies. Even so, European consumers are still using digital services much less compared to consumers in Asia, and they also have less experience using digital traceability systems (Penco et al. 2020; PWC 2019). However, some knowledge of traceability systems or personal experience is essential to recognize their added value (Yuan, Shuman Wang, and Yu 2020; A. Zhang, Mankad, and Ariyawardana 2020). This limits the transferability of recent findings on traceability systems from Asian studies to the European context.

In addition, existing studies have investigated the perception of traceability systems from the consumer's point of view, primarily from the perspective of food safety (A. Zhang, Mankad, and Ariyawardana 2020; Yoo, Parameswaran, and Kishore 2015; Treiblmaier and Garaus 2023). However, we are not aware of any study that focuses on the extent to which a traceability system might serve as a tool for conveying information and knowledge about food production to consumers. This is surprising, since consumers' dietary habits and shopping behavior have changed significantly in recent years. Nowadays, consumers make their food choices much more consciously and consider more product-related purchasing criteria, such as food origin (P. Megicks, J. Memery, and Williams 2008; J. Memery et al. 2015; Carey et al. 2011; Birch, J. Memery, and De Silva Kanakaratne 2018). Yet, it also requires providing more product information to consumers, which traditional paper-based labels struggle to do due to size constraints (Bacarella et al. 2015; Yuan, Shuman Wang, and Yu 2020). This should make quick response (QR) code-accessible traceability systems an attractive alternative information option for information-seeking consumers. Since, according to existing literature, one of the main benefits of traceability systems for European consumers is to obtain more information about product origin (Kehagia et al. 2007; van Rijswijk et al. 2008; Menozzi et al. 2015; Giraud and Halawany 2006), traceability systems could be particularly

relevant as a shopping guide for food buyers interested in food origin. However, it is still an open empirical question whether this is actually the case.

It is also an unanswered question how consumers' personal connection to food production influences their intention to use traceability systems to obtain more product information. In other words, the less consumers have personal touch points with food production in their daily lives, the more they might find a traceability system useful because it gives them access to information about food products that they have been missing but regard as valuable.

Consequently, this study aims to contribute closing this research gap by answering the following research questions:

1) *How are food traceability systems currently perceived by consumers in Germany?*
2) *How strongly are*
    a) *previous experience with digital traceability systems,*
    b) *interest in information on product origin and*
    c) *personal connection to food production influencing the usage intention*?

We focus on German consumers' perceptions of traceability systems because results on consumers' perceptions of traceability systems are often highly country specific (Yuan, Shuman Wang, and Yu 2020). Consequently, findings from studies on traceability systems conducted in Asian countries (Bai, C. Zhang, and Jiang 2013; A. Chang, Tseng, and Chu 2013; M.-F. Chen and Huang 2013; Jin, Y. Zhang, and Yining Xu 2017; Linhai Wu et al. 2016; X. Wu et al. 2021; L. Xu et al. 2019; Yin et al. 2017; Yuan, Shuman Wang, and Yu 2020) do not necessarily apply to the European cultural context. The results' transferability is also rather limited, as Asian consumers differ markedly from European consumers in terms of their general food purchasing behavior, use of digital services, and (socio-)cultural aspects related to food consumption (PWC 2019; Holmes, Byrne, and Rowley 2013; Vuylsteke et al. 2010; Swanson et al. 2011; Rašković et al. 2020). The size of the market is another reason to focus on Germany. Germany is

the second largest food retail market in Europe after France with sales of 139.4 billion euros (Eurostat 2021; GfK and IRI 2021).

The study is firstly an update on the perception of digital traceability systems from the perspective of European consumers. Secondly, it also examines how important it is for the intention to use such systems that consumers make their own experiences with them. This is a critical success factor that the European farm-to-fork strategy must ensure to make its digital information offensive a success. Besides, it is investigated to what extent consumers who mainly buy locally sourced food would use such a traceability system. For producers of local food, this may be a helpful hint on how they could additionally differentiate themselves from competitors. The study also adds to the existing literature on food traceability systems by exploring to what extent consumers without a personal connection to food production would use a traceability system and, consequently, might be the primary target group for traceable food products.

Within this paper we define the term traceability system according to Olsen and Borit (2018), who consider a traceability system as being a generic concept which comprises principles, practices and standards that are needed to ensure the traceability of food products. Hence, how such a system is implemented in practice holds no relevance to the core concept itself (Olsen and Borit 2018). However, for our study, we specifically use QR codes and barcodes to illustrate and provide examples of how traceability systems can be accessed by consumers in a user-friendly manner using mobile devices.

The essay is structured as follows: First, section 2 presents the hypotheses after reviewing the current literature on traceability systems. The methods are described in section 3, followed by the results in section 4. A discussion is laid out in section 5, limitations and future research are presented in section 6. The essay concludes with section 7.

2.2 Literature review and hypotheses development

2.2.1 Recognizing the added value of traceability systems requires experience

Food traceability systems can be a means to reduce information asymmetry, but to recognize their added value, consumers need to be exposed to them. Due to recent technological advancements in the Internet of things (IoT), such as QR codes, providing information via traceability systems has been facilitated to a large extent (Y. G. Kim and Woo 2016; X. Wu et al. 2021). For example, by scanning a QR code consumers can nowadays learn about how their food was produced, processed and transferred (X. Wu et al. 2021; Aung and Y. S. Chang 2014). Thereby, consumers can verify in real-time product quality, authenticity and traceability (Penco et al. 2020). An additional advantage of these IoT technologies is that there is a no longer a space limit for providing information as it is the case for simple paper labels (Bacarella et al. 2015; Yuan, Shuman Wang, and Yu 2020). Hence, since all relevant information can be made accessible for consumers, the information asymmetry can be diminished (Zecca and Rastorgueva 2016). However, using IoT technologies to make food products traceable and thus, food packages smart, is only just starting (Bouzembrak et al. 2019). Although nowadays mobile applications are an inevitable trend in the retail industry and can significantly improve consumers shopping experience (Bouzembrak et al. 2019; Rippé et al. 2017), the food retail industry is lagging behind this development (Fagerstrøm, Eriksson, and Sigurdsson 2020). In fact, Penco et al. (2020) found that the penetration rate of product label scanning via QR codes is still modest. Yet, if consumers already use certain mobile technology-enabled services, they are more likely to adopt other mobile technology-enabled services (Ozdemir and Trott 2009). Moreover, in order to recognize the added value of a traceability system, a certain degree of experience (A. Zhang, Mankad, and Ariyawardana 2020) with such traceability systems, respectively a certain degree of knowledge (Yuan, Shuman Wang, and Yu 2020) about such traceability systems, is necessary. However, once consumers have recognized the added value, this also has a positive effect on their attitude toward such systems (L. Hu, J. Ding, and

Xiying Yang 2021). Since according to the theory of planned behavior a positive attitude is a strong influencing factor for a person's future behavioral intention and thus behavior (Ajzen 1985), we formulate our first hypothesis as follows:

H1: Individuals having already experience with QR codes/barcodes have a higher intention to use a traceability system than individuals without any QR code/barcode experience.

2.2.2 Traceability for Europeans is primarily about product origin

Even though previous studies on traceability systems have focused strongly on meat products and originate mostly from Asian countries, food traceability studies conducted in Europe indicate that traceability for Europeans is primarily about product origin.

Especially the willingness to pay for traceable meat attributes has already been investigated quite in-depth (we recommend the meta-analysis of Cicia and Colantuoni (2010) for an overview). Moreover, studies that focus on the perception of traceability systems from a consumer's point of view mostly concentrate on the aspects of food risk and safety (Angulo, Gil, and Tamburo 2005; Giraud and Amblard 2003; Tessitore et al. 2020). It is noticeable, that Asian countries in particular are on the forefront of studying consumers' perception of traceability systems (Bai, C. Zhang, and Jiang 2013; A. Chang, Tseng, and Chu 2013; M.-F. Chen and Huang 2013; Jin, Y. Zhang, and Yining Xu 2017; Linhai Wu et al. 2016; X. Wu et al. 2021; L. Xu et al. 2019; Yin et al. 2017; Yuan, Shuman Wang, and Yu 2020).

The perception of traceability systems has also been studied in a European context, albeit to less extent and quite some years ago. In their focus group analysis, conducted in 12 European countries, Kehagia et al. (2007) investigated consumers' understanding of and expectations towards food traceability. As reported by Giraud and Halawany (2006), the results illustrate the heterogeneous views that consumers in Europe have of such traceability systems. The most frequently cited consumer benefits associated with food

traceability systems are supply chain control, safety, health, and product quality (van Rijswijk et al. 2008; A. Zhang, Mankad, and Ariyawardana 2020). Access to more information is another benefit cited by both consumers and retailers (Chrysochou, Chryssochoidis, and Kehagia 2009; Penco et al. 2020; Tessitore et al. 2020). Traceability systems can also be seen by consumers as a guarantee of food authenticity and credibility (Chrysochou, Chryssochoidis, and Kehagia 2009; Liu et al. 2018), increasing their trust in the food system (Anastasiadis, Apostolidou, and Michailidis 2021). In addition, food traceability offers consumers the added value of food experience and credibility attributes becoming quasi-search attributes (Fernqvist and Ekelund 2014; Gottschalk and Leistner 2013; Ngobo 2011). In this regard, it is salient that European consumers attach great importance to a traceability system that shows them the origin of a food product (Giraud and Halawany 2006; Hansstein 2014; Kehagia et al. 2007; Menozzi et al. 2015; Tessitore et al. 2020). Hence, a traceability system makes the credibility attribute of product origin verifiable by consumers.

Consumers in Europe generally have a strong preference for local food (Kehagia et al. 2007). Thus, when shopping, they pay particular attention to a product's origin (Bernués, Olaizola, and Corcoran 2003; Hansstein 2014) and also expect a traceability system to provide them with access to more details about a product's origin (Kehagia et al. 2007). Especially for those consumers, who frequently purchase food products locally such a traceability system consequently should be of interest, since some of the main benefits associated with traceable food, such as the perceived visibility and transparency of the food supply chain, and the increased safety associated with the products, are the same that consumers frequently name as purchasing motives for local food products (Grebitus, Lusk, and Nayga 2013; Sauter and Meyer 2004; A. Zhang, Mankad, and Ariyawardana 2020).

Moreover, using digital services is getting increasingly daily routine for consumers (PWC 2019; McKinsey & Company and EuroCommerce 2022). Therefore, local food shoppers, who are increasingly savvy about local food and like to get more detailed information about their food choices, should find it easy to adopt the use of traceability systems for

their food purchases. Rather, they should welcome this new information opportunity as it satisfies their detailed information needs.

So, since first, purchase motives for local and traceable food overlap to some extent, and second, digital traceability systems even make the origin of a product easily verifiable for consumers, a product attribute which plays a key role especially for consumers who frequently purchase food locally, our second hypothesis is:

H2: Frequently shopping food products locally has a positive influence on individuals' usage intention of traceability systems.

2.2.3 Traceability systems as a tool to reconnect consumers and producers

Even though people's daily lives are more detached than ever from food production, people simultaneously have a greater need to feel closer to their food (European Union 2020). Traceability systems might help satisfy this need. In a study about society's expectations of the agricultural sector in Germany, Zander et al. (2013) point out that the public's perception of the actual situation in agriculture is based on a low level of knowledge. According to the authors it is therefore necessary also from the food producers' side to get more active and to find ways to improve this knowledge (Zander et al. 2013; Dickinson and Bailey 2002; SocialLab-Konsortium 2019; Verbeke and Ward 2006). Food traceability systems can be one solution to improve this knowledge. If consumers can directly access supply chain information and learn, for instance, about the food's production method, origin, responsible producer and distribution process, consumers' lack of knowledge could be reduced. As a consequence, consumers also might be less dependent on information from third parties regarding food quality or safety and feel more confident with their purchasing decision (Vermeir and Verbeke 2006; Boogaard et al. 2010).

The need to re-engage with food production varies across individuals. One reason for this is that it differs greatly between individuals how much contact one still has with agriculture and thus, food production (Pfeiffer, Gabriel, and Gandorfer 2021). Basically, a distinction can be made between individuals who are still connected to agriculture in some way and individuals without such a connection. For people without any connection to agriculture, the information asymmetry between the individual as consumer and the food producer is usually more pronounced (Pfeiffer, Gabriel, and Gandorfer 2021). Therefore, a traceability system can add value, especially for these individuals, by providing direct access to food production information. In contrast, individuals who grew up on a farm should be less likely to feel a need for more information about food production provided by a traceability system. This is because, as consumers, they should perceive much less information asymmetry due to their greater familiarity with food production (Pfeiffer, Gabriel, and Gandorfer 2021). So, we hypothesize:

H3 a: Individuals who don't know any farmer have a higher intention to use a traceability system than individuals who do know a farmer.

H3 b: Individuals with an agricultural family background have a lower intention to use a traceability system than individuals without such an agricultural family background.

2.3 Data and research methodology

2.3.1 Data collection

The survey was set up in German language with the survey software Unipark (QuestBack GmbH 2019). To reduce possible effects of social desirability, participants were assured that their data would be collected anonymously and used for research purposes only.

Participants were recruited by students (39.56% of the data) and by making use of the experimenTUM laboratory in Munich, a student pool with more than 2,000 volunteers. The students recruited the participants as part of their final thesis, not paying survey respondents for participation. The members of the experimenTUM pool were sent an invitation to participate with the emphasis that the survey language was German. Respondents of the experimenTUM pool were paid for their participation (about 10 EUR)[13]. In addition, we conducted a quality control among these participants (answering one open and one closed comprehension question). Only if the answers were correct, the participants were admitted to the main study.

2.3.2 Survey measurements

The questionnaire was part of a larger study on consumer perception and evaluation of food traceability. Since the questionnaire was positioned at the end of the study, it was ensured from the preceding questions and tasks that participants had a common understanding of the term traceability system.

Our dependent variable ("I intend to increase the amount of food with a food traceability system in my future food purchases.") was taken from Choe et al. (2009) and measured on a five-point Likert scale. How participants perceive a traceability system was assessed with the scales on trust (3 items), perceived information asymmetry (2 items), fear of seller opportunism (3 items) and perceived uncertainty (2 items) taken from Choe et al. (2009), slightly adapted to our research context. All items were measured on a five-point Likert scale. Experience with any form of traceability system was asked with the item "Have you ever used a barcode/batch number or a QR code to find out about the origin of your product?". Besides this closed question, participants' attitudes towards 1)

13 We controlled for the difference in participant compensation and point of data collection in the analysis using the dummy variables dummy_wave_2 and dummy_wave_3. In addition, literature shows that setting incentives to increase response rate has only very little to no effect (Couper and Coutts 2006; Baur and Florian 2009; Tuten, Urban, and Bosnjak 2002).

barcodes or QR codes in general and 2) on food products in specific were measured with a bipolar scale, ranging from 1 = *bad* to 5 = *good*. Participants' attitude towards packaging information (Kayser, Böhm, and Spiller 2012) was measured as well on a five-point Likert scale. The dichotomous question if the study participant knows anyone who is a farmer or is employed on a farm was taken from Piel (2003). In addition, participants were asked to state, if they have grown up on a farm themselves. Local food shopping frequency was assessed with the question "How often do you buy local food products?", response options ranged from 1 = *once a month or less* to 4 = *more than once a week*. As socio-demographic variables we included age, gender, educational level, and residence size of the place where someone spent his childhood.

2.3.3 Analysis

2.3.3.1 Data preparation

In order to use the individual scales for further analyses and hypothesis testing, we checked the internal consistency of the overall constructs using Cronbach's alphas. The aggregated Cronbach's alphas for the constructs used in the questionnaire to assess the perception of the traceability system were of mediocre value (trust: $\boldsymbol{\alpha} = 0.560$; perceived information asymmetry: $\boldsymbol{\alpha} = 0.500$; fear of seller opportunism: $\boldsymbol{\alpha} = 0.688$; perceived uncertainty: $\boldsymbol{\alpha} = 0.631$). Consequently, an explanatory factor analysis on the scales revealed, that a two factors solution is most suitable (trace_f1, trace_f2). The resulting factor trace_f1 captures information reliability of the traceability system. The factor trace_f2 assesses, to which degree a traceability system is considered to help mitigate information asymmetry in the supply chain.[14]

14 The construct items trace_honest_postshopsec, trace_info_trust and trace_info_qualitygap were dropped due to scoring high on uniqueness. Meaning, these items were having a high percentage of variance that was not explained by the two suggested factors, being an indicator that these variables are not well explained by the factors.

2.3.3.2 Statistical analysis methods applied

We conducted an ordinary least square (OLS) and an ordered logistic regression with the intention to increase the share of food with a food traceability system in future food purchases, trace_increase_share_fut, as dependent variable in both regressions. As independent variables we included the constructs trace_f1, trace_f2, as well as items measuring the attitude towards QR codes/barcodes on food products (qr_attitude_food), a dummy variable for experience using QR codes/barcodes (dummy_qr_experience), participants' shopping frequency of local food products (local_food_frequ) and if the participant knows anyone working on a farm or being a farmer (dummy_know_farmer). We also controlled for the socio-demographic characteristics gender, age group and whether the participants grew up on a farm (dummy_farmer_child).

2.3.4 Participants

The overall sample consisted of 700 participants, but since only 689 respondents completed the questionnaire, and 9 observations were dropped during data cleaning, we only considered 680 observations for the analysis. The collection phase was done in three different waves.[15] The first wave took place from July to November 2018, the second was done in January 2020, and the third from July to August 2020.

Overall, 42.44% of respondents were female. With 42.14% the largest group of the respondents were younger than 25 years, 32.89% of the sample were between 25 and 35 years of age. In addition, 35.30% of the participants grew up in a large city with more than 100.000 inhabitants. Being asked if they knew someone who is a farmer, or is employed on a farm, 64.12% said yes, while among these 7.94% (n = 54) also stated, that

15 This approach allowed first of all an adaptive survey design, where the subsequent two waves incorporated additional control constructs based on insights from the first wave as well as helped to increase the total sample size.

they grew up on a farm. Having already experience with using a QR code to get information about product origin was affirmed by 46.47%. More details about the socio-demographic characteristics of the sample can be found in Table 1.

Variable	Percentage
Age[a]	
< 25 years	42.14
25-35 years	32.89
36-45 years	8.51
46-55 years	7.49
56-65 years	5.88
> 65 years	3.09
Women	42.44
Size of place where one grew up[a]	
up to village (< 10.000 inhabitants)	21.86
small town (< 20.000 inhabitants)	26.44
medium-sized town (< 100.000 inhabitants)	16.40
large city (at least 100.000 inhabitants)	35.30
Frequency of regional shopping	
once a month or less	8.68
1-2 time(s)/month	18.82
once per week	40.29
more than once a week	32.21
QR code experience	46.47

[a] $N = 677$ due to missing values

Note: Percentages may not total 100 due to rounding

Table 1: Descriptive statistics of the sample ($N = 680$)

2.4 Results

First, we present the results of the descriptive analysis of respondents' general attitudes toward QR codes/barcodes and toward QR codes/barcodes on food products in particular.

We distinguish between respondents with and without QR code/barcode experience and test for significant differences between these groups using Mann-Whitney test statistics. Respondents' experience with QR codes/barcodes and their attitudes toward QR codes/barcodes on food were then used as predictors (independent variables) for the subsequent multivariate regression models (OLS, ordered logistic regression) to test our hypotheses.

2.4.1 Participants' experiences with using QR codes or barcodes to find out about product origin

Although only 46.47% of the survey participants had already made an experience scanning a QR code or using a barcode to inform themselves about product origin, the mean (M = 3.884, SD = 1.065) and median (Mdn = 4.00) values for the general attitude towards barcodes and QR codes were quite positive. For the attitude towards barcodes or QR codes on food products, the mean value was 3.703 (SD = 1.121) and the median was as well 4.00, thus, confirming the positive attitude towards barcodes and QR codes also for food products among survey respondents. When differentiating between participants having had already experience using a QR code or similar and those missing such an experience, however, we found quite some difference in the evaluation of QR codes and barcodes in general, and with respect to displaying them on food products. For participants with experience in using such codes, the mean value for the general attitude towards barcodes or QR codes was 4.177 (SD = 0.946; Mdn = 4.00), while respondents missing such an experience had a mean value of only 3.629 (SD = 1.097; Mdn = 4.00). The difference between the two groups is significant (Mann-Whitney result for means z = 7.044; $p < .01$). The values for the attitude toward barcodes and QR codes on food products are very similar. Again, people who have already had experience with such codes rated them significantly more positively (Mann-Whitney result for means z = 7.120; $p < .01$). For further details see Table 2.

	M	*Mdn*	*SD*	*N*
respondents without experience				
general attitude towards QR codes/ barcodes	3.639	4	1.097	364
attitude towards QR codes/ barcodes for food	3.429	3	1.142	364
respondents with experience				
general attitude towards QR codes/ barcodes	4.177	4	0.946	316
attitude towards QR codes/ barcodes for food	4.019	4	1.011	316
overall sample				
general attitude towards QR codes/ barcodes	3.884	4	1.065	680
attitude towards QR codes/ barcodes for food	3.703	4	1.121	680

Note. [a] Attitude towards barcodes/QR codes was measured on a bipolar scale, ranging from 1 = *bad* to 5 = *good*.

Table 2: Summary statistics for the attitude[a] towards barcodes/QR codes

2.4.2 Hypotheses testing

After reporting the descriptive results, in the following we only report the results of the OLS model to test our hypotheses, since the signs of the coefficients of the ordered logistic regression have the same direction. However, for further details, please see Table *3*, where the coefficient estimates of the ordered logistic regression are reported on logit scale. For the OLS model as well as the ordered logistic regression the dependent variable was *trace_increase_share_fut,* the intention to increase the share of food with a food traceability system in future food purchases, measured on a five-point Likert scale.

From the OLS regression we see that the coefficient dummy_qr_experience has a significant positive influence on our dependent variable trace_increase_share_fut (β = 0.124, $p < 0.01$). Thus, the model confirms our hypothesis 1, stating that individuals who have already experience with using a QR code/barcode to find out about product origin have also a higher intention to increase the percentage of food with a food traceability system in their future food purchases. Also, the variable local_food_frequ has a

significant positive influence (β = 0.128, p < 0.01) on trace_increase_share_fut. As the variable local_food_frequ is measuring participants' shopping frequency of local food products, hypothesis 2 is to be accepted. Hence, shopping more frequently local food products positively influences the intention to increase the share of food with a food traceability system in future food purchases. Knowing a farmer, or someone working on a farm, has a significant negative influence (β = -0.119, p < 0.01) on trace_increase_share_fut. Our hypothesis 3a, stating that individuals who don't know any farmer have a higher intention to increase the share of food with a food traceability system in future food purchases can therefore be accepted. By contrast, for individuals with an agricultural family background the coefficient was significantly positive (β = 0.078, p < 0.05). Consequently, we must reject hypothesis 3b, claiming that individuals with an agricultural family background have a lower intention to increase the share of traceable food products in their future purchases. Our results show rather the opposite, being grown up on a farm positively influences the intention to increase the share of traceable food products in future purchases. From the model we also infer, that being female (β = 0.078, p < 0.05) as well as being older (β = 0.118, p < 0.05) have a positive influence on trace_increase_share_fut. We also note that trace_f2 (β = 0.209, p < 0.01) is the most important influencing factor for trace_increase_share_fut, that measures the degree to which a traceability system is considered to help mitigate information asymmetry in the supply chain. Finally, trace_f1, which captures the perceived information reliability of the traceability system has as well a significant positive influence on trace_increase_share_fut, although to a minor extent (β = 0.106, p < 0.01).

	Model (1) OLS			Model (2) Ordered Logit	
Variables	Coef.	Std. Err.	Beta	Coef.	Std. Err.
trace_increase_share_fut					
trace_f1	0.171***	(0.0592)	0.106	0.373***	(0.131)
trace_f2	0.343***	(0.0612)	0.209	0.752***	(0.137)
qr_attitude_food	0.0836***	(0.0312)	0.093	0.204***	(0.0688)
dummy_qr_experience	0.252***	(0.0703)	0.124	0.502***	(0.155)
local_food_frequ	0.140***	(0.0380)	0.128	0.324***	(0.0837)
dummy_know_farmer	-0.250***	(0.0711)	-0.119	-0.592***	(0.157)
dummy_farmer_child	0.292**	(0.126)	0.078	0.668**	(0.278)
female	0.159**	(0.0677)	0.078	0.319**	(0.148)
agegroup	0.0463**	(0.0185)	0.118	0.0981**	(0.0407)
dummy_wave_2	0.256**	(0.121)	0.098	0.592**	(0.266)
dummy_wave_3	0.474***	(0.0978)	0.192	1.114***	(0.224)
constant	0.302	(0.250)			
/cut1				2.895***	(0.577)
/cut2				5.051***	(0.586)
/cut3				6.776***	(0.610)
/cut4				9.553***	(0.660)
R-squared	0.297				
R-squared adjusted	0.286				
F	25.70				
Pseudo R2				0.126	

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: OLS and ordered logistic regression on the intention to increase the percentage of food with a food traceability system in future food purchases ($N = 680$)

2.5 Discussion

2.5.1 Participants' attitude and experience with QR codes and barcodes

Overall, the general attitude towards QR codes/barcodes and also towards food products among our participants is quite positive. Nevertheless, our analysis reveals that there are significant differences in the value perception of QR codes/barcodes among respondents depending on how familiar they are with such codes. Previous experience with QR codes/barcodes to identify product origin significantly positively influences the attitude toward such systems, as well as the future purchase intentions for these traceable food products. Regarding future purchase intentions, our results show that the influence of such experience is also greater than just having a positive attitude toward QR codes/barcodes on food products. Thus, the findings are in line with A. Zhang, Mankad, and Ariyawardana (2020) and L. Hu, J. Ding, and Xiying Yang (2021) who also emphasize the importance of consumers' experience with traceability systems to understand the added value they provide.

Yet, it is also clear from our results that the scanning rate of QR codes/barcodes on food products still has a lot of room for improvement (Penco et al. 2020), even though scanning a QR code to learn about the origin and supply chain of a food product is considered quite convenient according to the literature (T. Li and Messer 2019). One reason often cited in studies for the low scanning rate of QR codes, especially for a low-involvement product such as food (Acuti et al. 2022; Holmes, Byrne, and Rowley 2013; Tanner, McCarthy, and O'Reilly 2019), is consumer uncertainty about the purpose of the QR code (Tanner, McCarthy, and O'Reilly 2019). Our results support this finding. Among a subsample (n = 111) we asked about reasons for not having used a QR code/barcode to date to learn about a product's origin, the most frequently cited reason was not knowing that such an option exists (35.14%; n = 39), followed by being already satisfied to know that this option is at least available (32.43%; n = 36).

Based on these results, we follow Hansstein's (2014) suggestion as a first step. Whether through educational programs or information campaigns, getting consumers to value and use such traceability systems requires first of all effective communication that explains

to consumers the basic idea and benefits of traceable food products (Hansstein 2014). However, in a second step, we infer from our results that having a positive attitude towards such QR code/barcode based traceability systems does not contribute as much to promoting the intention to use them as experience does. Thus, communicating the functionality and benefits of traceability systems can only be a first step to increase consumers' knowledge about traceability systems. This step should be complemented by promotional activities in which consumers gain their own experience of using a traceability system accessible via QR code/barcode. Food retailers and manufacturers should therefore consider how best to design the shopping environment or product packaging to initially motivate consumers to test such QR codes/barcodes to learn about the benefits of traceable food (T. Li and Messer 2019). One recommendation could be to offer incentives in the form of, for example, prize draws or special offers (Tanner, McCarthy, and O'Reilly 2019; Trivedi, Teichert, and Hardeck 2019). A second idea could be to use emotional appeals. For example, an emotional appeal could be an image showing the farmer of the food or the landscape where the product is grown. In this way, the emotional appeal could arouse emotions and curiosity in consumers, leading them to actively seek more information by scanning the QR code (Acuti et al. 2022; Trivedi, Teichert, and Hardeck 2019) and thereby become familiar with the traceability system. As a food manufacturer, one could even think about integrating product traceability as a core element of a brand, as is the case with followfood (followfood n.d.) or Zurück zum Ursprung (HOFER KG 2021). Finally, another idea could be to complement the food traceability function with other services such as loyalty programs that would help familiarize consumers with traceability systems and increase and embed their use in everyday food shopping behavior (Okazaki, H. Li, and Hirose 2012; Tanner, McCarthy, and O'Reilly 2019).

2.5.2 Food traceability systems provide added value to local food shoppers

From the results, it can be seen that frequently purchasing local food positively influences the intention to increase the share of traceable products in future food purchases. One

argument why these frequent consumers of local food show greater interest in traceability systems could be their greater food involvement. Although food is a low-involvement good about which consumers tend to seek less information (Tanner, McCarthy, and O'Reilly 2019), we know from the literature that consumers who consider it important to buy food locally tend to have higher involvement (O'Kane 2016; Zepeda and Jinghan Li 2006). Also, in our results we see from the answers on participants' attitude towards packaging information that the more often someone buys food locally, the more important they consider information about food quality and the more time they take to read information on product packaging when shopping. Therefore, these consumers may also have higher motivation to seek and use additional information (Atkinson 2013; K. C. C. Yang 2004) provided by a traceability system in their product selection (Peschel et al. 2016). In addition, consumers are increasingly knowledgeable about local food products (Abrams and Soukup 2017). Traceability systems, which can also be used for local food, could thus be seen by these consumers as an information tool that addresses their increasing need to obtain more contextual information about these products. Indeed, in our sample, especially those consumers who buy local food more than once a week found it extremely important to find information on the cultivation and production process on the packaging for local food products.

Traceability systems are to some extent associated with the same benefits that consumers attribute to local food products, such as increased transparency, supply chain control, safety, health, and quality (A. Zhang, Mankad, and Ariyawardana 2020; van Rijswijk et al. 2008; Grebitus, Lusk, and Nayga 2013). As a result, participants who frequently purchase products locally may also have a higher intention to increase the share of traceable food in the future because, from their perspective, they offer similar benefits. Another rationale could be that a traceability system might be seen as a means to establish a more emotional connection with the food product and the people involved in the production process (Tanner, McCarthy, and O'Reilly 2019). Studies have found that emotional value is a very strong influencing factor in the purchase intention of local food (Giraud and Halawany 2006; Shin, H. Kim, and Severt 2021), but also that consumers of local food seek and value product-related experiences (Giraud and Halawany 2006; O'Kane 2016). Local food networks or farmers' markets are just two examples that offer such product-related experiences (O'Kane 2016; Kirwan 2004). Traceability systems also

have the potential to enable such product-based farm-to-fork experiences by blurring the lines between physical products and online content and to increase emotional engagement (O'Kane 2016; Penco et al. 2020). Consumers who frequently purchase food locally may therefore see the traceability system as a way to have a holistic farm-to-table purchasing experience, thereby also building or strengthening their emotional connection to a food product. Finally, consumers are increasingly demanding more from food products in terms of authenticity and originality (Autio et al. 2013; Lee et al. 2019). For local food in particular, studies have found that consumers also evaluate them based on their perceived authenticity. Yet, it is difficult for consumers to identify these authentic products (Nguyen and Gunasti 2011). In turn, a traceability system can be considered as an extrinsic cue that guarantees this authenticity (Chrysochou, Chryssochoidis, and Kehagia 2009; Liu et al. 2018; Nguyen and Gunasti 2011; Penco et al. 2020).

2.5.3 The influence of participant's connection to food production on their perception of food traceability systems

As urbanization increases (European Union 2020) and the number of farms and people employed in this sector decreases (Federal Statistical Office of Germany 2021), the physical, but also the social distance to agriculture will continue to grow (Nilsson, Tunçer, and Thidell 2004). This will also lead to a further alienation between food producers and consumers (Giampietri et al. 2018). However, from our results, we see that especially the study participants who reported having no contact at all with farmers or people working on a farm perceive a food traceability system as beneficial. Thus, consumers who are most distant from the food production process appear to value the ability to obtain more information about the food production process and its producers (Giampietri et al. 2018). This could be because such a traceability system can provide these consumers with insights on how their purchase decisions impact the supply chain that they have often lacked to date (Vermeir and Verbeke 2006), but that they find relevant (Giampietri et al. 2018; A. Zhang, Mankad, and Ariyawardana 2020). So far, most of the information consumers have about agriculture is conveyed through television (Kantar EMNID 2017). Therefore, third-party media reports have greatly influenced the image of agriculture and

consumers' attitude toward food production over the past 20 years (Pfeiffer, Gabriel, and Gandorfer 2021). In contrast, food traceability systems accessible via a QR code are a more direct communication channel without such an intermediary between food producers and consumers (Tanner, McCarthy, and O'Reilly 2019). Consumers who do not have a personal connection to agriculture might particularly value this immediate access to relevant information (Tanner, McCarthy, and O'Reilly 2019). Since product traceability information is primarily provided by producers (Tanner, McCarthy, and O'Reilly 2019), it could also convey a sense of closeness to food production to consumers who generally do not have personal contact with agriculture.

We also see that consumers' knowledge gap about food production is increasing (Pfeiffer, Gabriel, and Gandorfer 2021; Vermeir and Verbeke 2006). This lack of agricultural knowledge is especially large in case consumers have no personal contact at all to persons working in the agricultural sector (Pfeiffer, Gabriel, and Gandorfer 2021). Yet, we also know from literature that knowledge deficits can lead to consumer distrust in an industry (Allum et al. 2008; Sutherland et al. 2020). Thus, it could also be that our study participants without personal contact to farming have a higher intention to use a traceability system because their knowledge deficit and consequently their distrust towards the food industry are more pronounced compared to participants with such personal contact to farming. Using a traceability system, however, might help these participants to reduce their mistrust and their perceived uncertainty associated with food purchases by enabling them to access more information about the production process (Vermeir and Verbeke 2006) without the need for personal contact with the food producer.

In contrast to our hypothesis 3b, we did not find that individuals with a family background in agriculture have a lower intention to use a traceability system for their food purchases; rather, the opposite is the case. Participants who grew up on a farm show a significantly higher intention to use such traceability systems. Our results also indicate that participants who grew up on a farm, rate traceability systems significantly better than other study participants in terms of providing reliable information. Accordingly, the increased usage

intention among individuals with a family farming background might be attributed to the fact that these individuals derive greater value from a traceability system. Moreover, participants who grew up on a farm tend to have more expertise and knowledge about food production (Pfeiffer, Gabriel, and Gandorfer 2021). Therefore, we assume that the increased intention to use a food traceability system is less motivated by a need to reduce information deficits when purchasing food. We interpret this increased usage intention more as a sign of greater product involvement in the sense that people who grew up on a farm are generally more interested in food production issues and find it interesting to see how other food producers use such traceability systems and what information they share with potential customers. From our data, we can infer such an increased food involvement among participants who grew up on a farm at least when it comes to food origin and local food products. Meaning, participants who grew up on a farm inform themselves significantly more often about food origin and are also more frequently buying local food products than other study participants.

2.6 Limitations and future research

This study has its limitations which we consider in the following. The current research is based on convenience sampling. Consequently, the sample is not representative, and our results might be influenced by a certain level of self-selection bias. Moreover, the research has to contend with the general limitations of a survey, such as the social desirability bias.

Our study focuses on Germany. Already Yuan, Shuman Wang, and Yu (2020) emphasize that the perception of food traceability systems is often country specific. Therefore, our results are not necessarily transferable one-to-one to other countries, especially if the cultural setting is different. Consequently, we suggest that future research should also examine food traceability systems from the perspective of consumers' connection to food production and agriculture in other cultural settings or compare the usage intention of such traceability systems among different countries with varying shares of the agricultural sector in the respective total economy. A comparison between different European

countries in terms of prioritizing factors that mostly influence the future usage intention of food traceability systems could also be interesting. In particular, regarding the envisioned digital components of the European farm-to-fork strategy, this could be helpful to adjust the implementation of the strategy accordingly.

Our study only investigates the future usage intention of food traceability systems. Although usage intention is a good predictor of actual behavior (Ajzen 1985, 2011), future studies, for example in the form of a non-hypothetical conjoint analysis or experiment, should investigate to what extent usage intention also translates into actual usage behavior and willingness to buy. Also, it would be interesting to explore in a future study through qualitative interviews, what motivates people with an agricultural background in particular to use such traceability systems.

Finally, a recent trend in the IoT technologies which has the potential to form the future of food traceability systems is blockchain technology (Creydt and Fischer 2019; Gallo et al. 2021; Garaus and Treiblmaier 2021; Islam and Cullen 2021; Kennedy, Stitzinger, and Burke 2020). The first practical examples that use blockchain technology in their communication with customers, such as the food retailer Walmart, or the start-up Bytable Inc., already exist (Bouzembrak et al. 2019; L. Hu, J. Ding, and Xiying Yang 2021). Future research could therefore also study what factors influence consumers' perceived value of blockchain technology in relation to traceable food. For example, it would be interesting to investigate whether or how consumers weigh the advantage of blockchain technology in convincingly reducing information asymmetry between consumers and producers against the disadvantage of the comparably high energy requirements of this technology (Sedlmeir et al. 2020) in the purchase decision process.

2.7 Conclusion

In sum, we conclude that firstly, the influence on one' s future purchase intention of traceable food is greater for self-made experiences with scanning a QR code than for just having a positive attitude towards such traceability systems. Accordingly, it is crucial for

the success of the digital offensive of the European farm-to-fork strategy that the corresponding campaign motivates consumers to test these traceability systems and gain experience. Second, because consumers who frequently buy their food locally show a higher intention to increase the amount of traceable food in future purchases, it is worthwhile for food producers who offer and market their products as "from local origin" to consider implementing a traceability system. By increasing the transparency of the supply chain and offering a digital information service to customers, they could differentiate themselves from competitors. Thirdly, especially consumers without a personal connection to agriculture can imagine using a traceability system for their future food purchases. A food producer who focuses on an urban customer group that has little personal contact with agriculture could thus use a traceability system as an information tool on the one hand, but also as a marketing tool on the other (X. Wu et al. 2021; Yuan, Shuman Wang, and Yu 2020). As an information tool, it enables producers to offer real added value to their customers in form of detailed and transparent background information about the food product, thus generating knowledge and trust among customers. By using a traceability system as a marketing tool, however, these urban customers could also be addressed emotionally (Penco et al. 2020; Tanner, McCarthy, and O'Reilly 2019), thus increasing customer loyalty (Bloemer and Ruyter 1999; Brakus, Schmitt, and Zarantonello 2009; Loureiro and Roschk 2014). Ultimately, such a traceability system could evolve into a new, dynamic information and dialogue platform that facilitates information exchange between consumers and producers (Tanner, McCarthy, and O'Reilly 2019; Yacoub and Castillo 2022). In this way, it could even contribute to reconnecting consumers and producers in the long run (Giampietri et al. 2018).

3 Unraveling the importance of local food details in young consumers' purchasing decisions (Essay II)[16]

3.1 Introduction

When asked about the most exciting food trends for 2023, most top chefs agree that local food and "from farm to fork" menu ideas will become even more popular (Love Bond, 2022). In general, locally sourced food is a trend that is gaining momentum (Bazzani et al., 2017; Feldmann & Hamm, 2015; Knuck & Hess, 2022; Riefler, 2020; Shin et al., 2021). Consumers in Europe, and especially in Germany, have a strong preference for local food (Federal Ministry of Food and Agriculture [BMEL], 2022; Kehagia et al., 2007; Meyerding et al., 2019). As such, they pay close attention to product origin when shopping (Bernués et al., 2003; Hansstein, 2014) and are also willing to spend more if a product comes from "their" region (Grebitus et al., 2013; Lim & Hu, 2013; Printezis et al., 2019; Seitz, 2015).

However, so far there is no official definition for the terms "regional food" or "local food" neither within the European Union (EU) nor for Germany (Adams & Salois, 2010; Feldmann & Hamm, 2015; Menapace & Raffaelli, 2016; Mohr & Schlich, 2016). Thus, in many cases, "from local origin" has so far remained a credence attribute that is hardly verifiable for consumers (Fernqvist & Ekelund, 2014; Gottschalk & Leistner, 2013; Ngobo, 2011).[17] Yet, according to the German Nutrition Report 2022, consumers are

16 This essay is based on a working paper presented at the 6th HEFagrar PhD Symposium 2020 of TU Munich in Munich, Germany.

17 The European geographical indication labels are an exception, especially the "PDO - protected designation of origin" quality scheme, which applies to food and wine (European Commission [EC], n.d.). For food products registered as PDO, every part of the production, processing and preparation process must take place in the designated region. However, products with a PDO label or the less stringent EU quality scheme "PGI - protected geographical indication" (EC, n.d.) are not covered in this essay. The reason for this is that these labels are clearly defined by the EU and only apply to certain region-specific food products that are also sold over longer distances. Thus, since the way of production is officially regulated and also

increasingly interested in where and how their food is produced and request more food transparency (BMEL, 2022; Kraft et al., 2018). This is also due to several food scandals in recent years (EIT Food, 2020; Hempel, 2019; Kumpulainen et al., 2018), which have led consumers to demand stricter controls (Zander et al., 2013), but also more product transparency (Feldmann & Hamm, 2015) and traceability (Hou et al., 2019).

While several articles have already examined the topic of consumers' willingness to pay (WTP) for local food (Grebitus et al., 2013; Hou et al., 2019; Lim & Hu, 2013; Printezis et al., 2019; Seitz, 2015), there is currently a dearth of studies focusing on consumers' valuation of transparent, verifiable information regarding the origin of local food. There are only a few studies on consumer perceptions of the German "regional window" initiative (Hermanowski et al., 2014; Meyerding et al., 2019; Zander, 2018). Their findings, however, are of limited use in determining the exact utility of detailed origin information for consumers, as they evaluate the label from an overall impression.[18] As a result, until now, we lack research on the exact utility consumers derive from detailed local origin information disclosure (e.g., information about the exact place of production, name, picture of the producer). This is surprising, as supply chain transparency is frequently cited as one of the main positive aspects or purchase criteria by consumers for local food (Grebitus et al., 2013; O'Kane, 2016; Sauter & Meyer, 2004; Zander, 2018). Moreover, despite growing digital possibilities (e.g., blockchain technology), relatively few studies have looked more closely at consumer perceptions of product traceability (Chang et al., 2013; M.-F. Chen, 2008; M.-F. Chen & Huang, 2013; Loureiro & Umberger, 2007; Treiblmaier & Garaus, 2023; Vriezen et al., 2023; E. S.-T. Wang &

controlled for food products with an EU geographical indication, these products cannot be equated with local food in general (Feldmann & Hamm, 2015).

18 In addition, the focus of the regional window is primarily on the place of processing and not on the place of production, which can lead to irritation among consumers (Federal Ministry of Food and Agriculture [BMEL], 2021; Zander, 2018). Finally, the regional window provides various options for specifying the region of origin (e.g., county, state or specifying a radius in kilometers), allowing suppliers considerable leeway (INFO GmbH Markt- und Meinungsforschung, 2021; Zander, 2018).

Tsai, 2019; Yin et al., 2017), though none of these has focused on local food products and more recent European studies are rather lacking (Vriezen et al., 2023)[19].

Tracing local food to its place of origin with the help of, for instance, digital applications could be particularly interesting for young consumers, as they are highly digitally savvy on the one hand, but also pay close attention to product information on the other (ARD & ZDF, 2022; Blanc et al., 2021; Initiative D21, 2022). And although young consumers, i.e., millennials (generation Y) (Kilian et al., 2012) and post-millennials (generation Z) (Seemiller & Grace, 2016), are considered "quintessential consumers" (Kumar & Smith, 2018, p. 213) of local food and their preferences and perceptions are crucial for the food industry and policy makers given their increasing purchasing power (Kumpulainen et al., 2018; Muniady et al., 2014; Savelli et al., 2019), it is still unknown what specific label information about local food actually influences their preference for local food (Blanc et al., 2021; Kymäläinen et al., 2021).

Focusing on these young consumers, generations y and z, and providing in-depth food origin information at producing farm level, this study aims to fill this research gap using a hypothetical and non-hypothetical choice-based conjoint (CBC) experiment by answering the following research questions:

1) *To which degree do young consumers reward increased transparency and in-depth traceability on products of local origin?*

2) *What kind of information related to local product origin is of interest to young consumers?*

Furthermore, it is examined in more detail which information channels shape young consumers' perceptions of food production and its producers, and in a second study, also their basic knowledge in this domain is assessed.

This is motivated by the fact that firstly, finding out which information channels are mainly influencing consumers' perception about food production and its producers allows to better classify the results provided for the first two research questions. Moreover, limited recent literature exists on how consumers, and particularly young consumers in

19 Exceptions are recent studies by Treiblmaier and Garaus (2023) and Tessitore et al. (2020).

Germany perceive food production and the food producers behind their food (Kumpulainen et al., 2018; Pfeiffer et al., 2021; Rübcke von Veltheim et al., 2019; Zander et al., 2013). At the same time, especially young consumers have fewer direct interactions with food production in their daily lives (Kumpulainen et al., 2018; Shin et al., 2021), yet their expectations of food production strongly influence policy makers and the entire food industry, including food producers (Blanc et al., 2021). It is therefore of relevance to find out which information channels mainly shape their perception as well as their knowledge about food production as this will influence to which extent information details provided for local food products will be considered useful by these young consumers and whether they meet the information expectations of young consumers.

The third research question of this essay is therefore:

3) *Which information channels shape young consumers' perceptions of food production and the producers involved?*

By taking a closer look at young consumers' preferences and information needs regarding the origin of local products, the study aims to shed light on the degree to which increased transparency and in-depth traceability impact their local food decision-making. These findings will enable policymakers to develop targeted information campaigns tailored to this influential consumer group and aligned with the objective of the European farm to fork strategy, to empower (young) consumers to make more informed food purchase decisions (European Union [EU], 2020). The study will also help identify to which extent further actions are required to bridge the gap between young consumers and the topic of food production, ensuring the long-term social acceptance of food production and fostering constructive social discourse about its future (Commission on the Future of Agriculture, 2021a). Moreover, food industry actors can use these insights to customize their marketing strategies, meeting the specific preferences and expectations of young consumers.

This paper contributes to the literature on transparent food information provision, specifically focusing on food traceability and local food preference. First, it examines consumer perceptions of product traceability and the transparent provision of local food

information. This responds to consumer criticism of the lack of transparency of many credence claims (Macready et al., 2020) and addresses the lack of studies in this area (Vriezen et al., 2023). Second, it investigates the perception of food production among young consumers, a consumer group that is becoming increasingly influential but has been relatively little researched from this point of view. It examines how these young consumers perceive food producers and food production in Germany, and identifies the main information channels that influence their perceptions. Third, the study responds to Vriezen et al.'s (2023) call to increase the range of food products and the depth of traceability system to scientifically underpin the future development of traceability systems by using local blueberries as study object and disclosing their detailed production origin. Finally, the study combines a hypothetical and non-hypothetical CBC experiment (Vriezen et al., 2023), illustrating how to ensure logistic feasibility while minimizing hypothetical bias and food waste.

The remaining paper is structured as follows: It begins with a brief literature review on local origin labels and cue utilization theory, followed by the description of study 1. The analysis method used, the mixed logit model, is explained alongside this study's sample and experimental design, which employs a CBC experiment. Subsequently, the results of study 1 are reported, followed by the description of study 2, which used a survey. The general discussion encompasses both studies. The paper concludes with recommendations for the marketing of local food products and emphasizes the importance of updating consumers' perception of food producers and fostering direct consumer-producer exchange.

3.2 Literature review

3.2.1 The challenge with local origin labels

For the EU the definition of food labelling is laid down in the EU Regulation No. 1169/2011. According to this definition labels serve to protect consumers and assist them in informed decision-making (Federal Ministry of Food and Agriculture, n. d.). However, nowadays often rather the opposite is the case. As still, no official definition of the term "local product origin" exists, third-party and private labels coexist (Rossi & Rivetti, 2022). Producers and retailers can therefore choose whether to adopt third-party product certification or use a private label to communicate local product origin. For the latter, though, they have quite some room for interpretation when marketing a product as being from local origin. For consumers, this means that they now face a multitude of origin labels that, instead of helping with decision-making, rather create confusion (Brécard, 2014; Rossi & Rivetti, 2022).

However, if consumers are confused and begin to question the predictive as well as the confidence value of labels as extrinsic quality cue, the informational benefit associated with local origin labeling, to overcome consumer uncertainty regarding a product's credence quality characteristic, diminishes or even approaches zero (Harbaugh et al., 2011). In the worst case, consumers might even express skepticism about the label (Eden et al., 2008; Fenko et al., 2016; Rossi & Rivetti, 2022) with all its negative consequences for retailers and producers going along with it such as reduced purchase intention and thus, sales (Tang et al., 2017)[20].

20 A general tendency of increasing label skepticism is observed for both, private as well as third-party labels (Thøgersen, 2000). Obermiller and Spangenberg (1998) define consumer skepticism as a tendency towards disbelief. Skepticism towards product claims depends on consumers' ability to verify the claim information. Thus, for local origin labels it is especially pronounced since being a credence attribute it can hardly be verified without expertise knowledge, disproportionate costs arising, nor any further information given (Ford et al., 1990).

One possible countermeasure to address skepticism about local food labeling and restore consumer trust is to provide consumers with clear, accurate, and verifiable information about the local food product (van Rijswijk & Frewer, 2012). This can include information about the farm or producer, the specific location where the product was grown or raised, and the methods used to produce the product. In marketing, such product information is also referred to as a product's quality cue. However, whether a consumer uses this information to deduce the quality of a local product depends on how well the consumer believes the cue can serve as an indication of product quality.

3.2.2 Cue utilization theory

In marketing, cue utilization theory is used as a theoretical basis to study how people infer product quality from the characteristics of a product and other available information (Grunert, 2005). Although the terms "cue" and "signal" are often used interchangeably in the literature (Helm & Mark, 2007), we stick to the term (quality) cue because this term is more common in marketing (e.g., Monroe & Dodds, 1988; Rao & Monroe, 1989; Richardson et al., 1994), whereas the term "signal" is more commonly used by economists (Grunert, 2005).

According to the theory, products possess a set of cues that consumers use to infer product quality (Cox, 1962; Kukar-Kinney & Xia, 2017; Olson & Jacoby, 1972; Wu et al., 2021). Aside from product-intrinsic quality cues that can hardly be altered, such as color or taste in the case of food, products also have extrinsic quality cues, for example, price, brand, or labels (Bilkey & Nes, 1982; Olson & Jacoby, 1972; Richardson et al., 1994). Product cues are helpful to consumers because they reduce choice complexity by breaking a product down to a bundle of cues that point to specific properties or utilities (Herbes et al., 2020). As a second, product quality cues help reduce consumer purchase uncertainty.

3.2.2.1 Evaluation of local food products using product cues

Food shopping is a situation of uncertainty in which consumers often need to rely on external quality cues to evaluate a food product. This is because food products are strongly characterized by experience and credence attributes. As experience attributes are not verifiable until after the product is purchased (e.g., taste) or, in the case of credence attributes such as local product origin, are not verifiable at all, buying products with such attributes always involves a degree of uncertainty for the consumer (Crawford & Sobel, 1982; Dimoka et al., 2012).

Sellers attempt to reduce their customers' purchase uncertainty by offering product quality cues that aim to reduce this information asymmetry. However, this does not mean that every quality cue is considered personally relevant by consumers (Dimoka et al., 2012), nor do these multiple cues operate in a purely additive way (Akdeniz et al., 2013; Kukar-Kinney & Xia, 2017; Q. Wang et al., 2016). Reasons for a differentiated cue perception may include information search costs, but also that consumers assess information cues differently due to information processing costs (Purohit & Srivastava, 2001) or limit themselves to those information cues that are most relevant to them whilst ignoring others (Dimoka et al., 2012; Slovic & Lichtenstein, 1971; Steenkamp, 1990). Besides, the extent to which consumers use a particular cue to judge the quality of a product depends as well on its diagnosticity and the availability of other cues (Purohit & Srivastava, 2001; Shao et al., 2021; Slovic & Lichtenstein, 1971). Diagnosticity comprises (1) the predictive value of the cue, which indicates how well the cue predicts actual product quality, and (2) the confidence value of the cue, which indicates the extent to which consumers feel confident that they are able to use the cue correctly (Shao et al., 2021; Wu et al., 2021).

For example, to assess the quality of a local food product, consumers may use color, price, and information about the product's origin (Wu et al., 2021). Research shows that intrinsic cues are generally given more weight because they are considered more diagnostic and useful for evaluating product quality (Rao & Monroe, 1988; Szybillo & Jacoby, 1974). However, when intrinsic cues are scarce and not easily obtained (Maheswaran, 1994; Miyazaki et al., 2005; Zeithaml, 1988), consumers judge product quality based on extrinsic quality cues (S. Mishra et al., 2020; Sabri et al., 2020).

3.2.2.2 Important extrinsic and intrinsic product attributes when choosing a (local) food product

Extrinsic quality cues for local food products are usually related to a product's packaging. There are several ways to categorize these packaging cues (Herbes et al., 2020; Magnier & Crié, 2015; Magnier & Schoormans, 2015; Rettie & Brewer, 2000; Silayoi & Speece, 2004, 2007). However, we adopt the distinction made by Magnier and Schoormans (2015) and Rettie and Brewer (2000) as it is the most appropriate for investigating our research questions[21]. The authors distinguish between visual cues, such as appearance and pictures, and verbal cues, for example, claims and descriptions. Both types of cues have been shown to influence consumer decisions (Naylor et al., 2009; Orth & Malkewitz, 2008; Wansink et al., 2004). They do, however, address two different consumer decision processes (Evans, 2003; Evans & Over, 2013; Kahneman & Frederick, 2012; Magnier & Schoormans, 2015; Sloman, 1996; Stanovich, 1999).

Visual cues such as pictures and colors are important in attracting consumers' attention to a product because they are processed by system one, the heuristic way of processing information, i.e., fast, intuitive, and implicit (Evans & Curtis-Holmes, 2005; Magnier & Schoormans, 2015). In contrast, verbal cues in the form of concrete textual information

21 We decided against the distinction between structural, graphical and verbal packaging cues proposed by Magnier and Crié (2015) because our objective was not to determine the best way to package a local food product, but rather to find out which verbal and visual information cues influence consumer preference for local food products.

In addition, structural quality cues encompass many haptic product attributes, such as packaging material type, texture, and weight (Magnier & Crié, 2015). Consequently, we consider our experimental design, a laboratory experiment in which consumers must choose their preferred product option without being able to touch the product, to be inappropriate for investigating the effect of structural cues on consumers' product preference for a local food product.

are processed consciously, which occurs in system two, the analytic mode of reasoning (Evans & Curtis-Holmes, 2005; Magnier & Schoormans, 2015). Unfortunately, verbal cues struggle with being viewed skeptically by consumers, especially for experience and credence attributes (Magnier & Schoormans, 2015; Obermiller & Spangenberg, 1998). However, by combining visual and verbal cues, both types of extrinsic cues jointly contribute to increasing the number of arguments in favor of a product, ultimately increasing the persuasiveness of a product as consumers have more information to reflect on (Eagly & Warren, 1976; Magnier & Schoormans, 2015; Petty & Cacioppo, 1984). To answer our research question about which informational cues influence young consumers' preference for local food, we follow this line of reasoning and also combine visual and verbal cues.

3.3 Study 1 – CBC experiments on local origin information

3.3.1 Study objective

Using cue utilization theory as a theoretical basis, the first study wants to find out which informational cues about the origin of local food products young consumers value most. In other words, this study's objective is to find out whether it is more visual or verbal cues about the local origin of food products that most help young consumers assess the quality of local food products, and how much they generally value the increased transparency of local products conveyed by these cues.

In addition, Vriezen et al. (2023) argue in their review article that more research is needed to validate their assumption that how consumers respond to food traceability is highly dependent on the specific product and context. The authors therefore encourage to expand the range of products used to study consumers' response to product traceability, as well as to broaden the depth of traceability information provided (Vriezen et al., 2023). A second objective of this first study was then also to help fill this research gap. To this end,

a CBC experiment was conducted to determine how much utility consumers derive from visual and verbal information cues. Fresh blueberries were chosen as study object. As visual cue, consumers were shown a picture of the local food producer, and as verbal cues, the name of the producer, the exact place of origin, and the product price were shown.

Lastly, by providing direct and detailed information about food product origin without the use of a label, this study also explores the extent to which this type of information presentation can be a potential solution for consumers to develop a better knowledge and understanding for products of local origin (European Commission, Joint Research Centre, Thøgersen, J., Nohlen, H, 2022). Thar is, assessing the utility that these consumers derive from the different origin information attributes also allows to evaluate whether the current lack of knowledge and understanding of local origin information stems from their actual disinterest in food origin information or is more likely the result of a misguided, confusing, or inaccessible design and/or presentation of local product information to consumers (European Commission, Joint Research Centre, Thøgersen, J., Nohlen, H, 2022).

3.3.2 Materials and methods

3.3.2.1 CBC experiments

CBC experiments are nowadays a quite common research method in food research (Lizin et al., 2022; Printezis et al., 2019). This is due to their ability to reveal trade-offs that arise when choosing between a set of alternatives, especially when these alternatives are characterized by credence attributes. Gaining insights into the key elements of the consumer decision-making process is pivotal to informing public and private policies related to food production and consumption (Lizin et al., 2022).

Still, a shortcoming of hypothetical CBC experiments is, that the choices are not binding and effects from social desirability bias might influence the results (Bazzani et al., 2017; Lizin et al., 2022; J. Lusk & Shogren, 2007; Olesen et al., 2010). However, if study

participants do not reveal their true preferences, the external validity of CBC experiments is undermined (Lizin et al., 2022).

To mitigate hypothetical and socially desirable biases, this study combines hypothetical and non-hypothetical CBC experiments (Lizin et al., 2022). Non-hypothetical CBC experiments have already been applied by several other researchers in the food domain (Alfnes et al., 2006; Bazzani et al., 2017; Fang et al., 2019; J. L. Lusk & Schroeder, 2004). They are more effective because decision-making is incentivized by randomly selecting one out of the total choice sets as binding. Moreover, by using real food products and making participants pay for the chosen product in the randomly determined binding choice set, unless the non-purchase option was chosen, real world purchase decisions are better mimicked (Ballco & Gracia, 2020; Kallas et al., 2021; Liebe et al., 2019; Lizin et al., 2022; Moser et al., 2014; Yue & Tong, 2009).

3.3.2.2 Data collection and questionnaire structure

Both CBC experiments were conducted in the experimenTUM laboratory in Munich, a pool of students with more than 2,000 volunteers. To participate in the experiment, study participants had to provide informed consent. While the hypothetical CBC experiment was conducted from July to October 2018, data for the non-hypothetical CBC experiment were collected during the blueberry season in August 2018. A total of 176 participants took part in the hypothetical CBC and 80 participants were recruited for the non-hypothetical CBC experiment. Each respondent received 10 euros for participating in the hypothetical CBC and 10 euros minus the purchase price of the randomly selected binding option in the non-hypothetical CBC experiment. 44 participants were excluded from the final analysis, leaving us with 149 participants for the hypothetical and 63 participants for the non-hypothetical CBC experiments[22].

22 17 participants were excluded in the non-hypothetical, 27 participants in the hypothetical CBC experiment. Reasons were allergy to blueberries (2 participants in the non-hypothetical and 1 participant in the hypothetical CBC experiment), non-responses on shopping habits of local food (6 participants in the non-hypothetical and 16 participants in the hypothetical CBC experiment), inattention to answering the

The CBC experiments were conducted in German language and consisted of seven sections. To ensure greater accuracy and consistency, the experiments used only closed-ended questions. After a brief introduction, participants were first asked two comprehension questions to check whether they had understood the experimental procedure and, in the case of the non-hypothetical CBC experiment, were aware of its binding purchasing feature. Only if these questions were answered correctly were participants allowed to take part in the main CBC experiment. In section two, study participants were again informed about the choice task and reminded to choose between product alternatives solely according to their preferences and to consider each choice independently of all others. Participants also read a brief outline of the choice scenario, including a short description of the product attributes being studied. It was also emphasized that the products were identical apart from the attributes described. The third section then contained the hypothetical and non-hypothetical CBC experiment, respectively. Subsequently, participants were asked about their attitudes toward various aspects of their diet, their shopping habits, and especially their local food consumption. Of particular relevance to our research questions were participants' preferences for local food and their points of contact with food production and its producers. In addition, we also included questions to control for participants' familiarity with the attributes tested. Finally, the last section addressed participants' blueberry consumption and purchasing habits, as well as socio-demographic characteristics.

3.3.2.3 Research design

The choice task consisted of 16 choice sets. In each of these choice sets, participants could choose between two alternative packages of blueberries and a non-purchase option. The latter is usually included in choice experiments to create a more realistic purchase

choice sets (2 participants in the non-hypothetical and 8 participants in the hypothetical CBC experiment), and choosing exclusively the non-purchase option in all 16 choice sets (7 participants in the non-hypothetical and 2 participants in the hypothetical CBC experiment).

situation and thus increase the validity of the data (Profeta & Hamm, 2019; Sonntag et al., 2023). To avoid ordering effect, the order of the choice scenarios was randomized (Loureiro & Umberger, 2007).

The experimental design followed a sequential Bayesian approach (Bazzani et al., 2017; Lizin et al., 2022). A D-efficient unlabeled design (D-error = 0.235205) was created using the software package Ngene (Choice Metrics, 2018). A D-efficient design requires prior values for the attributes of interest (Ferrini & Scarpa, 2007). Since no previous study could be found that examined the relevant attributes, a pilot study (N = 40) was conducted (Ferrini & Scarpa, 2007).

In this pilot study, all priors for the parameters were assumed to be zero (Street & Burgess, 2007). This resulted in an orthogonal main effects fractional factorial design with only twelve product attribute combinations instead of the full factorial 48 (3x2x2x4) combinations for the first choice alternative in each choice set. The second alternative was then generated via shifting (Sawtooth Software, 2000). In the final step, Bayesian design updating was applied (Scarpa et al., 2007). That is, the data from the pilot study were used to run a Multinomial Logit Model (MNL), from which the parameter estimates of the attributes and the non-purchase constant were taken and used as Bayesian priors to create the final D-efficient unlabeled choice design (Bazzani et al., 2017). This approach has been used in previous studies where it has proven its suitability not only for multinomial logit models but also for mixed logit models (Bazzani et al., 2017; Bliemer & Rose, 2010; Caputo et al., 2013).

3.3.2.4 Characteristics of sample

With 38.26% in the hypothetical and 38.10% in the non-hypothetical CBC experiment, there were slightly more men than women in the samples. On average participants were 24 years old (SD = 4.41) (23.8 years in the hypothetical and 24.4 years in the non-hypothetical CBC experiment) and were mostly growing up and living in a big city with at least 100.000 inhabitants. In the hypothetical CBC experiment 55.70% of the study participants knew at least a farmer or someone being employed at a farm, while in the

non-hypothetical CBC experiment this was the case for 61.90%. 59.06% of the study participants were at least shopping blueberries once or twice a month in the hypothetical CBC experiment, and 53.97% indicated to do so in the non-hypothetical CBC experiment. Summary statistics for socio-demographic variables can be found in Table 4.

Variable	Hypothetical CBC experiment (N = 149)	Non-hypothetical CBC experiment (N = 63)
Age		
< 25 years	59.06	52.38
25-30	36.91	46.04
31-35	2.68	1.59
36-40	1.34	-
Women	38.26	38.10
Size of place of childhood		
village	16.22	11.29
small town	18.92	32.26
medium town	18.92	19.36
big city	45.95	37.10
Domicile size		
village	6.04	4.76
small town	12.75	22.22
medium-sized city	10.74	17.46
big city	70.47	55.56
Knows farmer or farm employed	55.70	61.90
Farm child	4.70	7.94
Shopping frequency for local food		
more than once a week	21.48	14.29
once a week	33.56	42.86
1-2 per month	19.46	17.46
once per month or less	12.75	12.70
don't know	12.75	12.70
Shopping frequency for blueberries		
more than once a week	8.72	3.17
once a week	20.81	17.46
1-2 per month	29.53	33.33
seldom	29.53	30.16
never	11.41	15.87

Table 4: Socio-demographic sample characteristics of CBC experiments

3.3.2.5 Products

Fresh blueberries (125 g) were used to conduct the hypothetical and non-hypothetical CBC experiments. German consumers consider local origin as an important attribute especially for fruits (BMEL, 2022). In particular blueberry production has become a real trend in Germany, with 3,363 hectares of acreage being now the third largest producer of blueberries in the EU (Eurostat, 2022; Statistisches Bundesamt, 2023) and cultivated blueberries being the most important bush berry species in Germany in 2021 (Statistisches Bundesamt, 2022). Moreover, blueberries have already been researched in other conjoint analyses (Hu et al., 2009; Little et al., 2015; Schnettler et al., 2011). One constraint of a non-hypothetical CBC experiment using a real product is, that the product used for the CBC experiment can only be described with existing product attributes. Consequently, the alternatives were described by the following attributes: price, place of production origin, name of the producer, respectively producing entity, and visual depiction of the producer or producing entity. Before the study, price levels (€ 1.50, € 1.80, € 2.00) were selected by scanning the average market prices for 125 g blueberries. Table 5 summarizes the attributes and attribute levels used in the hypothetical and non-hypothetical CBC experiment.

Attributes	Attribute levels
Price	• 2,00 € (8,00 €/kg) • 2,50 € (10,00 €/kg) • 3,00 € (12,00 €/kg)
Place of origin	• 94419 Reisbach, Lower Bavaria • - (no information)
Name of producer	• Being displayed • - (no information)
Visual. product cue	• Male producer (Josef Eder) • Female producer (Steffi Eder) • Producer couple (Steffi and Josef Eder) • Neutral logo

Table 5: Attributes and levels of the CBC experiments

3.3.2.6 Econometric methods

While we can observe the levels of the attributes of each alternative, we cannot directly determine the preferences of individuals (Boccia & Punzo, 2021). However, to derive these preferences, we can estimate different choice models. These models differ in their assumptions about consumer preferences and in their specification of the density of stochastic terms (Colombo et al., 2009; Hensher & Greene, 2003).

In our case, data from the hypothetical and non-hypothetical CBC experiment was analyzed with a mixed logit model (also known as random parameters logit model (RPL)). By this, three limitations of the standard logit model, the MNL model, for analyzing discrete choice data are overcome. These limitations are: (I) the assumption that the error terms are independently and identically distributed with a Gumbel (extreme value type I) distribution, imposing homogeneous preferences for all parameters across respondents, (II) independence of choices, thus, decisions are assumed to be uncorrelated over time, and (III) independence of irrelevant alternatives (IIA), meaning that the introduction of a

new choice alternative does not change the choice probabilities of existing alternatives (Rigby, 2005).

Several studies already show that consumers' preferences for local food are best described to be heterogeneous (Gracia et al., 2014; Hu et al., 2012; Hu et al., 2009). It follows, that also in this study on local blueberries, heterogeneity on respondents' tastes is likely. Therefore it is best to apply a more flexible discrete choice model for data analysis, such as the mixed logit model (Bazzani et al., 2017). The mixed logit model overcomes the weaknesses of the MNL by assuming, that the functional form and the arguments of utility are common across respondents, but that the parameters vary across the individuals (Hasselbach & Roosen, 2015). Also, the mixed logit model allows for correlation among unobservable parameters over time (Alfnes, 2004; McFadden & Train, 2000). Moreover, the standard Hausman test showed evidence against the IIA assumption in this study's data, which also encourages the use of the mixed logit model instead of the MNL.

As a form of logit model, the mixed logit model is based on random utility theory (McFadden, 1974), which assumes, that out of a set of several alternatives, an individual will choose the option that yields the highest utility among the different possibilities (Thurstone, 1927). In other words, a mixed logit model presumes that individuals are utility maximisers. As such, the observed choices show the relative preferences for the modelled set of alternatives (Profeta & Hamm, 2019).

How strong this preference is, is expressed by the utility U_{nit} of alternative *i* perceived by individual *n* in choice situation *t* (Profeta & Hamm, 2019). According to Hensher et al. (2010) the utility U_{nit} consists of a deterministic (observable) component V_{nit} and a random stochastic (unobservable) component ε_{nit}:

$$U_{nit} = V_{nit} + \varepsilon_{nit} = \beta_n' x_{nit} + \varepsilon_{nit}$$

In the deterministic component, $\beta_n' x_{nit}$, x_{nit} is a vector of observed variables related to alternative i and individual n, *and* β_n is an individual coefficient vector, representing preference heterogeneity, that characterizes choices by the overall t situations (Bazzani et al., 2017; Hasselbach & Roosen, 2015). The stochastic term ε_{nit} is the unobserved error term. It is assumed to be independent of β and x. The probability of choosing alternative

i is equal to the probability that the utility of alternative *i* is greater than (or equals) the utility of all other alternatives in the choice set C_n (Boccia & Punzo, 2021).

Applied to the hypothetical and non-hypothetical choice data in this study, the following model results:

$$U_{nit} = ASC + \beta_1 price_{nit} + \beta_2 place\_of\_origin_{nit} + \beta_3 name\_producer_{nit} + \beta_4 visual\_cue\_producer_{nit} + \varepsilon_{nit}$$

where *ASC* is an alternative-specific constant that represents the non-purchase choice alternative. The continuous variable $price_{nit}$ comprises the three price levels used in the experiment; $place\_of\_origin_{nit}$ and $name\_producer_{nit}$ are dummy variables being one if the "place of origin", respectively "name of producer" is shown, and zero otherwise, $visual\_cue\_producer_{nit}$ is a vector of picture specific dummy variables.

For all conjoint attributes, the parameters (β) estimated by the mixed logit models were assumed to be independent random parameters, following a normal distribution, apart from the non-purchase option which was modelled as fixed parameter. This means, that for each random parameter β, the mixed logit model calculates mean, variance and covariance estimates, which aim to describe the different consumer preferences (Fonner & Sylvia, 2015). The mixed logit models were then estimated by using the Stata module *mixlogit (Hole, 2007)* in the STATA 13.1 software (StataCorp, 2013). The simulations were based on two thousand Halton draws, as Halton sequences work more effectively than random draws (Hensher & Greene, 2003). The log-likelihood ratio-test was used to compare the model fits of the different models (Hensher et al., 2010).

While the first model of each CBC experiment accounted only for the main effects, additional models were estimated to account for all possible two-way interactions among the conjoint factors and between the conjoint factors and the socio-demographic variables. However, none of these additional estimated models, neither for the hypothetical nor for the non-hypothetical experiment, could significantly improve the basic main effects model. Therefore, the following analyses focus on the main effects models.

3.3.3 Results

3.3.3.1 Results of the CBC experiments

Estimates for the mixed logit model are given in Table 6. For both CBC experiments, all parameters are significant at the 0.1% level, but the parameters for the attributes *place* and *visual_cue_couple* in the hypothetical and *non-purchase option* as well as *name* in the non-hypothetical CBC experiment, which are significant at the 1% (*place, visual_cue_couple, name*) and 5% level (*non-purchase option*), and the parameter for *price*, which is not significant at all. Surprisingly, only the estimate of the visual cue attribute "male producer" is significantly positive, while all other significant visuals cue estimates as well as the verbal cue estimates *place* and *name* are negative.

This means that, as expected, participants prefer to choose a package of local blueberries over none, and contrary to expectations, lower prices are not preferred over higher prices, nor do study participants want to know the name or exact place of origin of local blueberries. Moreover, in comparison to seeing a neutral logo depicted on the product packaging, they prefer to see a picture showing a male producer, while they prefer less than a neutral logo to see a female producer, or a producer couple being displayed. These results are constant for both CBC experiments. Nevertheless, for the verbal product attribute cue *place*, for which random distribution has been assumed, there are heterogeneous preferences as evidenced by the significant estimated standard deviations as for the *price* attribute. Meaning, study participants differ in their preferences regarding the local blueberry package indicating the exact origin of blueberry production as well as the price of the fresh local blueberries.

	Hypothetical CBC experiment		Non-hypothetical CBC experiment	
	Mean	*SD*	*Mean*	*SD*
non-purchase option	-3.46***		-1.13*	
	0.41		0.48	
price	-0.21	0.55***	0.02	0.68***
	0.18	0.05	0.22	0.08
place	-0.63**	0.43***	-1.28***	0.58***
	0.19	0.10	0.25	0.15
name	-0.38***	-0.15	-0.25**	-0.04
	0.06	0.13	0.09	0.58
visual_cue_woman	-0.66***	0.00	-0.68***	-0.00
	0.08	0.09	0.14	0.18
visual_cue_man	1.35***	0.02	2.15***	0.01
	0.32	0.31	0.36	0.23
visual_cue_couple	-0.26**	0.00	-0.49***	-0.00
	0.08	0.09	0.14	0.17
Log Likelihood	-1799.63		-874.29	
Observations	7152		3024	

Note. Standards errors are given in parentheses. Estimates for standard deviations are given in the column *SD*.*Significant at the 5% level, **Significant at the 1% level, ***Significant at the 0.1% level.

Table 6: Parameter estimates from the mixed logit models for the hypothetical and non-hypothetical CBC experiments

3.3.3.2 Results of follow-up questionnaire

From the questionnaire attached to the choice task, it was seen that the CBC experiment participants obtained their perceptions and information about agriculture in Germany mainly from friends and relatives, newspapers, television, and by far the most from the internet (see Table 7). Here, most information channels were equally influential for the perceptions of German agriculture among the hypothetical and non-hypothetical study samples. Larger differences were only found for the information channels *newspapers/magazines*, *television,* and *vacation/farm visits*, although none of these differences was significant at an alpha level of .05.

Information channel	Hypothetical CBC in % (*N* = 149)	Non-hypothetical CBC in % (*N* = 63)	Overall in % (*N* = 212)
Conversations with farmers	28.19	34.92	30.19
Friends and relatives	56.38	57.14	56.60
School	41.61	38.10	40.57
Newspapers/magazines	55.03	42.86	51.42
Radio	17.45	11.11	15.57
Internet	63.76	63.49	63.68
Social media (Facebook)	22.82	17.46	21.23
TV	48.99	61.90	52.83
Farmers' market/farm shops	26.17	30.16	27.36
Vacations/farm visits	35.57	49.21	39.62
Events	8.05	12.70	9.43
Advertising posters	12.75	11.11	12.26
Other	6.04	6.35	6.13

Table 7: Information channels that shape perceptions about German agriculture among CBC experiment participants in percent (multiple choices possible)

Results of the control study on the attractiveness of the producer pictures

Since the results of the visual and verbal cues were in quite unexpected direction, it was firstly ensured that the difference in the utilities of producers' pictures, hence the visual cues, was not due to a difference in their attractiveness. This was not the case (Kruskal-Wallis test, $\chi 2(2) = 0.905$, $p = 0.8241$) as the results of a small control study ($N = 35$) show (see Appendix B for further details on the mean attractiveness ratings of the producer pictures as well as the socio-demographic sample characteristics of the small control study).[23]

23 Although the control study was conducted among a different sample than the CBC experiments, the samples were both only focusing on young consumers belonging to generations Y and Z and comparable in most relevant socio-demographic and food purchasing characteristics (gender, persons living in a household, main shopping responsible, domicile size, shopping frequency for fresh blueberries, frequency of informing oneself about product origin). Significant differences were only found for the size of place of childhood ($p = 0.0039$) and purchase frequency of local products ($p = 0.0141$). Meaning, respondents in the

3.4 Study 2 - Questionnaire on gender role perception in agriculture

Surprised by the unexpected results from the hypothetical and non-hypothetical CBC experiments, it was decided in a second step to investigate in more detail which ideas young consumers have about agriculture and in particular agriculture as a professional field, also for women. It was also because the attached survey in the first study showed the great influence of the media on young consumers' ideas and perceptions about agriculture that a follow-up step was to find out how young consumers perceive female farmers and to what extent gender-stereotyped thinking about the agricultural sector still prevails among young consumers. For this purpose, study 2, a supplementary questionnaire study was conducted.

3.4.1 Data collection and participants

Study participants were informed about the general purpose of the questionnaire (to find out how society perceives the professional field of agriculture), they were assured anonymity and informed that their data would only be used for research purposes. Additionally, participants were made aware that they could withdraw from the study at any time, and a contact address was provided for any follow-up questions and to signal

control study were more often purchasing local products and less respondents in the control study spent their childhood in a big city.

Producer attractiveness was controlled for only after the CBC experiments because not only was the strong difference in the utility sign direction very surprising, but also because the CBC experiment included the non-hypothetical study part. Thus, for operational and feasibility reasons, the CBC experiment was naturally limited to the actual producers shown. That is, even if significant differences had been found in the attractiveness ratings of the male and female producer or producer couple, it would only have been possible to control for them and not to refer to any other producer alternative. However, no such significant difference in attractiveness ratings was found.

trustworthiness. Participants gave their informed consent by checking a box. Only after doing so, the survey started.

Data collection took place from June-July 2021 as well as October-November 2021. During this period, 243 respondents from generation y and generation z filled out the questionnaire which was designed with the software program Qualtrics (Qualtrics, 2020). After data cleaning 197 valid responses remained.[24] The socio-demographic characteristics are shown in Table 8.

24 Since the questionnaire focused on the perception of German farmers, 30 survey responses were excluded because the respondents were living outside of Germany. Also, 11 responses were excluded because participants did not finish the survey and 5 observations were dropped because they were pretesting the survey.

Variable		%
Age		
	< 18 years	1.02
	18-24	78.17
	25-34	15.23
	35-44	5.58
Women		51.27
	Place where one grew up	
	Bavaria	64.97
	other state in Germany	35.03
	Size of place of childhood	
	village	18.78
	small town	28.43
	medium town	12.69
	big city	40.10
Domicile size		
	village	12.18
	small town	14.21
	medium-sized city	9.14
	big city	64.47
Farm child [a]		5.81
Shopping frequency for local food [b]		
	more than once a week	27.37
	once a week	50.28
	1-2 per month	15.08
	once per month or less	2.79
	don't know	4.47

Note. [a] $N = 155$, [b] $N = 179$ due to missing values.

Table 8: Socio-demographic sample characteristics (N =197)

3.4.2 Measures

To get a better impression of young consumers perception and contact points with agriculture we asked them if they come often into contact with agriculture in their everyday life (adapted from Weninger, 2014, measured on a 5-point Likert scale ranging from 1 = *don't agree at all* to 5 = *totally agree*), how well they know about the

professional field of agriculture (taken from SINUS Markt- und Sozialforschung, 2020; adapted to the agricultural context and measured on a 5-point Likert scale ranging from 1 = *not at all* to 5 = *extremely well),* and how much they are interested in agriculture as a field of work (SINUS Markt- und Sozialforschung, 2020, measured on a 5-point Likert scale ranging from 1 = *not at all interested* to 5 = *extremely interested*). To find some further explication for our CBC experiment results we also wanted to know what constellation they think of when thinking of a farm (cf. Kuhlmann, 2016), and to what extent the gender of the producer matters when buying local food (*"I don't care about the gender of the farmer when I buy local food products"*, measured on a 5-point Likert scale ranging from 1 = *don't agree at all* to 5 = *totally agree*). Finally, they were asked to indicate to which degree they think the societal image of women in agriculture (cf. Kuhlmann, 2016; Lehmann et al., 2020; Loy et al., 2020; Schanz et al., 2018), as of agriculture as such must change in the future (cf. Berkes & Mergenthaler, 2020; Commission on the Future of Agriculture, 2021b; Kuhlmann, 2016; Mayr, Johannes, Resl, Thomas & Quendler, 2017). Both items were measured on a 5-point Likert scale, ranging from 1 = *don't agree at all* to 5 = *totally agree.* A dichotomous question was included asking if the study participant knows anyone who is working in agriculture (Piel, 2003). Besides, local food shopping frequency was assessed with the question *"How often do you buy local food products?"*, response options ranged from 1 = *more than once a week* to 4 = *once a month or less*.[25] Socio-demographic variables included age, gender, the size of the place where someone spent their childhood, the size of their current residence, and the federal state in which someone lives, as well as if the surveyed person grew up on a farm (see Table B3 in Appendix B for an overview of the survey questions used in the supplementary questionnaire).

25 As response option also 5 = I don't know was given.

3.4.3 Results

Overall, survey respondents did not very often have contact with agriculture in their everyday life. In our sample 69.54% stated that they know someone working in agriculture, while 30.46% did not. About 53.3% stated that they do not very often have touchpoints with agriculture in their daily life, while 29.95% do have. Interestingly, female respondents had significantly more contact with agriculture compared to male respondents (M_{male} = 2.46, SD = 1.26 vs. M_{female} = 2.85, SD = 1.24; Mann-Whitney test: z = 2.268; p = .0232). Similarly, participants residing in rural areas reported more frequent touchpoints with agriculture (Kruskal-Wallis test, $\chi 2(3)$ = 26.177, p < .001) and indicated having significantly better knowledge about agriculture (Kruskal-Wallis test, $\chi 2(3)$ = 27.060, p < .001), although the overall level of knowledge was relatively low (see Table 9 for further details). Most respondents (67.51%) knew only very little about the professional field of agriculture, while 11.17% stated that they were having extremely or very well knowledge. Only 14.72% were at least very interested in agriculture as a field of work, while 45.18% had little or no interest at all in this work field.

Residential size	Variable	*Mean*	*SD*	*Mdn*
Up to village (*n* = 24)	Agricultural interest [a]	3.7	1.2	3.5
	Agricultural knowledge [b]	3.3	1.1	3
	High contact with agriculture [c]	3.9	1.3	4
Small town (*n* = 28)	Agricultural interest	2.8	.8	3
	Agricultural knowledge	2.4	.88	2
	High contact with agriculture	2.8	1.1	3
Medium-sized town	Agricultural interest	2.5	.99	2
(*n* = 18)	Agricultural knowledge	2.2	.94	2
	High contact with agriculture	2.8	1.1	3
Large city (*n* = 127)	Agricultural interest	2.5	.86	2
	Agricultural knowledge	2	.8	2
	High contact with agriculture	2.4	1.2	2
	Agricultural interest	2.7	.99	3
Overall (*N* = 197)	Agricultural knowledge	2.2	.96	2
	High contact with agriculture	2.7	1.3	2

Note. Residential size was defined as follows: up to village for < 10,000 inhabitants; small town for < 20,000 inhabitants; medium-sized town for < 100,000 inhabitants: larger city for at least 100,000 inhabitants.

[a] Interest in the agricultural field was measured on a 5-point Likert scale, ranging from 1 = *not at all interested* to 5 = *extremely interested*; [b] Knowledge of agriculture as professional field was measured on a 5-point Likert scale, ranging from 1 = *no knowledge at all* to 5 = *extremely well*; [c] High contact to agriculture in daily life was measured on a 5-point Likert scale, ranging from 1 = *don't agree at all* to 5 = *totally agree.*

Table 9: Descriptive statistics for interest, perceived knowledge, and having high contact with agriculture by residential size (*N* = 197)

When thinking about farm constellations most survey respondents thought of a family farm (75.13%), while only very few had a female farmer in mind (2.54%) (see Table 10). Still, being directly questioned, almost all survey participants (99.49%) stated that a producers' gender is unimportant when buying local food. Finally, with a mean of 3.66 (*SD* = 0.808) most respondents agreed that the social image of women in agriculture must change in the future just as the image of agriculture in society as such (*M* = 4.18, *SD* = 0.698). That societal image of women in agriculture must change was significantly more agreed upon by female respondents than male (M_{male} = 3.5, *SD* = 0.79 vs. M_{female} = 3.82, *SD* = 0.79; Mann-Whitney test: *z* = 2.775; *p* = .0054).

	n	*%*
Farmer	25	12.69
Female farmer	5	2.54
Married couple	6	3.05
Family farm	148	75.13
Large scale farm	13	6.60

Table 10: Constellation survey respondents think of when thinking of a farm (*N* = 197)

3.5 General discussion

3.5.1 Increased information transparency is insufficient to be useful for consumers

As it is common in most CBC analyses, the non-purchase option was estimated as a fixed parameter, which assumed that participants have the same preferences, i.e., that they all prefer one of the product alternatives offered, rather than choosing no product alternative at all, to increase their utility. Consequently, the significant negative effect of the non-purchase option in both CBC experiments is in the expected direction (Boccia & Punzo, 2021; Hasselbach & Roosen, 2015; Sonntag et al., 2023).

In the present study, the price attribute is slightly negative but not significant. This suggests that, surprisingly for the experimental participants, higher prices did not have a significant negative effect on their utility. However, it would go too far as to conclude that price did not have a significant effect for any of the study participants, i.e., it was not important for their product choice decision. Rather, the insignificance of the price attribute could be interpreted as a signal of an ambiguous quality cue. This reasoning is also supported by the significant standard deviation estimates of the price attribute in both CBC experiments, indicating preference heterogeneity among study participants. Consequently, some participants apparently interpreted higher product prices as either

neutral or positive, which cancelled out the negative effect of higher prices on the utility of other experimental participants, ultimately leading to the insignificance of the attribute because the two effects overlap.

Considering higher prices as either neutral or positive can be explained by the fact that they may also be interpreted as a sign of high (food) quality (Rao & Monroe, 1989). Since local food is also purchased because of the high quality attributed to it, some participants might have simply preferred to pay more to get a high quality food product or hoped to support local farmers and the local economy even more by doing so (Feldmann & Hamm, 2015; Grebitus et al., 2013; Telligman et al., 2017). Or, although this would be unusual, for these individuals price is simply not a product attribute that is significantly influencing their decision to purchase a local food product, therefore the insignificant price estimate.

The attributes producer name (*name*) as well as product origin (*place*) showed significant negative estimates in both CBC experiments, contrary to the direction that was expected. In the following, several approaches are outlined which might explain these results. However, to finally determine which approach has had most influence, it is admitted that future investigations based on follow-up studies are needed.

The first reason why the attributes producer name as well as product origin were significantly negative may be attributed to participants either preferring less information or finding the provided information too detailed or complex to process, resulting in the opposite effect of consumers deliberately ignoring the cues. Finding the right balance between too simple and too detailed information provision is crucial to avoid overwhelming consumers and missing the goal of helping them make informed decisions (Verbeke, 2005). The reason for this overload is the limited cognitive capacity of consumers which results in the willingness to ignore information, especially in the absence of time (Verbeke, 2005).

Alternatively, verbal cues such as producer place and name might have been too simplistic for knowledgeable consumers interested in local food, as they seek more comprehensive background information beyond just the producer's name and place of origin to influence their food choices (Abrams & Soukup, 2017; Peterson et al., 2015).

The lack of social connectedness due to the distance between the place of local food production and the experiments' location could explain the negative estimates of verbal cues as well. Local food choices are not only driven by geographic proximity but also social proximity, and consumers' close relationship with producers influences their choices (Denver et al., 2019; Fernández-Ferrín et al., 2018; Hasanzade et al., 2022; Jensen et al., 2019; Onozaka et al., 2010; Telligman et al., 2017). Social proximity refers to the perceived relational distance between the actors involved in the supply chain, including consumers and producers (Eriksen, 2013; Hasanzade et al., 2022). However, in the case of the CBC experiments, the production location of the local blueberries was 100 km away from the study location.[26] Thus, the positive social (relational) impact, such as support for the local economy, community, and farmers, was not directly visible to the study participants. Besides, the participants were largely unfamiliar with the region, as indicated by the questionnaire attached to the choice task. Thus, the absence of a tangible social connection and the lack of regional knowledge could be further reasons for the significant negative estimates of both verbal cues (Grunert et al., 2010).

Uncertainty about the diagnostic value of the verbal cues could be another reason why both cues have had a significant negative impact on study participants' utility. According to Harbaugh et al. (2011), it is already sufficient for consumers to be slightly uncertain about the informativeness of the cue to reduce or even offset its positive effect. Rossi and Rivetti (2022) argue along the same line, stating that quality cues are only effective if consumers recognize and understand them and perceive them as useful as well as credible. Since perceived credibility is an essential dimension of consumer trust (Nilsson et al., 2004; Riskos et al., 2021) and consumers are increasingly skeptical of credence claims on food products (Rossi & Rivetti, 2022), it may well be that the detailed information provided about food origin and producer name was not perceived as credible enough to overcome study participants' generally low trust and propensity to distrust food industry actors (EIT Food, 2020; Meijboom et al., 2006; Rossi & Rivetti, 2022). In other words, simply increasing transparency and offering more information to study participants,

26 However, in the literature it is very common to define the local origin of a product as a place that is within a distance of 100 km (Demmeler, 2008; Kögl & Tietze, 2010; Verbraucherzentrale Bundesverband e.V., 2022).

although very important according to the literature (Meijboom et al., 2006), was probably not enough in our case to restore consumer trust in food industry actors, here embodied by local blueberry producers. Instead, one may conclude that the information and the entity providing the information must first also be seen as trustworthy, which requires more than increasing transparency and providing information (Meijboom et al., 2006). According to Meijboom et al. (2006), trustworthiness also requires that food producers, like all other actors in the food industry, communicate and explain to consumers the values by which they act.

The last explanatory approach to be outlined is that visual cues are often underestimated, while verbal cues are overestimated in consumer decision-making.

3.5.1.1 Comparison of visual and verbal cues within CBC experiments

Surprisingly, compared to the significantly negative verbal cues, producer name and product origin, the visual cue with a male producer (*visual_cue_man*) showed a significantly positive parameter estimate in the CBC experiments, for which the neutral visual cue *logo* served as a base.

This can be attributed to the processing of visual cues occurring in the almost instantaneous, intuitive and automatic part of consumers' decision-making (system I), while verbal cues require more cognitive processing in the conscious decision-making domain (system II) (Kahneman, 2013; Kannengiesser & Gero, 2019; Magnier & Schoormans, 2015). In grocery shopping, where consumers are usually under time pressure or face a large range of products, i.e., are exposed to a high cognitive load, but at the same time have low product involvement, automatic processing of visual cues usually prevails (Magnier & Schoormans, 2015; Verbeke, 2005). This is accompanied by the use of decision heuristics, often including stereotyped thinking, and being guided in decision-making by visual cues rather than verbal cues, as the former align more effectively with the cognitive processing route.

Applied to the present CBC experiments, this suggests that participants were likely to have used system I, focusing on the visual cue rather than the verbal ones. In this process,

they could have been subconsciously driven by implicit stereotypical reasoning, connecting food producers with a male producer. This resulted in a significant positive effect on the utility of the *visual_cue_man* and significant negative effects for the visual cues *visual_cue_woman* and *visual_cue_couple* compared to the neutral visual cue of the producers' logo.

3.5.1.2 Comparison of verbal cues between CBC experiments and supplementary questionnaire

The visual cue results differ significantly between the CBC experiments and the supplementary questionnaire. While survey participants indicated that producer gender does not matter when purchasing local food, the CBC experiment results showed a significant positive effect of the male producer cue and significant negative effects of the female and producer couple cues on utility.

Again, the difference could be attributed to the processing route elicited by the respective method (Lange et al., 2002; Mueller et al., 2010; Paivio & Csapo, 1973). Unlike the direct question in the supplementary questionnaire, the indirect querying of gender preference in the CBC experiments might have captured participants' automated and intuitive processing of information cues (Mueller et al., 2010). This aligns with previous research showing differences in attribute importance for visual cues between direct and indirect preference elicitation methods (Mueller et al., 2010). In other words, when asked directly, study participants may indicate at a metacognitive level that gender is an unimportant (visual) information cue, yet they are still influenced by it subconsciously when choosing a food product (Mueller et al., 2010). This is further evidence that consumer decision-making is often influenced by factors of which decision makers may not be aware, with visual cues being particularly underestimated (Breitmeyer et al., 2004; Chartrand, 2005; Fitzsimons et al., 2002; Ro et al., 2009).

3.5.2 Subconscious stereotyped thinking in local food purchases

The results show that what consumers consciously express in a questionnaire does not necessarily correspond to what they subconsciously choose. While the vast majority of respondents indicated that the gender of the food producer does not matter when buying local food, the results of the CBC experiments prove the opposite. However, when asked what constellation they think of when they imagine a farm, most respondents thought of a family farm.

To effectively change (gender-)stereotyped thinking, it is important to recognize that implicit stereotyped-thinking can affect anyone (Hinton, 2017), despite strong efforts to avoid it, as shown in the findings of Lai et al. (2016) and Gaertner and McLaughlin (1983). Although study participants did consciously reject the use of stereotyped thinking, they could not completely evade it, nor were interventions able to bring about long-term change in stereotyped thinking (Gaertner & McLaughlin, 1983; Hinton, 2017; Lai et al., 2016).

This is consistent with the findings of the present studies. While study participants in their role as young consumers in the supplementary questionnaire also consciously demanded and supported gender equality in food production and called for a change towards a more balanced role attribution between men and women, gender stereotypical thinking nevertheless seems to have subtly guided study participants in their decisions in the CBC experiments, the indirect preference elicitation method.

The challenge with implicit gender-stereotyped thinking is that it develops at a young age, regardless of parental efforts to prevent it (Del Río & Strasser, 2013; Raymond, 2013). Studies show that even when gender bias is addressed through interventions, these measures only impact behavior, but have little effect on attitudes (Paluck et al., 2021). Interestingly, Hinton (2017) argues that stereotypical thinking is rooted in the normal functioning of the predictive brain and is not per se flawed because it relies on true descriptions of the world. That is, these stereotypical associations are derived from the individual's experiences in their social environment (Hinton, 2017). Consequently, this results in stereotypical beliefs and gender bias varying among individuals and regions,

such as within the EU (European Institute for Gender Equality [EIGE]; Hinton, 2017; Mihálik & Matejková, 2022).

However, when implicit stereotypical thinking is prevalent in decision-making, especially when decision-making occurs through the processing route of system I, as in food purchasing decisions (Verbeke, 2005), and is shaped by childhood experiences as well as social conditions, then addressing the prevailing culture and social environment becomes crucial to changing stereotypical role attributions and implicit stereotypical thinking in the food producing industry as well (Del Río & Strasser, 2013; Hinton, 2017; Raymond, 2013). This is also supported by a recent study by Begeny et al. (2020). The authors show that greater gender equality in professional representation alone is not sufficient to reduce gender bias (Begeny et al., 2020). Instead, cultural change is necessary to address the underlying causes, rather than believing that simply increasing the number of female agricultural executives will be enough to reduce gender bias (Begeny et al., 2020; Hinton, 2017).

3.5.3 Women in agriculture

The visual cue showing a female producer (*visual_cue_woman*) was rated significantly negative by the participants in the CBC experiments compared to the neutral logo, which induced the second, supplementary study to look more closely at young consumers' perceptions of women in agriculture. The respondents clearly expressed their opinion that the societal image of women in agriculture, as well as agriculture in general, needs to change (for the better) in the future.

The agricultural sector in Germany is heavily male-dominated, with only 36% of agricultural employees being women (Davier et al., 2023; Destatis, 2021). The results of the supplementary survey therefore correspond very well with how the German Commission on the Future of Agriculture describes the agricultural sector in its final report - a sector in which traditional role models persist stubbornly and women and marginalized groups have difficulties being recognized and regarded as equal members of the community (Commission on the Future of Agriculture, 2021a). Accordingly, the

proportion of women among farm managers in Europe is very low (Bundesinformationszentrum Landwirtschaft, 2023). In figures, for Germany this means about 28,412 thousand (about 10.8%) female compared to 234,662 thousand male farm managers (Davier et al., 2023; Destatis, 2021). This gender disparity also explains why 39.09% of our survey respondents consider female workers unusual in agriculture. And although the dominance of men is now waning somewhat, female farm managers still encounter reservations (Contzen, 2004; Davier et al., 2023; Lehmann et al., 2020).

This is also reflected in the findings of the supplementary questionnaire: the majority of respondents agreed that the image of women in agriculture differs from that of other fields of work. Only 50% of them think that the working environment in agriculture is not more suitable for men. Consequently, the survey respondents, especially the female ones, were very supportive of changing the image of women in agriculture in society. This has also been urged by the German Commission on the Future of Agriculture and the few research reports on women in agriculture (Contzen, 2004; Davier et al., 2023; Kuhlmann, 2016; Lehmann et al., 2020; Loy et al., 2020; Schanz et al., 2018).

To address this societal image change and strengthen female leadership, the German Commission on the Future of Agriculture and existing research reports recommend to promote more female role models and mentors, integrating women more closely into male networks, relieving them of non-career promoting tasks, establishing flexible work models, and improving the work-life balance to better reconcile family and work (Davier et al., 2023; Lehmann et al., 2020; Loy et al., 2020). The latter two factors are particularly relevant, as the agricultural sector is considered to be lagging behind other sectors in both aspects (Davier et al., 2023). Given the limited research on women in agriculture, it is also worthwhile to focus more on data collection and research on this topic.

3.5.4 Knowledge and perception of agriculture as such

Today, only 1.3% of the workforce in Germany is working in agriculture (Junge, 2021). Thus, it is not surprising, that we find for our young consumers in the supplementary survey that more than two-thirds of the respondents stated to have little or no knowledge

at all about agriculture. This most probably also results from the fact that the majority of them has not very much touch points with agriculture in their everyday life. These findings are in line with current literature. Forsa (2018) found in their survey that about 41% of survey participants do not know any farmer personally, although many of them would be interested in talking to farmers about their work. In bigger cities with 500.000 inhabitants or more, the percentage of people who do not know any farmer personally (61%) was even higher (forsa, 2018). In our supplementary questionnaire we see similar results as also among our young respondents nearly one third does not anyone working in agriculture. In line with the literature, we find as well that people living more rurally having significantly more touch points to agriculture in their daily life and also consider themselves more knowledgeable about agriculture, although only at low to moderate level (Boehm et al., 2010; Gross & Roosen, 2021; SocialLab-Konsortium, 2019).

These findings again highlight the growing geographical as well as mental alienation between consumers and producers, leading to a lack of consumer trust towards producers (Gross & Roosen, 2021; Meijboom et al., 2006; Nilsson et al., 2004). Still, closing the knowledge gap about food production between consumers and producers to a certain extent with the help of transparent and traceable information about food product origin, thereby also aiming to increase consumer trust (Meijboom et al., 2006), could not be achieved with the CBC experiments as used in study 1.

A major reason for this might be because our young consumers showed on average only moderately or little interest in agriculture. Hence, even if Zander et al. (2013) found that some consumers wish to have closer contact to farmers and food production especially for those living urban, from our results we have to conclude that among young consumers there are rather few. What is apparent from the first study, though, is that the media have a significant influence as a source of information for these young consumers. More than by friends, nearly two-thirds of young consumers' perception of the German agriculture is influenced by internet sources. Quoted by every second, newspaper articles and TV have similar relevance as friends, while schools have comparably influence on few. Finally talking to farmers is only named by less than one third of young consumers. This latter finding is in sharp contrast to a survey from 2017, where in a representative study among the German population this factor was named by 56% as influencing their perception about German agriculture (Kantar EMNID, 2017). Yet, this substantial

difference can be explained once more by the very few touchpoints of young consumers with agriculture. Besides, the decreasing importance of school as information source for agriculture was already found in 2017, while the influence of relatives and friends as well as newspapers, however, has remained quite similar (Kantar EMNID, 2017). Finally, our results highlight the changing media consumption patterns of young consumers as the internet replaces TV as most influential information source (A. Mishra & Maity, 2021; Moscardelli & Liston-Heyes, 2005).

3.6 Practical implications

Practical implications arising from this study are, first, that simply increasing the transparency of local products by providing more detailed product origin information is not sufficient to meet young consumers' needs. If consumers cannot associate anything with the product information presented because, for example, they are unfamiliar with the location of local food production, transparent presentation of product origin may actually backfire and reduce consumer value for local food. Therefore, retailers and producers should consider familiarizing customers with the place of production through appropriate marketing efforts before providing extensive product origin details. If it is impractical to acquaint customers with the place of production and producers, then this high level of transparency and traceability of local products cannot be justified by the related costs, and retailers and food producers should rather look for more promising ways to improve consumer access to product information, as envisaged in the European farm to fork strategy (EU, 2020). Alternatively, while providing the same depth of information as in our CBC experiments, food retailers and producers could also explore how to create a stronger emotional connection with the local food products among their customers. Emotion is a strong driver of purchase decisions for local food (Shin et al., 2021), but compared to alternative food systems (e.g. farmers' markets or farm stores), conventional supermarkets and grocery stores are still far less successful in creating an emotional

attachment among their customers to the local food they offer. So, there is still potential to leverage this buying motive.

Secondly, women working in agriculture must become more visible to consumers. This requires efforts from policy makers, retailers, the media and research, but also from the women themselves. Policymakers need to focus more on women working in agriculture, identify their support needs and, based on this, launch targeted initiatives to promote female executives so that there are more female farm managers in the future than there are today (Lehmann et al., 2020; Loy et al., 2020). Retailers and the media, in turn, should be held more accountable for conveying a realistic picture of modern agriculture in Germany, i.e., also presenting female producers (Kuhlmann, 2016; Mayr, Johannes, Resl, Thomas & Quendler, 2017; Schanz et al., 2018). Likewise, women working in agriculture themselves need to raise their voices and strive for visibility, addressing the absence of female role models and mentors in leadership positions in agriculture (Loy et al., 2020).

Thirdly, these findings suggest that increasing urbanization and the steady decline in the number of farms in the EU will lead to further alienation between producers and consumers (Eurostat, 2018; Giampietri et al., 2018; Nilsson et al., 2004). This will further aggravate knowledge gaps about food production among consumers. To avoid relying solely on third parties such as the media with little expertise to convey information about food production, new forms of communication and dialogue are needed that enable a direct exchange of viewpoints between consumers and food producers (Kuhlmann, 2016; Mayr, Johannes, Resl, Thomas & Quendler, 2017; Schanz et al., 2018). This should be done in conjunction with the use of the internet as an information channel. In the future, the creation of new dialogue formats could increase young consumers' interest in agriculture, enable a better understanding between consumers and producers, and positively influence the perception of agriculture in Germany (Commission on the Future of Agriculture, 2021a; Pfeiffer et al., 2021; Zander et al., 2013).

3.7 Limitations and avenues for future research

The results of this essay should be interpreted considering certain limitations. The research questions in this study were all addressed from a young consumers' perspective. Consequently, its results are far from being representative. Still, they illustrate which information is indeed considered relevant among young consumers, an increasingly important customer segment (Blanc et al., 2021; Kallas et al., 2021; Kumpulainen et al., 2018; Rossi & Rivetti, 2022; Savelli et al., 2019), when deciding on local food products.

Although each study attempted to minimize social desirability bias by assuring study participants of anonymity, its influence on the results cannot be completely ruled out. At least for the CBC experiments, though, it was tried to minimize its influence as much as possible by complementing the hypothetical CBC experiment with its non-hypothetical equivalent. Despite the logistical and operational effort involved, it would be very welcome if future research were to repeat the CBC experiment in a field setting. This is because various factors impact food purchase decisions, including product-related factors, individual differences, and environmental conditions (P.-J. Chen & Antonelli, 2020; Grunert et al., 2014; Renner et al., 2012; Rossi & Rivetti, 2022; Rousseau, 2015). In our laboratory setting, we intentionally excluded these factors to reduce complexity and first understand what local food product information is actually of interest to young consumers. However, supplementing our results with field data would allow us to see how this local product information is weighted relative to other product information, such as production method or appearance, in a real-world shopping environment (Grunert et al., 2014; Rossi & Rivetti, 2022; van Bussel et al., 2022).

While the focus in this essay was on fresh blueberries, expanding the product range in future studies would help to verify the transferability of the findings. Moreover, our choice data was collected before the Covid-19 pandemic, during which the agricultural sector has gained increased importance, especially for young consumers. They now pay even more attention to buying products with short transport distances and supporting the local economy (BMEL, 2020). Therefore, conducting a replication study under current market conditions, as we transition from a pandemic to an endemic state in terms of Covid-19, would be valuable. This would also allow to test whether the results of this

essay remain valid in the face of rising food prices due to high inflation and changing consumer dynamics.

Future research could also pay more attention to the emotional factors that drive consumers to purchase local food, particularly by investigating the concept of place attachment (Banerjee & Quinn, 2022; Giraud & Halawany, 2006; Shin et al., 2021). Place attachment is defined as the personal connection an individual feels for a place (Kyle et al., 2004). According to the literature, place attachment motivates consumers to support the community by buying local food, as it evokes a sense of belonging and identity (Banerjee & Quinn, 2022; Brehm & Eisenhauer, 2008; Memery et al., 2015; Shin et al., 2021). Yet, how this relationship between place attachment and purchasing local food is influenced by the increasingly cosmopolitan lifestyle of young consumers, is currently unexplored but an exciting avenue for future research (Czepkiewicz et al., 2020; Forsberg, 2019; Keating, 2021).

The findings also reveal that a significant proportion of young consumers have no personal connection to food production and a large majority know very little about agriculture. Moreover, most of their perceptions about agriculture do not come from actors who are actually involved in agriculture, but from third parties, such as (social) media sources. Future research may therefore explore ways to facilitate direct interaction between consumers and food producers. Eventually, researching how to overcome gender-related stereotypes in agriculture and how to support women taking on management roles therein should be a focus of future qualitative and quantitative studies as still, they even influence young consumers decision-making subconsciously.

3.8 Conclusion

Based on cue utilization theory and the implementation of two CBC experiments and a subsequent, supplementary survey, this essay shows which product information (information cues) is actually used by young consumers when evaluating a local food product. The essay also examines which information channels shape young consumers'

perceptions of food production and the producers involved. In addition, some current views of young consumers about agriculture are described.

Overall, the results show that there is information about local products, whose provision is considered valuable in the literature, but whose positive utility, at least for young consumers, cannot be supported by our empirical data. Specifically, our results cannot prove that consumers derive any utility from knowing the exact place of origin or the name of the producer of a local food product. Rather, with their significantly negative signs our results show the opposite.

Therefore, a supplementary questionnaire study was conducted to better interpret the surprising results of the two CBC experiments and to better understand why only the image of the male producer had a positive estimate among study participants. The survey data showed that what consumers consciously express in a questionnaire does not necessarily correspond to how they subconsciously decide in a CBC experiment. While the vast majority of survey participants indicated that the gender of the food producer does not matter when purchasing local food, the results of the CBC experiments prove otherwise. Interestingly, however, the majority of respondents agreed that society's image of women in agriculture needs to change (for the better) in the future, as does society's view of agriculture as a whole.

Overall, this essay, with its focus on assessing the benefits of detailed information on the origin of local food, addresses the criticism of the lack of transparency of many credence claims, which include local origin (Macready et al., 2020). Moreover, this is one of the few studies on young consumers' perceptions of food producers and agriculture in Germany, which is surprising given their increasing economic importance, but also political weight for the successful implementation of the European farm to fork strategy. The essay provides helpful insights for food industry stakeholders who are currently discussing how to improve the present regulation of local food and how to proceed with providing transparent and traceable food information to consumers.

4 Comparing the effect of different message frames on the willingness to buy suboptimal local products among young consumers in Germany (Essay III)[27]

4.1 Introduction

Reducing food waste is a major challenge on our path to sustainable consumption and production, which is also embodied in target 12.3 of the Sustainable Development Goals (SDGs) and aims to halve food waste and food loss by 2030 (United Nations Environment Programme [UNEP], 2021). According to the latest Food Waste Index Report 2021 of the UNEP, approximately 931 million tons of food waste were generated in 2019, suggesting that approximately 17% of total global food production may be wasted (UNEP, 2021), accounting for 8% to 10% of global greenhouse gas (GHG) emissions (Poore & Nemecek, 2018; Mbow *et al.*, 2019).

Although we know that retailers account for only a rather small share of total food waste compared to, for example, consumer households (UNEP, 2021), retailers nevertheless bear a special responsibility. As their procurement policies and practices, as well as actions against food waste, have an impact beyond their own supply chain level, they consequently also have a decisive influence on how much food waste is generated along the entire supply chain (Hooge *et al.*, 2018; Dreyer *et al.*, 2019; Aschemann-Witzel *et al.*, 2020) and also can influence consumers' knowledge and attitudes towards food waste and the perception of food as such (Aschemann-Witzel, 2018a; Aschemann-Witzel *et al.*, 2020). For this reason, it is useful to investigate how much retailers can influence the perception and willingness to purchase food that may be wasted because it is perceived

27 This essay was presented at the ERSCP 2021 of the European Roundtable for Sustainable Consumption and Production (ERSCP) Society in Graz, Austria, and the International Conference on Environmental Psychology 2021 of the Environmental Psychology Division of the International Association for Applied Psychology (IAAP) in Siracusa, Italy.

as *suboptimal* by promoting these suboptimal products with differently framed messages. The term suboptimal food refers to products that differ from their optimal or normal counterpart in terms of 1) their appearance (Bunn *et al.*, 1990) 2) expiration of the best-before date, or 3) defects in the product packaging (White *et al.*, 2016), without having any disadvantages in terms of safety and intrinsic quality (Göbel *et al.*, 2015; Aschemann-Witzel *et al.*, 2016; Hooge *et al.*, 2017).

In order to motivate consumers to buy suboptimal food products, existing research shows that it is effective to adapt the framing of the advertising message to the type of suboptimality, or to emphasize it in particular (van Giesen & Hooge, 2019; Mookerjee *et al.*, 2021). Surprisingly, however, as far as we know there is no study in the literature that investigates to what extent the willingness to purchase suboptimal food can also be increased by emphasizing a product's local origin - a product characteristic that is usually cited as decisive purchase criterion (Bazzani *et al.*, 2017; Printezis *et al.*, 2019; Thøgersen *et al.*, 2019). Yet, this attribute is present regardless of whether a product is considered suboptimal or optimal. Stressing this product characteristic could therefore be just as beneficial for the willingness to purchase a suboptimal food product as it is for its optimal counterpart. Accordingly, the aim of the study is to answer the following two research questions:

1) *To what extent can emphasizing the local origin of a suboptimal food product serve as a viable complementary strategy to increase the willingness to purchase suboptimal local food products and, consequently, help to reduce food waste in the retail sector?*

2) *What role do consumers' origin, local food purchasing behavior and consumers' attitudes towards suboptimal food and the best-before date play in this context?*

The present research concentrates on suboptimality in terms of date labelling, specifically dairy products that are close to the best-before date because food that is expired is often considered as an important reason for food waste (Garrone *et al.*, 2014; Patra *et al.*, 2020; Samotyja & Sielicka-Różyńska, 2021), especially in the case of dairy products (Lebersorger & Schneider, 2014; Albizzati *et al.*, 2019; Goodman-Smith *et al.*, 2020;

Tesco PLC, 2021). To achieve SDG Target 12.3, it is thus important to find strategies that increase the willingness to purchase dairy products close to their best-before date. Moreover, we focus on the group of younger consumers, i.e. the generation of millennials (generation Y) (Kilian *et al.*, 2012) and post-millennials (generation Z) (Seemiller & Grace, 2016) for several reasons. First, they represent an age group of consumers that is already a critical target group for companies and whose importance will increase in the future (Muniady *et al.*, 2014; Kumpulainen *et al.*, 2018; Savelli *et al.*, 2019). Second, although it has already been noted that these young consumers differ significantly in their characteristics from previous generations (Schlossberg, 2016), their behavior still raises questions (Taken Smith, 2012; Valentine & Powers, 2013). Third, even if these young consumers are particularly concerned about environmental issues (Bucic *et al.*, 2012), in terms of food waste behavior previous studies draw an ambivalent picture (Koivupuro *et al.*, 2012; Stefan *et al.*, 2013; Graham-Rowe *et al.*, 2014; Stancu *et al.*, 2016; Hebrok & Boks, 2017; Hooge *et al.*, 2017; Cicatiello *et al.*, 2019).

Our study adds to the existing literature by investigating to which degree food waste avoidance practices at the retailer stage can benefit from the local food shopping trend. Secondly, the study provides an update on the significance of the best-before date as an orientation aid and decision criterion for young German consumers when shopping. An update is of interest because studies show that in recent years the understanding of the best-before date among consumers has increased and it is no longer understood as a strict "throw-away" criterion (van Boxstael *et al.*, 2014; Wilson *et al.*, 2018; BMEL, 2020a). Third, we are among the first who show a use case for the zero-one-inflated beta (ZOIB) regression model and illustrate when its model fit is superior for data analysis in comparison to a fractional regression model.

In the next section, we develop our hypotheses based on the literature on local food products and attribute framing theory. The following materials and methods section presents our choice of stimuli, experimental design and survey measures. After presenting our results in section four, we discuss the theoretical and practical implications of our

findings in section five, followed by the study's limitations and giving recommendations for future research directions in section six. The paper concludes with section seven.

4.2 Literature review and theoretical background

4.2.1 Local food shoppers' purchase intention for suboptimal local food

Out of the desire to consume more sustainably, it can be observed that consumers' expectations towards food are steadily increasing (Megicks *et al.*, 2012). Consequently, nowadays also ethical and environmental aspects are important purchase criteria when deciding on a food product (Megicks *et al.*, 2008). Local food products thereby seem to be a perfect option for many consumers (Megicks *et al.*, 2012), although their ethical and environmental benefits are not undisputed (Grebitus *et al.*, 2013; Young, 2021) and still no official definitions of the terms "regional" or "local food" exist (Adams & Salois, 2010; Feldmann & Hamm, 2015; Menapace & Raffaelli, 2016; Mohr & Schlich, 2016). Nevertheless, from a consumer perspective, buying locally produced food is strongly associated with socially responsible and environmentally conscious consumption (Zumwalt, 2001; Sauter & Meyer, 2004; van Rijswijk *et al.*, 2008; Memery *et al.*, 2015; Girgenti *et al.*, 2016; Bernard *et al.*, 2019), in which consumers make decisions based on a broader set of criteria in addition to self-interested factors such as product quality (Weatherell *et al.*, 2003; Carey *et al.*, 2011; Megicks *et al.*, 2012). Moreover, studies have found that especially sustainability-related benefits, such as support for the local community (Memery *et al.*, 2015), ethical consumption, and concern for the environment (Megicks *et al.*, 2008; McEachern *et al.*, 2010; Grebitus *et al.*, 2013; Feldmann & Hamm, 2015), are important aspects considered when purchasing local food (Tregear & Ness, 2005; Birch *et al.*, 2018).

Above all, for consumers who place particular value on local food, ethical as well as ecological aspects are very strong purchase motives (Tregear & Ness, 2005; McEachern *et al.*, 2010; Dukeshire *et al.*, 2011; Johnston *et al.*, 2011). Correspondingly, these

consumers should also have a higher purchase intention for suboptimal local dairy products than consumers who are less inclined to buy food locally. This is because, on the one hand, the product quality of dairy products shortly before the expiration of the best-before date is still considered perfectly acceptable as defined by the best-before date (Koutsoumanis *et al.*, 2020). So, the self-interested aspect of product quality should not be the determining factor for the product decision. On the other hand, consumers who care a lot about buying local food because they pay attention to ethical and environmental aspects in their food choices should feel especially compelled to decide for suboptimal local dairy products to help avoid an unnecessary waste of resources, particularly since food waste is considered highly unethical (Aschemann-Witzel, 2016; Ribeiro *et al.*, 2018; Chang, 2021). In addition, individuals who frequently buy local food for ethical and environmental reasons may also be more motivated to choose suboptimal local food to avoid feeling guilty. These consumers might otherwise be particularly likely to feel guilty for violating a social norm ("food should not be wasted"), but also for potentially violating their own personal norms ("I am trying to avoid food waste") (Dahl *et al.*, 2003). Accordingly, we formulate the following hypothesis:

H1: Placing high value on local food shopping positively influences the willingness to purchase local dairy products that are close to the expiration of the best-before date.

4.2.2 Using compelling messages to reduce food waste

Research from a variety of fields, including communications, psychology, and economics, suggests the strategic use of compelling messages to make people aware of an issue and assist them in deciding to take a particular action or engage in a particular behavior (Rothman *et al.*, 1993; Pelletier & Sharp, 2008; O'Keefe, 2016). In the effort to reduce food waste, this means that retailers can use persuasive product messages to alert consumers to the problem and encourage them to take greater action against food waste by adjusting their purchase behavior to buy more suboptimal products (Hooge *et al.*, 2017; Aschemann-Witzel, 2018a). Besides, the framing of a product plays a crucial role in how consumers perceive and evaluate the product (Levin & Gaeth, 1988), as well as it influences their price estimation for it (DelVecchio *et al.*, 2007).

The theoretical basis for this is known as attribute framing strategy as described by Levin and Gaeth (1988). According to this strategy, an attribute is deliberately manipulated within the framing context, which in consequence has an impact on the attractiveness evaluation of an investigated issue, hence, on the dependent variable (Levin & Gaeth, 1988). The strategy is based on the prospect theory of Tversky and Kahneman (1981), which states that a consumer's attitude is influenced by how a piece of information is framed. In addition, O'Keefe (2016) and Rothman *et al.* (1993) were able to show that the framing of messages can also induce people to change their attitude towards a particular behavior or their behavioral intention.

Levin and Gaeth (1988) explain the mechanism of action of the attribute framing theory by the fact that the way an attribute is framed has an influence on how information is encoded and represented in the associative memory. Consequently, this difference in representation in the associative memory is seen as the cause of the valence-consistent shifts in the respondents' answers, i.e., in the attractiveness ratings of the item under study (Levin & Gaeth, 1988). Transferred to the problem of food waste, this means when describing a suboptimal product with a positive product attribute, i.e., applying a positive frame, the suboptimal product should be evaluated more favorably, e.g., in terms of quality or purchase intention, because of the positive associations the attribute evokes in the respondent's memory, than when describing the suboptimal product with a negative product attribute. In addition, the framed attribute acts like an immediate prime, a stimulus, which sets the "evaluative tone" (Levin & Gaeth, 1988). This ultimately determines whether the information provided by the attribute is evoking positive or negative associations in the memory among respondents during the exposure with the object of interest (Levin & Gaeth, 1988).

While for food that is considered suboptimal due to its shape or appearance, there are ideas to use a message frame that points out the products' authenticity (van Giesen & Hooge, 2019) to increase purchase intention, for products near the expiration date there are mainly studies that investigate the effect of messages on food wastage or alternatively emphasize price savings (Helmert *et al.*, 2017; Hooge *et al.*, 2017; Aschemann-Witzel, 2018a). For example, it was investigated how these price savings or anti-food waste messages affect the willingness to purchase suboptimal products (Aschemann-Witzel *et*

al., 2018; Aschemann-Witzel, 2018a; van Giesen & Hooge, 2019), brand perception of a product (Theotokis *et al.*, 2012) or perception of the retailer (Louis & Lombart, 2018).

The studies by Septianto *et al.* (2020), Shao *et al.* (2020) and Grewal *et al.* (2019) take a rather different approach to reduce food waste by focusing on the influence of (positive) emotions on consumers. Indeed, there are several studies that point to the importance of emotions in food waste (Graham-Rowe *et al.*, 2014; Falasconi *et al.*, 2019; Septianto *et al.*, 2020). However, emotional value also plays a substantial role in local food (Giraud & Halawany, 2006; Shin *et al.*, 2021).

4.2.3 Stressing local product origin to reduce food waste

Local food is often associated with authenticity (Tregear *et al.*, 1998; Beverland, 2006; Beer, 2008) and makes consumer think of the place, its culture and inhabitants (Dekhili *et al.*, 2011). This finally contributes to the affective feelings consumers may have toward local food, giving local food products emotional value (Verlegh & Steenkamp, 1999; van Ittersum, 2001). Emotional value is in this case defined as the perceived utility derived from a local food product's capacity to arouse feelings or affective states (Sheth *et al.*, 1991). These feelings can be triggered by emphasizing product origin, whereupon the consumer transfers the feelings associated with origin to the local product (van Ittersum, 2001). As an example, a product's place of origin may evoke feelings of pleasure and happiness based upon consumers' experiences with that place (van Ittersum, 2001). Also Giraud and Halawany (2006) argue that the emotional value towards a local product is induced by an image transfer between the production location and the product. Recently, this emotional value was found to be the most helpful consumption value predicting students' intention to purchase local food in the United States (Shin *et al.*, 2021).

We argue that for a suboptimal product of local origin, a message frame that emphasizes this local origin is very likely to increase consumer purchase intention. This is because a message frame that stresses local origin specifically seeks to address the emotional value of the product to consumers. Thus, the suboptimal product may benefit from the positive associations that consumers have with the place and with its local food. It may also be

that the positive quality associations that consumers generally have with local food products (van der Lans, 2001; Grebitus *et al.*, 2013) are transferred to the suboptimal local food products. Therefore, we formulate the following hypothesis:

H2: A message emphasizing the local origin of the suboptimal dairy product has a positive effect on the willingness to purchase this dairy product, which is close to its best-before date.

The desire to support a local community and its inhabitants can also be the result of what is called *place attachment* in the literature (Altmann & Low, 1992; Williams *et al.*, 1992; Hildago & Hernández, 2001; Kyle & Graefe *et al.*, 2004). According to Kyle, Mowen and Tarrant (2004) place attachment can generally be defined as the personal connection an individual feels for a place. The generic term *place* used in the definition can in turn be understood at different spatial levels (Memery *et al.*, 2015). Thakor *et al.* (2018) show in their study that in addition to a local or regional understanding, place attachment is also a valid and useful construct at state level. Hence, they show, that social identity can also be inferred from state residence and ultimately lead to a social-identity based bias or at least to a tendency to preferably support businesses and products from the own home-state (Thakor *et al.*, 2018). However, to develop a certain attachment towards a place it needs experience and social interaction with that place, but also time. If so, tough, this place can also become part of one's identity (Rubinstein & Parmelee, 1992; Taylor & DiPietro, 2020). Therefore, it is not surprising that, for example, local residents who have a rich history with a place feel the greatest identification with that place (Rowles, 1983; Pretty *et al.*, 2003; Kyle, Mowen & Tarrant, 2004). In terms of different life stages, a person's childhood is especially crucial for the development of attachment to a place (Sobel, 1990; Hay, 1998). In other words, according to Morgan (2010), growing up in only one place during childhood is a prerequisite for developing a strong attachment to a place.

Eventually, previous studies from Memery *et al.* (2015), Czarnecki *et al.* (2021) and Shin *et al.* (2021) show, that if consumers identify more strongly with a place, then they are also more strongly supporting and protecting this place by purchasing local food products and make greater efforts to behave environmentally friendly (Kyle & Graefe *et*

al., 2004; Daryanto *et al.*, 2020). Applied to our study, acting environmental-consciously would mean avoiding wasting local resources by buying suboptimal local dairy products. Considering these findings, we expect that if a suboptimal food product comes from the same place where the consumer spent most of his or her childhood and to which he or she still has a personal connection, this should positively influence the purchase probability. Accordingly, we formulate the following hypothesis:

H3a: Individuals who grew up mostly in the state where the suboptimal dairy products come from show a higher willingness to purchase these products than individuals who did not grow up in that state.

Apart from looking at the products, we assume that a local message frame is more effective, in the sense of provoking a higher increase in the choice probability of the suboptimal dairy products, among consumers who grew up mainly in the place where also the product originates from. This is because a local message frame, stressing the local origin of the suboptimal dairy product, should be especially suitable to address the self-concept and desire of consumers mainly grown up in this region to express their affiliation with the region and its community (Dilley, 2009; Memery *et al.*, 2015). Therefore, our hypothesis is:

H3b: There is a positive interaction effect between individuals' place of childhood and a local origin message frame. Put differently: A local message frame increases the purchase probability of the suboptimal products more for individuals who also grew up in the place from which the suboptimal products originate than for individuals for whom the products' origin and the place of their childhood do not overlap.

4.3 Material and methods

While the experiment was designed with QuestBack GmbH (2019) and Qualtrics (2020), the analysis was done with StataCorp (2019). The first three treatments (*t_control,*

t_price, t_food_waste_av.) were conducted in person, whereas treatment four (*t_local_origin*) was done as an online experiment due to the COVID-19 pandemic containment measures. The experiment was conducted at the experimenTUM laboratory in Munich, which is a pool of students with more than 2,000 volunteers, in June 2019 and December 2020. [28]

28 Before starting the analysis, it was controlled for significant differences in the sample composition of the three on-site treatments (t_control, t_price, t_food_waste_av.) and the fourth treatment performed online (t_local_origin). Significant differences were found with respect to gender (percentage of women on-site: 56.84% vs. percentage of women online: 44.34%; two-sample test of proportions: z = -2.03; p = .0427), household size (Mann-Whitney test: z = -2.172; p = .0303), and frequency of main purchases (Mann-Whitney test: z = -2.124; p = .0354), while no significant differences were found for all remaining socio-demographic variables and sample characteristics (age, allergy to dairy products, education, proportion of respondents who grew up in Bavaria, size of the town where the respondent grew up and size of the town where their family currently lives, food involvement, importance of buying local food, shopping responsibly, preference for dairy products, brand attachment, and place attachment to Bavaria). The variables for which significant differences were found (household size, frequency of main purchases, and gender) were included as control variables in the regression models, but no significant influences were found. The results remained robust as reported in the results section.

4.3.1 Stimuli choice and development

Participants were in total confronted with three choice sets, each consisting of an optimal and a suboptimal dairy product alternative (see Table 11).

Choice set products	• Fresh milk • Cheese • Yoghurt	
Number of choice sets per participant	3	
Product alternatives per choice set	2	• Alternative 1: optimal product (9 days before best-before date) • Alternative 2: suboptimal product (2 days before best-before date)

Table 11: Choice task summary

The three choice sets were generated following a 3x4 design, with three different dairy products (fresh milk, cheese and yoghurt) and three different messages framing the suboptimal dairy product alternative. The fourth treatment served as control treatment. We chose these three products in order to cover the product category of dairy products as much as possible, but also to be able to analyze the extent to which consumers make a purchase-deciding differentiation within products of this category when considering the best-before date. In other words, it is thereby possible to find out to what extent consumers may also take into account the fact that different types of dairy products also differ in terms of how long they can still be used after the best-before date has expired if stored correctly (Dairy Food Safety Victoria, n. d.; Stefansdottir *et al.*, 2018; BMEL, 2020b; Plasil, 2020). Moreover, there are general differences in purchase frequency between these three products (Arbeitsgemeinschaft Verbrauchs- und Medienanalyse, 2020), which could also influence our variable of interest, the purchase probability of the suboptimal product.

In each choice set the optimal dairy product was 9 days before the best-before date, whereas the suboptimal dairy product was 2 days before expiry. As stimuli, two local dairy product brands were chosen which are not only advertising their local origin and paying attention to the local production of their products, but which are also available to the study participants as local products at their usual shopping place. The local (sub-)optimal dairy products were shown to the study participants in the form of pictures in order to make the choice tasks as illustrative as possible and also to give the study participants a realistic impression of the respective packaging size and thus quantity of the product. In addition to the product price and the best-before date, each choice set also included the product name and information about the quantity unit in text form. With the exception of the exact date of the best-before date and the product price, the visual depiction of the suboptimal and optimal dairy product was identical (see Figure 1). All suboptimal dairy products were offered at a 50% price discount as it was done in previous studies on choice likelihood of suboptimal products (Kulikovskaja & Aschemann-Witzel, 2017; Aschemann-Witzel, 2018a). Moreover, a price reduction of 50% also lies within the usual range of price discounts at which dairy products close to expiry are offered in German supermarkets. In order to simulate the purchase decision made in a grocery store as closely as possible, we based the design of the price tag and message framing cue on the color scheme and design commonly used for this purpose in Germany. Thus, the price tag was visually identical for the suboptimal and optimal product. Yet, the suboptimal product was additionally accompanied by the message framing cue. For reasons of realistic presentation, we also decided against highlighting the best-before date in color.

Overall, we used the following three different message frames: price savings, food waste avoidance and local (Bavarian) product origin. The price message framing “Angebot! Sparangebot!” (“Offer! Super saver!”) was adapted from Aschemann-Witzel *et al.* (2018), the food waste avoidance message “Zu gut für die Tonne!” ("Too good for the bin!") was formulated following the framing of the food waste prevention initiative which is run by the German BMEL. In the local product condition, the message “Unsere Lebensmittel aus Bayern sind zu gut für die Tonne!” (“Our products from Bavaria are too good for the bin!”) was emphasizing the specific Bavarian origin of the dairy products.

Figure 1: Example of the local origin stimuli ("Our products from Bavaria are too good for the bin!") presented to measure choice likelihood for the suboptimal over the optimal local dairy product

4.3.2 Experimental design

At the beginning of the study, each study participant was first asked for the current date and was presented with the definition of the best-before date. Only if the date was given correctly and a comprehension question about the best-before date was answered correctly was the participant passed on to answer the main choice task. Asking for the current date ensured that, on the one hand, the participant was aware of the short period of time until the best-before date of the suboptimal product was reached, but that, on the other hand, the choice sets corresponded to a purchase decision situation that was as realistic as possible. Furthermore, by providing the definition of the best-before date to the study participants at the beginning of the experiment, we made sure that possible differences in the choice probability for the suboptimal products between the different treatments would not be due to differences in the understanding of the best-before date between the four study groups. After successfully passing the comprehension check, study participants were randomly sent to one of the four possible treatments (control, price savings, food waste avoidance, local product origin), in which each participant then

was confronted with the main choice task (see Table 12). The choice task consisted of the three independent choice sets which were presented in randomized order. Within each of the three choice sets, study participants were asked to rate their choice likelihood of the suboptimal dairy product (yoghurt, cheese, milk) on a 0-100% slider scale ("How likely will you choose the product depicted below instead of the product depicted above?") (Aschemann-Witzel et al., 2018). Each suboptimal dairy product was accompanied by the message of the respective treatment, thus keeping the message constant within the three choice sets for the individual study participant but varying the message content between the individual study participants.

	Control	Price	Food waste avoidance	Local origin
no Bavarian	36	30	41	41
Bavarian origin	41	38	26	54

Table 12: Number of participants in the four different message frame treatments (*N* = 307)

4.3.3 Survey measures

For reasons of clarity, this section reports only those survey measurements that are relevant for the scope of this study. However, the complete questionnaire can be sent by the author at any time upon request.

Dependent variable: The dependent variable in this study is the likelihood of choosing the suboptimal (2 days before best-before date) dairy product over the optimal dairy product on a 0-100% slider scale ("How likely will you choose the product depicted below instead of the product depicted above?") (Aschemann-Witzel *et al.*, 2018).

Perceived quality: After stating their choice likelihood of a product, respondents were asked to compare the perceived quality of the suboptimal and optimal dairy product, on eight different criteria (appearance, taste, freshness, healthiness, process quality, convenience, quality/price ratio, quality overall) on a 9-point Likert scale ranging from 1 = *inferior* to 9 = *superior* (Aschemann-Witzel *et al.*, 2018).

Food waste attitude: In order to assess respondents' attitude towards food waste avoidance practices we used the scale by Aschemann-Witzel (2018b).

Expiry date perception: The scale to measure respondents' risk perception of the expiry date was taken from Shah and Hall-Phillips (2018).

Pro-environmental self-Identity and socially responsible consumption: To which degree respondents consider themselves as environmental friendly persons and socially responsible consumers was assessed with the scales from Loebnitz *et al.* (2015) and Chen and Jai (2018).

Local shopping behavior: How important it is for study participants to buy local food products was assessed with six items on a 5-point Likert scale developed by Geschmackstage Deutschland e.V. (2016).

Treatment message perception and familiarity: Familiarity with the message frame of the respective treatment was measured with a 5-point Likert scale, for perception we used the message attitude scale by Chen and Jai (2018).

Familiarity with the food waste avoidance campaign: On a 5-point Likert scale on familiarity, respondents were asked how familiar they are with the "Too good for the bin!" initiative of the German BMEL.

Brand loyalty: To control for brand attachment to the two local brands used, we asked participants about their brand loyalty to these two brands using the brand loyalty scale by So *et al.* (2016).

Socio-demographic measures: Finally, participants indicated how often they do their main shopping and supplementary shopping (Stefan *et al.*, 2013), how often they buy and consume dairy products (Costanigro *et al.*, 2011) and how much they like dairy products (Ilyuk, 2018) as well as if they are allergic to dairy products. Also their food involvement

(Stefan *et al.*, 2013) and household size were retrieved as well as shopping responsibility. Lastly, we asked respondents for their age, gender, educational level, nationality and in case of German nationality, we also questioned them about the state in which they spent most of their childhood.

4.4 Results

Of the 307 study participants, 48.21% percent were female and 51.79% of respondents reported that they spent most of their childhood in Bavaria. A majority of 64.14% of participants were between 16 and 24 years old, with a sample mean of 24.15 years (*SD* = 6.01) and a median of 23 years. There were 38.89% individuals living in a single-person household and 25.82% living in a two-person household. Table 13 provides an overview of the socio-demographic characteristics of the sample.

Variable	Percentage
Age[a]	
16-24	64.14
25-34	32.57
35-44	0.99
45-54	1.32
55-64	0.99
Women	48.21
Place where one grew up	
Bavaria	51.79
other state in Germany	28.01
outside Germany	20.20
Shopping responsible	
mostly me	57.65
shared	33.22
mostly other person	9.12
Household size[b]	
1 Person	38.89
2 Persons	25.82
3 Persons	14.05
> 3 Persons	21.24

Note. [a] $N = 304$, [b] $N = 306$ due to missing values

Table 13: Socio-demographic sample characteristics ($N = 307$**)**

4.4.1 Choice probability of suboptimal dairy products

For simpler presentation, we calculated the choice likelihood of the suboptimal dairy products, our dependent variable, by taking the average choice probability (*fpro)* across the three products (milk, yoghurt, cheese; Cronbach's alpha: 0.71; see Table C1 in Appendix C for the average choice probability of each dairy product by treatment).

The choice probability *fpro* ranged between a minimum of 10% and a maximum of 100%, where the former was quoted once (0.33%) and the latter 49 times (15.96%). With a mean of 72.72% ($SD = 22.37$) and a median of 76.67% choice probability for the suboptimal dairy products was quite high. In Table 14 the choice probabilities for the suboptimal dairy products are displayed, distinguishing between the four different treatments and if

the childhood was mostly spent in Bavaria or not. In case an individual mainly spent the childhood in Bavaria, the state of growing up was identical with the state of the suboptimal dairy product origin. This differentiation in place of childhood is relevant because it is subsequently used for testing hypotheses 3a and 3b.

	Childhood not mainly in Bavaria (*n* = 148)			Childhood mainly in Bavaria (*n* = 159)		
Treatment	*Mean*	*SD*	*Mdn*	*Mean*	*SD*	*Mdn*
Control (36/41)	75.89	22.46	82.33	74.7	20.82	80
Price savings (30/38)	60.73	24.46	57	74.25	20.3	75
Food waste avoidance (41/26)	74.82	21.35	80	70	23.01	75
Local origin (41/54)	73.03	23.25	79	74.15	22.61	79.67

Note. In brackets, sample sizes are given for the childhood mainly not / mainly spent in Bavaria.

Table 14: Average choice probability of suboptimal dairy products by treatment and place of childhood (*N* = 307)

In the next step, we wanted to gain a better understanding of which factors were the most critical for the purchase probability of suboptimal local dairy products. Since our dependent variable *fpro* was measured in percent on a continuous scale and, in addition, contained a clustering of density at the value of 1 (*n* = 49), we decided to use a ZOIB regression model (Ospina & Ferrari, 2010; Ospina & Ferrari, 2012; Attanasi *et al.*, 2016; Masserini *et al.*, 2017). Still, for reasons of comparison, we also used two additional econometric techniques – an ordinary least squares (OLS) and fractional regression specification (Papke & Wooldridge, 1996).

The main advantage of the ZOIB is that the technique not only considers the character of the dependent variable, a choice probability between the interval [0, 1] which is estimated with a Beta distribution function, but also accounts for the non-symmetrical distribution of our data with a cluster of data points at the value of one (Licandro & Mello, 2019). To

model the choice probability at the value one, though, a Bernoulli distribution is used (Ospina & Ferrari, 2012). The ZOIB specification assumes that the decisions at the very extreme value of zero or one are different in nature from decisions ranging within the interval of]0,1[(Licandro & Mello, 2019; Öhler *et al.*, 2019). Applied to our study, this means that the ZOIB model enables us to determine the drivers for a purchase probability within the interval of]0, 1[independently of the drivers for a purchase probability of 1.

In Table 15 the estimation results of the ZOIB, fractional and OLS regression models are presented. For the ZOIB and fractional regression the results of the estimated coefficients and standard errors are reported on logit scale. Since our dependent variable does not take values of 0, we report the ZOIB regression results only for decision probabilities between]0, 1[, and separately for decision probabilities of 1 (equivalent to 100% choice probability). The ZOIB regression model was estimated using the Stata module *zoib* from Buis (revised 2012). In the following, the coefficients of the ZOIB model are examined in more detail.

	ZOIB regression				Fractional regression		OLS regression	
	Proportion		One-inflate					
Variables	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
fpro								
local_shopping	-0.125	(0.0778)			-0.101	(0.0920)	-0.0216	(0.0168)
d_bavaria_origin	-0.188	(0.210)			-0.222	(0.253)	-0.0444	(0.0470)
Treatment								
t_price	-0.613***	(0.218)			-0.708***	(0.251)	-0.146***	(0.0505)
t_food_waste_av.	-0.0327	(0.209)			-0.00303	(0.253)	-0.00139	(0.0467)
t_local_origin	0.00955	(0.207)			-0.138	(0.268)	-0.0285	(0.0467)
Interaction term								
bavarian_origin x t_price	0.829***	(0.299)			0.858***	(0.328)	0.176**	(0.0689)
bavarian_origin x t_food_waste_av.	-0.0738	(0.311)			-0.284	(0.368)	-0.0519	(0.0695)
bavarian_origin x t_local_origin	0.0932	(0.284)			0.141	(0.348)	0.0324	(0.0638)
milkprod_like	0.0827**	(0.0407)			0.0976**	(0.0493)	0.0192**	(0.00887)
expiry_date_checking	-0.126***	(0.0441)	-0.0495	(0.126)	-0.159***	(0.0545)	-0.0292***	(0.00953)
food_waste_attitude	0.312***	(0.0713)	0.829***	(0.211)	0.460***	(0.0803)	0.0903***	(0.0160)
Constant	-0.216	(0.508)	-6.070***	(1.458)	-0.690	(0.565)	0.385***	(0.110)
AIC	91.555				368.457		-92.939	
BIC	151.185				413.179		-48.217	
r2							0.198	
r2_a							0.168	

Note. Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 15: Estimated models for choice probability *fpro* of suboptimal dairy products ($N = 307$)

4.4.2 Hypothesis 1 and 2: Importance of local shopping and influence of local message frame on suboptimal local products' purchase probability

Table 15 shows that unlike our expectations considering local food shopping important as a consumer has no significant influence on the willingness to purchase local suboptimal products. Consequently, we have to reject hypothesis 1, as well as hypothesis 2, since compared to the control treatment, the local origin message frame (*t_local_origin)* neither influences respondents' choice probability. Contrasting to what we expected, though, we see a significant negative influence on choice probability in case of a price savings message frame (p = .005), which reduced the odds ratio of choosing the suboptimal dairy products by 45.83%. The reduction in choice probability is obtained by exponentiating the coefficient of *t_price* ($e^{-0.613}$). However, in case the respondent mainly spent the childhood in Bavaria, the price savings message frame had exactly the opposite effect, meaning that the odds ratio of choosing the suboptimal dairy products was increased by 24.11% (p = .006). Moreover, the more a participant likes milk products in general, the higher the choice likelihood for the suboptimal dairy products (p = .042). Regarding socio-demographic variables we cannot find any significant influence on choice probability. Participants who rely heavily on the expiration date when assessing the risk of a food product report a significantly lower likelihood of purchasing suboptimal dairy products (p = .004). This means that the odds ratio of choosing the suboptimal dairy products declines by 11.84%. Interestingly, compared to female respondents, the perceived risk in case of not checking the expiration date is significantly more pronounced among male respondents (M_{female} = 4.35, SD = 1.29 vs. M_{male} = 4.89, SD = 1.23; Mann-Whitney test: z = 3.55; p < .001).

For study participants who indicated a choice probability of 100% over all three suboptimal dairy products (n = 49), hence, the one-inflate model part of the ZOIB, the attitude towards food waste avoidance practices was the only factor significantly influencing the choice probability. While the attitude towards food waste prevention practices is also a significant factor (p < .001) among respondents with a choice

probability within the interval of]0, 1[, the size of the log-odds of this factor was more than twice as large in the group of participants with 100% choice probability ($p < .001$).

4.4.3 Hypothesis 3: Influence of consumers' origin on suboptimal local products' purchase probability

Due to the fact, that we had 49 participants stating a choice probability of 100% for all three suboptimal products, our dependent variable *fpro* was highly left skewed (Shapiro-Wilk test: $p < .001$). Accordingly, we used a Mann-Whitney test to examine our hypothesis 3a. Hypothesis 3a claims that overall, individuals who grew up mostly in the region were the products originate from show a higher willingness to purchase these suboptimal dairy products than individuals who did not grow up in this region. Since the product origin of the investigated dairy products is Bavaria, we consequently tested for significant differences in the choice probability between study participants who mainly grew up in Bavaria and participants mainly spending their childhood not in Bavaria. While the mean value ($M_{Ch_{Bavaria_{yes}}} = 73.64$, $SD = 0.22$ vs. $M_{Ch_{Bavaria_{no}}} = 71.73$, $SD = 0.23$) for the choice probability of the suboptimal dairy products *fpro* was, as expected, higher among study participants mainly spending their childhood in Bavaria, the test statistic of the Mann-Whitney test was not significant ($z = -0.602$; $p = .547$). As a result, we reject hypothesis 3a, the overall choice probability for the local suboptimal products is not significantly influenced by the participants' place of childhood. Hypothesis 3b is also to be rejected, since the interaction term *bavarian_origin x t_local_origin* in the ZOIB model did not significantly increase the choice probability of the suboptimal local products either (Mann-Whitney test: $z = -0.24$; $p = .815$).

4.4.4 Robustness check

A robustness check was performed to exclude the possibility that the high purchase probability of the suboptimal local dairy products we observed across all treatments is a)

due to the high price discount of 50% or b) due to the fact that at the beginning of the experiment the participants were again explicitly confronted with the definition of the best-before date to avoid any mix-up with the use-by date. To test the robustness of the results, we restricted ourselves to the product category of local fresh milk, since in the first study the variance of the purchase probability was highest for this product category (see Table C1 in Appendix C).

As a baseline and reference treatment, we used the treatment with the Bavarian message frame (*t_local_origin*) and modified it in two further treatments (*t_no_def*, *t_30_discount*) as follows: In *t_no_def*, study participants were not presented with a definition of the best-before date at the beginning of the experiment, with the discount held constant at 50%. In *t_30_discount*, on the other hand, as in *t_local_origin*, participants were given the definition of the best-before date at the beginning of the experiment, but the price discount was only 30% (which is also a common price discount for food close to expiry in Germany). The Bavarian message frame was kept identical to *t_local_origin* in *t_no_def* and *t_30_discount*. In total, we had 64 participants in *t_no_def* and 60 participants in *t_30_discount*. The average willingness to purchase local fresh milk 2 days before expiration was 69.14% (*SD* = 31.53, *Mdn* = 77.50%) for *t_no_def* and 64.67% (*SD* = 31.06, *Mdn* = 72.50%) for *t_30_discount* (see Table 7 in the Appendix for the choice probability by treatment and place of childhood). A Kruskal-Wallis test, $\chi 2(2) = 1.17$, $p = 0.556$ showed no significant difference in the choice probability between the three groups (*t_local_origin*, *t_no_def*, *t_30_discount*). Moreover, we also tested for significant influences of the two additional treatments (*t_no_def*, *t_30_discount*) in our ZOIB regression model. However, in comparison to *t_local_origin*, serving in this case as base treatment, no significant influence was found (see Table C3 and Table C4 in Appendix C).

We can therefore conclude that the high willingness to purchase local dairy products 2 days before the expiration of the best-before date is not due to the fact that possible misunderstandings of the best-before date were cleared up before the choice task. Furthermore, the high willingness to purchase does not seem to be due to the absolute amount of the 50% discount.

4.5 Discussion

4.5.1 Theoretical contributions and implications

4.5.1.1 High choice probability

Overall, we find an unexpectedly high purchase probability across all treatments for our tested local dairy products close to expiry date. From a product perspective, this contrasts with Aschemann-Witzel *et al.* (2018) who only found an average choice likelihood of 45% for different kinds of suboptimal products. For dairy products, Hooge *et al.* (2017) and Aschemann-Witzel (2018a) also observed choice probabilities well below the average choice probability of 72.72% found in our sample. Yet, from a socio-demographic perspective, the high purchase probability in terms of age and education is in line with Hooge *et al.* (2017), but also Aschemann-Witzel (2018a) and Cicatiello *et al.* (2019), who also find a higher choice probability for suboptimal products among young and more educated consumers in a supermarket setting.

The pronounced awareness of food waste and environmental issues among this consumer group (Bucic *et al.*, 2012) may have been part of the reasons why the overall purchase probability for the suboptimal local products was quite high. Another explanation for the fairly high choice probability could be that the 50% discount applied across all treatments was simply too attractive for study participants to reject the offer, not least because our sample consisted mainly of students. Consequently, the high attractiveness of the discount could also be one possible reason why no treatment effects were found for the different message frames other than price savings (Chen *et al.*, 1998). Yet, from the results of our robustness check, we see at least no significant difference in the choice probability for a 30% price discount to a 50% price discount.

Finally, the high choice probability might as well be explained by the fact that consumers nowadays have a better understanding of the best-before date (Melbye *et al.*, 2017; Thompson *et al.*, 2018) and handle it more flexibly (Thompson *et al.*, 2018; BMEL, 2020a). Still, whether this flexible approach to the best-before date among young

consumers is transferable to other product categories remains to be clarified for future research. Previous research results indicate that the product type is an important decision criterion in suboptimal food purchase decisions (Hooge *et al.*, 2017).

4.5.1.2 Importance of local shopping and influence of local message frame

Regarding local shopping behavior, the results show that it does not significantly positively influence the willingness to purchase suboptimal local dairy products if a consumer particularly places value on local food products. A possible explanation for this could be that for study participants primarily self-interested aspects, such as freshness (Grebitus *et al.*, 2013; Bernard *et al.*, 2019), are important when buying local food. The argument that buying suboptimal local food makes an additional contribution to sustainable consumption and protects resources (Memery *et al.*, 2015) may therefore not outweigh the perceived loss of quality among these study participants. It could also be that consumers who attach particular importance to the local origin of food place at least as high quality demands on their groceries as consumers who are less concerned about buying mostly local. Future studies could therefore investigate whether suboptimality is penalized as strongly in the case of local food, leading to a reduced willingness to pay, as in the case of organic food products (Yue, Alfnes, & Jensen, 2009), especially among consumers to whom the purchase of local foods is particularly important.

Overall, neither the food waste prevention message frame nor the local origin message frame significantly increased the likelihood of choosing the suboptimal local dairy products. Both message frames emphasized altruistic purchase motives. This is opposed by the price savings message frame, which appeals to self-interest by emphasizing cost savings. However, only for the price savings message frame a significant influence on the purchase probability for our dairy products is observable. From these results we conclude that millennials and post-millennials are not significantly influenced by altruistic message frames in their likelihood to purchase suboptimal local food products, but rather by a message frame that emphasizes self-interest. This is surprising, given that these young study participants, in their role as consumers, generally place a high value on socially responsible consumption, strongly endorse practices against food waste, and are also

concerned about buying local food products (Bucic *et al.*, 2012; Stefan *et al.*, 2013; Hooge *et al.*, 2017; Cicatiello *et al.*, 2019; Shin *et al.*, 2021). However, Aschemann-Witzel *et al.* (2018) also stress that the existing body of research on the choice of appropriate message frames to increase the purchase of suboptimal products provides a mixed picture. Accordingly, further research is needed to better understand under which circumstances it is more beneficial for the purchase probability of suboptimal food products to emphasize altruistic (van Giesen & Hooge, 2019), respectively self-interested purchase motives.

4.5.1.3 Influence of consumers' origin

Contrary to our expectations, we did not find a significantly higher purchase probability for our suboptimal dairy products among study participants who spent most of their childhood in Bavaria, hence the region where also the products originate from. Moreover, even in the treatment that emphasized Bavarian local origin, we could not find a significant difference between study participants who spent most of their childhood in Bavaria and those who did not. Accordingly, we had to reject our hypotheses 3a and 3b. However, it could be that the motivation to avoid food waste as much as possible, regardless of the origin of the product, leveled out possible differences in the choice probability between the two consumer groups, differing in the place of their childhood. Nevertheless, at least based on the descriptive comparisons of the mean and median values of the purchase probability, we can see a tendency that people who have already spent their childhood in the same region from which the suboptimal products originate show a higher propensity to purchase these products. We leave it to future research to empirically test whether the motivation to prevent food waste as much as possible actually makes the origin of a product less relevant to the likelihood of choosing suboptimal food products.

4.5.1.4 Influence of price savings message frame

Even if it is nowadays common practice to offer products at reduced prices shortly before the expiration of the best-before date (Hooge *et al.*, 2017; Aschemann-Witzel, 2018a), studies have shown that price reduction strategies are not always understood favorably by customers (Zielke, 2014). In his study conducted in Germany, Zielke (2014) could show that price discounts can be perceived by consumers both positively (in the sense of an offer – a "good deal") but also negatively (in the sense of feeling guilty or ashamed). In this context, perceived product quality plays a major role. Only in case the consumer perceives the product having at least a certain quality, there is the chance that the consumer experiences the positive feeling of enjoyment of having made a good deal. Moreover, if a consumer has a positive sense of value towards a product, then the feelings of shame and guilt related to low prices are also mitigated (Zielke, 2014).

When comparing the assessment of the product quality of the suboptimal dairy products, it is noticeable that people who spent most of their childhood in Bavaria rated at least one of the three products examined, fresh milk, significantly better and, although not significantly, also tended to rate the quality of the suboptimal cheese better. This difference in the quality assessment of study participants, depending on the place of their childhood, is only found in the price savings treatment (see Table C5 in Appendix C). The testing of other possible explanatory constructs such as familiarity with the price savings message frame, receptiveness to sales promotions (Le Borgne *et al.*, 2018), place attachment to Bavaria or Berchtesgaden (the latter is the product origin of our tested products milk and yogurt, which is also contained in the product brand that we used, "Berchtesgadener Land"), showed no significant differences between the study participants with predominant childhood in Bavaria or not in Bavaria. Consequently, we attribute the positive impact of the price savings treatment on the purchase willingness in the group of study participants with predominant childhood in Bavaria to the fact that this group rated the product quality of the suboptimal food products as being as good as the optimal products. So, the feeling of having made a good deal might predominate in this group. By contrast, the dominant emotion of feeling guilty could explain the negative influence of the price savings treatment on the willingness to purchase our suboptimal local dairy products among those participants who did not spend their childhood in

Bavaria. Whether this negative effect is due to the feeling of having violated one's own standards with regard to product quality, or what one personally defines as responsible purchasing behavior as a consumer (Dahl *et al.*, 2003; Zielke, 2014), can unfortunately not be conclusively clarified on the basis of the present study. Still, by comparing within this study group the quality ratings of the suboptimal dairy products among the different message frames, we tend to argue for the former argument.

Another reason van Giesen and Hooge (2019) mention for observing mixed effects for price discounts on the choice probability of suboptimal food products is the possibility that combining a high product quality signal with a price reduction, signaling low product quality might irritate consumers. This consideration may also apply to our opposite effects regarding the price savings message frame. Since local food products are associated with high quality (Grebitus *et al.*, 2013), offering them as a bargain offer with a 50% price discount might have caused some confusion and doubts about the actual product quality of the suboptimal dairy products on part of our participants. In their experiments Darke and Chung (2005) could show that negative quality inferences from price discounts were especially pronounced in case a product was offered without any quality assurance or when a consumer was uncertain about product quality. Thus, we argue that in our study, providing an additional quality assurance for the suboptimal dairy products may have helped dampening the negative price quality inference and consequently negative effect of a price savings message on the choice probability among consumers not mainly being grown up in Bavaria. The opposite effect we observe for study participants who grew up mainly in Bavaria could be explained by their greater familiarity with the local product brands we used in our study, since according to Rao and Monroe (1989), negative price-quality inference is most likely to occur when the brand name or seller is not well-known.

4.5.2 Implications for practitioners

Our study suggests some useful implications for retailers but also for policymakers. In the retail context, our study already finds a high willingness to purchase local food products close to their best-before date. Thus, we conclude that some progress has already

been made in recent years by policymakers and retailers to create greater consumer consciousness about the problem of food waste. Nevertheless, policymakers should still encourage retailers to further expand this practice of offering suboptimal food. Indeed, the findings of our study participants suggest that consumers are clearly more willing to purchase suboptimal products than retailers currently offer them. The results show that the likelihood of purchasing suboptimal dairy products is significantly lower among individuals who consider not checking expiration dates on food to be highly risky. We find this strong focus on the expiration date as a guide to risk assessment particularly among male participants. For policy makers, these results could therefore be an impetus to consider how food literacy can be increased among male consumers as well, so that they do not need to focus so much on the expiration date to assess a product for its suitability for consumption. One way of promoting food literacy could be, to explicitly include the topic of food waste in the school curriculum and, above all, to address how consumers can recognize whether a food product is still edible without necessarily having to orient themselves to the expiration date.

For retailers, on the other hand, our recommendations are the following: First, while millennials and post-millennials generally show a high willingness to purchase suboptimal local dairy products, retailers cannot additionally positively influence this purchase probability through altruistic messaging. Therefore, instead of using altruistic message frames, retailers should continue advertising suboptimal local dairy products with the price savings message frame that is already used in practice. However, this sales promotion should be supplemented by a note on the impeccable quality of the products despite their short best-before date and point out that these dairy products are usually still consumable several days after reaching the best-before date if stored correctly. In this way, retailers can prevent a price savings message from reducing the likelihood of purchasing suboptimal local dairy products among those consumers who perceive a price reduction as a signal of reduced quality, thus achieving exactly the opposite effect (Theotokis *et al.*, 2012). Our final recommendation for retailers relates to the size of the discount. Based on our results, we cannot find a significant difference in the purchase probability between a price reduction of 30 percent and 50 percent. Therefore, it can be financially very rewarding for retailers to find out, possibly by testing, what is the

minimum required discount for their customers for local dairy products close to expiration date at which the sales rate is acceptable for the retailer.

4.6 Limitations and future research directions

A limitation to mention is that the way in which our dependent variable was measured may have overwhelmed some participants. It may not have been possible for all participants to estimate exactly their purchasing probability on a scale of 0% to 100% or how the indication of, for example, a 50% purchase probability is to be understood. Supplementing such a percentage scale with a Likert scale measuring purchase intention would certainly be advisable for future studies.

Additionally, it has to be noted that we only measured the purchase probability, thus, the buying intention for the suboptimal dairy products and not the actual purchase decision. Nevertheless, behavioral intention is a strong predictor of actual behavior, including environmentally conscious behavior (Follows & Jobber, 2000), to which we also count the avoidance of food waste.

To increase the external validity of our study design, we tried to design the message frames as similar as possible to those that are commonly used in practice in Germany. Moreover, the local dairy products we used for our study were from two different local brands (*Berchtesgadener Land*, *Goldsteig*). Even if we do not see any brand influence on the choice probability of the suboptimal local dairy products in our results, for future research it might still be interesting to see if our results also replicate for non-branded local suboptimal dairy products.

Also, for external validity reason, we stayed with the price reduction of 50% in the main study and the 30% price discount in the robustness check as these two levels of price discounts are the most common ones used for food products close to expiry in Germany. Using our robustness check, we did not find a significant difference in the purchase probability of local suboptimal dairy products between a 30% and a 50% price reduction.

Accordingly, it may be valuable to examine the purchase probability of local suboptimal products with other degrees of price reduction as well. In particular, it would be interesting to determine the minimum required level of price reduction for local dairy products close to expiry to keep the purchase probability at the high level we found for the 50% price reduction.

Within our study, we focused exclusively on 1) dairy products 2) coming from one region (Bavaria) in Germany and 3) being suboptimal in terms of their short best-before date. Subsequent studies could investigate to what extent our results are transferable to 1) other product groups 2) products with a different local origin 3) local products with other types of suboptimality (product packaging, appearance). In our study, the dairy products were 2 days before expiry. Future research might explore as well in more detail to which degree the choice probability for local products close to expiry correlates with the number of days until the expiration of the best-before date. Furthermore, we focused on the young consumer groups of millennials and post-millennials. Hence, future research could extend this study to other consumer groups. Since these young consumer groups tend to have stronger budget constraints than older consumer groups (Cicatiello *et al.*, 2019), the willingness to purchase the local suboptimal dairy products examined in our study might be lower for older consumers. Finally, regarding Germany and Denmark, Tsalis (2020) found that especially consumers with limited financial budgets are rather unwilling to buy suboptimal food just for price-saving reasons. The authors suggest that one reason for this behavior may be that these consumers are reluctant to show these financial constraints to others. Consequently, it remains to be tested if the choice probability for the suboptimal local dairy products remains that high as in our results if these young consumers are being put in a purchasing scenario where one's grocery shopping behavior can be perceived by others. From the literature we know at least that people do not necessarily behave in the same way in public as they do in private (White *et al.*, 2019a, 2019b).

4.7 Conclusion

This study aimed to answer the research question to what extent can emphasizing the local origin of a suboptimal food product serve as a viable complementary strategy to increase the willingness to purchase suboptimal food products and, consequently, help to reduce food waste in the retail sector. Therefore, we conducted an experiment among the young consumer groups of millennials and post-millennials, which investigated the effectiveness of message frames of different focus: price savings, food waste prevention and local product origin.

In sum, it can be concluded that placing more value on local products when shopping does not influence the decision probability for local dairy products which are close to expiry. Similarly, it has no influence on the decision probability whether a consumer has been familiar with the region from which the suboptimal dairy products originate since childhood. Yet, we generally find that young millennial and post-millennial consumer groups are highly willing to purchase local dairy products close to their expiration date when a discount is offered. Still, our findings also reveal that the use of altruistic message frames cannot additionally increase their purchase willingness. In contrast, we see ambiguous results on the likelihood of choosing the suboptimal local dairy products when a self-centered price savings message frame is used. That is, emphasizing price savings has a negative effect on the quality perception of the suboptimal dairy products for a subset of consumers.

Consequently, at least for the group of millennial and post-millennial consumers in Germany, we cannot fully agree with Aschemann-Witzel (2018a) who recommends that instead of focusing on a suitable message frame for offering suboptimal products, retailers should rather make the practice of price reductions for suboptimal products more popular among their customers. We argue that thinking about the most suitable message frame for different types of suboptimal products is still a valuable endeavor. Our results show that one must be very careful with framing suboptimal products, as bargain offers will not backfire with certain consumer groups, dampening the positive development that consumers have made regarding their increased engagement with food waste avoidance practices. In line with Tsalis (2020) we rather suggest to adopt a more differentiated

pricing strategy to increase consumers' willingness to purchase suboptimal foods in a more targeted manner.

5 Conclusion

5.1 Summary of main research findings and its implications

The essays presented in this dissertation examined the perception of food traceability systems among consumers in Germany (essay I), the utility of more information and increased transparency on food products of local origin (essay II) and the effectiveness of different message frames to increase the purchase intention of local food products close to their best-before date (essay III). All three essays are empirical, quantitative studies. Accordingly, their hypotheses are based on agency theory, signaling and cue usage theory (essays I and II), and the attribute framing approach (essay III). In this way, this dissertation sought to advance knowledge on how insights from behavioral economics can promote sustainable food consumption and ultimately contribute to achieving SDG 12. The following paragraphs summarize the key findings of essays one through three and outline their practical implications.

5.1.1 Essay I

Essay I uses a survey to analyze how food traceability systems are perceived by consumers in Germany. Part of the research question was also to identify relevant factors that influence consumers' intention to use them.

The results show that only 46.47% of survey participants had experience scanning a QR code or barcode to find out about product origin. Consequently, even among young consumers in Germany, the scanning rate of QR codes/barcodes on food products still has a lot of room for improvement, as has already been argued in the literature (Penco et al., 2020). One reason studies often cite for QR code scan rates being low, especially for a low-involvement product like food (Acuti et al., 2022; Holmes et al., 2013; Tanner et al., 2019), is consumer uncertainty about the purpose of the QR code (Tanner et al., 2019). Similarly, the subsample in this study asked about the reasons for not using a QR

code/barcode to date cited as the most common reasons not knowing that such an option exists (35.14%), followed by the satisfaction of already knowing that the option is at least available (32.43%).

Applying an OLS regression to identify the most important factors influencing consumers' usage intentions, it was found that the influence on future purchase intentions of traceable food is greater for having self-made experience with scanning a QR code than for merely having a positive attitude towards such traceability systems. Not least for the success of the digital offensive of the European farm-to-fork strategy, this is a crucial point to consider. Food retailers and manufacturers should therefore consider how best to design the shopping environment or product packaging to motivate consumers to actually try such QR codes/barcodes to make their own experiences and thereby learn about the benefits of traceable food (Li & Messer, 2019). Using incentives in the form of special offers or prize draws could be one idea (Tanner et al., 2019; Trivedi et al., 2019), while complementing a food traceability service feature with other services such as loyalty programs in a retailer’s mobile shopping app and thus embedding its use in everyday shopping behavior could be another (Okazaki et al., 2012; Tanner et al., 2019).

In addition, consumers who frequently purchase their food locally showed a greater willingness to buy more traceable food in future purchases. For food producers who offer and market their products as "from local origin" it might thus be worthwhile to consider implementing a traceability system.

Similarly, consumers who do not know a farmer or someone who works on a farm showed an increased willingness to buy traceable products. One reason for this could be because such a traceability system can provide these consumers with insights about the impact of their purchasing decisions on the supply chain that they have often lacked (Vermeir & Verbeke, 2006) but find relevant (Giampietri et al., 2018; A. Zhang et al., 2020), without requiring any personal contact with food producers. From a practical perspective, this suggests that likewise food producers targeting an urban customer segment that does not have close personal contact with agriculture could potentially introduce a traceability system. As an information tool, it would enable producers to provide real added value to their urban customers in the form of detailed and transparent background information about the food product, thereby improving consumers’ knowledge and building trust.

However, by using a traceability system as a marketing tool, these urban customers may also be emotionally engaged (Penco et al., 2020; Tanner et al., 2019), which helps increase customer loyalty (Bloemer & Ruyter, 1999; Brakus et al., 2009; S. M. C. Loureiro & Roschk, 2014).

5.1.2 Essay II

Essay II uses a hypothetical and non-hypothetical CBC experiment to examine to what extent consumers value increased transparency for locally sourced food, which gives them access to more product background information. It also explores which information channels shape mainly young consumers' perceptions of food production and identifies their knowledge and touch points with agriculture.

Both CBC experiments showed very similar results. Unlike what was assumed from the literature (M.-F. Chen, 2008; M.-F. Chen & Huang, 2013; Yin et al., 2017), the product attributes *place*, i.e. detailed production origin, and producer *name* were significantly negative in the mixed logit models. Hence, knowing the exact place of production of the local product, like knowing the producer's name, had on average a negative effect on respondents' utility. Likewise, compared to the neutral producer logo, which served as base category for the product attribute *visual producer information*, pictures of the female producer or producer couple were significantly less preferred by experimental participants. In contrast, the picture of the male producer was significantly more preferred than the neutral logo. Besides, from the questionnaire attached to the choice task, it was seen that the experimental participants obtained their ideas and information about agriculture mainly from friends, newspapers, television, and the Internet.

Consequently, these results cannot prove that consumers derive any utility from knowing the exact place of origin or producer name of a food product. Moreover, the rather high percentage of participants who got their information and perception about agriculture mainly from television, newspapers and the Internet, is further evidence of the growing alienation between consumers and producers (Giampietri et al., 2018; Nilsson et al., 2004).

To gain a better understanding of the unexpected results, an additional survey was conducted. The sample was of comparable composition, i.e., young consumers of the same age cohort, although not identical to the sample from the two CBC experiments.

The findings obtained can be summarized as follows: First, only a minority of study participants reported having a good knowledge of agriculture, while nearly two-thirds had little to no knowledge. When asked which constellation they have in mind when they picture a farm, most respondents thought of a family farm. At the same time the vast majority of survey participants stated that a food producer's gender is unimportant when buying local food. Yet, by preferring largely the male producer, the results of the preceding CBC experiments rather prove the opposite. Hence, the results show that what the majority of consumers consciously express in a questionnaire does not necessarily correspond to what they unconsciously opt for in a purchase decision, which is further evidence that humans are better described as homo heuristicus than homo economicus (D. Enste & Potthoff, 2021). Because the image of the female producer was rated significantly negatively by participants in the CBC experiments compared to the neutral logo, this supplementary study also asked questions that looked more closely at the image of women in agriculture as perceived by consumers. Respondents clearly indicated that they believe society's image of women in agriculture needs to change (for the better) in the future, as does society's image of agriculture as a whole.

The incongruence in response behavior between the incentivized CBC experiments and the supplementary survey supports the idea that people tend to make heuristic decisions influenced by latent stereotypical thinking. While most survey participants claimed that producer gender was irrelevant to buying local food, the CBC experiments found the opposite. One explanation for these differing responses between the CBC experiments and the supplementary questionnaire could be found in the different cognitive processing pathways for visual and verbal cues in consumer decision-making. Automatic processing of visual cues, i.e., system I, dominates in time-deprived and low-involvement decision-making scenarios, such as grocery shopping. This would explain why experimental participants focused on the visual cue of a male producer in the experiments, owing to subconscious gender-stereotypical thinking patterns.

The negative estimates for the verbal cues, i.e., the name of the food producer and the exact place of food origin, could be due to the fact that participants either preferred simpler information or found the cues provided too complex. Alternatively, it is possible that the simplicity of the verbal cues was not sufficient for well-informed young consumers seeking more comprehensive background information. A lack of social proximity with the food producer or the local food origin, as well as an underestimation of the influence of visual cues on local food purchase decisions seen in research so far, may also have influenced the results. Accordingly, it is advisable to conduct further studies to investigate these explanatory possibilities in future research, ultimately identifying the most applicable reasoning.

Practical implications that can be derived from this study are, first, that women who are active in agriculture need to become more visible to consumers. This requires efforts from politics, retailers, the media, and research, but also from the women themselves. Policymakers need to focus more on women working in agriculture, identify their potential needs for support and, building on this, launch targeted promotional initiatives for female executives so that in the future there will be more female farm managers than currently (Lehmann et al., 2020; Loy et al., 2020). Retailers and the media, for their part, should be made more accountable for conveying a realistic picture of modern agriculture in Germany, hence, present also female producers (Kuhlmann, 2016; Mayr, Johannes, Resl, Thomas & Quendler, 2017; Schanz et al., 2018). Also the women active in the agricultural sector themselves are called upon to make their voices heard more strongly and to strive for visibility in the industry, as not least the lack of female role models and mentors is cited as one of the main reasons why women are lacking, especially in management positions in the agricultural sector (Loy et al., 2020). Finally, the very limited number of scientific studies on women in agriculture to date should be extended (Lehmann et al., 2020). Qualitative as well as quantitative research is needed on how young women in agriculture in particular can be supported in taking on leadership roles. In addition, there is still a need for research on which measures can help to overcome stereotypes and gender-specific role attributions both within the agricultural sector and in the external perception of this sector.

Second, these findings suggest that increasing urbanization and the steady decline in the number of farms across the EU will lead to further alienation between producers and consumers (Eurostat, 2018; Giampietri et al., 2018; Nilsson et al., 2004). This will further increase the knowledge gaps about food production among consumers. To avoid that in the future information and the perception of agriculture is only conveyed by rather poorly qualified third parties such as general newspapers, TV, internet and social media, new forms of communication and dialogue are needed that enable consumers and food producers to directly exchange their points of view (Kuhlmann, 2016; Mayr, Johannes, Resl, Thomas & Quendler, 2017; Schanz et al., 2018). In perspective, this could also counteract mutual alienation.

5.1.3 Essay III

Essay III describes an experimental study that analyzes the impact of different message frames on the perception and purchase willingness of local food products close to their best-before date. Besides, it was examined what role do consumers' origin, purchase behavior and consumers' attitudes towards suboptimal food and the best-before date play in this context.

With a mean of 72.72%, the choice probability for the suboptimal food products was quite high. In this regard, the overall choice probability for the suboptimal products was as expected higher among those study participants who spent most of their childhood in Bavaria, but not significant. Thus, the purchase likelihood for the local suboptimal products was not significantly influenced by the participants' place of childhood. Accordingly, given the overall high purchase probability, policymakers and retailers appear to have already made some progress in recent years in raising consumer awareness of the problem of food waste. Nevertheless, policymakers should encourage retailers to continue expanding this practice of offering suboptimal food. In fact, the findings of this study indicate that consumers are significantly more willing to purchase suboptimal products than retailers currently offer.

Furthermore, contrary to what was expected, emphasizing a product's local origin in a message frame did not influence participants' likelihood of choosing it. Surprisingly, however, a significant negative influence on choice probability was observed in case of emphasizing price savings in the message frame ($p < 0.01$). Yet, if the respondent spent his or her childhood mainly in Bavaria, this emphasis on price savings had exactly the opposite effect, that is, it increased the probability of choosing the suboptimal product. Hence, one must be very careful with framing suboptimal products so that bargain offers do not backfire on certain consumer groups and dampen the positive trajectory that consumers have made towards becoming more engaged in food waste prevention. For retailers, the recommendation that can be drawn from these findings is that instead of using message frames highlighting local food origin, they should continue promoting suboptimal local food with the price-saving message already being used in practice. However, this message should be supplemented by a reference to the products' impeccable quality despite the short best-before date and should point out that these products are usually edible for several days after the best-before date has been reached if stored properly. This allows retailers to prevent a price message frame from reducing the likelihood of purchasing suboptimal local products among those consumers who perceive a price reduction as a signal of lower quality (Theotokis et al., 2012).

Finally, participants who relied strongly on the expiration date when assessing the risk of a food product reported a significantly lower likelihood of purchasing the suboptimal local food products ($p < 0.01$). Interestingly, the perceived risk associated with not adhering to the best-before date was significantly higher among male compared to female respondents. Policymakers may therefore find these results an impetus to consider how to improve food literacy among male consumers as well. One way to promote food literacy could be to include the topic of food waste more extensively in the curriculum, explicitly covering how consumers can tell if a food item is still edible without necessarily relying on the best-before date.

5.2 Limitations and avenues for future research

Perfect studies do not exist, they always involve trade-offs resulting from usually limited available resources (e.g., human, or financial resources or data access). This results in the limitations of a study, as it is also the case for the studies of this dissertation. These will be addressed in the following section.

The research questions raised in the three essays were all answered from the perspective of mainly young consumers. Accordingly, the study results are not representative for the overall population in Germany. However, they do provide a good impression of the factors that influence the food choices of an increasingly important customer segment (Kumpulainen et al., 2018; Muniady et al., 2014; Savelli et al., 2019).

Human decisions, and consequently also the study results of this dissertation, are always influenced by the concrete decision context and the conditions prevailing at the time the decision is made. So, also the cultural background of the study participants and their social and economic situation must be taken into account when interpreting the results. Especially with regard to food purchase decisions, a multitude of factors play a role. These can be product-related, but also based on individual differences, such as purchasing routines and habits, and depend on environmental conditions (P.-J. Chen & Antonelli, 2020; Renner et al., 2012). In terms of framework conditions, it must be mentioned that the studies of this dissertation were always conducted assuring anonymity to the study participants. It is known from the literature, however, that people also behave very much according to whether their actions are observable by others (White et al., 2019a, 2019b). Accordingly, future research could first replicate the studies in this dissertation and based on that, discriminate cases according to whether the purchase decision is observable by others.

All three essays were geographically limited to Germany (essay I), respectively to the federal state of Bavaria and especially to products from Bavarian origin (essay II and III). Therefore, the results are not necessarily transferable one-to-one to other countries, or other states in Germany. For the topic of essay I on food traceability systems, future research could consequently examine the perception of such systems also among different

countries with likewise comparably little knowledge on agriculture among citizens and varying shares of the agricultural sector in the respective total economy (Fielke et al., 2020; Pfeiffer et al., 2021; Sutherland et al., 2020; World Bank; The World Bank Group). A comparison between different European countries in terms of prioritizing factors that mostly influence the future usage intention of food traceability systems could also be interesting. In particular, regarding the envisioned digital components of the European farm-to-fork strategy, this could be helpful to adjust the implementation of the strategy accordingly. It also remains an open question for future research to which extent the results of essays II and III are found in other states of Germany. Differences might be found because in comparison to other states in Germany Bavaria is quite into agriculture (Statista, 2022b, 2022c; Pfotenhauer et al., 2023), as well as its inhabitants are considered to have a quite pronounced regional identity in comparison to other states of Germany (Pfotenhauer et al., 2023) which eventually makes them particularly interested in local food products.

In essays I and III, moreover, only behavioral intention was measured. Although usage intention is a good predictor of actual behavior (Ajzen, 1985, 2011), future studies, for example in the form of a non-hypothetical choice or field experiment, should investigate to what extent behavioral intention also translates into actual consumer behavior. Field experiments as well as studies using scanner data would be highly appreciated to see if the results on usage intention found in essays I and III also translate into real product purchases with monetary expenditures.

Besides, essays II and III use very specific products in their studies, once fresh blueberries, once dairy products. Since different preference structures are to be expected for different products, future studies are very welcome to expand this product range and to check the transferability of the study results to other products (Grebitus et al., 2013; Nganje et al., 2011).

Considering the focus on local food in this dissertation, future research should also pay more attention to the emotional factors that motivate consumers to buy local food (Giraud & Halawany, 2006; Shin et al., 2021). Given the tension between personal place attachment (Altman & Low, 1992; Hildago & Hernández, 2001; G. Kyle et al., 2004;

Williams et al., 1992) on the one hand, and the cosmopolitan everyday life of young consumers in particular on the other, this is an exciting avenue for future research.

From the first and second essay, it is apparent that a significant proportion of young consumers have no personal connection to food production and a large majority know very little about agriculture. Bridging the growing alienation between food consumers and producers and closing the increasing knowledge gaps will therefore require developing new platforms to share information and foster dialogue between these two parties. Future research could provide valuable ideas on how such platforms could look and function.

To effectively change consumption for sustainability, it is essential to understand how consumers make their choices and what factors influence those choices. Since consumers are only boundedly rational, policies and initiatives to promote responsible consumption based solely on the assumption of a rational decision-maker will most likely fail to achieve their goals (Beckenbach et al., 2016). This is because they only address the conscious decision-making part of consumers (system II) and ignore the intuitive, almost instantaneous, and automatic processing part (system I) that is also inherent in every consumer (albeit to varying degrees). Consequently, to fundamentally change food shopping and consumption patterns, it is necessary to address consumers appropriately and take into account their real decision-making process (Beckenbach et al. 2016, p. 23). For this very purpose, insights and concepts from behavioral economics provide important guidance. By using empirical research to demonstrate the extent to which principal-agent theory, signaling, framing, and cue-usage theory can be useful in both understanding consumers' food decision-making process and influencing consumers' food choices, this dissertation supports policymakers, the food industry, and all other practitioners active in the field of SDG 12, in identifying the most promising mix of policies, industry practices, and voluntary commitments to move forward toward a responsibly consuming and producing society. In doing so, the avenues for future research outlined above can hopefully be an impetus for further engaging research questions that will help shape this pathway.

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Appendices

Appendix A: Tables (Chapter 2)

Question / Item	Response options
Einstellung zu Rückverfolgbarkeitssystemen	
Das Rückverfolgbarkeitssystem liefert ausreichend objektive Informationen über die landwirtschaftlichen Erzeugnisse.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Die Informationen des Rückverfolgbarkeitssystems sind glaubwürdig.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Ich erwarte, dass das Rückverfolgbarkeitssystem vertrauensvolle und richtige Informationen bereitstellt.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Ein Rückverfolgbarkeitssystem reduziert die Informationslücke zwischen Erzeugern landwirtschaftlicher Erzeugnisse und Konsumenten bezüglich der „Qualität von Lebensmitteln“.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Ein Rückverfolgbarkeitssystem reduziert die Informationslücke bezüglich der Lieferkette zwischen Erzeugern landwirtschaftlicher Erzeugnisse und Konsumenten.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Die Produzenten von	• Stimme voll und ganz zu

Landwirtschaftlichen Erzeugnissen, welche Produkte mit einem Rückverfolgbarkeitssystem verkaufen, werden die Konsumenten nicht täuschen.	• Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Die Verkäufer von landwirtschaftlichen Erzeugnissen, welche Produkte mit Rückverfolgbarkeitssystem verkaufen, werden die Angaben, wie lange ein Lebensmittel von seiner Erzeugung bis zu seinem Verkauf im Umlauf ist, nicht fälschen.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Ein Rückverfolgbarkeitssystem wird undurchsichtige Produktionsketten reduzieren.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Der Kauf von landwirtschaftlichen Erzeugnissen mit einem Rückverfolgbarkeitssystem wird das Maß an Unsicherheit, welches mit dem Kauf von Lebensmitteln verbunden ist, reduzieren.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Der Kauf von landwirtschaftlichen Erzeugnissen mit einem Rückverfolgbarkeitssystem wird das Maß an Unsicherheit, welches nach dem Kauf von Lebensmitteln als Reaktion auftritt, reduzieren.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Ich beabsichtige bei meinen zukünftigen Lebensmitteleinkäufen, den Anteil an Lebensmittel mit einem System zur	• Stimme voll und ganz zu • Stimme zu • Teils/teils

Rückverfolgbarkeit von Lebensmitteln zu erhöhen.	• Stimme nicht zu • Stimme überhaupt nicht zu

Erfahrung mit Rückverfolgbarkeitssystemen

Haben Sie schon einmal den Barcode / die Chargennummer oder einen QR-Code benutzt, um sich über die Herkunft Ihres Produktes zu informieren?	• Ja • Nein

Wie würde Sie Ihre Einstellung zu Barcodes bzw. QR-Codes grundsätzlich beschreiben?

Schlechte Idee	☒	☐	☐	☐	☐	Gute Idee

Wie würde Sie Ihre Einstellung zu Barcodes bzw. QR-Codes auf Lebensmittelprodukten beschreiben?

Schlechte Idee	☐	☐	☐	☐	☐	Gute Idee

Einstellung gegenüber Verpackungsinformationen

Informationen über die Qualität meines Essens sind mir besonders wichtig.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Ich ärgere mich, dass wichtige Informationen nicht auf der Vorderseite einer Lebensmittelverpackung stehen.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Ich achte beim Einkauf von	• Stimme voll und ganz zu • Stimme zu • Teils/teils

Lebensmitteln bewusst darauf, dass sie bestimme Prüf- bzw. Gütesiegel (z.B. Stiftung Warentest, Fresenius, TÜV, Ökotest) tragen.	• Stimme nicht zu • Stimme überhaupt nicht zu
Beim Einkauf nehme ich mir die Zeit, Informationen auf Lebensmittelverpackungen genau zu lesen.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Ich lese mir die Angaben auf Lebensmittelverpackungen genau durch.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Ich finde es störend, dass auf einer Lebensmittelverpackung immer mehr Detailangaben stehen.	• Stimme voll und ganz zu • Stimme zu • Teils/teils • Stimme nicht zu • Stimme überhaupt nicht zu
Kontakt zur Landwirtschaft	
Kennen Sie jemanden, der Landwirt ist, oder in einem landwirtschaftlichen Betrieb beschäftig ist?	• Ja, kenne jemanden • Nein, kenne ich nicht
Sie Sie auf einem Bauernhof aufgewachsen?	• Ja • Nein
Einkaufsverhalten	
Wie häufig kaufen Sie regionale Lebensmittel?	• Öfters als einmal die Woche • Einmal die Woche • Ein oder zweimal im Monat • Einmal im Monat oder weniger

	• Ich weiß es nicht
Wie häufig haben Sie sich bei Lebensmitteln, die Sie im letzten Monat gekauft haben, über deren Herkunft informiert?	• Mehr als vier Mal • Vier Mal • Drei Mal • Zwei Mal • Ein Mal • Gar nicht • Weiß nicht / keine Angabe
Soziodemographische Merkmale	
Bitte geben Sie Ihr Alter an	• _____ (Freitextfeld)
Ihr Geschlecht:	• weiblich • männlich
Welches ist Ihr höchster Bildungsabschluss? (Falls Sie sich derzeit noch in Ihrer Ausbildung befinden, so geben Sie bitte den von Ihnen derzeit angestrebten Abschluss an?)	• Hauptschulabschluss • Realschulabschluss (Mittlere Reife) • Allgemeine Hochschulreife (Abitur) / Fachhochschulreife • Bachelor • Master • Diplom • Promotion • Sonstiges (bitte nennen): _____
Wie groß ist der Ort, an welchem Sie aufgewachsen sind?	• Einzelhof (Ansiedlung mit bis zu zwei Wohngebäuden) • Weiler (Ansiedlung mit 3 bis 9 Wohngebäude)

	• Dorf (bis zu 2.000 Einwohner) kleine Kleinstadt (2001 bis 9999 Einwohner) • Größere Kleinstadt (10.000 bis 19.999 Einwohner) • kleine Mittelstadt (20.000-49.999 Einwohner) • große Mittelstadt (50.000 – 99.999 Einwohner) • kleine Großstadt (weniger als 500.000 Einwohner) • große Großstadt (mind. 500.000 .Einwohner)

Table A1: Survey questions

Appendix B: Tables (Chapter 3)

Variable	*Mean*	*SD*	*Mdn*
Female producer	2.71	1.43	3
Male producer	2.46	1.44	3
Producer couple - woman	2.71	1.54	3
Producer couple - man	2.6	1.35	3

Table B1: Attractiveness ratings of producer pictures (*N* = 35)

Variable		*%*
Age		
	< 25 years	11.43
	25-30	11.43
	31-35	45.71
	36-40	31.43
Women		45.71
Place where one grew up		
	Bavaria	62.86
	other state in Germany	37.14
Size of place of childhood		
	village	31.43
	small town	34.29
	medium town	8.57
	big city	25.71
Domicile size		
	village	14.29
	small town	20.00
	medium-sized city	14.29
	big city	51.43
Farm child[a]		8.57
Shopping frequency for local food[b]		
		40.00
	more than once a week	
	once a week	28.57
	1-2 per month	14.29
	once per month or less	5.71
	don't know	11.43

Table B2: Socio-demographic sample characteristics of control study (*N* = 35)

Question / Item	Response options
Ich komme häufig in meinem Alltag mit Landwirtschaft in Berührung	• Stimme voll und ganz zu • Stimme zu • Stimme weder zu, noch lehne ab • Stimme nicht zu • Stimme überhaupt nicht zu
Wie gut kennen Sie sich im Berufsfeld: Landwirtschaft aus?	• Extrem gut • Sehr gut • Mittelmäßig • Ein bisschen • Überhaupt nicht
Wie interessiert sind Sie am Arbeitsfeld: Landwirtschaft?	• Extrem interessiert • Sehr interessiert • Gemäßigt interessiert • Wenig interessiert • Gar nicht interessiert
An welche Zusammenstellung denken Sie, wenn Sie an einen Bauernhof denken?	• Landwirt • Landwirtin • Verheiratetes Bauernpaar • Familienbetrieb • Landwirtschaftlicher Großbetrieb
Mir ist das Geschlecht der/des Landwirt/in egal, wenn ich regionale Produkte einkaufe	• Stimme voll und ganz zu • Stimme zu • Stimme weder zu, noch lehne ab • Stimme nicht zu • Stimme überhaupt nicht zu
Das gesellschaftliche Bild von Frauen in der Landwirtschaft muss sich in Zukunft ändern	• Stimme voll und ganz zu • Stimme zu • Stimme weder zu, noch lehne ab

	• Stimme nicht zu • Stimme überhaupt nicht zu
Das gesellschaftliche Bild von Frauen in der Landwirtschaft unterscheidet sich von dem anderer Arbeitsbereiche	• Stimme voll und ganz zu • Stimme zu • Stimme weder zu, noch lehne ab • Stimme nicht zu • Stimme überhaupt nicht zu
Die Landwirtschaft ist ein männlich dominiertes Arbeitsfeld	• Stimme voll und ganz zu • Stimme zu • Stimme weder zu, noch lehne ab • Stimme nicht zu • Stimme überhaupt nicht zu
Das Arbeitsfeld der Landwirtschaft ist eher für Männer geeignet	• Stimme voll und ganz zu • Stimme zu • Stimme weder zu, noch lehne ab • Stimme nicht zu • Stimme überhaupt nicht zu
Weibliche Arbeitskräfte sind in der Landwirtschaft unüblich	• Stimme voll und ganz zu • Stimme zu • Stimme weder zu, noch lehne ab • Stimme nicht zu • Stimme überhaupt nicht zu
Das Bild der Landwirtschaft in der Gesellschaft muss sich in Zukunft ändern	• Stimme voll und ganz zu • Stimme zu • Stimme weder zu, noch lehne ab • Stimme nicht zu • Stimme überhaupt nicht zu
Das gesellschaftliche Bild der Landwirtschaft hat sich im Laufe der Zeit positiv verändert	• Stimme voll und ganz zu • Stimme zu • Stimme weder zu, noch lehne ab • Stimme nicht zu

	• Stimme überhaupt nicht zu
Das gesellschaftliche Bild der Landwirtschaft muss sich in Zukunft verbessern	• Stimme voll und ganz zu • Stimme zu • Stimme weder zu, noch lehne ab • Stimme nicht zu • Stimme überhaupt nicht zu
Kennen Sie jemanden der in der Landwirtschaft arbeitet?	• Ja • Nein
Wie häufig kaufen Sie regionale Lebensmittel?	• Öfters als einmal die Woche • Einmal die Woche • Ein oder zweimal im Monat • Einmal im Monat oder weniger • Ich weiß es nicht
Wie alt sind Sie?	• unter 18 • 18 - 24 • 25 - 34 • 35 - 44 • 45 – 54 • 55 - 64 • 65 – 74 • 75 - 84 • 85 oder älter
Welchem Geschlecht fühlen Sie sich zugeordnet?	• Männlich • Weiblich • Non-binär / drittes Geschlecht • Keine Angabe
In welchem Bundesland leben Sie?	• Baden-Württemberg • Bayern • Berlin • Brandenburg • Bremen

	• Hamburg • Hessen • Mecklenburg-Vorpommern • Niedersachsen • Nordrhein-Westfahlen • Rheinland-Pfalz • Saarland • Sachsen • Sachsen-Anhalt • Schleswig-Holstein • Thüringen • Ich wohne außerhalb Deutschlands
Wie groß ist der Ort, an welchem Sie aufgewachsen sind?	• Einzelhof (Ansiedlung mit bis zu zwei Wohngebäuden) • Weiler (Ansiedlung mit 3 bis 9 Wohngebäuden) • Dorf (bis 2.000 Einwohner) • Kleine Kleinstadt (2.001 – 9.999 Einwohner) • Größere Kleinstadt (10.000 – 19.000 Einwohner) • Kleine Mittelstadt (20.000 – 49.999 Einwohner) • Große Mittelstadt (50.000 – 99.999 Einwohner) • Kleine Großstadt (weniger als 500.000 Einwohner) • Große Großstadt (mind. 500.000 Einwohner)
Wie groß ist der Ort, an dem Sie derzeit leben?	• Einzelhof (Ansiedlung mit bis zu zwei Wohngebäuden)

	• Weiler (Ansiedlung mit 3 bis 9 Wohngebäuden) • Dorf (bis 2.000 Einwohner) • Kleine Kleinstadt (2.001 – 9.999 Einwohner) • Größere Kleinstadt (10.000 – 19.000 Einwohner) • Kleine Mittelstadt (20.000 – 49.999 Einwohner) • Große Mittelstadt (50.000 – 99.999 Einwohner) • Kleine Großstadt (weniger als 500.000 Einwohner) • Große Großstadt (mind. 500.000 Einwohner)
Sind Sie auf einem Bauernhof aufgewachsen?	• Ja • Nein

Table B3: Survey questions of supplementary questionnaire

Appendix C: Figures and tables (Chapter 4)

Treatment	Product	*Mean*	*SD*	*Mdn*
Control (*n* = 77)	Milk	67.88	29.73	75
	Yogurt	81.04	25.85	90
	Cheese	76.84	25.80	81
Price savings (*n* = 68)	Milk	61.76	31.86	70
	Yogurt	76.12	24.61	83
	Cheese	66.99	30.97	79
Food waste avoidance (*n* = 67)	Milk	67.79	29.84	75
	Yogurt	81.16	24.46	90
	Cheese	69.90	29.23	75
Local Origin (*n* = 95)	Milk	66.34	32.02	78
	Yogurt	79.49	24.94	85
	Cheese	75.18	26.45	82

Table C1: Average choice probability of suboptimal dairy products by treatment (*N* = 307)

	Childhood not mainly in Bavaria (*n* = 61)			Childhood mainly in Bavaria (*n* = 63)		
Treatment	*Mean*	*SD*	*Mdn*	*Mean*	*SD*	*Mdn*
No definition (28/36)	60.14	31.44	62	76.14	30.18	91.5
30% discount (33/27)	73.06	28.18	80	54.41	31.82	60

Note. In brackets. sample sizes are given for the childhood mainly not / mainly in Bavaria.

Table C2: Average choice probability of robustness check of suboptimal milk by treatment and place of childhood (*N* = 124)

	ZOIB regression					
	Proportion		One-inflate		Zero-inflate	
Variables	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
fpro						
local_shopping	0.0569	(0.119)				
d_bavaria_origin	-0.0957	(0.244)				
Treatment						
t_no_def	-0.419	(0.287)				
t_30_discount	0.117	(0.289)				
Interaction term						
bavarian_origin x t_no_def	0.622	(0.409)				
bavarian_origin x t_30_discount	-0.441	(0.396)				
milkprod_like	0.0545	(0.0634)				
expiry_date_checking	-0.0927	(0.0581)	0.0566	(0.116)		
food_waste_attitude	0.202*	(0.108)	1.128***	(0.254)		
Constant	-0.809	(0.779)	-7.972***	(1.659)	-3.290***	(0.416)
ln_phi	0.966	0.098				
AIC	265.205					
BIC	316.04					
chi2	14.89					

Note. Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C3: Estimated zero-one-inflated beta regression model of robustness check for choice probability *fpro* of suboptimal milk ($N = 219$)

	Fractional regression		OLS	
Variables	Coef.	Std. Err.	Coef.	Std. Err.
fpro				
local_shopping	0.148	(0.146)	0.0315	(0.0287)
d_bavaria_origin	-0.0362	(0.303)	-0.00395	(0.0621)
Treatment				
t_no_def	-0.511	(0.346)	-0.109	(0.0728)
t_30_discount	0.0736	(0.355)	0.0161	(0.0698)
Interaction term				
bavarian_origin x t_no_def	0.604	(0.466)	0.117	(0.0977)
bavarian_origin x t_30_discount	-0.971**	(0.462)	-0.215**	(0.100)
milkprod_like	0.170**	(0.0697)	0.0369**	(0.0145)
expiry_date_checking	-0.0862	(0.0672)	-0.0171	(0.0138)
food_waste_attitude	0.412***	(0.123)	0.0894***	(0.0253)
Constant	-2.556***	(0.842)	-0.0545	(0.180)
AIC	282.269		94.848	
BIC	316.159		128.739	
chi2	39.43			
ll	-131.1		-37.42	
F			4.639	
r2			0.167	
r2_a			0.131	

Note. Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C4: Estimated fractional regression model and OLS model of robustness check for choice probability *fpro* of suboptimal milk ($N = 219$)

	Childhood not mainly in Bavaria (n = 30)			Childhood mainly in Bavaria (n = 38)		
Product	*Mean*	*SD*	*Mdn*	*Mean*	*SD*	*Mdn*
Fresh milk	4.27	1.39	4	5.05	1.09	5
Yoghurt	5.17	1.18	5	5.05	1.01	5
Cheese	4.73	1.34	5	5.11	1.01	5

Note. [b] Total product quality was measured on a bipolar scale, ranging from 1 = *inferior* to 9 = *superior* (Aschemann-Witzel *et al.*, 2018).

Table C5: Perceived total product quality[b] for suboptimal dairy products by place of childhood (n = 68) in price savings treatment