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Essays on Consumer Behavior regarding Grocery Shopping: The Case of Organic Food

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Abstract

In an attempt to live a more conscious and sustainable life, a growing number of consumers are turning to organically-produced food. Increasing sales of organic food, however, not only benefit peoples' conscience. Policy makers see the promotion of organic farming as a way to tackle climate change, reduce biodiversity loss, and support farmers. For them, organic farming plays an essential role in developing a sustainable food system. Major retail chains have entered the market for organic food too, seeing it as an attractive opportunity to portray a 'green' image while benefiting both from differentiated product offerings and higher margins. Against this background, the number of research efforts with regard to organic food has soared, highlighting also the scientific relevance of the topic. In this thesis, I examine three research areas concerning organic food retailing. First, I investigate the consumer perspective on organic food retailers, placing the focus on supermarkets and organic stores. I find that these two retail formats attract different types of shoppers. Indeed, supermarket shoppers differ considerably from organic store shoppers in socio-demographic characteristics, shopping behavior, and underlying reasons for store choice. Second, I focus on the role of consumers' levels of knowledge about organic food and on the importance of accurate targeting for promoting organic food. I present evidence that building up knowledge among consumers is promising to increase their intention to buy (more) organic food. Importantly, the messages and channels used to convey such information ought to be tailored to consumer segments to be effective. I find indications that failure to do so could even backfire. Third, I analyze the effect of a traffic light eco-label on sales of sustainable and organic food in an online grocery shopping setting. I identify a specific eco-label design that is promising in nudging shoppers towards sustainable and organic food options. I show that the effect of such a label tends to be (partly) subconscious and that the effect size depends on shopper characteristics. Overall, this thesis addresses several research gaps in the literature on organic food retailing and provides concrete implications both for policy makers and retail executives, who aim to promote organic food.

Summary in German

Das zunehmend populäre Ziel, ein bewusstes und nachhaltiges Leben zu führen, bringt eine steigende Anzahl an Konsumenten dazu, sich gesünder und umweltschonender zu ernähren. Ein wichtiger Aspekt ist dabei oftmals der Kauf von Bio-Lebensmitteln. Sowohl politische Entscheidungsträger als auch Handelsketten unterstützen diese Entwicklung. Während Politiker die Förderung der Bio-Landwirtschaft als einen Beitrag zur Entwicklung eines nachhaltigen Landwirtschaftssystems begreifen, profitieren Handelsketten von einem nachhaltigeren Image und erhöhten Margen. Mit steigender Bedeutung des Marktes für Bio-Lebensmittel hat auch die Anzahl und die Relevanz von wissenschaftlichen Studien, die sich mit Bio-Lebensmitteln und deren Vermarktung beschäftigen, zugenommen. In dieser Dissertation untersuche ich drei Fragestellungen in diesem Bereich. Zunächst erörtere ich die Konsumentenperspektive auf die Angebotsseite des Bio-Lebensmitteleinkaufs, wobei der Fokus auf Supermärkten und Bio-Läden liegt. Ich finde heraus, dass diese beiden Geschäftsformate unterschiedliche Konsumententypen ansprechen. Soziodemographische Charakteristika, Verhaltensweisen während des Einkaufs und Präferenzen bei der Wahl des Einkaufsortes unterscheiden sich teils erheblich. Anschließend untersuche ich, inwieweit das Wissen der Konsumenten über Bio-Lebensmittel ihre Kaufentscheidung beeinflusst, und ich erforsche, mit welchen Informationen die Intention, (mehr) Bio-Lebensmittel zu kaufen, gesteigert werden kann. Ich finde heraus, dass der Wissensstand den Kauf von Bio-Lebensmitteln beeinflusst und dass die Konsumentenansprache gezielt auf Segmentebene erfolgen sollte, um unerwünschte Effekte zu vermeiden. Zuletzt analysiere ich den Effekt, den ein Öko-Label auf den Absatz von umweltschonenden und biologischen Produkten im Lebensmittel-Onlinehandel haben kann. Ich identifiziere ein intuitiv gestaltetes Öko-Label-Design, das Konsumenten dazu bringt, sich vermehrt für derartige Produkte zu entscheiden. Ich zeige außerdem, dass der Effekt dieses Labels ein (zumindest teilweise) unterbewusster ist und dass die Wirkung des Labels von bestimmten Eigenschaften der Konsumenten abhängt. Insgesamt adressiert diese Dissertation mehrere Forschungslücken der Literatur zu Bio-Lebensmitteln und deren Vermarktung und leitet konkrete Implikationen sowohl für politische Entscheidungsträger als auch für Manager im Lebensmittelhandel ab.

Contents

List of Figures

List of Tables

Abbreviations

General Abbreviations

EU	European Union
EUR	Euro
FAO	Food and Agriculture Organization of the United Nations
GHG	Greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
SME	Small and medium-sized enterprises
UN	United Nations

Specific Abbreviations[1]

ATT	Attitude
CI	Confidence interval
EC	Environmental concern
ELM	Elaboration Likelihood Model
INT	Intention
LGT	Light organic consumers
NON	Non-organic consumers
OCC	Occasional organic consumers
OKN	Objective knowledge
ORG	Organic share
PBC	Perceived behavioral control
REG	Regular organic consumers
SBN	Subjective norm
SKN	Subjective knowledge
TPB	Theory of Planned Behavior

[1] While abbreviations listed under the headline 'General Abbreviations' are not introduced separately in the text, abbreviations listed under the headline 'Specific Abbreviations' are. The latter group has additionally been included in this section to enable a central lookup point for all abbreviations used in this thesis.

1 Introduction

In this chapter, I provide both a general overview of the thesis' motivation and background as well as a review of the current state of literature. The following remarks thus aim to facilitate the classification of the research efforts covered in this thesis. A complete outline of the thesis' overall structure is provided in Section 1.3.

1.1 Motivation

1.1.1 Private Household Behavior and its Consequences

"Humankind is facing a number of global environmental challenges, such as climate change, resource depletion, or biodiversity loss. (…) Notwithstanding the important role of technological development and international and national policy making, the contribution of individual behavior should not be underestimated." (Klöckner, 2013)

As a consequence of the recently increased attention by the general public towards sustainability in general, and the climate in particular, politicians are pushed towards raising climate-related ambitions. This has led to numerous pledges of countries worldwide to reach carbon neutrality within the next decades (Carattini & Löschel, 2021). Yet, the trend towards environmental protection is not limited to politics alone. Private sector enterprises have to cater to people's changing preferences too (e.g., Vieira & Radonjič, 2020). As Mostafa (2007, p. 446) noted: *"Nowadays, environmental consciousness is not only an ideology of activists, but also a matter of 'market competition', which influences consumer behavior"*. Indeed, sustainability has become a crucial element in enterprises' production and marketing efforts (e.g., He & Harris, 2020). For many companies, sustainability efforts are no longer an option but a necessity to stay competitive in today's marketplace.

While these efforts by private sector enterprises and policy makers play important roles on the trajectory towards the protection of the climate and the environment as a whole (Hoegh-Guldberg et al., 2019), it is private household behavior that accounts for the highest energy use

and the highest GHG emissions in most developed countries (e.g., Hertwich & Peters, 2009; Klöckner, 2013). According to Hertwich and Peters (2009), more than 70% of GHG emissions globally are related to private household consumption. Changes in consumer behavior are thus crucial to supplement technological developments and public regulations (Creutzig et al., 2018; Jungbluth, Tietje, & Scholz, 2000; Lehner, Mont, & Heiskanen, 2016). This insight is not new. The term 'sustainable consumption' is traced back to the UN Earth Summit in 1992, where the Agenda 21 document already called for action to *"(…) promote consumption patterns that reduce environmental stress and meet the basic needs of humanity"* (Vittersø & Tangeland, 2015, p. 92). More recently, a number of authors have stressed that private consumption practices are *the* major lever for change (e.g., Griskevicius, Tybur, & van den Bergh, 2010; Trivedi, Patel, & Acharya, 2018; Yazdanpanah & Forouzani, 2015). However, in contrast to this observation, individuals typically underestimate the impact of their own purchasing decisions, especially concerning food choices (Scalco, Noventa, Sartori, & Ceschi, 2017).

Despite people becoming increasingly aware of consumption-related problems (e.g., Gleim, Smith, Andrews, & Cronin Jr, 2013; Scalco et al., 2017; Schmuck, Matthes, & Naderer, 2018), unsustainable behavior persists. One such behavior is the purchase of goods that are not produced according to some form of sustainability standard, where *"people buying such goods often seem to act against their own moral standards"* (Falk & Szech, 2013, p. 707). Over a decade ago, Kilbourne and Pickett (2008, p. 885) even argued *"'environmentally concerned' consumers do not seem to show any consistent preference for environmentally friendly products in their purchase behavior"*. While this has arguably changed to some extent (Cerri, Testa, & Rizzi, 2018; Trivedi et al., 2018), the share of consumers basing most of their purchases on sustainability considerations remains negligible. As a possible reason for this observation, Griskevicius et al. (2010) note that people are reluctant to change habits, particularly if doing so requires sacrifices, for instance, by paying a premium for the more environmentally friendly alternative.

Behavior-change interventions are thus difficult and potentially costly to implement. In an attempt to reduce the negative environmental impact of private household behavior, it appears promising to focus on the levers with the highest GHG emission reduction potential and those associated with the most negative adverse effects on the environment in general. Three categories stand out in particular: food, housing, and mobility (e.g, Hertwich & Peters, 2009; Tukker & Jansen, 2006; Vittersø & Tangeland, 2015). Together, these categories make

up around 70%[2] of the life cycle environmental impact of households in industrialized countries (e.g., Klöckner, 2013; Tukker & Jansen, 2006). In this thesis, I focus on the category of food. This has several reasons.

For one thing, food consumption is frequently found to account for the most negative environmental impact of all private consumption categories (e.g., Hertwich & Peters, 2009; Ritchie, 2020). In the EU, one third of a household's total environmental impact is related to food consumption (Reisch et al., 2013).[3] This figure is even higher for developing countries (Hertwich & Peters, 2009). As such, *"food consumption is a major issue in the politics of sustainable consumption and production because of its impact on the environment, individual and public health, social cohesion, and the economy (…) [and is] high on policy agendas worldwide (…)"* (Reisch, Eberle, & Lorek, 2013, p.7). Several authors argue that consumers can have a significant impact in reducing their environmental footprint by changing their food choices (e.g., Jungbluth et al., 2000; Klöckner, 2013). Consequently, the consumption of food is a, if not *the*, major and influenceable lever in reducing the negative environmental impact of private household behavior.

For another, GHG emissions *"are significantly underestimated for foods, suggesting a possible blind spot suitable for intervention"* (Camilleri, Larrick, Hossain, & Patino-Echeverrri, 2019, p. 53; Hartikainen, Roininen, Katajajuuri, & Pulkkinen, 2014). Consequently, the question arises whether and how it is possible to help consumers make better food-related decisions both for themselves and for society at large (Maki, Burns, Ha, & Rothman, 2016). Indeed, behavior-change interventions could be particularly promising for food purchases since most consumers make food purchasing decisions intuitively (e.g., Dijksterhuis, Smith, van Baaren, & Wigboldus, 2005; Puska, Kurki, Lähdesmäki, Siltaoja, & Luomala, 2018; Thøgersen & Nielsen, 2016). By influencing consumers' food purchasing decisions, potential interventions could have an impact on an everyday basis since people need to buy food frequently. In contrast, consumer decisions on mobility and housing are typically made every several years only, entail a considerable monetary effect on the purchaser, and are arguably made with a considerable amount of deliberation and research (e.g., Kahneman,

[2] Exact numbers vary depending on the geographic region studied, on the time of the assessment, and on the method used. The resulting percentage point ranges deviate only slightly from one another, though, and thus increase the confidence in the provided number.

[3] According to the authors' definition of 'total environmental impact', the figure includes the use and the pollution of energy, land, water, and soil as well as the emissions of GHG.

2011). These decisions are thus more difficult to influence by behavior-change interventions.[4] However, as highlighted by Richter, Thøgersen, and Klöckner (2018, pp. 2848-2849), *"we still know too little about the processes steering consumers towards pro-environmental food choices".*

This thesis aims to address this gap by exploring means to induce sales of sustainable food and by deriving concrete implications for both policy makers and grocery retailers. To be even more precise, I focus on a particular kind of sustainable food: organic food. Each of the thesis' three self-contained essays is contributing to the overarching research question of "how to induce further organic food sales?". The underlying reasons and the necessary background information are outlined in detail in the following sections, starting with the scale of the agricultural sector, followed by a detailed contemplation on organic food and its market.

1.1.2 The Agricultural Sector and the Food Supply Chain

The size of the agricultural sector is substantial. More than a third of Earth's land cover is occupied by agriculture (Reganold & Wachter, 2016) and over one quarter of the total global workforce is employed by the sector (The World Bank, 2021). As such, it feeds over seven billion people and provides an essential service, catering to a basic human need (Clark & Tilman, 2017). However, the massive scale and the current production methods utilized come at a cost. As highlighted by Poore and Nemecek (2018, p. 987): *"With current diets and production practices, feeding 7.6 billion people is degrading terrestrial and aquatic ecosystems, depleting water resources, and driving climate change"*. Similarly, Reisch et al. (2013, p.7) declare unambiguously: *"the western food system is clearly unsustainable".*

Indeed, the agricultural sector is one of the main contributors to GHG emissions, biodiversity loss, agrochemical pollution, and soil degradation (e.g., Clark & Tilman, 2017; Reganold & Wachter, 2016; Vittersø & Tangeland, 2015). As such, the food supply chain is responsible for over one quarter of the total anthropogenic GHG emissions (Poore & Nemecek, 2018; Ritchie, 2019), which is projected to rise further (Bacon & Krpan, 2018; Byerly et al., 2018). Wollenberg et al. (2016) even argue that agriculture will become the sector with the highest surplus emissions by 2030. Already today, the agricultural sector is emitting more GHG

[4] Of course, consumer decisions concerning housing and mobility may also be influenced. Corresponding means, however, are more likely to include monetary incentives such as subsidies and favorable (or unfavorable) tax treatments aimed at incentivizing particular sustainable behaviors or rather discouraging behaviors that are considered unsustainable. This thesis does not focus on behavior-change interventions built on monetary effects.

emissions than road transport, aviation, shipping, and rail combined (Reisch et al., 2013; Ritchie, 2020). Next to GHG emissions, food production accounts for the highest freshwater consumption in the world (Reisch et al., 2013) and is accountable for a third of global terrestrial acidification and for nearly 80% of eutrophication, both of which are known to reduce biodiversity and ecological resilience (Poore & Nemecek, 2018; Reisch et al., 2013).

Ecological resilience has received particular attention since the outbreak of the COVID-19 pandemic. While the source of the virus has not been identified with certainty at the time of writing, it was most likely transmitted to humans from pangolins, bats, or other wildlife (El-Sayed & Kamel, 2021; Jandrić et al., 2020). As a potential facilitator to the crossover from animals to humans, authors increasingly point to industrial food production practices (e.g., Altieri & Nicholls, 2020; Chakraborty & Maity, 2020; Jandrić et al., 2020). They argue that the current practices at slaughter houses and mass husbandry facilities create opportunities for viruses to mutate and spread. They further argue that monocultures come at the expense of natural habitats and cause deforestation, which can lead to spill-overs of diseases from wildlife to livestock and humans. The destruction of wildlife's natural habitats increasingly forces animals to share their habitat with other species or to advance to populated areas, both of which often causing distressing situations for the animals, which can lead to greater virus loads in the animals (Chakraborty & Maity, 2020; El-Sayed & Kamel, 2021). Combined with closer contact to other animals and humans, the likelihood of virus spread is elevated. To prevent and treat the current COVID-19 outbreak, Chakraborty and Maity (2020) conclude: *"(…) billions of dollars are being spent to developing diagnostic, treatment, and medicine. But we are neglecting the primary tools of prevention such as forestation and respecting wildlife habitats".*

As Altieri and Nicholls (2020, p. 525) put it: *"Like never before, COVID-19 has revealed how closely linked human, animal, and ecological health are."* Similarly, Jandrić et al. (2020, p. 3) note: *"As we started to explore various aspects of the pandemic, it has become crystal clear that COVID-19 cannot be thought of in isolation from wider environmental concerns."* The pandemic has caused awareness that rising temperature and ocean levels, deforestation, and more frequent extreme weather events affect both the ecosystem *and* human health (Chakraborty & Maity, 2020). A notion the IPCC highlighted more than six years prior to the pandemic in recommending to reduce stressors on ecosystems and habitat fragmentation (IPCC, 2014). With linkages such as these slowly gaining mainstream attention, food production practices come to the focus once again.

In Europe, groceries typically account for more than one third of a household's total consumption and are thus a major lever in reducing the adverse effects of food production (Chekima, Oswald, Wafa, & Chekima, 2017; Reisch et al., 2013; Vlaeminck, Jiang, & Vranken, 2014). Indeed, authors such as Jungbluth et al. (2000, p. 141) stress that *"consumers have the chance to reduce the environmental impacts significantly due to their food purchases"*. However, many consumers[5] are still not aware of the connection between the food they purchase and the resulting environmental consequences. And if they do make a connection, most are concerned about plastic-wrapped packaging and distance of transport (Bacon & Krpan, 2018; Pedersen, Aschemann-Witzel, & Thøgersen, 2018). Of course, using less packaging and foregoing certain non-domestic food options can provide environmental benefits. However, the main levers to reduce agriculture's negative impact consist of reducing meat and dairy consumption (e.g., Graham & Abrahamse, 2017; Poore & Nemecek, 2018; Scalco et al., 2017), minimizing food waste (e.g., Lehner et al., 2016; Wollenberg et al., 2016), and increasing the share of sustainable and organic production methods (e.g., Crowder & Reganold, 2015; Desquilbet, Maigné, & Monier-Dilhan, 2018; Reganold & Wachter, 2016). In this thesis, I focus on the latter: organic food.

One reason for this decision lies in the observation that *"about two-thirds of the total energy use arises already during the production of food (…)"* (Jungbluth et al., 2000, p. 134; Reisch et al., 2013). The authors continue by pointing out that the production stage is the most important when contemplating food productions' impacts on the environment and that the agricultural technique used is one of the impact's most important determinants. This is partly due to the fact that many of the adverse environmental effects are traced back to the excessive usage of synthetic pesticides and chemical fertilizers[6] (Reisch et al., 2013), which are forbidden to use in organic production practices. I provide details about organic production guidelines in the following section.

Another reason lies in the type of decision that consumers make most often. As adequate nutrition is a basic human need, people face many decisions concerning food every single day. These decisions include contemplations on whether to eat out or at home, whether

[5] In this thesis, the terms 'consumer', 'shopper', and 'grocery shopper' are used interchangeably.
[6] Reisch et al., (2013) note that the production of synthetic pesticides and chemical fertilizers make up around 40% of the agricultural production's total energy demands, resulting in significantly less energy demand per unit of production by organic farms.

to eat a vegetarian dish or one that includes meat, and which vegetables to buy. However, there is one decision that stands out: *"More relevant for consumers are often the choices among variants of a product (e.g.[,] organic or conventionally grown carrots)"* (Jungbluth et al., 2000, p. 135). Consequently, I focus my research efforts on investigating and influencing this latter decision type of whether to choose the organic or the conventional variant of a product.

Finally, reviewing the current strategies of the EU towards a sustainable food system highlights the significant role attributed to organic food by policy makers (e.g., European Commission 2020b; Reisch et al., 2013). In contrast, a reduction in meat and dairy consumption, for instance, is no explicit goal. I touch upon the EU's strategies in the following section, in which I provide background information both on organic food itself and on the organic food market.

1.1.3 Organic Food

After conducting an extensive meta-study on the subject, Reganold and Wachter (2016, p. 2) conclude: *"The challenge of feeding a growing population expected to reach 9 to 10 billion people by 2050 while protecting the environment is daunting. Adopting truly sustainable farming systems on a wide scale is our best opportunity for meeting this grand challenge and ensuring future food and ecosystem security."* Following an increasing number of reports about the exploitation and the destruction of the environment and natural resources by chemically intensive food systems and monocultures, organic agriculture is seen as an important part of the solution to the prevalent problem by researchers (e.g., Chekima et al., 2017; Desquilbet et al., 2018; Puska et al., 2018), public organizations (e.g., FAO, 2021), and policy makers (e.g., European Commission, 2020b; Hansen, Sørensen, & Eriksen, 2018; USDA, 2021). Indeed, Vittersø and Tangeland (2015, p. 91) note that organic food is *"(…) a spearhead in the transition to a more sustainable food system".*

This was not always the case. Sceptics considered organic farming *"to be ideologically driven and inefficient"* and as an issue to food security, if applied at a greater scale (Reganold & Wachter, 2016, p. 1). In reality, the organic agriculture's performance in terms of yields is subject to many individual conditions. These conditions include climate, farmer expertise, and the intensity of external (synthetic) input use before the conversion to organic agriculture (FAO, 2021a). Oversimplifying, yields of organic agriculture tend to be, on average, lower compared to conventional agriculture (Reganold & Wachter, 2016). Indeed, farmers in

industrialized countries typically experience lower yields during the transition period from conventional to organic production methods since it takes time for sufficient biological activity to be restored to make up for the discontinuation of synthetic external inputs (FAO, 1999). However, in cases of extreme weather events such as droughts or pests, organic production methods prove to be more resilient and to produce higher yields than conventional alternatives (FAO, 2021a; Lotter, Seidel, & Liebhardt, 2003). This resilience could become crucial for food security and the income of farmers in the upcoming decades, should the frequency and duration of such extreme events indeed increase along with progressing climate change (e.g., Grillakis, 2019; FAO, 2021b; Hoegh-Guldberg et al., 2019). Further, while food production exceeds the need of the global population (e.g., Reisch et al., 2013), world hunger remains since *"food security is not only a question of the ability to produce food, but also of the ability to access food"* (FAO, 2021a). Organic agriculture can be of help in market-marginalized areas as organic production methods are not dependent on external (often expensive) inputs, are less at risk of yield failures across the variety of crops harvested, and can increase family incomes due to higher market returns (FAO, 1999 & 2021a).

Aside from the discussion on food security and yields, studies that have compared organic production with conventional production attest organic methods a wide range of advantages over conventional alternatives. These advantages include better soil quality and less soil erosion, lower energy use, higher biodiversity, lower water pollution, fewer nitrogen leakages, more ecosystem services, higher employment, safer working conditions, lower pesticide residues, and higher profitability (amongst many, Crowder, Northfield, Strand, & Snyder, 2010; Lockeretz, Shearer, & Kohl, 1981; Reganold & Wachter, 2016).

Consequently, organic food is recognized as being more sustainable than conventional alternatives across both environmental and economic dimensions[7] and to provide a number of benefits to ecosystems and humans (e.g., Akaichi, Glenk, & Revoredo-Giha, 2019; Puska et al., 2018; Reganold & Wachter, 2016). The reasons are found in the production methods used

[7] The FAO (1999 & 2021b) recognizes organic agriculture as a sustainable food system and defines such a system as: *"A sustainable food system is one that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generation [sic] is not compromised. This means that it is profitable throughout, ensuring economic sustainability, it has broad-based benefits for society, securing social sustainability, and that it has a positive or neutral impact on the natural resource management, safeguarding the sustainability of the environment."*

to grow and produce food in compliance with organic standards[8] (European Commission, 2021b). Organic production guidelines aim to promote soil quality, thereby binding CO2 and water while preventing depletion (FAO, 2021c). Also, crop diversity is increased, which reduces monocultures, increases ecological resilience, and provides for higher food security (FAO, 1999 & 2021c; Reisch et al., 2013). Further, organic production guidelines promote higher animal welfare standards and prohibit irradiation, sewage sludge, genetic engineering, prophylactic use of antibiotics, and the utilization of synthetic pesticides and fertilizers (e.g., Akaichi et al., 2019; Desquilbet et al., 2018; Reganold & Wachter, 2016). For a product to get certified as 'organic', concrete production guidelines[9] have to be met, which vary to some degree depending on geography and certifying agency. In Europe, it is the EU that provides legally-binding regulation and that maintains a system of control and enforcement to ensure that farmers and producers comply with the organic practices (European Commission, 2021b). For consumers to recognize organic food products, a universal organic logo has been introduced to provide a coherent visual identity to organic products sold in the EU (European Commission, 2021b).[10]

Recognizing the benefits entailed in a higher organic share of total food production, the European Commission has set concrete targets to increase the share of organic farming land to at least 25% by 2030 as part of the EU's Farm to Fork Strategy and its recently announced European Green Deal (European Commission, 2020b). To achieve this, conversion of conventional agricultural land to organic farming land, and the corresponding organic food retail sales, must undergo a considerable increase. Today, organic farming land in the EU accounts for a share of 8.5% (Eurostat, 2021), only a third of the EU's targeted share. Even though organic shares have risen steadily over the last decade – both in terms of farming land and sales – and are expected to rise further (e.g., Olson, 2017; Reganold & Wachter, 2016; Willer & Lernoud, 2019), the projected increase is forecasted to result in a share of organic

[8] The European Commission (2021b) defines organic farming as *"(…) an agricultural method that aims to produce food using natural substances and processes. This means that organic farming tends to have a limited environmental impact as it encourages: the responsible use of energy and natural resources; the maintenance of biodiversity; preservation of regional ecological balances; enhancement of soil fertility; maintenance of water quality. Additionally, organic farming rules encourage a high standard of animal welfare (…)".*

[9] An organic certification is thus a process claim rather than a product claim (FAO, 1999). The certification does not guarantee certain product attributes, e.g., having a minimum nutritional value, but that the product in question was produced in accordance with certain production guidelines.

[10] The EU's logo for organic products can be found at this address: https://ec.europa.eu/info/food-farming-fisheries/farming/organic-farming/organics-glance_en, last accessed on 20th of September 2021.

farming land of between 12-18% by 2030 (European Commission, 2020a, 2021a), falling significantly short of the EU's set target.

Consequently, additional measures are needed to meet the target. For this, the European Commission has recently launched the Organic Action Plan, entailing 23 actions to support organic food (European Commission, 2021a). An increased demand for organic food by consumers is identified as central in convincing farmers to convert to organic production practices (European Commission, 2021a; Yazdanpanah & Forouzani, 2015). Hence, the main lever for achieving the set targets is to induce further organic food retail sales. Similar to the share of organic farming land, organic food retail sales have risen steadily and amount to over EUR 45 billion in the EU (Statista, 2021b). At this size, the EU is the second largest market for organic food globally and hosts most of the countries with the highest market share of organic food (Willer & Lernoud, 2019).

An important reason behind the increase in sales stems from the fact that major retail chains[11] have entered the market for organic food (e.g., Ellison, Duff, Wang, & White, 2016; Perrini, Castaldo, Misani, & Tencati, 2010; Willer & Lernoud, 2019). While the EU's food sector in general is highly fragmented with as many as 99% of companies being SMEs (e.g., Food Drink Europe, 2020; Reisch et al., 2013), food retailing is an exception. The retail sector has the highest turnover of all sectors in the food supply chain, employs the second most people after agriculture, and is highly concentrated (e.g., Food Drink Europe, 2020; Reisch et al., 2013). *"In their role as 'supply chain bottlenecks', these large retail chains (…) wield enormous market power"* (Reisch et al., 2013, p. 9). At the same time, a key limitation of the literature on organic food is its lack of focus on the link between the consumer and the retailer. Khare and Pandey (2017, p. 983), for instance, note that *"research on organic food retailing is in a nascent stage (…)".* I provide details on this observation in Section 2.1. Consequently, grocery retailers form a central part of this thesis.

Including organic products into their assortments, these retailers have brought organic food to mainstream attention and have increased organic food's availability (e.g., Aertsens, Verbeke, Mondelaers, & van Huylenbroeck, 2009; Bezawada & Pauwels, 2013; Jonas &

[11] In this thesis, the terms 'retail chain', 'retailer', 'grocery retailer', and 'supermarket chain' are used interchangeably. The same applies to the terms 'retail outlet', 'retail format', and 'grocery shopping outlet'. An important vocabulary distinction, though, concerns the terms 'supermarket' and 'organic store'. Concrete definitions used for these two different types of grocery retailers are provided in Section 2.2.1.

Roosen, 2005). As grocery retailers are typically faced with fierce competition, thin margins, and low shopper switching costs (Orth & Green, 2009), they often see organic food as an opportunity to portray a 'green' image while benefitting both from differentiated product offerings and higher margins (Bezawada & Pauwels, 2013; Crowder & Reganold, 2015; Gleim et al., 2013).

However, despite the support of both policy makers and retailers, and even though organic food is considered the most successful green product worldwide (e.g., Nuttavuthisit & Thøgersen, 2017; Vega-Zamora, Torres-Ruiz, & Parras-Rosa, 2019), organic food retail sales still only account for a market share of considerably less than 10%, even in most developed countries (Willer & Lernoud, 2019). The challenge of a low market share of sustainable products is common for years. Indeed, while green purchasing behavior is often viewed as an essential means to achieve higher environmental sustainability (e.g., Byerly et al., 2018; Cerri et al., 2018; Paul, Modi, & Patel, 2016), Griskevicius et al. (2010, p. 393) already noted in 2010: *"Considering the detrimental environmental effects produced by pollution, overpopulation, and depletion of natural resources, numerous scholars and public officials have called for increased urgency in motivating people to engage in proenvironmental [sic] behaviors."* Similarly, Prothero et al. (2011, p. 31) argued: *"(…) the problems related to unsustainable consumption are growing, and the approach to addressing them must become more intentional, comprehensive, and systematic."* and Maki et al. (2016, p. 242) noted: *"(…) there is a continuing need for strategies that successfully alter individuals' proenvironmental [sic] behaviors".* Concerning more sustainable food purchasing decisions in particular, Richter et al. (2018, p. 2848) highlighted: *"There is still insufficient policy, and insufficient knowledge, to accomplish these goals [curtailing environmental degradation by sustainable consumption and sustainable production of food] on the institutional or individual level".*

In this thesis, I explore means to induce sales of organic food, deriving concrete recommendations for both policy makers and grocery retailers. In the following section, I provide an overview of the current state of research concerning organic food retailing and I comment on the various links between the presented research streams and the original efforts of this thesis.

1.2 Theoretical Background and Research Overview

1.2.1 The Market for Organic Food

In the early stages, the market for organic food used to be an anti-establishment movement. Organic food pioneers both in Europe and North America were often motivated by a vision of an environmentally-friendly agricultural system and the goal to regain control over food production from major corporations (Johnston, Biro, & MacKendrick, 2009). Instead of relying on mass production, organic food used to be grown and produced by small-scale farmers. It was either sold in farmgate sales and on weekly markets or it was marketed by local community efforts (Johnston et al., 2009; Perrini et al., 2010). Next to this informal distribution network, the emergence of organic stores in the 1970s and 1980s used to be the only form of organic food retailing and led to a first increase in the market share of organic products in Europe (Jonas & Roosen, 2005; Perrini et al., 2010). Due to their small size and their rootedness in local communities of organic farmers and early organic consumers, organic stores facilitated the access to a broader assortment of organic products and thus enabled a higher level of convenience for early organic shoppers, without compromising much of the desired personalized interaction to like-minded people. This led to organic stores becoming the dominant sales channel for organic food at the time (Aertsens, Mondelaers, & van Huylenbroeck, 2009).

In the late 1990s, organic food retailing has begun to change fundamentally when major grocery retail chains started to include organic product lines into their assortments (Aertsens, Mondelaers, & van Huylenbroeck, 2009; Jonas & Roosen, 2005; Perrini et al., 2010). Reacting to a steadily increasing consumer demand for sustainable and healthy products, major producers and retailers have entered the market, which has led to an unprecedented scale of organic food production and distribution (Jonas & Roosen, 2005). While this ongoing development has been welcomed by many, it has also led to criticism. Some of the early organic food advocates fear a *"conventionalization"* of organic agriculture (Desquilbet et al., 2018, p. 195). According to them, global supply chains, downward pressure on prices, and bigger farms are not compatible with the original ideas of organic agriculture (Desquilbet et al., 2018; Johnston et al., 2009; Smith & Marsden, 2004).

At the same time, these developments – that have not only taken place in Europe, but in most industrialized countries globally – have enabled the commercial significance of organic

food (Willer & Lernoud, 2019). In the early 2000s, organic food's market share in Austria and Germany – two of the leading countries with regard to organic food both at that time and today – stood at 2-3% (Jonas & Roosen, 2005). Today, Austria has recently crossed the 10% mark (Statista, 2021a) and organic food sales are frequently seen as the fastest growing segment in the global food sector (e.g., Aertsens, Mondelaers, & van Huylenbroeck, 2009; Olson, 2017; Reganold & Wachter, 2016). Indeed, while *"the market was practically nonexistent 30 years ago"*, organic food has become the most successful green product category with global sales at around EUR 100 billion annually (e.g., Juhl, Fenger, & Thøgersen, 2017, p. 519; Willer & Lernoud, 2019). In the meantime, supermarkets have overtaken organic stores as the dominant sales channel for organic food and account for the lion share of sales in the mature organic food markets of industrialized nations (Willer & Lernoud, 2019).

Despite these developments, organic food remains a niche in the global food regime (e.g., Olson, 2017; Vittersø & Tangeland, 2015). Even in Denmark, the country with the highest organic market share globally, organic food accounts for merely around 15% of the country's total food market (Juhl et al., 2017; Willer & Lernoud, 2019). Further, roughly 90% of organic food sales are concentrated in Europe and North America (e.g., Aslihan Nasir & Karakaya, 2014; Thøgersen & Zhou, 2012; Willer & Lernoud, 2019). In contrast, even today, organic food is barely existent in less developed countries. There, market shares rarely exceed 1% (Willer & Lernoud, 2019). But even in industrialized nations, only a small number of regular and committed organic consumers make up the majority of total organic food sales (e.g., Buder, Feldmann, & Hamm, 2014; Padel & Foster, 2005). The large majority of grocery shoppers spend either nothing or only a fraction of their grocery budget on organic products. The potential for further organic food sales thus remains significant and *"(…) leaves a tremendous opportunity for green retailers that are able to capture larger segments of consumers"* (Gleim et al., 2013, p. 46). In this thesis, I am investigating means to realize some of this potential.

1.2.2 Research Streams

With gained popularity of organic food among the general public, the number of research efforts concerning organic food increased significantly (Scalco et al., 2017). Similar to the development of the market for organic food itself, corresponding research gained momentum around the turn of the century (Aertsens, Verbeke et al., 2009; Akaichi et al., 2019),

while the vast majority of studies have been carried out in the last decade (Scalco et al., 2017; Trivedi et al., 2018). Next to the number of studies published, the topic's relevance is further demonstrated by the interdisciplinarity of these studies. Economists, nutritionist, social psychologists and others are investigating different aspects of the organic food domain (Scalco et al., 2017). Depending on the field, studies either focus on the impact of the consumers' choices or on the determinants of consumers' choices and means to influence those choices (Scalco et al., 2017). In this thesis, which is rooted in the field of business administration, I take on a marketing and business viewpoint and thus focus on the latter. As such, I focus on and extend the research efforts concerning organic food *retailing*.

Organic food retailing and the underlying investigations of environmentally conscious consumer attitudes and green purchasing behavior are important emerging research streams under the broad domain of green marketing (Trivedi et al., 2018). Depending on the concrete delimitation chosen, there are three major research streams within the area of organic food retailing in particular.[12] These research streams are presented in the following. Further, they are linked with the original research efforts of this thesis.

1.2.2.1 The Profile of Organic Consumers

To be able to market organic food successfully, grocery retailers need to understand the shopper types they cater to (Davies, Titterington, & Cochrane, 1995; Rana & Paul, 2017; Trivedi et al., 2018). In the early studies on organic food retailing, investigations concerning the 'average organic food consumer' were thus among the most common (Aslihan Nasir & Karakaya, 2014). There are several options on how to profile organic consumers and on how to differentiate them both from one another and from consumers (almost) exclusively purchasing conventionally produced food. While some studies highlighted differences in psychological areas such as perceived consumer effectiveness (e.g., Trivedi et al., 2018), self-identity (e.g., Yazdanpanah & Forouzani, 2015), and values such as collectivism or long-term

[12] Some authors argue in favor of a fourth research stream that comprises of studies investigating consumers' willingness to pay for organic food (e.g., Aslihan Nasir and Karakaya (2014)). Exemplary studies include, among others, Mesías Díaz, Martínez, Carrasco Pleite, Miguel Martínez Paz, and Gaspar García (2012), Akaichi et al. (2019), and Janssen and Hamm (2012). Given organic food is sold at a premium, these authors investigated how much consumers are willing to pay for certain organic products compared to the conventionally produced alternative. I refrain from including these studies as a separate research stream since they may also be considered a sub-stream of the research stream covered in Section 1.2.2.3. Further, the stream would comprise of significantly less studies than the other streams included in this review and the insights of these studies do not form an essential basis for the original work presented in this thesis.

orientation (e.g., Juhl et al., 2017; Leonidou, Leonidou, & Kvasova, 2010), most studies focused on demographic profiling, which proofed to be largely effective in describing the average organic consumer (Hjelmar, 2011).

According to these studies, the average organic consumer tends to be female (e.g., Aertsens, Verbeke et al., 2009; Aslihan Nasir & Karakaya, 2014; Davies et al., 1995), has completed a high level of formal education (e.g., Aslihan Nasir & Karakaya, 2014; Dimitri & Dettmann, 2012; Ngobo, 2011), and lives in a household that includes children (e.g., Aertsens, Mondelaers, Verbeke, Buysse, & van Huylenbroeck, 2011; Hughner, McDonagh, Prothero, Shultz, & Stanton, 2007; Olson, 2017). While some contradicting findings do exist (e.g., Aertsens et al., 2011; Cerri et al., 2018), the characteristics of gender, education, and children in the household are widely recognized as typical components of an organic consumer's profile.

The influence of certain other attributes on the purchasing frequency and the purchasing amount of organic food continues to be contested (e.g., Leonidou et al., 2010). Most noteworthy, the evidence regarding attributes such as age or income is still unclear. While a majority of studies found or postulated both attributes to be positively correlated with a higher organic share (e.g., Cerri et al., 2018; Rana & Paul, 2017), i.e., a higher share of total food items of organic origin purchased by a shopper, evidence also exists that points to other conclusions (e.g., Aertsens, Verbeke et al., 2009; Hansen et al., 2018). Dimitri and Dettmann (2012) argued that diverging findings in this field may be the result of different sample selections and study designs. Indeed, the mentioned studies focused on different geographic regions, product categories, and time periods. Further, several authors argue that the profile of the average organic consumer changes over time (e.g., Dimitri & Dettmann, 2012; Naspetti & Zanoli, 2004; Padel & Foster, 2005).

The rise of organic food purchases in mainstream supermarkets, the increasing consumer awareness of consumption-related problems, and the fluctuating consumer preferences with regard to sustainable and organic products have led to new developments concerning today's types of organic food consumers and their shopping behaviors. These developments have triggered the need for further investigations into the profile and the shopping behavior of organic consumers (e.g., Paul et al., 2016; Rana & Paul, 2017; Septianto, Kemper, & Paramita, 2019). Indeed, while early studies assumed organic consumers to be 'homogenous', this has been shown not to be the case (any more) (e.g., Gerini, Alfnes, &

Schjøll, 2016; Guyader, Ottosson, & Witell, 2017). Hence, many studies highlight the need to differentiate between consumer segments when investigating their profiles and shopping behaviors to enable policy makers and retailers to target consumers effectively (e.g., Götze, Mann, Ferjani, Kohler, & Heckelei, 2016; Lee & Hwang, 2016).

In this thesis, I differentiate between several segments and extend the research stream's existing findings of organic consumer profiling in several ways. In Essay 1, I explore differences between shoppers with regard to both their profile and their shopping behavior, depending on which retail outlet they choose for their grocery shopping activities. In Essay 2, I divide respondents into three segments, depending on their organic share. Based on this segmentation, I show that these segments need to be targeted with different types of messages in order for them to be effective in promoting organic food sales. I also find that consumer segments differ in which channels they use and trust to obtain information about food. Finally, in Essay 3, I again divide subjects into segments depending on their respective organic share in grocery shopping. I find that the introduction of an eco-label is less effective for subjects with a high organic share than for those with lower organic shares. The research stream of consumer profiling thus plays a central role in this thesis.

1.2.2.2 Motives of Organic Food Purchases

Research efforts on shoppers' motives to purchase organic food gained momentum during the 1990s and continued in the 2000s (e.g., Aertsens, Verbeke et al., 2009; Hughner et al., 2007; Padel & Foster, 2005). Of course, as consumers differ so does their motivation to buy particular items. Also, many consumers mention more than only one reason why they prefer organic food (e.g., Hansen et al., 2018; Padel & Foster, 2005). Still, research has found largely stable motives behind organic food purchases.

A particularly noteworthy finding is that organic food has the distinct characteristic of being purchased both for egoistic and altruistic purposes. While most (food) consumption is guided by purely egoistic motivations, organic food purchases are often guided by a blend of egoistic and altruistic purposes (e.g., Hansen et al., 2018; Kareklas, Carlson, & Muehling, 2014; Septianto et al., 2019). According to Kareklas et al. (2014), these two kinds of motivations often preclude each other but are compatible in the area of organic food. Indeed, many authors identify claims regarding organic food's healthiness and environmental friendliness as the two main motivations for consumers to buy it (e.g., Hughner et al., 2007;

Juhl et al., 2017; Teng & Wang, 2015). While perceived health benefits stemming from the consumption of organic food are considered an egoistic consideration, an expected better sustainability performance of organic food is considered an altruistic motivation (e.g., Hansen et al., 2018; Kareklas et al., 2014; Septianto et al., 2019). Hence, most consumers indeed recognize the higher environmental friendliness of organic food. However, many consumers continue to have doubts about this claim and find it difficult to judge organic food's actual level of sustainability (e.g., Nuttavuthisit & Thøgersen, 2017; Olson, 2017; Padel & Foster, 2005). We[13] cover this aspect in detail in Essay 3. There, we investigate means to address this issue by enabling consumers to judge the environmental performance of food products in a fast and intuitive manner by utilizing an eco-label.

Next to the most frequently mentioned benefits of healthiness and sustainability, organic food is also associated with a more natural taste (e.g., Aertsens, Verbeke et al., 2009; Puska et al., 2018), higher animal welfare standards (e.g., Bradu, Orquin, & Thøgersen, 2014; Cerri et al., 2018; Kareklas et al., 2014), higher food safety, i.e., organic food being perceived as less prone to contamination and food scandals (e.g., Aertsens, Verbeke et al., 2009; Lee & Hwang, 2016; Rana & Paul, 2017), a feeling of nostalgia interpreted as *"going back to the roots"* (e.g., Rana & Paul, 2017, p. 161; Teng & Wang, 2015), and support for small-scale farming aimed at higher independence from global corporations and support for the local economy (e.g., Rana & Paul, 2017; Teng & Wang, 2015).

Most of these motivations are considered to be consistent with the prevalent social norm in most societies. Against this background, some authors have explored the potential existence of additional motives that may be less socially approved. Such motives may be underestimated in importance since they may be less often mentioned due to social desirability bias. Indeed, Puska et al. (2018) noted that status motives can play a role in a consumer's decision for organic food too. Due to the positive connotations associated with organic food and the premium price charged, organic food meets the requirements to be considered an item that can signal the buyer's 'superior' status to other people (e.g., Griskevicius et al., 2010; Puska et al., 2018). Still, the motive of *"going green to be seen"* seems not to play a decisive role for most organic food consumers (Griskevicius et al., 2010, p. 392). Rana and Paul (2017) find that this motive

[13] The third essay in this thesis is based on a joint research effort of Christoph Moosauer and myself. In the context of this research effort, I refer to the two of us when using the term 'we'.

is particularly prevalent only among households pursuing a luxurious lifestyle and possessing a high disposable income.

Some authors argue that the motives behind organic food purchases are still not fully understood (e.g., Hansen et al., 2018). Similarly, others argue that the reasons behind organic food purchases – as well as the reasons for deciding against it – depend on the concrete product category considered (e.g., Buder et al., 2014; Padel & Foster, 2005). The motive to choose organic meat, for instance, may differ from the motive to choose organic vegetables. Further, some authors postulate that the motivations to buy organic food are similar across geographic regions (e.g., Nuttavuthisit & Thøgersen, 2017), while others argue that the opposite is the case (e.g., Aertsens, Verbeke et al., 2009; Rana & Paul, 2017). Hence, even though many studies have been carried out in this research stream, room for further research remains.

In this thesis, I build on the research stream's gathered insights in developing hypotheses on shopper motives to visit a particular grocery retail outlet (Essay 1) and on what kind of message to convey to shoppers to increase their intention to buy organic food (Essay 2). Most importantly, the research question of Essay 3 is built on the research stream's finding that sustainability considerations are a main motivation for most consumers to choose organic food over alternative options. Otherwise, there would be no need to introduce an eco-label that provides easy-to-digest sustainability information to (online) grocery shoppers in an attempt to increase organic and sustainable food sales. Further details on the respective focus of the essays are provided in Section 1.3.

1.2.2.3 Barriers Inhibiting Organic Food Purchases

As outlined in Section 1.2.1, the market for organic food remains a niche in today's total food market. A large majority of consumers are regularly found to hold positive attitudes towards organic food (e.g., Aertsens et al., 2011; Bradu et al., 2014) and an increasing share of consumers recognize the need to take environmental considerations into account when shopping (e.g., Olson, 2017; Trivedi et al., 2018; Vlaeminck et al., 2014). However, this stands in contrast to the continuing low market share of sustainable products in general, and organic food in particular (e.g., Gleim et al., 2013; Padel & Foster, 2005; Reczek, Irwin, Zane, & Ehrich, 2018).

Consequently, many studies identify an *"attitude-behavior gap"* (e.g., Nuttavuthisit & Thøgersen, 2017; Perrini et al., 2010, p. 524; Vlaeminck et al., 2014). As Chekima et al.

(2017, p. 1438) put it: *"The most consistent findings from previous studies have been the inconsistency between consumers' claims and their actual behavior."* Similarly, Irwin and Naylor (2009, p. 234) call this phenomenon *"one of the most pervasive and puzzling inconsistencies in human behavior (…)".* Against this background, authors such as Trivedi et al. (2018) characterize the exploration of the link between environmentally-sensitive consumer attitudes and their purchasing behavior as an important and emerging research area. Indeed, the attitude-behavior gap suggests that while attitudes are a determinant of behavior, certain additional factors moderate this relationship and inhibit behavior, i.e., hindering grocery shoppers to purchase (more) organic food. In this research stream, authors investigate which barriers to organic food purchases exist. In this thesis, Essay 2 and Essay 3 explore means to address and overcome some of these barriers. In the following, I outline the main barriers to organic food purchases and provide first details on the respective essay's research focus both next to the concrete barriers addressed and in Section 1.3 when outlining the overall structure of the thesis.

Since the emergence of organic food, the most frequently identified barrier has been price (e.g., Gleim et al., 2013; Hansen et al., 2018; Padel & Foster, 2005). Due to its utilized production methods, its stricter guidelines (e.g., on animal welfare), and its (often) smaller scale, organic food is sold at a premium compared to conventionally produced food (e.g., FAO, 2021c; Kareklas et al., 2014; Mesías Díaz et al., 2012).[14] Consequently, grocery shoppers face the daily decision to either choose a more expensive organic product or a cheaper conventional product. Hence, *"egoism and price consciousness act as barriers to organic purchases"* (van Doorn & Verhoef, 2015, p. 436). Or as Poore and Nemecek (2018, p. 990) highlight when discussing the need for fast and comprehensive change to tackle climate change and other environmental threats: *"The case of organic food shows how passing premiums to consumers limits total market size and widespread practice change".* As touched upon when reviewing findings concerning motives behind the purchase of organic food, a higher price may not be a major barrier for all consumers alike. Instead, for those who purchase organic food out of

[14] According to Akaichi et al. (2019) and FAO (2021d), another factor for the premium prices of organic food is that – in contrast to conventional food – they often additionally include factors beyond the food production itself. These factors would otherwise be regarded as negative externalities that may or may not occur at some point in the future, where they are not directly linked to the food production anymore. Illustrative examples include medical expenses for the treatment of farmers suffering from inappropriate handling of pesticides or expenses for the purification of contaminated sewage.

status-signaling reasons, a higher price may even constitute an incentive (Cerri et al., 2018). Similarly, price may be less of an issue for households with a relatively high disposable income. Given the contested findings regarding the influence of income on the organic share of consumers outlined in Section 1.2.2.1, this thought remains a hypothesis as of yet and is investigated in Essay 2.

Next to price, availability is the second most prominent barrier (e.g., Buder et al., 2014; Davies et al., 1995; Juhl et al., 2017). With the market entry of major retailers, the barrier of availability has been reduced (e.g., Mesías Díaz et al., 2012; Perrini et al., 2010; Rana & Paul, 2017). A similar development is noted for the aforementioned barrier of price since supermarkets benefit from economies of scale and thus make organic food more accessible to a broader set of grocery shoppers, both in terms of availability and price (e.g., Bezawada & Pauwels, 2013; Ellison et al., 2016; Padel & Foster, 2005). Still, a reduced barrier of availability is currently experienced only in countries with established markets for organic food, i.e., mostly in Western Europe and North America (e.g., Paul et al., 2016), and only as far as grocery retailing is concerned. The share of organic food in restaurants and canteens is still negligible at around 1%. This holds true even for Germany, the country with the biggest market for organic food in Europe, making it difficult for consumers to find a single organic option on most menus (e.g., Food Service, 2020). Against this background, some regions – for instance in Austria – plan to implement a minimum organic share in canteens of schools, hospitals, and public administration offices (Kurier, 2020). While lower than it used to be, limited availability thus continues to be a barrier that inhibits the growth of organic food sales.

Another frequently identified barrier is trust (e.g., Nuttavuthisit & Thøgersen, 2017; Teng & Wang, 2015; Vega-Zamora et al., 2019). Trusting an exchange partner is defined as having the expectation that this partner will act with responsibility and integrity, and that – in this case – the consumer thus accepts the risk of being disappointed (Nuttavuthisit & Thøgersen, 2017). Hence, trust reduces the complexity in consumers' decision making processes (e.g., Hartmann, Klink, & Simons, 2015; Hsu & Chen, 2014), particularly when the consumer is in a vulnerable position (Perrini et al., 2010). This is arguably the case for organic food purchases. While farmers and producers can judge the actual attributes of their products, consumers lack this possibility, which represents information asymmetry (Hansen et al., 2018; Janssen & Hamm, 2012). Hence, organic food is often considered a credence good, i.e., consumers cannot verify its attributes even after they completed the purchase (e.g., Janssen

& Hamm, 2012; Nuttavuthisit & Thøgersen, 2017; Perrini et al., 2010). Nuttavuthisit and Thøgersen (2017) use the distinction between personal trust and system trust. While the former is important in situations of personal and close contacts, for instance to local farmers, the latter tends to be universal and includes trust in institutions. Since today's food value chain tends to be anonymous, i.e., only a minority of consumers personally know the producers growing the food they purchase (e.g., Hartmann et al., 2015), a consumer's level of (abstract) system trust is arguably more influential in food buying decisions. When purchasing organic food at a retailer, *"consumers need to trust the certification and control processes as well as the organic label and other communication informing them and guaranteeing that a product is indeed organic"* (Nuttavuthisit & Thøgersen, 2017, p. 324).

Consequently, for a consumer to decide to purchase organic food, he or she has to trust that organic food entails the expected benefits over conventional food he or she buys it for (see Section 1.2.2.2) and, in addition, that the specific product in question was actually produced according to organic standards. Otherwise, the consumer might fear being cheated (e.g., Nuttavuthisit & Thøgersen, 2017), particularly as organic food is sold at a premium. At the same time, this premium provides an incentive for producers to only pretend a sustainable origin, a practice termed *"greenwashing"* (e.g., Guyader et al., 2017; Nuttavuthisit & Thøgersen, 2017; Schmuck et al., 2018, p. 136). In cases where uncertainty remains, people tend to follow the behavior of the majority and their own personal established habits, which both correspond to sticking to conventionally produced food (e.g., Aertsens, Verbeke et al., 2009; Griskevicius et al., 2010). Against this background, an official and mandatory labeling scheme by an independent third party plays a crucial role in reducing the prevalent information asymmetry in the credence good market of organic food (e.g., Janssen & Hamm, 2012; Perrini et al., 2010). In this thesis, we explore the corresponding effect of a sustainability label on the purchase decision of (online) grocery shoppers in Essay 3. Importantly, emphasis is also placed on potential interaction effects between a newly-introduced eco-label and existing organic labels.

Another important barrier, which is closely related to trust, is knowledge (e.g., Mesías Díaz et al., 2012; Pieniak, Aertsens, & Verbeke, 2010; Teng & Wang, 2015). As outlined, consumers both have to trust in the benefits derived from organic food consumption in general and in a specific product's actual organic origin. Particularly the former aspect can be addressed by raising a consumer's level of knowledge about organic food and its distinct characteristics.

Without a sufficient level of knowledge, consumers may not be in a position to judge what they pay the premium price for, making an informed decision unlikely (e.g., Mesías Díaz et al., 2012; Padel & Foster, 2005; Vittersø & Tangeland, 2015). Indeed, *"in the absence of green information, consumers evaluate products based on price"* (Guyader et al., 2017, p. 323). In contrast, consumers possessing a high level of knowledge about organic food tend to be more likely to have a higher organic share and to have a higher willingness to pay (e.g., Mesías Díaz et al., 2012; Pieniak et al., 2010). In an early study on the subject, Padel and Foster (2005, p. 623) even postulated: *"Price remains a barrier for many consumers, but it is possible that its significance could be diminished, were consumers to be made more aware of the reasons for the higher price and convinced that organic food is a value for money choice despite the premium."*

However, authors continue to find low levels of knowledge about organic food among consumers (e.g., Mesías Díaz et al., 2012; Nuttavuthisit & Thøgersen, 2017; Pieniak et al., 2010). Despite ongoing efforts by the EU and other institutions to address this knowledge gap, utilized information campaigns have not resulted in the desired outcomes (e.g., Gleim et al., 2013; Trivedi et al., 2018; Vittersø & Tangeland, 2015). I take up this observation again in Essay 2 and provide a potential reason for the disappointing outcome as of yet. Indeed, while authors frequently find high levels of awareness concerning organic food, subject-specific knowledge is low (e.g., Naspetti & Zanoli, 2004; Teng & Wang, 2015). The general construct of knowledge is divided into subjective knowledge and objective knowledge (e.g., Brucks, 1985; Flynn & Goldsmith, 1999; Raju, Lonial, & Mangold, 1995). While subjective knowledge corresponds to what a person believes he or she knows about a subject, objective knowledge measures the actual quality and quantity of facts stored in a person's memory (Brucks, 1985). While correlated, these constructs are shown to be distinct and thus ought to be separated when investigating the impact of knowledge on a shopper's behavior (e.g., Aertsens et al., 2011). Indeed, *"(…) what people think they know does not very strongly match with what they actually know"* (Pieniak et al., 2010, p. 586). However, rarely has this differentiation been implemented in existing studies on knowledge in the field of organic food retailing. Similarly, Septianto et al. (2019, p. 104) recently pointed out that *"(…) there is a distinct lack of studies on the promotion of organic food specifically"*. In this thesis, I address potential means to overcome the barrier of knowledge both in Essay 2 and Essay 3. While Essay 2 focuses on

changing deliberate decisions by shoppers, Essay 3 is addressing intuitive decision making. Further details on this differentiation are provided in the following section.

To sum up, organic food retailing is a current and relevant topic that has received significant attention by researchers during the last decades. In this thesis, I build on all of the three research streams outlined and provide distinct contributions to the literature by furthering our understanding of how to induce further organic food sales. In the following, I provide an overview of the thesis' structure and the respective focus and contribution of each essay.

1.3 Thesis Structure

This thesis includes an overall introduction, three self-standing essays, and a collective conclusion. Each essay contributes a particular part to the overarching research question of "how to induce further organic food sales?". Still, the essays can be read independently from each other. They are self-contained and thus include separate introduction and conclusion sections. The order in which the essays are presented is chosen deliberately, but they may be read out of order if desired. To allow for a general overview, each essays' key characteristics are illustrated in Table 1 and further elaborated on in the following.

In Essay 1, I provide an overview of the status quo of organic food retailing. I extend the research stream concerning the profile of organic food consumers outlined in Section 1.2.2.1 by investigating who the consumers are that shop at organic stores and supermarkets. Further, I explore consumers' shopping behavior inside these stores, and I identify consumers' reasons for their retail format choice, thereby extending the literature on motives behind organic food purchases outlined in Section 1.2.2.2. As such, the essay addresses the literature's key limitation of a lack of focus on the retail context in which organic food is purchased. While studies have examined the links between the consumer and the product, the links between the consumer and the retailer have received scant attention. The essay thus answers calls for research by, among others, Ellison et al. (2016), Hwang and Chung (2019), Khare and Pandey (2017), Rana and Paul (2017), and van Doorn and Verhoef (2015). Next to these scientific contributions, the findings provide implications for both supermarket executives and organic store owners.

In Essay 2, I analyze the role of knowledge about organic food and the impact that accurate targeting has on inducing organic food sales. I assess the association of a consumer's level of knowledge to a consumer's share of total food items of organic origin purchased. In addition, I explore how consumer segments differ in which channels they use and trust to obtain information about food. Also, I gather evidence on what message type is most effective in increasing a consumer's intention to buy (more) organic food, thereby providing insights on a potentially promising mean to overcome the barrier of limited consumer knowledge about organic food, which is outlined in Section 1.2.2.3. As such, the essay addresses the research gap of a lack of focus on targeted communication in the literature of organic food retailing. I take up recommendations for future research by, among others, Cerri et al. (2018), Guyader et al. (2017), Trivedi et al. (2018), Vega-Zamora et al. (2019), and Verain, Dagevos, and Antonides (2015). Based on the obtained findings, I additionally derive implications for both grocery retailers and policy makers, enabling them to target their marketing and communication efforts more effectively.

In Essay 3, we investigate what eco-label design is the most promising in influencing online grocery shoppers' product choices. Moreover, we explore whether the introduction of an eco-label leads to a higher number of sustainable food choices, organic food choices, and choices of organic food subject to additional (sustainability) regulations, and whether the effect size depends on shopper characteristics. In doing so, we provide insights on a further potential means to overcome the barrier of knowledge in inducing organic food sales and build on calls for future research by, among others, Byerly et al. (2018), Meyerding, Schaffmann, & Lehberger (2019), Richter et al. (2018), Thøgersen and Nielsen (2016), Wilson, Buckley, Buckley, and Bogomolova (2016), and Wobker, Eberhardt, and Kenning (2015). We also elaborate on potential interaction effects between an eco-label and organic labels. This notion has not been researched to date either. While the investigated means in Essay 2 is aimed at addressing the conscious and deliberate decision making of grocery shoppers, the studied means in Essay 3 is targeting a subconscious and intuitive aspect of decision making.

In the collective conclusion, I reiterate the concrete research gaps addressed in each essay and I link and discuss the essays' main findings, contributions, and implications. In addition, I outline promising areas for future research. The included appendix at the end of the thesis contains supplementary materials utilized for the three essays.

Table 1: Overview of Key Essay Characteristics

	Essay 1	Essay 2	Essay 3
Overarching research question		***How to induce further organic food sales?***	
Focus	Get an understanding of the (organic) grocery shoppers and their view on the status quo of organic food retailing	Target the (organic) grocery shoppers and change the status quo by addressing shoppers' *deliberate* decision making	Target the (organic) grocery shoppers and change the status quo by addressing shoppers' *intuitive* decision making
Research characteristics			
Research question	Who are the consumers that shop at supermarkets and organic stores and what are the underlying reasons for their retail format choice?	How should informational messages be targeted and which channels should be used to increase grocery shoppers' intentions to choose (more) organic food?	Does the introduction of an eco-label lead to a higher number of sustainable and organic food choices in online grocery shopping?
Related call for research	Ellison et al. (2016); Hwang and Chung (2019); Khare and Pandey (2017); Rana and Paul (2017); van Doorn and Verhoef (2015)	Cerri et al. (2018); Guyader et al. (2017); Trivedi et al. (2018); Vega-Zamora et al. (2019); Verain et al. (2015)	Byerly et al. (2018); Meyerding et al. (2019); Richter et al. (2018); Thøgersen and Nielsen (2016); Wilson et al. (2016); Wobker et al. (2015)
Unit of analysis	Socio-demographic characteristics and behaviors of supermarket shoppers and organic store shoppers and the respective reasons for their retail format choice	Shoppers' levels of knowledge about organic food, their intentions to buy organic milk dependent on informational message shown, and their usage and trust in informational channels	Number of choices of sustainable and organic food options in online grocery shopping
Approach	In-person, self-administrated, store-intercept survey among 444 Austrian grocery shoppers	In-person, self-administrated, store-intercept survey among 444 Austrian grocery shoppers, incl. an experiment	Factorial online survey among 53 grocery shoppers, followed by a randomized online experiment with 390 subjects
Analysis	Binary logistic regression, cross-tabulation analyses, t-tests	ANOVAs, linear regressions	Chi-square tests of independence, Friedman rank tests, Mann-Whitney U, Poisson & multiple regressions, t-tests
Finding	Organic store shoppers and supermarket shoppers are distinct groups. They differ in socio-demographics, shopping preferences, and shopping behaviors and thus need to be addressed separately.	Limited consumer knowledge about organic food is a significant barrier. Informational messages are most effective when targeted to occasional organic consumers and shown inside grocery stores.	A traffic-light eco-label design is effective in inducing choices of sustainable and organic food. The effect is partly subconscious and partcularly strong for less-involved grocery shoppers.
Contribution	Addressing the lack of focus on the retail context in which organic food is purchased, i.e., the link between grocery shoppers and retailers	Addressing the lack of focus on targeted communication efforts in the literature of organic food retailing	Addressing interaction effects between an eco-label and organic labels and testing the effectiveness of a concrete eco-label design in online grocery shopping
Addressee	Organic store owners and supermarket executives	Policy makers and grocery retail executives	Policy makers and grocery retail executives

2 Supermarkets Versus Organic Stores: An Analysis of Store Patronage, Shopping Behavior, and Underlying Reasons

Lambert Neumayr

A key limitation of the literature on organic food is its lack of focus on the retail context in which organic food is purchased. The present study addresses this research gap by investigating the shopper perspective of the two dominant retail outlets for organic food: supermarkets and organic stores. To better understand shopper types and their behaviors and preferences, retailers should be enabled to target marketing efforts and product assortments in line with their customers. Against this background, I conducted an in-person survey at supermarkets and organic stores across Austria, reaching more than 440 shoppers. I find that supermarket shoppers tend to be male, young, price-sensitive, and pressed for time. These shoppers place great importance on convenience and price level, valuing the efficient one-stop-shop promise of supermarkets, which for them outweighs product quality considerations and the lower level of trust towards the retailer. Organic store shoppers, on the other hand, tend to be female, older, and more knowledgeable about food. These shoppers are willing to spend more time on grocery shopping, prioritizing product quality and the shopping experience in their decision of where to shop. As they value their trust-based association with their store, they regard price rather as value for money.

Keywords: Organic food; Organic store; Shopping behavior; Store choice; Supermarket; Retail outlet

2.1 Introduction

Consumers have become increasingly aware of consumption-related problems (Cerri et al., 2018; Scalco et al., 2017), a case in point being the adverse effects of today's food production practices on soil degradation, chemical pollution, and climate change (Poore

& Nemecek, 2018; Reganold & Wachter, 2016). In an attempt to act more sustainably, a growing number of consumers are turning to organically-produced food, which they consider to be both more natural and less harmful to the environment (Chekima et al., 2017; Puska et al., 2018; Reganold & Wachter, 2016). Increasing sales of organic food, however, not only benefit the environment and peoples' conscience. Major retail chains have entered the market for organic food, seeing it as an attractive opportunity to portray a green image while benefiting both from differentiated product offerings and higher margins (Bezawada & Pauwels, 2013; Crowder & Reganold, 2015; Gleim et al., 2013). As a consequence, while close to non-existent only decades ago, the market for organic food has increased rapidly (Juhl et al., 2017). Today, organic food is considered the most successful green product worldwide (e.g., Nuttavuthisit & Thøgersen, 2017; Vega-Zamora et al., 2019).

This popularity it has gained among consumers has also led to an increasing number of publications related to organic food, further evidence of the theme's growing importance (Akaichi et al., 2019; Scalco et al., 2017). Studies have investigated the links between the consumer and the product, such as consumer motives to buy organic food (e.g., Puska et al., 2018; Septianto et al., 2019; Trivedi et al., 2018), and willingness to pay a higher price for it (e.g., Hansen et al., 2018; Janssen & Hamm, 2012; van Doorn & Verhoef, 2015) as well as the barriers hindering consumers from buying (more) organic food (e.g., Gleim et al., 2013; Nuttavuthisit & Thøgersen, 2017; van Doorn & Verhoef, 2015). However, a key limitation of the literature is its lack of focus on the link between the consumer and the retailer, i.e., the retail context in which organic food is purchased. Many authors have indicated that this prevalent research gap is important to address (e.g., Ellison et al., 2016; Hwang & Chung, 2019; Rana & Paul, 2017). For instance, Khare and Pandey (2017, p. 983) noted that *"research on organic food retailing is in a nascent stage (…)",* van Doorn and Verhoef (2015, p. 437) stated that *"in particular, the impact of supply-side factors on organic purchase behavior is due to limited and conflicting empirical evidence still unclear",* and Hwang and Chung (2019, p. 293) recently argued: *"(…) despite increasing competition among retail chains selling organic foods, little is known about how consumers choose stores for organic food buying".*

The literature on store choice in retailing is traditionally focused on price or promotions (e.g., Danziger, Hadar, & Morwitz, 2014; Rhee & Bell, 2002). However, this can only be applied in part to store choice in the case of organic food, as consumers' price elasticity, price-quality perceptions, and motivations with regard to organic food have been found to differ from

those relating to other product groups or conventional food alternatives (Bezawada & Pauwels, 2013; Hjelmar, 2011; Hwang & Chung, 2019). One study even found that organic food may be a poor fit for retailers' traditional marketing activities per se (Ngobo, 2011). It is against this background that the present study addresses this research gap (1) by investigating who the consumers are that shop at organic stores and supermarkets, (2) by exploring consumers' shopping behavior inside these stores, and (3) by identifying consumers' reasons for their retail format choice, enabling retailers to target their marketing activities and product offerings to their customers more effectively.

2.2 Theoretical Background and Hypothesis Development

2.2.1 Theoretical Background

Up until the 1990s, the organic food market was considered an anti-establishment movement, characterized by small-scale regional farmers and a community-based supply network of farm-gate sales and organic stores (Johnston et al., 2009; Perrini et al., 2010). Since then, major retailers have entered the market at scale, with supermarkets becoming the most important sales channel for organic food in developed countries (Desquilbet et al., 2018; Willer & Lernoud, 2019). Together with organic stores, these two retail formats dominate the market with combined market shares often above 90% (Willer & Lernoud, 2019). The remainder are attributable to all other sales channels combined, and are not covered by this study, due to their low market share, sparse distribution, irregular frequencies, and limited assortments (Naspetti & Zanoli, 2004). I define organic stores as small-scale, owner-run grocery retailers offering organic food on an exclusive basis. In contrast, I define supermarkets as large-scale grocery retail chains offering a broad assortment, covering both organic food and conventionally produced food.

When major retailers started selling organic food, many people welcomed the resulting increased availability, the broader assortment, and the lower price premiums (e.g., Aertsens, Verbeke et al., 2009; Bezawada & Pauwels, 2013). Others, however, feared a *"conventionalization"* (Desquilbet et al., 2018, p. 195) or *"corporatization"* (Johnston et al., 2009, p. 510; Perrini et al., 2010, p. 514) of organic food. These critics perceived large-scale offerings as detrimental to the very idea behind organic food, allegedly leading to global supply chains, undermining of quality standards, and downward price pressure on farmers (Desquilbet

et al., 2018). These diverging views suggest that supermarkets might be perceived differently than organic stores by shoppers and that such retail formats may attract different shopper types. Hwang and Chung (2019, p. 303) even argued that *"(…) rather than consumers' attitudes toward organic food, attitude toward a retail chain is more critical to attract consumers to the store for organic food buying (…)"*. Indeed, several authors have raised similar assumptions over the years (e.g., Bezawada & Pauwels, 2013; Nuttavuthisit & Thøgersen, 2017; Pedersen et al., 2018). However, despite being identified as a potentially important research stream by many, rarely have these assumptions actually been studied (Ellison et al., 2016).

The only exception is a recent study by Hwang and Chung (2019). These authors explored the role of the perceived fit between retailer image and organic food in consumer decisions regarding where to shop. While it provides initial evidence of the differences between store-choice decisions for organic food shopping in contrast to previously researched contexts, the study has several limitations. First, utilizing a web-based survey, the authors applied convenience sampling at a US university. This led to a polarized sample of young students with little (organic) grocery shopping experience on the one hand and older university staff members on the other. Thus, the sample did not allow any insights into particular consumer types and their shopping behaviors. To overcome those weaknesses, the authors recommended that future research be conducted in the form of a field study, involving sampling directly within the target population of grocery shoppers. Second, the study focused exclusively on the multinational retail chain Walmart. Again, the authors recognized the limitations this entailed and recommended including other retail store formats, particularly specialty retailers. The present study addresses these shortcomings, while providing additional insights into the factors that lead consumers to shop either at supermarkets or organic stores.

2.2.2 Hypotheses Development

2.2.2.1 Do Supermarkets Attract Different Consumers Than Organic Stores?

Studies in the research stream exploring the profiles of shoppers who buy organic food have hitherto primarily focused on demographic profiling, which has proven to be largely effective (Hjelmar, 2011). However, contested results remained (Dimitri & Dettmann, 2012). For instance, while females are regularly found to buy more organic food than males (e.g., Hansen et al., 2018; Hughner et al., 2007), the evidence regarding attributes such as age or income is still unclear. While a majority of studies found or postulated both attributes to be

positively correlated with a higher organic share (e.g., Cerri et al., 2018; Rana & Paul, 2017), evidence also exists that points to other conclusions (e.g., Aertsens, Verbeke et al., 2009; Hansen et al., 2018). Transferring these insights to retail store choice, Carpenter and Moore (2006) confirmed that socio-demographic characteristics have a significant effect on store choice. However, prior results did not take into account the store choice for organic food.

As organic stores exclusively offer organic produce, while supermarkets also offer conventionally-produced food, I assume that organic stores are predominately frequented by consumers with a high organic share. Indeed, initial evidence based on focus groups and laddering interviews points in a similar direction (Naspetti & Zanoli, 2004; Padel & Foster, 2005). Females should thus be more likely to shop at organic stores. Also, females tend to attach greater importance to the relational aspects of service delivery than males (Klemz & Boshoff, 2001), and this might be more prevalent in small-scale organic stores (Naspetti & Zanoli, 2004).

H1a Organic store shoppers are more likely to be female than supermarket shoppers.

Similar to the argumentation on gender, the majority of studies found older shoppers to have a higher (as outlined, exceptions do exist) organic share than younger shoppers (e.g., Cerri et al., 2018; Rana & Paul, 2017). I thus expect older shoppers to be overrepresented at organic stores. Further, Hwang and Chung (2019) claimed that purchases by younger and older consumers are driven by different motivations. They found that older consumers assign greater importance to the perceived fit between retailer and organic food than young consumers. I thus expect perceived fit to be higher at organic stores, given their pioneering role in the organic food market (Perrini et al., 2010), which should again lead to an overrepresentation of older consumers at organic stores. Due to their smaller scale, organic stores might also have a more personal service delivery (Klemz & Boshoff, 2001). I expect older shoppers to value such personalized attention more than do younger shoppers due to less time constraints and more health-related concerns (Hwang & Chung, 2019).

H1b Organic store shoppers are more likely to be in an older age group than supermarket shoppers.

As the effect of a consumer's income on his or her organic share is still contested, Carpenter and Moore (2006) found income to be the only demographic characteristic that has

an effect on store patronage. In their study, high-income respondents were overrepresented in small specialty stores. In turn, Naspetti & Zanoli (2004) claimed that low-income consumers strongly prefer supermarkets. Combining these findings, I expect high-income shoppers to be overrepresented at organic stores, while the opposite should be the case for supermarkets.

H1c Organic store shoppers are more likely to have a high income than supermarket shoppers.

I also analyze the effect of another variable on store choice, which has not been researched in this context to date: the grocery shopping budget. This variable, both in absolute terms as well as set in relation to income, is seen as a proxy for the importance a consumer assigns to food in his or her daily life. As prices in small-scale organic stores tend to be higher than in large-scale retail chains and since regular organic shoppers were found to have a higher involvement with food than other shoppers (Naspetti & Zanoli, 2004), organic store shoppers should have a higher grocery shopping budget than supermarket shoppers.

H1d Organic store shoppers are more likely to have a high grocery shopping budget than supermarket shoppers.

Further, seizing a recommendation for future research by Hwang and Chung (2019), I explore whether shoppers' varying levels of knowledge about organic food influence their store choice. These authors postulated that consumers with a sound knowledge of organic labels might place less emphasis on a retailer-organic food fit, i.e., a knowledgeable consumer would not care as much about the retail outlet he or she purchases the organic food from. In contrast, Naspetti and Zanoli (2004) hypothesized organic store shoppers to have a higher level of knowledge of organic food than supermarket shoppers. I build on the latter hypothesis, arguing that knowledge about organic food might enable consumers to better differentiate between the offerings of supermarkets and organic stores. Hence, knowledgeable consumers might choose organic stores over supermarkets as the former might be perceived as the more authentic option (Guyader et al., 2017). I split this construct into objective knowledge, i.e., a shopper's actual level of knowledge, and subjective knowledge, i.e., a shopper's perceived level of knowledge (Moorman, Diehl, Brinberg, & Kidwell, 2004).

H1e Organic store shoppers are more likely to have a high level of knowledge about organic food than supermarket shoppers.

2.2.2.2 Does Consumer Shopping Behavior Differ Between Retail Outlets?

The characteristics of a retail outlet influence a shopper's decision making process and behavior (Ailawadi, Ma, & Grewal, 2018; Guyader et al., 2017). However, rarely have studies differentiated between retail formats. A notable exception is the focus-group study by Naspetti and Zanoli (2004). The authors identified a (small) group of consumers who place great importance on food in their daily lives. These consumers are more involved with food issues and make an effort to make educated buying decisions (Hansen et al., 2018; Naspetti & Zanoli, 2004). The authors postulated that a higher involvement is more likely with regular organic consumers and that supermarket shoppers show lower involvement than organic store shoppers. In a study based on laddering interviews, Padel and Foster (2005) claimed that supermarkets serve a functional purpose of minimizing the time that consumers need to complete their grocery shopping, thus catering to consumers who are pragmatic and convenience-oriented (Hjelmar, 2011). Hence, I expect organic store shoppers to assign less importance to time efficiency than supermarket shoppers.

H2a Organic store shoppers invest more time in grocery shopping than supermarket shoppers.

Similarly, I hypothesize that shoppers differ in the amount of information they obtain and process. In particular, I investigate the two main sources of information available in a retail store: product packaging and staff members. While I do not expect the product packaging itself to differ considerably between retail outlets, I expect organic store shoppers to spend more time reading the information on product packaging than supermarket shoppers. Further, both the desire and the opportunity of shoppers to ask staff members for additional information may vary significantly. Naspetti and Zanoli (2004) regarded supermarket personnel as lagging behind the personnel in specialty stores in terms of their product knowledge and postulated that regular organic consumers have a greater interest in such additional information. Additionally, I postulate that the smaller scale of organic stores and the corresponding lower level of anonymity might facilitate a personal exchange of information.

H2b Organic store shoppers read the information on product packaging more often than supermarket shoppers.

H2c Organic store shoppers ask staff members for additional information more often than supermarket shoppers.

2.2.2.3 What Are the Reasons for Consumers Shopping either at Supermarkets or Organic Stores?

While there is scant literature concerned with store attributes influencing a consumers' store-choice decision in the case of organic food shopping, studies on the more general level of retailing or grocery shopping exist. As outlined, though, *"(…) for organic foods, consumers' retailer choice can be more complex"* (Hwang & Chung, 2019, pp. 293–294). Consequently, I build on factors previously identified by these general studies and combine these sources with insights specific to organic food to postulate hypotheses.

While some suggest that consumers perceive bigger food stores to offer higher quality products (Krukowski, McSweeney, Sparks, & West, 2012), studies predominantly conclude that large outlets, such as supermarkets and discounters, need to improve on the signaled quality of their food items (e.g., Konuk, 2020; Ngobo, 2011). In addition, Desquilbet et al. (2018) compared supermarkets with organic stores and found that food products offered at organic stores are, on average, both healthier and more environmentally friendly than products offered at supermarkets. The authors did not investigate, however, whether consumers also perceive it this way, which I hypothesize to be the case.

H3a Consumers placing a high importance on the quality of food on offer are more likely to shop at organic stores than at supermarkets.

Price is identified as a major barrier to many consumers against buying organic food more regularly or even at all (e.g., Gleim et al., 2013; Poore & Nemecek, 2018; van Doorn & Verhoef, 2015). Hence, price level is frequently a major factor when deciding where to shop. Due to their more considerable economies of scale and negotiating power, large-scale retailers have advantages over small retailers in terms of the prices they are able to offer (e.g., Carpenter & Moore, 2006; Perrini et al., 2010). I thus expect shoppers placing high importance on price to have a preference for supermarkets. In contrast, there may be another (smaller) group of shoppers who value low-priced organic food less, perceiving price as a sign of quality (Ngobo, 2011). Indeed, Carpenter and Moore (2006) found that price is a less important factor among specialty store shoppers. Supermarket shoppers may thus attach a greater relative importance to price than organic store shoppers.

H3b Consumers placing a high importance on price level are more likely to shop at supermarkets than at organic stores.

Prior research on retail format choice often found product selection to be a major factor for consumers. In exploring the attributes of retail format choice between hypermarkets and supermarkets, Reutterer and Teller (2009) found that hypermarkets are chosen for major shopping trips, due to the superior consumer expectations in terms of product assortment (and price), while consumers prefer smaller stores (supermarkets in this case) for minor fill-up trips. Given their considerably larger retail space, supermarkets usually have a wider and more varied assortment than specialty stores (Buder et al., 2014) or family-run businesses (Orth & Green, 2009). Supermarkets might thus be preferred by consumers who value a wide selection (Nilsson, Gärling, Marell, & Nordvall, 2015), particularly when these consumers prefer to be able to choose between organic and a non-organic alternatives (Naspetti & Zanoli, 2004). While broader assortments are seen as positive by many, there are also consumers who experience a *"feeling of being lost in the supermarket"* (Johnston et al., 2009, p. 528). These consumers may rather have a preference for a pre-selected assortment in a smaller store. While the term 'selection' may thus mean different things to different consumers, I expect consumers assigning a higher relative importance to product selection to shop at a supermarket.

H3c Consumers placing a great importance on selection are more likely to shop at supermarkets than at organic stores.

Despite playing a central role in consumers' decisions regarding where to shop (Bell, Ho, & Tang, 1998), store location has rarely been included in studies regarding store choice (Hansen et al., 2018). Earlier hypotheses point to the expectation that supermarkets should be more conveniently located than organic stores (Naspetti & Zanoli, 2004; Nilsson et al., 2015). The main underlying reason for this is the higher absolute number of supermarket outlets, which increases the probability that a supermarket outlet is located closer to a consumer's home, workplace or other place of interest than an organic store. I thus hypothesize that a consumer placing high priority on store location is inclined to shop at a supermarket.

H3d Consumers placing a high importance on location are more likely to shop at supermarkets than at organic stores.

While considered less often than price or assortment, the perceived atmosphere in a retail outlet may also play a role in a consumer's decision regarding where to shop. In this regard, indications point towards a consumer preference for organic stores. Reutterer and Teller (2009) found that smaller retailers were, among other reasons, chosen for their more pleasant

atmosphere, while Naspetti and Zanoli (2004, pp. 246–247) quoted individual consumers who considered supermarkets to be *"crowded, chaotic and noisy places"*.

H3e Consumers placing a high importance on atmosphere are more likely to shop at organic stores than at supermarkets.

Klemz and Boshoff (2001) argued that small retailers have advantages over large retailers by virtue of their closer customer contact, personalized attention, and service. According to these authors, large retailers focus on standardized offerings and the predictability of their service delivery, which creates an efficient but anonymous shopping experience. Similarly, Carpenter & Moore (2006) claimed that customer relationships are more favorable with smaller retailers. Analyzing consumer loyalty for family-owned and non-family-owned businesses, Orth and Green (2009) noted that family-owned businesses are in a favorable position for leveraging customer relationships. Taken together, I postulate that organic stores are in a more favorable position for leveraging personalized attention to customers than supermarkets.

H3f Consumers placing great importance on personalized attention are more likely to shop at organic stores than at supermarkets.

Finally, as organic food is considered a credence good, i.e., buyers cannot verify the promised attributes even after purchasing it (Nuttavuthisit & Thøgersen, 2017), trust plays a major role in a consumer's decision making process (e.g., Guyader et al., 2017; Vega-Zamora et al., 2019). However, previous research has focused on the role of trust in a consumer's product choice rather than a consumer's store choice (Viktoria Rampl, Eberhardt, Schütte, & Kenning, 2012). Consumer trust in retailers, defined as *"a positive belief about the integrity, reliability, and dependability of and confidence in a retailer",* has been coined *"an ever-increasing decisive factor for success in food industry buyer-seller relationships"* (Shih-Tse Wang & Tsai, 2014, pp. 213–214). Studies found that family-run businesses are trusted more than non-family-run businesses (Orth & Green, 2009) and that large corporations are less trusted than small stores (Padel & Foster, 2005). Concerning organic food in particular, some authors have questioned whether consumers trust the authenticity of organic products sold at supermarkets (Naspetti & Zanoli, 2004; Perrini et al., 2010; Sridhar, Bezawada, & Trivedi, 2012). Given that a high-quality perception (Shih-Tse Wang & Tsai, 2014) and an authentic

store image (Guyader et al., 2017) are found to reduce the transaction risk caused by low trust, I expect organic stores to be in a favorable position regarding consumer trust.

H3g Shoppers trust organic stores more than they trust supermarkets.

2.3 Research Design

2.3.1 Method

I applied an in-person quantitative paper-and-pencil survey, which enabled me to reach a broad set of shoppers sampled directly from the target population (Viktoria Rampl et al., 2012). Surveys are the dominant method employed in the literature on organic food (e.g., Cerri, Thøgersen, & Testa, 2019; Juhl et al., 2017; Olson, 2017) and are considered especially useful for studying attitudes (Ajzen & Cote, 2008; Schwarz, 2008), particularly when consumers hold factually-based opinions about a subject and are thus in a position to articulate them accurately, which was found to be the case in the context of retail stores (Orth & Green, 2009). To minimize social desirability bias and to ensure standardization, I preferred anonymous self-administration over interviewing respondents (Brace, 2008; Cerri et al., 2019). Further, to prevent misunderstandings, I remained within a distance of a few meters from the respondents throughout the data collection process in case any clarification was needed. To get a sound understanding of the obtained data quality and to minimize risks associated with employing multiple researchers, I conducted the data collection exclusively on my own.

2.3.2 Data Collection

Data collection took place in Austria between June and August 2019. I surveyed shoppers both at branches of a major Austrian supermarket chain and at individual owner-run organic stores. To obtain a broad representation of shopper types, I approached shoppers at various time slots throughout the day, both on weekdays and on weekends (Nuttavuthisit & Thøgersen, 2017; Pedersen et al., 2018). In addition, data collection involved branches and stores in urban, semi-urban, and rural areas across the country, including both affluent and non-affluent areas (Buder et al., 2014; Zikmund, Babin, Carr, & Griffin, 2011). To prevent the self-selection of shoppers, e.g., those with particularly favorable or unfavorable attitudes towards organic food or certain retailers, shoppers were told that the study dealt with the general topic of ‘grocery shopping’ (Pedersen et al., 2018). Also, I did not offer any participation incentive

except for a glass of water or fruit juice, identifiable neither as organic nor as non-organic. Recruiting respondents directly at grocery shopping outlets is a common method in studies concerning organic food (e.g., Nuttavuthisit & Thøgersen, 2017; Pedersen et al., 2018; Perrini et al., 2010). This approach has the advantages that respondents are already in a shopping mindset (Ajzen, 2011; Hansen et al., 2018), do not have to rely on biased memory of past shopping experiences (Kothari, 2004; Reczek et al., 2018), and cannot look up information without the researcher noticing (Bradburn, Sudman, & Wansink, 2004).

2.3.3 Survey Instrument

The survey was developed in three stages. First, I created an initial version based on general survey best practices (e.g., Brace, 2008; Bradburn et al., 2004; Kothari, 2004) and established, subject-specific scales. The survey consisted of closed questions with a pre-defined set of answers, mostly based on rating scales (Zikmund et al., 2011). Each question and answering option was based on ideas or scales of subject-related studies.[15] The survey was written in English, translated into German, and subsequently translated back into English. Second, the instrument's validity was examined by experts from both the industry and the scientific community. Third, I conducted a pilot study comprising 47 respondents. These respondents were asked to complete the survey and to indicate any aspects they deemed to be unclear or misleading. Some respondents additionally took part in short cognitive interviewing sessions (Schwarz, 2008). Following Cerri et al. (2019), the pilot survey additionally included a social desirability scale (Vésteinsdóttir, Reips, Joinson, & Thorsdottir, 2017) to measure how prone respondents were to socially-desirable answering patterns. I excluded the scale from the final survey after pilot results revealed no strong indications for the existence of such a bias. The questionnaire, which was also used for Essay 2, can be found in Appendix A.

2.4 Results and Discussion

2.4.1 Sample Characteristics

I obtained 444 completed surveys from a total of 1,400 grocery shoppers approached. This was equivalent to a response rate of 32%. A missing declaration of consent or poor data

[15] In this thesis I have not included the extensive question and source catalogue I developed as the basis for the survey due to reasons of brevity. I welcome interested readers to ask for a copy.

quality led to the exclusion of eight surveys, yielding a sample size of 436 (Table 2). Of these, 227 shoppers completed the survey at supermarkets (52%) and 209 at organic stores (48%). While shoppers usually patronize several stores (Buder et al., 2014), *"they typically have a primary affiliation"* (Rhee & Bell, 2002, p. 225). Since the outlet that each shopper was approached at was not necessarily his or her main grocery shopping venue, respondents were specifically asked to state their main outlet as part of the survey. As the organic store group included 14 respondents who mainly shopped at organic supermarkets, i.e., outlets exclusively offering organic food on a scale similar to supermarkets, I additionally conducted analyses excluding these respondents to rule out distorting effects. As the results were only affected on a decimal level, these respondents continued to form part of the sample. In contrast, I excluded 18 respondents who mainly shopped at outlets other than supermarkets and organic stores.

Table 2: Sample Characteristics

Characteristics	Definitions	n	%
Gender			
Female		281	64%
Male		154	35%
Age group	*Years*		
Young	34 or below	118	27%
Middle	35 - 59	204	47%
Old	60 or above	113	26%
Level of income	*EUR per person in household*		
Low	1,500 or less	101	23%
Middle	1,501 - 2,250	168	39%
High	2,251 or more	121	28%
Main grocery shopping outlet			
Supermarket		297	68%
Organic store		121	28%
Other		18	4%

Note: N = 436. Percentages may not add up to 100 due to rounding or item non-response.

2.4.2 Do Supermarkets Attract Different Consumers than Organic Stores?

First, I analyzed whether the assumption that organic store shoppers had a higher organic share than supermarket shoppers was true. I found that the mean organic share was indeed .38 higher for organic store shoppers ($p < .001$). This provided the basis for further

analyses, with the attention now on more detailed differences. As shown in Table 3, I investigated socio-demographic characteristics using cross-tabulations based on Harris, Dall'Olmo Riley, Riley, and Hand (2017).

Confirming H1a, a cross-tabulation on gender yielded both a significant Pearson Chi-Square score of $X^2 = .002$ and a Fisher's exact test score of $p = .002$, suggesting that females were more attracted by organic stores than males. The opposite was true for supermarkets. Hence, while further validating the dominant view that females tend to buy more organic food than males (e.g., Hansen et al., 2018), this result adds to the discussion by identifying where females prefer to buy organic food. The underlying reasons for this finding – as well as for the other findings presented in the following – are outlined in Section 2.4.4.

Table 3: Cross-Tabulation Analyses on Differences Between Consumer Characteristics

Characteristics	Sig.	Organic store			Supermarket			Total	
		n	%	Stand. Resid.	n	%	Stand. Resid.	n	%
Gender	$X^2 = .002$	120	29%		297	71%		417	
Female		91	34%	1.5	178	66%	-1.0	269	65%
Male		29	20%	-2.1	119	80%	1.3	148	36%
Age group	$X^2 < .001$	120	29%		297	71%		417	
Young		18	16%	-2.7	98	85%	1.7	116	28%
Middle		59	31%	0.5	134	69%	-0.3	193	46%
Old		43	40%	2.1	65	60%	-1.4	108	26%
Income level	$X^2 = .47$	106	28%		268	72%		374	
Low	(n.s.)	23	24%	-0.8	73	76%	0.5	96	26%
Middle		50	31%	0.6	111	69%	-0.4	161	43%
High		33	28%	0.0	84	72%	0.0	117	31%

Note: Percentages may not add up to 100 due to rounding or item non-response.

H1b was confirmed too. Older consumers were more likely to shop at organic stores than the age group of young consumers ($X^2 < .001$). In line with the findings of Hwang and Chung (2019), younger consumers seem to place less importance on where they purchase organic food products. This raises the question of whether young consumers of today will still be attracted to organic stores once they have grown older or whether the current older generation will prove to be the last one to have a preference for organic stores. Either way, organic stores are already well-advised to increasingly target young consumers today.

In contrast, income level did not prove to be a differentiating factor. While standardized residuals for low-income consumers indicated a lower share of organic store shoppers (-0.8) and an overrepresentation of supermarket shoppers (0.5), the differences were not significant. The values of other standardized residuals were even smaller. H1c was thus rejected. This finding contradicts the result by Carpenter and Moore (2006), who found that high-income earners are more likely to shop at specialty stores, and thus adds to the contested state of literature on how important income level actually is with regard to (organic) grocery shopping (e.g., Aertsens, Verbeke et al., 2009; Aslihan Nasir & Karakaya, 2014; Hjelmar, 2011). A potential reason for this finding is that Carpenter and Moore (2006) exclusively focused on conventional specialty retailers, i.e., small retail stores that have non-organic offerings. It could be argued that these stores focus on a premium offering of 'exotic' products, which attracts high-income earners due to status-signaling and similar reasons. In contrast, based on my obtained results, small organic stores might rather be preferred for different reasons. I elaborate on those reasons in Section 2.4.4.

Next, I analyzed the grocery shopping budget as a percentage of income (Table 4). Organic store shoppers had a mean score of $M = .20$, i.e., they reported to spend 20% of their net household income on groceries, which was higher than for supermarket shoppers ($M = .17$, $p = .02$). As this variable was set in direct relation to income, I ran a second t-test using an absolute grocery shopping budget to validate the result. To avoid anchoring bias, respondents had to insert an absolute number in a free-text field. Despite the high standard deviation, caused by some respondents not being aware of their precise budget, H1d was accepted. Organic store shoppers indeed showed a higher monthly grocery shopping budget than supermarket shoppers ($p = .05$). Combined with the finding that income level alone played no significant role in differentiating where a consumer does his or her grocery shopping, these results lead to an interesting interpretation. While a certain minimum level of income is necessary to afford organic food, the actual differentiating factor between consumer types might rather be the importance a consumer places on food, measured as a proxy by the grocery shopping budget as a percentage of income. Even certain low-income households could thus afford to buy premium-priced organic food or to shop at organic stores. For these households, it might rather be about prioritizing additional spending on food over other areas such as clothing or mobility.

Table 4: Independent Sample T-Test Results for Organic Share, Grocery Shopping Budget, and Knowledge

Characteristics	Organic store shoppers M (SD)	Supermarket shoppers M (SD)	t	df	Sig (2-tailed)	Mean diff.	Std. Error diff.	95% CI	
Organic share	.84 (.17)	.46 (.25)	17.57	311	.000	.38	.02	.34	.43
Grocery shopping budget (% of income)	.20 (.12)	.17 (.11)	2.26	329	.02	.03	.01	.004	.06
Grocery shopping budget (absolute)	578 (408)	495 (247)	1.96	138	.05	83.83	42.81	14	154
Objective knowledge	.47 (.25)	.26 (.27)	7.33	413	.000	.21	.03	.15	.27
Subjective knowledge	3.96 (0.92)	3.12 (1.08)	7.96	255	.000	0.84	0.10	0.63	1.04

Finally, I found organic store shoppers to have both a considerably higher level of objective ($p < .001$) and subjective knowledge ($p < .001$) about organic food than supermarket shoppers. Hence, H1e was accepted. This result was closely in line with Naspetti and Zanoli (2004), who argued that consumers with a lower level of knowledge apply a simpler cognitive structure in their approach to shopping at organic stores. A possible interpretation is that knowledgeable shoppers might be more likely to recognize differences between organic product offerings of supermarkets and organic stores, thus perceiving organic stores to offer higher quality given their smaller scale and pioneering role in the market for organic food.

2.4.3 Does Consumer Shopping Behavior Differ Between Retail Outlets?

Another interesting aspect revealed by analyzing differences between consumer groups at organic stores and supermarkets is their respective shopping behavior. As shown in Table 5, I found that organic store shoppers invest more time in grocery shopping than supermarket shoppers ($X^2 = .05$). The higher the invested time a consumer reported, the greater the likelihood that this consumer was shopping at an organic store, which confirmed H3a. I found the highest overrepresentation of organic store shoppers in the group investing more than three hours per week (standardized residual 1.8). Next to the finding that organic store shoppers invest a higher income share in grocery shopping, this result adds to the conclusion that these consumers assign a higher significance to grocery shopping, and presumably to food in general, than supermarket shoppers do.

Table 5: Cross-Tabulation Analyses on Differences in Shopping Behavior

Characteristics	Sig.	Organic store			Supermarket			Total	
		n	%	Stand. Resid.	n	%	Stand. Resid.	n	%
Time invested (per week)	X^2 =	120	29%		296	71%		416	
Less than 1 hour	.05	34	26%	-0.6	96	74%	0.4	130	31%
1 -2 hours		43	25%	-0.9	129	75%	0.6	172	41%
2 - 3 hours		29	35%	1.0	55	66%	-0.6	84	20%
More than 3 hours		14	47%	1.8	16	53%	-1.2	30	7%
Read product package info*	X^2 <	120	29%		291	71%		411	
(Nearly) Never	.001	4	10%	-2.4	38	91%	1.5	42	10%
2		9	18%	-1.5	41	82%	0.9	50	12%
3		15	21%	-1.3	56	79%	0.8	71	17%
4		34	36%	1.2	61	64%	-0.8	95	23%
Very often		58	38%	2.0	95	62%	-1.3	153	37%
Ask staff for info*	X^2 <	118	29%		285	71%		403	
(Nearly) Never	.001	15	12%	-3.8	116	89%	2.4	131	33%
2		29	29%	-0.1	71	71%	0.0	100	25%
3		18	25%	-0.6	53	75%	0.4	71	18%
4		38	59%	4.3	27	42%	-2.8	65	16%
Very often		18	50%	2.3	18	50%	-1.5	36	9%

** As end-point-denominated scales were used, answering options between the poles are indicated as numbers.*

Note: Percentages may not add up to 100 due to rounding or item non-response.

To investigate shopping behavior in more detail, organic store shoppers reported reading product package information more often than supermarket shoppers ($X^2 < .001$), which confirmed H3b. Standardized residuals for organic store shoppers showed a continuous increase from -2.4 for the response *'(nearly) never'* to 2.0 for *'very often'*. The opposite was true for supermarket shoppers. I also found that organic store shoppers engage staff members more frequently than supermarket shoppers ($X^2 < .001$), which leads to the acceptance of H3c. For instance, while only 29% of responses corresponded to organic store shoppers, 59% of respondents indicating they *'often'* asked staff members for additional information were organic store shoppers, which constitutes a considerable overrepresentation. While this group was more likely to engage in both reading product package information and asking staff members, the magnitude of difference was higher for the latter behavior. This result highlights the importance of staff members in organic stores (Klemz & Boshoff, 2001; Naspetti & Zanoli, 2004). A knowledgeable and approachable staff might represent a unique characteristic of an organic store and a competitive advantage over supermarkets. Combining the results for H3b

and H3c provides yet another indication that organic store shoppers are considerably more involved in buying (organic) groceries than supermarket shoppers.

2.4.4 What Are the Reasons that Consumers Have for Shopping at either Supermarkets or Organic Stores?

In the final step, I explored six characteristics of grocery shopping outlets that could influence a consumer's decision for or against the particular outlet, by running a binary logistic regression (Table 6). The predictive power of the model was validated by an omnibus test of model coefficients ($p < .001$), and accurate model fit was confirmed by a non-significant Hosmer and Lemeshow test ($p = .77$ (n.s.)). A Nagelkerke R^2 value of .33 confirmed that the characteristics considered indeed explained a considerable amount of variance in store choice.

Table 6: Binary Logistic Regression Results for Retail Outlet Characteristics Affecting the Decision Where to Shop

Characteristics	B	S.E.	Wald	Sig.	Exp(B)	95% CI	
Quality	.99	.42	5.65	.02	2.69	1.19	6.09
Price	-.66	.13	24.92	.000	.52	.40	.67
Selection	-.29	.16	3.49	.06	.75	.55	1.02
Location	-.48	.13	14.29	.000	.62	.48	.79
Atmosphere	.40	.16	6.42	.01	1.50	1.10	2.04
Personalized attention	.43	.12	13.32	.000	1.54	1.22	1.94

Note: Encoding: organic store = 1, supermarket = 0; Nagelkerke $R^2 = .33$

N = 383, 118 (30.8%) organic store shoppers, 265 (69.2%) supermarket shoppers

Omnibus test of model coefficients: $X^2 = 102.71$, df 6, $p < .001$

Hosmer & Lemeshow test of model fit: $X^2 = 4.91$, df 8, $p = .77$ (n.s.)

While quality was important for a large majority of respondents, a respondent particularly valuing the quality of the products on offer was considerably more likely to shop at an organic store than at a supermarket (Exp(B) 2.69, $p = .02$), confirming H3a and previous indications by Hwang and Chung (2019). As expected, there was a significant overlap between perceived quality and the actual quality offered (Desquilbet et al., 2018). Consequently, supermarkets should try to improve the consumers' quality perceptions of the (organic) products they offer. A promising approach could be to leverage consumers' existing high-

quality perceptions towards certain organic brands or private certification labels (Janssen & Hamm, 2012). Including such products in the product assortment may result in positive spillover to the perceived quality of other products. Organic stores, in turn, are well advised to build upon their solid quality image when competing with large retailers. Organic stores should be careful not to compromise quality, as this may decrease the perceived fit between the store image and the products offered (Hwang & Chung, 2019).

Price level also yielded a significant result ($p < .001$). The greater the role that price plays in a consumer's decision, the higher the likelihood that this consumer shopped at a supermarket, confirming H3b. Price-sensitive consumers indeed preferred supermarkets over organic stores. In contrast, in line with the argumentation by Carpenter and Moore (2006), organic store shoppers assigned a lower relative importance to price when deciding where to shop. For this group, factors such as quality were even more important, underscoring earlier indications that purchasing decisions regarding organic food are not exclusively based on price (Hwang & Chung, 2019; Ngobo, 2011). Organic stores are thus again advised to refrain from sourcing lower-quality products for the sake of being able to offer somewhat lower prices in an attempt to compete with large-scale competitors.

Selection showed an Exp(B) value of 0.73 ($p = .06$), which led to acceptance of H3c at a .10-level of significance. While consumers particularly valuing selection indeed preferred supermarkets, which was in line with the findings comparing large retailers to small retailers (e.g., Naspetti & Zanoli, 2004; Orth & Green, 2009), the result was not straightforward. Speculating about potential reasons, organic stores may not be directly comparable to the conventional mom-and-pop stores or specialty retailers used in previous studies (e.g., Nijssen & Douglas, 2008; Reutterer & Teller, 2009). While retail space tends to be equally scarce, some organic stores may have an even wider organic assortment than certain supermarkets. By specializing exclusively in organic food, consumers may thus find a broader selection of organic items in an organic store, particularly as far as uncommon products or, e.g., products designed for intolerances are concerned.

Taking up the recommendation by Hansen et al. (2018) and Dimitri and Dettmann (2012), I also investigated store location. Consumers attaching great importance to the grocery store location preferred supermarkets over organic stores ($p < .001$), confirming H3d. As postulated, this may be due to the considerably larger number of supermarket outlets. As noted

by Carpenter and Moore (2006), consumers associate supermarkets with increased efficiency as they are often close by and can act as a one-stop shop, offering all the products that a consumer needs on a daily basis under one roof. Given that both selection and location are factors favoring supermarkets, I conclude that consumers prioritizing 'convenience', i.e., a category combining these two factors, tend to prefer supermarkets over organic stores.

In contrast, the more importance a consumer attaches to the atmosphere in a grocery outlet, the more likely he or she was to shop at an organic store ($p = .01$). H3e was thus also accepted. This was in line with Naspetti and Zanoli (2004), who argued that many consumers perceive supermarkets as crowded and noisy places, and with Reutterer and Teller (2009) who found that Austrian consumers prefer smaller retailers, among other reasons, due to the more pleasant atmosphere there. A related factor was personalized attention. The more important it was for a consumer to receive personalized attention, the more likely the consumer was to shop at an organic store ($p < .001$), confirming H3f. In a similar way to the overarching category of convenience, I combine the factors of atmosphere and personalized attention into a category I term 'shopping experience'. Naspetti and Zanoli (2004, p. 244) stated that consumers do not feel anonymous in organic stores and that these consumers sometimes even characterize organic store owners as *"friends",* highlighting the different shopping experience in these outlets validated in the present study.

Finally, to gain an insight into the level of trust projected by consumers on retailers, I calculated several independent sample t-tests (Table 7). First, I explored whether both organic store shoppers and supermarket shoppers had the same level of trust in their respective main retail outlet. While the trust of supermarket shoppers for supermarkets attains a mean score of $M = 3.59$, organic store shoppers trusted organic stores significantly more ($M = 4.53$, $p < .001$). I extended the analysis by asking both consumer groups about their trust in either of the two outlets. Organic store shoppers trusted organic stores more ($M = 4.63$) than did supermarket shoppers ($M = 4.17$, $p < .001$), while the level of trust in supermarkets was higher for supermarket shoppers (M = 3.03 vs. M = 2.63, $p < .001$). Hence, the absolute level of trust in supermarkets was significantly lower than the level of trust in organic stores, supporting H3g. Interestingly, even supermarket shoppers trusted organic stores significantly more (M = 4.17) than supermarkets (M = 3.03). This result confirms that supermarkets are the outlet of choice for the majority of consumers, even though they are at the same time trusted the least (Naspetti & Zanoli, 2004). The result was in line with Hwang and Chung (2019, p. 294), who

argued that some consumers may have *"mixed feelings"* about buying organic food from price-oriented retail chains when their perceptions of the store conflict with their high-quality perception of organic food.

Decision makers at supermarkets ought to be attentive to these results, as a high proportion of consumers seem to have a particularly low level of trust in supermarkets. Still, while trust does play a role in deciding where to do grocery shopping, other identified factors seem to influence the decision to an even greater extent. Otherwise, organic stores would be the shopping outlet of choice for the majority of consumers, which is not the case. Organic stores, on the other hand, should balance their expansion goals with the potentially detrimental effects stemming from (allegedly) becoming more 'supermarket-like' from the perspective of their customers, as such a development could undermine their current competitive positioning.

Table 7: Independent Sample T-Test Results for Consumers' Levels of Trust in Different Retail Formats

Characteristics	Organic store shoppers M (SD)	Super-market shoppers M (SD)	t	df	Sig (2-tailed)	Mean diff.	Std. Error diff.	95% CI	
Trust in main outlet	4.53 (0.55)	3.59 (0.78)	13.72	302	.000	0.94	0.07	0.81	1.08
Trust in organic stores	4.63 (0.57)	4.17 (0.90)	6.18	341	.000	0.46	0.07	0.31	0.61
Trust in supermarkets	2.63 (0.94)	3.03 (0.99)	-3.82	406	.000	-0.41	0.11	-0.62	-0.20

2.5 Conclusion

As grocery retailers are faced with fierce competition, thin margins, and low shopper switching costs (Orth & Green, 2009), it is of great importance to a retailer's marketing and retailing activities to get to know their customers as well as their behaviors and their motivations for shopping at a particular outlet (Rana & Paul, 2017).

In the present study, I find that organic store shoppers are predominantly female and in an older age group, allocate a higher income share to grocery shopping, and possess higher levels of knowledge about organic food. For supermarkets, the respective opposites tend to be true, while they are also less trusted by consumers compared with organic stores. As regards

shopping behavior, organic store shoppers display a higher level of involvement. They invest considerably more time in grocery shopping than supermarket shoppers and obtain information about products on a more regular basis. For organic store shoppers, grocery shopping is generally not merely an automated task or a boring necessity; food plays a central role in their lives.

Again, the opposite tends to be true for supermarket shoppers, a fact that is underpinned by the reasons identified by consumers for shopping where they do. While a preference for supermarkets is due to pragmatic concerns such as convenience and price, organic stores are preferred for the product quality and shopping experience they offer. I thus conclude that there may be two distinct shopper types (Naspetti & Zanoli, 2004). The first is the organic store shopper, who places great importance on quality, atmosphere, and personal relations. Of course, also this type of shopper is concerned with price or convenience. However, the relative importance of factors such as quality, trust, and atmosphere outweighs pure efficiency factors (Bezawada & Pauwels, 2013; Hjelmar, 2011). The second shopper type is the supermarket shopper, who prioritizes convenient and pragmatic grocery shopping (Hjelmar, 2011). While even this type trusts organic stores more than his or her own grocery shopping outlet, competitive prices paired with a convenient one-stop-shopping experience are too important benefits to trade off against (Padel & Foster, 2005).

In the light of these findings, I derive several implications for the two types of retailer studied. As highlighted by Rhee and Bell (2002), retailers need to find a balance between retaining their existing customers and attracting new ones. As the two identified shopper types value widely differing factors, finding such a balance is a challenging endeavor.

Supermarkets are well-advised to continue building on their strength of the transactional efficiency they are valued for. At the same time, they ought to increase the level of trust accorded them by consumers. One way to address this issue could be to conduct marketing activities highlighting that all products sold as organic, particularly those sold under home brands, have to comply with the same legal requirements set out by official certification bodies like the European Union, irrespective of where they are sold. Supermarkets may also benefit from improving their social and environmental performance and by communicating these efforts to the public (Perrini et al., 2010). In this way, consumers may feel that they are supporting good causes by shopping at this particular retailer.

For organic stores, the findings suggest that they should remain in the market niche they already successfully occupy. While the position of supermarkets on the organic food market will most likely become ever more dominant, there are certain aspects that large-scale retailers cannot satisfy in the same way that organic stores can. Despite the efforts outlined, it will, for instance, be difficult for supermarkets to offer a similar level of trust and personal service, coupled with a more intimate atmosphere. This insight further emphasizes the importance to organic stores of having knowledgeable and approachable staff members (Naspetti & Zanoli, 2004). While they are in a minority, there is a consumer type that values characteristics that can be summed up as shopping with a *"human touch"* (Klemz & Boshoff, 2001, p. 85). Hence, organic stores would be ill-advised to fight 'uphill battles' against supermarkets' economies of scale (Klemz & Boshoff, 2001). The quality of the products offered should not be compromised to achieve slightly lower prices. Similarly, expanding may actually harm the very image that organic stores currently benefit from. In contrast, as seen from the finding that knowledgeable consumers tend to prefer organic stores, it may pay off to engage in information campaigns, perhaps also cost-effectively conducted by staff members (Gleim et al., 2013) as well as by word of mouth (Khare & Pandey, 2017; Rana & Paul, 2017), to increase consumers' knowledge about organic food. The more consumers know about organic food and the differences between the product offerings of organic stores and supermarkets, the greater the chance that more consumers will prefer organic stores as their main grocery shopping outlet.

2.6 Limitations and Future Directions

The present study is subject to certain limitations. While surveys are promising when researching attitudes (Ajzen & Cote, 2008; Schwarz, 2008), the data obtained is correlational. Hence, no causal inferences can be drawn (Yazdanpanah & Forouzani, 2015). Approaching shoppers immediately after they have engaged in the activity they are being asked about provided valuable benefits, such as a high external validity. As many shoppers were pressed for time, though, a non-response error cannot be ruled out (Khare & Pandey, 2017). Further, as with most studies on organic food (Cerri et al., 2018; Lee & Hwang, 2016; van Doorn & Verhoef, 2015, among many others), the data obtained is self-reported. To minimize the associated risks, I assured the respondents of their anonymity and utilized a social desirability

scale in the pilot study that revealed no biased answering patterns. Lastly, given the length of the survey and the chosen method of data collection, I studied most variables with single-item scales. While this should be no issue with narrow and easy-to-understand constructs such as the ones studied (Lee & Hwang, 2016), multiple-item scales are less sensitive to measurement error (Nuttavuthisit & Thøgersen, 2017).

In the present study I provide a diverse set of insights into consumer perspectives of supermarkets and organic stores that can be built upon by future research. For one thing, I recommend investigating how shopping behavior may be actively influenced by the retailer, using, for instance, nudging (Lehner et al., 2016). It could be explored whether different nudge alternatives display different levels of effectiveness between retail formats. Moreover, future efforts could include organic supermarkets in addition to organic stores and (conventional) supermarkets in comparison of consumer perspectives of retailers selling organic food. Based on the findings presented, I expect organic supermarket shoppers to place greater importance on selection and price than organic store shoppers, but less importance on atmosphere and personal attention. At the same time, the difference may not be as significant as when comparing organic store shoppers and (conventional) supermarket shoppers. It thus remains to be seen whether organic supermarket shoppers are a distinct shopper group or merely a sub-group of organic store shoppers. Finally, this research study focuses on the country of Austria, which is often considered a *"pioneering"* country concerning organic food (Vittersø & Tangeland, 2015, p. 92). The results obtained may thus not be generalizable to other countries or cultures, particularly those that currently have a low organic market share. Future research could replicate the present study in such a setting to explore the sensitivity of results to the maturity of the organic market in a country or to its culture.

3 How to Induce Sales of Organic Food: The Decisive Role of Knowledge and Accurate Targeting

Lambert Neumayr

A key limitation of the literature on organic food is its lack of focus on targeted communication. The present study addresses this research gap by investigating the barrier of limited consumer knowledge about organic food and by identifying means to overcome it. Against this background, I conducted an in-person survey at supermarkets and organic stores across Austria, reaching more than 440 shoppers. The survey was built on the Theory of Planned Behavior and included experimental design elements based on the Elaboration Likelihood Model. I find that shoppers who possess less objective or subjective knowledge about organic food have a lower organic share. Categorizing shoppers into segments, I find that regular organic consumers inform themselves about food more often – and via different sources – than occasional or non-organic consumers. While food plays a major role in most regular organic consumers' lives, occasional and non-organic consumers tend to be reached inside the store only. Furthermore, I find initial evidence that educational messages tend to be effective only if tailored to consumer segments. Non-organic consumers should be informed about the benefits of organic food to increase their intention to buy it. While the same is true for occasional organic consumers, their buying intention might be increased even further by confronting them with negative information about conventional food alternatives.

Keywords: Consumer segment; Organic food; Product knowledge; Retailing; Targeted communication

3.1 Introduction

While most consumers underestimate the impact of their daily purchasing decisions (Scalco et al., 2017), they do have become aware of consumption-related problems (e.g., Gleim et al., 2013; Trivedi et al., 2018). This has led to growing markets for sustainable products, a

case in point being the market for organic food (Juhl et al., 2017; Nuttavuthisit & Thøgersen, 2017; Vega-Zamora et al., 2019). However, while most consumers display a positive attitude towards organic food (e.g., Aertsens et al., 2011; Bradu et al., 2014), it remains a niche in the total food market. Organic food sales typically only account for a market share of less than 10%, even in developed countries (Olson, 2017; Vittersø & Tangeland, 2015; Willer & Lernoud, 2019). Hence, positive attitudes are often not translated into the corresponding buying behavior, leading to an 'attitude-behavior gap' (e.g., Cerri et al., 2018; Reczek et al., 2018; Trivedi et al., 2018). The widespread adoption of organic food is impeded by barriers. These barriers include factors such as price (e.g., Gleim et al., 2013; Hansen et al., 2018), availability (e.g., Cerri et al., 2018; Juhl et al., 2017), trust (e.g., Nuttavuthisit & Thøgersen, 2017; Vega-Zamora et al., 2019), and knowledge (e.g., Mesías Díaz et al., 2012; Pieniak et al., 2010). In this study, I focus on the barrier of knowledge.

In recent years, several authors have hypothesized that building up knowledge about sustainable products among consumers could be one of the most promising means to induce further sales (e.g., Cerri et al., 2018; Gleim et al., 2013; Nuttavuthisit & Thøgersen, 2017). For instance, Vittersø and Tangeland (2015) argued that for self-regulating markets to work, consumers need to have a certain level of product knowledge to make informed choices. Similarly, Guyader et al. (2017, p. 323) emphasized that *"in the absence of green information, consumers evaluate products based on price"*. Since organic food is sold at a premium, I expect a sufficient level of knowledge to be of primary importance.

However, many authors found the level of knowledge among consumers to be minimal (e.g., Naspetti & Zanoli, 2004; Nuttavuthisit & Thøgersen, 2017; Pieniak et al., 2010). Indeed, prior efforts to raise consumers' levels of knowledge have largely proven ineffective (Gleim et al., 2013). As has been highlighted by many authors (e.g., Akaichi et al., 2019; Vega-Zamora et al., 2019; Verain et al., 2015), targeted communication – rather than addressing every consumer with the same type of message transmitted via a random channel – is considered crucial, yet not sufficiently addressed in the literature on organic food to date. It is against this background that I address this research gap (1) by splitting the barrier of knowledge into subjective and objective knowledge and analyzing the respective associations to a consumer's organic share, (2) by exploring how consumers differ in which channels they use and trust to obtain information about food, and (3) by gathering initial evidence on what message type is the most effective in increasing a consumer's intention to buy (more) organic food.

3.2 Theoretical Background and Hypotheses Development

3.2.1 Knowledge

The Theory of Planned Behavior (TPB), which is considered one of the most influential research models on the prediction of human behavior (Ajzen, 2011), provides the basis for the investigation on why certain people engage in a given behavior while others do not (Ajzen & Cote, 2008). According to the TPB, a person's behavior is best predicted by the person's intention (INT) to perform the behavior. In turn, there are three main determinants of INT: personal attitude (ATT), subjective norm (SBN), and perceived behavioral control (PBC) (Ajzen & Cote, 2008; Scalco et al., 2017). The TPB has been validated in the literature on consumer behavior with regard to sustainable products in general, and regarding food choices in particular (e.g., Cerri et al., 2018; Scalco et al., 2017; Tarkiainen & Sundqvist, 2005). It thus provides a solid basis for the present study on organic food, especially since the TPB is also regarded *"to serve as a framework for behavior change interventions"* (Nuttavuthisit & Thøgersen, 2017, p. 328). Nevertheless, the TPB's predictability likelihood of behavior might be limited without the inclusion of additional factors influencing INT (Conner & Armitage, 1998). Indeed, Yazdanpanah and Forouzani (2015) found that the inclusion of additional variables increased the model's predictive utility in the context of organic food. In principle, the TPB is open to such additional predictors (Ajzen, 1991), while only a limited number of them should be added at once to allow for meaningful results (Conner & Armitage, 1998). Hence, taking up the recommendation by Cerri et al. (2018), I modify and validate the model to account for a consumer's level of knowledge about organic food.

Since organic food is associated with multiple benefits (e.g., Reganold & Wachter, 2016; Scalco et al., 2017; Verain et al., 2015), I postulate that a higher level of knowledge should have a positive effect on a consumer's INT to buy organic products. In investigating the influence of a consumer's level of knowledge about organic food on his or her decision making, I differentiate subjective from objective knowledge. Subjective knowledge (SKN) measures a person's *perception* of what he or she knows, whereas objective knowledge (OKN) measures *actual* knowledge (Brucks, 1985; Flynn & Goldsmith, 1999). While these constructs are correlated, they do not coincide. Depending on the field of research, Flynn and Goldsmith (1999) reported correlation coefficients of $r = .30$ to .60. With regard to organic food, Pieniak et al. (2010) found an even lower correlation of $r = .29$. Consumer research has a long history

of splitting these two constructs (Moorman et al., 2004). The literature on organic food, though, largely ignored this differentiation (Pieniak et al., 2010), which is considered a limitation. Indeed, Moorman et al. (2004) argued that SKN and OKN have different antecedents and influence behavior to different extents, while both Brucks (1985) and Raju, Lonial, and Mangold (1995) claimed that SKN has a higher influence on a person's decisions than OKN. Transferring these insights to consumer behavior concerning organic food, I postulate the following:

H1a The higher the consumer's objective knowledge about organic food, the higher the consumer's organic share.

H1b The higher the consumer's subjective knowledge about organic food, the higher the consumer's organic share.

H1c Subjective knowledge has a stronger positive effect on a consumer's organic share than objective knowledge.

3.2.2 Channel Use and Channel Trust

Successful promotion of 'green' products requires a detailed understanding of consumers and their decision making processes (e.g., Chekima et al., 2017; Rana & Paul, 2017; Yazdanpanah & Forouzani, 2015). Being exposed to fierce competition, low margins, and increasingly demanding consumers, retailers have discovered organic food as an attractive means to portray a green image, increase margins, and achieve a differentiated positioning (e.g., Ailawadi et al., 2018; Bezawada & Pauwels, 2013; Crowder & Reganold, 2015). However, while retailers – and policy makers – have become increasingly aware of the opportunity to launch informational campaigns to promote organic food, the impact of those efforts remained marginal as of yet (Gleim et al., 2013; Trivedi et al., 2018; Vittersø & Tangeland, 2015). One of the underlying reasons is that accurate targeting of informational messages concerning organic food remained scarce, despite its potential being identified as *"tremendous"* (Gleim et al., 2013, p. 60). Indeed, Verain et al. (2015, p. 399) noted that *„who* [*sic*] *to approach with what strategy is still in its infancy"* and Vega-Zamora et al. (2019) highlighted that while organic food researchers frequently suggest to tailor communication efforts, they provide no explanation or analysis on how to design those efforts effectively. In this study, I aim to address this research gap by gathering initial evidence.

To gain a better understanding of consumer types, I categorize consumers into segments (e.g., Bezawada & Pauwels, 2013; Gleim et al., 2013; Padel & Foster, 2005). Building on prior studies, segmentation is based on a consumer's organic share (e.g., Aertsens, Verbeke et al., 2009; Desquilbet et al., 2018; Gerini et al., 2016). Similar to Pedersen et al. (2018), I differentiate between non-organic consumers (NON), occasional organic consumers (OCC), and regular organic consumers (REG). I hypothesize that these consumers differ in how regularly they collect information about food, in which channels or media they use to obtain this information (*'channel use'*) (Aertsens et al., 2011; Trivedi et al., 2018; Xu & Wyer, 2010), and in the amount of trust they put into the collected information (*'channel trust'*) (Nuttavuthisit & Thøgersen, 2017). In this study, the term 'channel' is understood as any medium or source that can convey information to a shopper. These investigated channels range from blog articles or social media profiles to information campaigns or posters inside a grocery store. As prior insights are limited, I formulate the hypotheses on the general level of *channel use* and *channel trust*. However, I provide initial indications on the associations between consumer segments and individual channels in Section 3.4.4.

H2a The higher the consumer segment's organic share, the higher the segment's channel use.

H2b The higher the consumer segment's organic share, the higher the segment's channel trust.

3.2.3 Message Type

I expect that the message type that is most effective in increasing a consumer's INT to buy organic food varies between consumer segments. Studying the topic of climate change, Chapman, Lickel, and Markowitz (2017) argue that different segments of the population respond differently to the same appeal. Such an analysis has frequently been raised as a research gap in the literature on organic food (e.g., Guyader et al., 2017; Juhl et al., 2017; Trivedi et al., 2018). To my best knowledge, Vega-Zamora et al.'s (2019) study is the only one that conducted such an analysis. In an attempt to build consumer trust in organic food, the authors gathered initial evidence by exploring what message to transmit and how to do it. However, in contrast to the present study, they neither differentiated between consumer segments, nor did they analyze separate channels.

The Elaboration Likelihood Model (ELM) by Petty and Cacioppo (1986) is considered one of the most influential models concerning consumer behavior and persuasion (Vega-Zamora et al., 2019). I thus chose the ELM to form the theoretical base for the present investigation. According to the ELM, persuasion occurs either via a central route, which is based on thoughtful consideration of subject-specific arguments, or via a peripheral route, which is built on heuristics, emotions, and affective associations. High elaboration likelihood is associated with the central route, whereas low elaboration likelihood is tied to the peripheral route. Factors influencing a consumer's elaboration likelihood include a message's personal relevance, the consumer's ability to process the provided information, and whether the message confirms or is opposed to a consumer's current opinion (Petty & Cacioppo, 1986).

Pieniak et al. (2010) and Vega-Zamora et al. (2019) postulated that emotional messages could be more effective in influencing consumers regarding their purchasing decisions of organic food than messages which are based on the rationality of arguments alone. Based on the ELM, though, I expect differences in effectiveness between consumers. Those with a high organic share, a high level of knowledge, and a positive attitude towards organic food might (be able to) elaborate more thoroughly on the provided messages. These consumers could thus be less susceptible to emotional content. Hence, I hypothesize that the effect of an emotional message is associated negatively with a consumer's level of knowledge and, if H1 is accepted, also with a consumer's organic share.

According to Aertsens, Verbeke et al. (2009), targeting consumers with negative information about conventional food could be one of the only ways to break their habit of buying these products. Put differently, conveying unfavorable information pertaining the alternative to organic food might be more effective in influencing consumers to buy (more) organic food than highlighting the benefits of organic food itself. Based on the ELM, though, I again expect differences between consumer segments. Since both negative messages about conventional food and positive messages about organic food would most likely contradict the established opinions of NON, the elaboration likelihood should be low. The resulting effect of the two message types on NON is thus difficult to predict and may depend on which type is regarded as less incompatible by these consumers. Given a lack of corresponding prior evidence, I decide against postulating a concrete hypothesis for this segment but to gather initial evidence. In turn, I hypothesize that both message types should be effective in influencing the segment of OCC. Since most consumers display a positive attitude towards

organic food in general (e.g., Aertsens et al., 2011), both a positive message about organic food and a negative message about conventional food should reaffirm the existing opinions of OCC. This should lead to a high elaboration likelihood, which might cause an increased INT to buy (more) organic food. A similar argumentation should be valid for REG. This segment, though, is characterized by a high organic share already. The remaining potential for further organic food sales is thus limited. Consequently, I consider NON and OCC the target segments in this investigation and postulate hypotheses only for these two segments.

H3a Emotional messages have the strongest effect on non-organic consumers.

H3b Occasional organic consumers' intentions to buy organic food are increased both by positive messages about organic food and by negative messages about conventional food.

3.3 Research Design

3.3.1 Method

I applied an in-person quantitative paper-and-pencil survey, which enabled me to reach a broad set of shoppers sampled directly from the target population (Viktoria Rampl et al., 2012).[16] Surveys are the dominant method employed in the literature on organic food (e.g., Cerri et al., 2019; Juhl et al., 2017; Olson, 2017) and are considered especially useful for studying attitudes (Ajzen & Cote, 2008; Schwarz, 2008). This holds particularly true when consumers hold factually-based opinions about a subject and are thus in a position to articulate them accurately, which was found to be the case in the context of grocery shopping (Orth & Green, 2009). To minimize social desirability bias and to ensure standardization, I preferred anonymous self-administration over interviewing respondents (Brace, 2008; Cerri et al., 2019). Further, to prevent misunderstandings, I remained within a distance of a few meters from the respondents throughout the data collection process in case any clarification was needed. To get

[16] For Essay 2, I utilized the same questionnaire and the same data collection effort as for Essay 1. Hence, Section 3.3 is closely related to Section 2.3. As each essay is self-standing, I included the research design section for Essay 2 as well. While similar, the sections are not identical since I focused on different parts of the questionnaire depending on the respective research questions studied.

a sound understanding of the obtained data quality and to minimize risks associated with employing multiple researchers, I conducted the data collection exclusively on my own.

3.3.2 Data Collection

Data collection took place in Austria between June and August 2019. I surveyed shoppers both at branches of a major Austrian supermarket chain and at individual owner-run organic stores. To obtain a broad representation of shopper types, I approached shoppers at various time slots throughout the day, both on weekdays and on weekends (Nuttavuthisit & Thøgersen, 2017; Pedersen et al., 2018). In addition, data collection involved branches and stores in urban, semi-urban, and rural areas across the country, including both affluent and non-affluent areas (Buder et al., 2014; Zikmund et al., 2011). To prevent the self-selection of shoppers, e.g. those with particularly favorable or unfavorable attitudes towards organic food, shoppers were told that the study dealt with the general topic of grocery shopping (Pedersen et al., 2018). Also, I did not offer any participation incentive except for a glass of water or fruit juice, identifiable neither as organic nor as non-organic. Recruiting respondents directly at grocery shopping outlets is a common method in studies concerning organic food (e.g., Nuttavuthisit & Thøgersen, 2017; Pedersen et al., 2018; Perrini et al., 2010). This approach has the advantages that respondents are already in a shopping mindset (Ajzen, 2011; Hansen et al., 2018), do not have to rely on biased memory of past shopping experiences (Kothari, 2004; Reczek et al., 2018), and cannot look up information without the researcher noticing (Bradburn et al., 2004).

3.3.3 Survey Instrument

The survey was developed in three stages. First, I created an initial version based on general survey best practices (e.g., Brace, 2008; Bradburn et al., 2004; Kothari, 2004) and well-established, subject-specific scales. The survey was written in English, translated into German, and subsequently translated back into English. The survey consisted of closed questions with a pre-defined set of answers, mostly based on rating scales (Zikmund et al., 2011). In addition, I employed a short experiment that was characterized by a randomized between-subject design with one control condition and four treatment conditions. Each respondent was handed one of five different survey versions by chance, while respondents were not aware of the existence of different versions at any time. While respondents in the control condition were not confronted with any informational message before answering questions on their INT to buy organic milk,

respondents in the treatment conditions were confronted with one message each before answering the same questions. Messages included positive information about organic milk, one in emotional tone with a picture and one in non-emotional tone without any visual cue, and negative information about conventional milk, while again only one of the two messages was emotional in tone and included a picture. Contrary to the study by Vega-Zamora et al. (2019), messages contained no sources to not distort results based on source cues (Petty & Cacioppo, 1986). I chose milk as the product example since the impact of media was found to be the highest for dairy products (Sridhar et al., 2012). To increase personal relevance, all messages were based on health claims. Health is found to be a main reason for most consumers to buy organic food (e.g., Chekima et al., 2017; Juhl et al., 2017).

Second, the instrument's validity was examined by experts in the subject matter from both the industry and the scientific community. Third, I conducted a pilot study comprising 47 respondents. These respondents were asked to complete the survey and to indicate any aspects they deemed to be unclear or misleading. Some respondents additionally took part in cognitive interviewing sessions (Schwarz, 2008). Following Cerri et al. (2019), the pilot survey additionally included a social desirability scale (Vésteinsdóttir et al., 2017) to measure how prone respondents were to socially-desirable answering patterns. I excluded the scale from the final survey after pilot results revealed no strong indications for the existence of such a bias. The complete questionnaire can be found in Appendix A.

3.4 Results and Discussion

3.4.1 Sample Characteristics

I obtained 444 completed surveys from a total of 1,400 grocery shoppers approached. This was equivalent to a response rate of 32%. A missing declaration of consent or poor data quality led to the exclusion of eight surveys, yielding a sample size of 436 (Table 8). Of these, 227 shoppers completed the survey at supermarkets (52%) and 209 at organic stores (48%). Organic shares obtained were most likely overestimated due to the survey's answering format.[17] Consequently, I chose ranges with high cut-off points for the categorizations of consumer

[17] For instance, indicating to have bought the organic alternative in a certain product category once out of the last five times corresponded to an organic share of 20%, which was more than double the Austrian average (Willer & Lernoud, 2019).

segments. I additionally conducted analyses based on slightly different ranges to rule out distorting effects. Results were not adversely affected.

Table 8: Sample Characteristics

Characteristics and groups	Definitions	n	%
Gender			
Female		281	64%
Male		154	35%
Age group	*Years*		
Young	34 or below	118	27%
Middle	35 - 59	204	47%
Old	60 or above	113	26%
Level of income	*EUR per person in household*		
Low	1,500 or less	101	23%
Middle	1,501 - 2,250	168	39%
High	2,251 or more	121	28%
Level of formal education			
Low	Apprenticeship or lower	127	29%
Middle	Secondary school	121	28%
High	University or equivalent	176	40%
Consumer segment	*Organic share*		
NON	0 - 20	64	15%
OCC	21 - 60	175	40%
REG	61- 100	190	44%
Main grocery shopping outlet			
Supermarket		297	68%
Organic store		121	28%
Other		18	4%

Note: N = 436. Percentages may not add up to 100 due to rounding or item non-response.

3.4.2 Model Applicability

First, I assessed the multiple-item scales' inter-item reliabilities using the software SPSS. I obtained high reliability levels with regard to the TPB scales (ATT: .91; SBN: .98; INT: .92). The PBC scale was the only exception. It yielded a Cronbach's alpha value of .48. As reported by Yazdanpanah and Forouzani (2015), the alpha coefficient is regularly lowest for the PBC construct. In the present study, the lower coefficient was most likely caused by adapting Ajzen's (2011) established scale to include actual barriers towards buying organic food, which was recommended, for instance, by Scalco et al. (2017). Indeed, mid-income and

high-income respondents rated their PBC higher than low-income respondents did, confirming the importance to include price when utilizing the TPB in studies on organic food. For the established SKN scale, alpha was at .86, indicating high reliability. The newly-developed OKN scale yielded an alpha value of .53, which was presumably the result of dividing the scale into questions concerning product knowledge and label recognition. The remaining scales yielded decent internal reliabilities (*channel use*: .72; *channel trust*: .75). Second, following Nuttavuthisit and Thøgersen (2017), I tested the TPB's applicability by running several linear regression analyses iteratively (Table 9). Regression results confirmed that ATT, SBN, and PBC indeed affected the organic share of a consumer (ORG) only indirectly via INT. When adding INT as an IV in the second regression, ATT, SBN, and PBC all became non-significant predictors of ORG. Hence, the model's applicability was confirmed. ATT was the strongest predictor, while SBN was relatively the weakest (ATT: ß = .59, $p < .001$; SBN: ß = .15, $p < .001$; PBC: ß = .23, $p < .001$), confirming several previous findings (e.g., Scalco et al., 2017; Yazdanpanah & Forouzani, 2015).

Table 9: Theory of Planned Behavior Applicability Tests

						Unstand.Coeff.		Stand.Coeff.		
DV	IV	df	F	Sig.	R^2	B	S.E.	ß	t	Sig.
Regression 1		3, 416	63.349	.000	.314					
ORG	Constant					.473	.082		-5.757	.000
	ATT					.135	.015	.403	9.097	.000
	SBN					.037	.012	.134	3.097	.002
	PBC					.076	.017	.192	4.401	.000
Regression 2		4, 415	82.612	.000	.443					
ORG	Constant					-.294	.076		-3.859	.000
	ATT					.025	.017	.076	1.459	.145
	SBN					.015	.011	.053	1.33	.184
	PBC					.024	.017	.060	1.452	.147
	INT					.147	.015	.557	9.833	.000
Regression 3		1, 424	332.24	.000	.439					
ORG	Constant					-.146	.041		-3.591	.000
	INT					.174	.010	.663	18.227	.000
Regression 4		3, 423	196.33	.000	.582					
INT	Constant					-1.18	.240		-4.925	.000
	ATT					.745	.044	.586	17.105	.000
	SBN					.154	.034	.150	4.477	.000
	PBC					.349	.051	.233	6.897	.000

3.4.3 Knowledge

I found a moderate correlation of $r = .31$ between OKN and SKN, which was closely aligned with Pieniak et al.'s (2010) result of $r = .29$. These authors conducted the first such analysis concerning organic food and confirmed the need to separate these two knowledge constructs (Flynn & Goldsmith, 1999; Moorman et al., 2004). In the present study, OKN and SKN positively affected ORG, both directly and indirectly via INT (Table 10), supporting H1a and H1b. Hence, consumers possessing high levels of knowledge about organic food tended to buy more organic food than less knowledgeable consumers, which was in line with both Mesías Díaz et al. (2012) and Nuttavuthisit and Thøgersen (2017). H1c was also supported. SKN was indeed a more important determinant of both ORG and INT than OKN, which confirmed initial evidence gathered by Flynn & Goldsmith (1999) and Pieniak et al. (2010).

Table 10: Extension of the Theory of Planned Behavior Model by the Variables Objective Knowledge and Subjective Knowledge

						Unstand.Coeff.		Stand.Coeff.		
DV	IV	df	F	Sig.	R^2	B	S.E.	ß	t	Sig.
Regression 1		5, 415	125.47	.000	.602					
INT	Constant					-1.046	.239		-4.369	.000
	ATT					.689	.045	.542	15.264	.000
	SBN					.125	.035	.124	3.550	.000
	PBC					.269	.051	.178	5.245	.000
	OKN					.340	.128	.089	2.655	.008
	SKN					.129	.036	.132	3.618	.000
Regression 2		3, 416	128.94	.000	.482					
ORG	Constant					.228	.044		-5.214	.000
	INT					.140	.011	.524	13.015	.000
	OKN					.121	.039	.118	3.085	.002
	SKN					.054	.010	.205	5.138	.000

The absolute level of knowledge among respondents was found to be limited, despite focusing on the country of Austria, which is characterized by one of the highest organic shares globally. On a scale from 1 (lowest) to 5 (highest), the segment of NON yielded a SKN value of 2.65 (SD = 1.16). For OCC and REG, the values amounted to 3.04 (SD = 1.03) and 3.91 (SD = 0.86) respectively. For OKN, the obtained values were even lower. Each segment lagged behind the attainable score of 1.0 (NON: M = 0.16, SD = 0.24; OCC: M = 0.27, SD = 0.27; REG: M = 0.43, SD = 0.26). While respondents indicated to have an average or above-average

level of knowledge about organic food, actual knowledge was marginal. Hence, a low level of knowledge has persisted over the years, which confirmed earlier indications by, for instance, Mesías Díaz et al., 2012, Nuttavuthisit & Thøgersen, 2017, and Padel & Foster, 2005. Since I found the level of knowledge to be positively associated with a consumer's organic share, the finding provides further support for the notion that educational efforts concerning organic food could have a significant impact on consumers' purchasing behaviors.

3.4.4 Channel Use and Channel Trust

In identifying promising means to increase consumers' levels of knowledge about organic food, I analyzed which channels consumers used to obtain information about food and to what degree consumers trusted the provided information. Overall, *channel use* was at M = 2.80 (SD = 0.73), while *channel trust* was at M = 3.24 (SD = 0.62). Hence, respondents collected food-related information only irregularly, but tended to trust the information that was provided to them. I calculated two ANOVAs to test for differences between segments (Table 11). I found that OCC and REG obtained information about food more often than NON. *Channel use* was even higher for REG than for OCC. H2a was thus supported. REG were deliberately overrepresented in the sample to allow for meaningful comparisons between segments. Hence, the already low *channel use* scores obtained in the sample could even be *higher* than the actual *channel use* scores in the population. Combined with the reported finding that the level of knowledge among respondents was marginal, most people indeed appear to make food purchasing decisions without much deliberation.

Table 11: Channel Use and Channel Trust per Consumer Segment

								Bonferroni	
DV	IV	df	F	Sig.	R^2	M	S.E.	Pairs	Sig.
ANOVA 1		2, 410	27.897	.000	.120				
Channel use	NON					2.401	.089	NON-OCC	.041
	OCC					2.658	.053	OCC-REG	.000
	REG					3.071	.051	REG-NON	.000
ANOVA 2		2, 406	11.421	.000	.053				
Channel trust	NON					3.030	.079	NON-OCC	.670
	OCC					3.142	.047	OCC-REG	.000
	REG					3.389	.044	REG-NON	.000

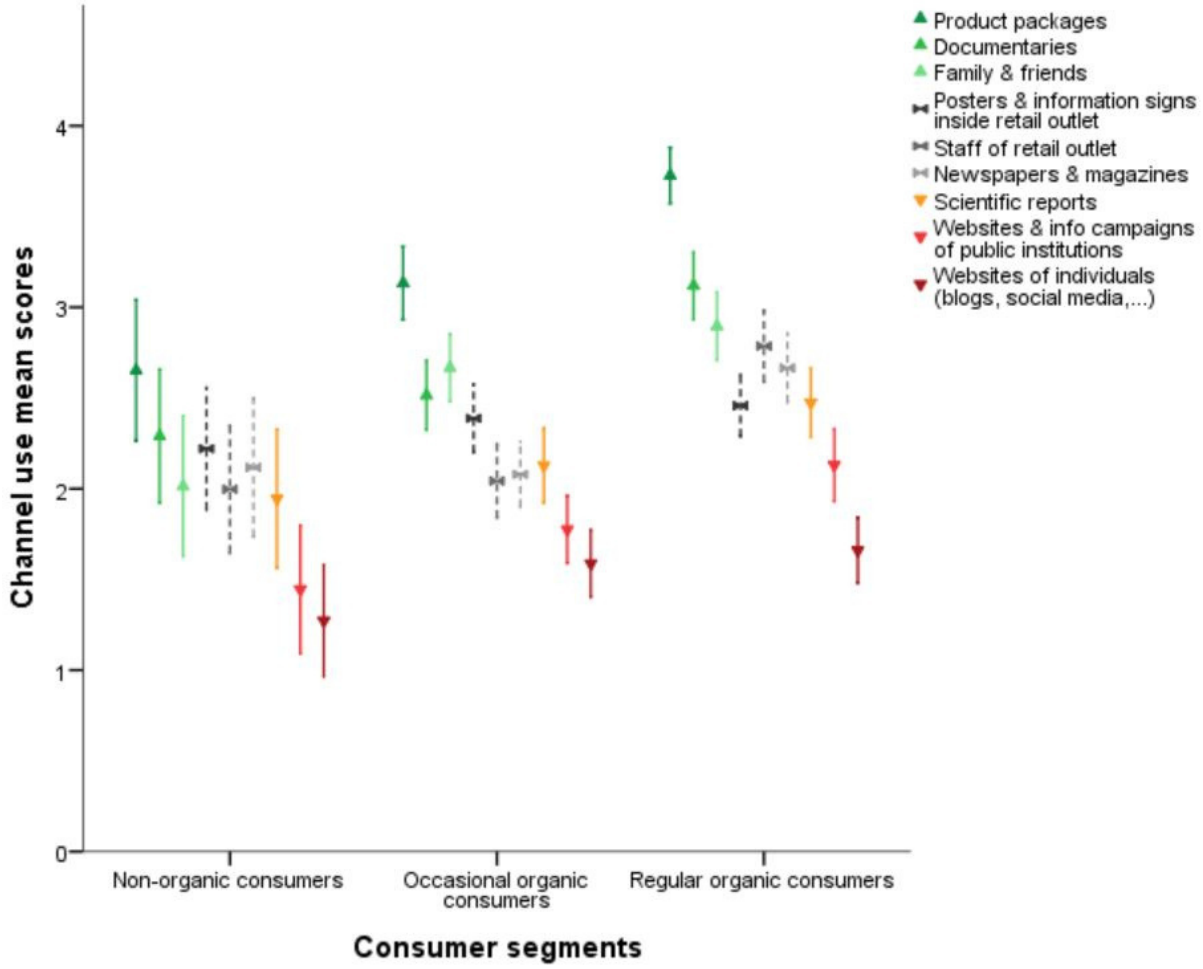
Channel trust scores were higher than *channel use* scores across segments. While the difference between NON and OCC was not significant, REG trusted the channels they were presented with to a higher extent than NON or OCC did. H2b was thus partially supported. Put differently, most consumers indeed seem to see grocery shopping as a low-involvement task (Aertsens et al., 2009), but tend to be open towards information presented to them. This matched earlier findings by Cerri et al. (2018) and highlighted once more how effective educating shoppers about organic food could be in inducing sales.

Subsequently, I calculated several ANOVAs to obtain initial evidence with regard to individual channels. I did find indications that the presented overall results extended to individual channels (Figure 1). However, channel differences were, at times, not significant at a .05-level, particularly concerning the segment of NON. Hence, the obtained results should be further validated before definite conclusions are drawn.

The channel *product packages* was used most often across segments, which was in line with Aertsens et al. (2011). *Documentaries* also ranked in the top three channels consistently (NON: rank 2; OCC: rank 3; REG: rank 2). In contrast, *websites & info campaigns of public institutions* and *websites of individuals* ranked last-but-one and last respectively. Next to insufficient targeting, which is addressed in the following section, this finding may partly explain the limited impact that informational campaigns by public institutions have had as of yet (Gleim et al., 2013).

The remaining channels varied in absolute and relative use across segments. While *posters & information signs inside retail outlets* showed high usage for both NON (rank 3) and OCC (rank 4), usage was (in relative terms) lower for REG (rank 7). *Family & friends*, on the other hand, ranked fifth for NON, but second for OCC, and third for REG. *Staff of retail outlet* ranked only sixth for both NON and OCC, but fourth for REG, which might have been (at least partly) attributable to the fact that most REG reported to shop at organic stores, whereas most NON and OCC reported to shop at supermarkets. Finally, *scientific reports* were not used regularly by either segment. This channel ranked seventh for NON, fifth for OCC, and sixth for REG.

Figure 1: Channel Use per Individual Channel and Segment



Note: The position of the arrow on the colored line marks the calculated channel use mean score of the individual channel. The length of the line illustrates the 95% CI. The CI is larger for NON than for OCC and REG due to the smaller n of NON in the sample. Both the chosen line colors and the directions of the arrows are used for readability purposes only.

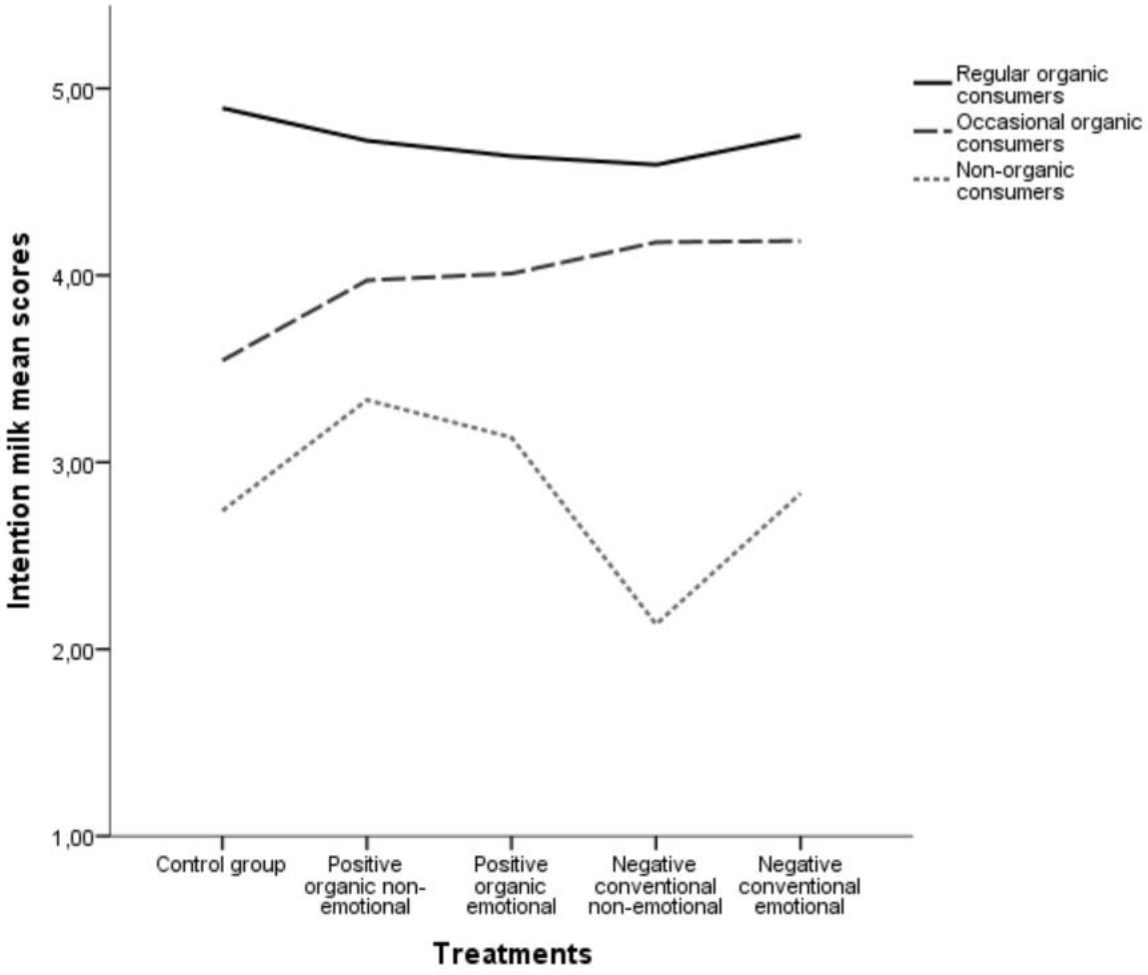
The indications of the channels' different relative importance for consumer segments point to an interesting conclusion. Most NON and OCC tend not to actively inform themselves about food, particularly not outside of the grocery shopping activity itself. Consequently, I postulate that targeting these consumers should be most effective inside grocery stores, particularly by utilizing posters and information signs. In fact, NON and OCC may even only be reached during their shopping activity. On the contrary, REG tend to actively look out for information on food. REG not only tend to be more involved than NON and OCC during grocery shopping itself, but they also place a notable significance on food in daily life. Of

course, REG can also be reached inside grocery stores, but rather through different channels such as competent staff and valuable information printed on product packaging.

3.4.5 Message Type

Finally, I explored concrete options of how to target consumer segments by means of an experiment that was built into the survey. As expected, the INT to buy organic milk (*'intention milk'*) was higher for REG (M = 4.70, SD = 0.76) than for OCC (M = 3.98, SD = 1.16, $p < .001$) and NON (M = 2.83, SD = 1.55, $p < .001$). The difference between OCC and NON was also significant ($p < .001$). The interaction *treatment group*consumer segment* was significant only at a .15-level ($p = .14$), which was most likely caused by a small n per sub-group. Hence, obtained results are regarded as indications that should be further validated.

Figure 2: Intention to Buy Organic Milk Across Treatments and Segments



As postulated, the treatments tended to have different effects dependent on the consumer segment (Figure 2). REG had the lowest dispersion of scores between treatments. For REG, neither positive messages about organic milk, nor negative messages about conventional milk significantly affected their *intention milk* scores. Emotionality of messages had no effect either. As expected, REG thus had high absolute *intention milk* scores independent of the treatment condition they were randomly assigned to.

In contrast, OCC's *intention milk* scores were raised by all four treatments, which provided support for H3b. Emotionality of messages, on the other hand, had no significant impact. Confronting OCC with positive messages about organic milk led to higher *intention milk* scores compared to those observed in the control condition, where subjects were not confronted with any message. Negative information about conventional milk yielded even higher *intention milk* scores. Both values were significant at a .10-level. While these findings imply that targeting OCC with informational messages could be promising for inducing organic sales no matter the type of message conveyed, negative messages about conventional milk could be even more effective than positive messages about organic milk. As a possible interpretation, OCC, who already buy a decent share of food in organic quality, might be wary about conventionally produced food to a certain extent and might thus be assured in their view, when provided with negative information about conventional products.

In contrast, conveying the same negative message about conventional milk to NON did not increase but decrease their intention to buy organic milk, at least if the message's tone was unemotional. If presented in emotional tone, the negative message had no significant effect. This led to two conclusions. First, the segment of NON was the only segment where the emotionality of presented messages had any effect. While this provided further support for H3a, I rejected the hypothesis nevertheless since the difference was not significant at a .10-level. Still, these results are an indication that Vega-Zamora et al.'s (2019) finding of emotional messages being more effective in influencing consumers with regard to organic food than rational messages may not be applicable to all consumer segments to the same extent. Second, contradicting the expectation by Aertsens, Verbeke et al. (2009) that negative information about conventional produce would break the habit of buying conventional food, confronting NON with negative information about conventional milk was even counterproductive. In fact, the negative message might have triggered a response of defiance since the information conveyed was in stark contrast to the current shopping habits of NON. On the other hand,

positive information about organic milk tended to raise NON's intention to buy it, independent of the message's emotionality. Still, the sub-groups of NON were too small to obtain significant results. The possible interpretation that targeting NON could be most effective when educating these shoppers about the benefits of organic food 'without a wagging finger' thus needs further validation.

3.5 Conclusion

The success of organic food depends on the consumer (Akaichi et al., 2019). However, most consumers are not able to make their daily grocery shopping decisions in an educated manner and thus tend to make purchasing decisions without much deliberation and mainly based on price considerations (Gleim et al., 2013; Reczek et al., 2018). It is against this background that I find that raising consumers' levels of OKN and SKN about organic food can be promising for inducing further organic food sales. Furthermore, I gather initial evidence that such efforts should be tailored to consumer segments. While REG should be reassured of their shopping behavior, I conclude that no extensive marketing measures are required for this segment. REG buy organic food on a regular basis already and tend to inform themselves about food proactively. Due to their established convictions, REG may not be appreciative of information they are confronted with.

In contrast, I consider breaking NON's habit of buying conventional food a long-term endeavor. Marketers should engage in cost-benefit analyses when deciding whether and how to target this segment, since skepticism and barriers towards organic food are significant among these consumers. Policy makers, who have an interest in raising the organic share in the general population, might thus be in a more favorable position to target these consumers as they are not mainly motivated by a particularly high return-on-investment as most private sector enterprises are. If marketers do aim to target NON, providing positive information about organic food appears most effective, particularly if done during grocery shopping.

The most promising target segment for inducing further organic food sales is the segment of OCC. These consumers display a positive attitude towards buying organic food, process more information about food than NON, and have already engaged in actual buying behavior of organic food. OCC lack the conviction or confidence, though, to buy (premium-priced) organic products more regularly (Buder et al., 2014). I expect that this barrier can be

overcome by targeted information (Padel & Foster, 2005). Indeed, I find that OCC welcome information conveyed to them. OCC may be best targeted similar to how NON are targeted, with the additional option to confront them with negative information about conventional food products, if feasible. Such efforts can play an important role in ensuring that OCC do not get stuck on their journey towards becoming REG themselves one day.

3.6 Limitations and Future Directions

The present study is subject to certain limitations. Approaching shoppers immediately after they have engaged in the activity they are being asked about provided valuable benefits, such as a high external validity. As many shoppers were pressed for time, though, a non-response error cannot be ruled out (Khare & Pandey, 2017). Further, as with most studies on organic food (Cerri et al., 2018; Lee & Hwang, 2016; van Doorn & Verhoef, 2015, among many others), the data obtained is self-reported. To minimize the associated risks, I assured the respondents of their anonymity and utilized a social desirability scale in the pilot study that revealed no biased answering patterns. Also, while ensuring a broad representation of shopper types sampled from the target population, store-intercept sampling may not allow for generalizations, particularly since an uneven distribution of consumer segments in the sample has contributed to some results not being statistically significant.

The present study provides contributions to the debate on how to induce organic food sales by overcoming the barrier of limited knowledge about organic food among consumers. One area in which I encourage future research is in conducting field experiments inside grocery stores to validate the obtained findings. This would overcome inherent limitations of surveys, such as correlational and self-reported data (Hwang & Chung, 2019; Vlaeminck et al., 2014). For another, research studies on organic food have either focused on a developed or on a developing country, which has made it difficult to compare findings. I focused on the mature organic food market of Austria. Future research would contribute to the scientific discourse by conducting a similar study in a cross-cultural setting (Hansen et al., 2018; Rana & Paul, 2017; Trivedi et al., 2018). Further, while I find a higher level of knowledge to be positively associated with the consumer's organic share, this relation may be bi-directional (Aertsens et al., 2011). The assumed direction, i.e., knowledge influencing behavior, has been based on Nuttavuthisit and Thøgersen (2017) and the often-validated innovation decision process by

Rogers (2010). Still, further insights into this relationship with regard to organic food might be valuable. Finally, changing habitual behaviors of consumers is a long-term task (Poore & Nemecek, 2018) that requires a bundle of measures (Hansen et al., 2018). In the present study, I explore how to induce further organic food sales by persuading consumers via the ELM's central route of thoughtful information processing. Another means could be in-store 'nudging' (Guyader et al., 2017; Lehner et al., 2016). As grocery shoppers frequently make buying decisions almost unconsciously (Dijksterhuis et al., 2005), i.e., via the ELM's peripheral route, the concept of nudging (Thaler & Sunstein, 2008) might be particularly promising.

4 How to Induce Sales of Sustainable and Organic Food: The Case of a Traffic Light Eco-Label in Online Grocery Shopping

Lambert Neumayr & Christoph Moosauer[18]

Food consumption is one of the major levers of a private household's environmental impact. However, grocery shoppers often lack the time, the involvement, or the necessary knowledge to accurately judge a food product's environmental friendliness. As a result, shoppers either forgo sustainability considerations completely or they rely on heuristic factors, for example the product's origin. In an attempt to empower grocery shoppers to make informed yet time-saving decisions, we explore the introduction of an eco-label to highlight a product's environmental footprint at a glance. We first conducted an online survey to determine the kind of eco-label design that would be the most promising for promoting sales of sustainable and organic food. Second, we conducted an online experiment to test the eco-label's effect on online shoppers' choices across four product categories. We find that the eco-label does indeed have a significant, partly subconscious, effect, particularly if the label has an intuitive, traffic light-colored design. The effect is greatest for low-involvement shoppers, a group that otherwise mainly bases its purchasing decisions on price. Even more promisingly, the greatest reductions are in product choices of the least sustainable product alternatives. In turn, organic food that complies with even stricter (environmental) regulations than those required by organic minimum standards are chosen significantly more often.

Keywords: Consumer behavior; Nudging; Online grocery shopping; Organic food; Sustainable diet; Traffic light eco-label

[18] Author contributions: Lambert Neumayr: conceptualization, methodology, validation, writing, supervision, project administration. Christoph Moosauer: formal analysis, investigation, data curation, visualization.

4.1 Introduction

The agricultural sector is one of the main contributors to greenhouse gas (GHG) emissions, biodiversity loss, agrochemical pollution, and soil degradation (e.g., Clark & Tilman, 2017; Reganold & Wachter, 2016; Vittersø & Tangeland, 2015). The main levers to reduce this negative impact consist of reduced meat consumption (e.g., Graham & Abrahamse, 2017; Poore & Nemecek, 2018; Scalco et al., 2017), minimized food waste (e.g., Lehner et al., 2016; Wollenberg et al., 2016), and a higher share of sustainable and organic production methods (e.g., Crowder & Reganold, 2015; Desquilbet et al., 2018; Reganold & Wachter, 2016). In this study, we focus on the latter.

Since organic food is recognized as being more sustainable than conventional alternatives (e.g., Akaichi et al., 2019; Puska et al., 2018; Reganold & Wachter, 2016), policy makers in the EU have set targets to increase the share of organic farming land to 25% by 2030 (European Commission, 2020). To achieve this, organic food sales must undergo a considerable increase, as they currently only account for a market share of less than 10% (Willer & Lernoud, 2019). Retailing strategies promoting organic food have met with a relative lack of success (Gleim et al., 2013; Vittersø & Tangeland, 2015). Some authors have even argued that traditional marketing methods may not be suitable for organic products, as shoppers have distinct motivations to buy them (Bezawada & Pauwels, 2013; Kareklas et al., 2014; Ngobo, 2011). Consequently, the question arises as to whether it is possible to help consumers make better food-related decisions both for themselves and for society at large (Maki et al., 2016), particularly as GHG emissions *"are significantly underestimated for foods, suggesting a possible blind spot suitable for intervention"* (Camilleri et al., 2019, p. 53; Hartikainen et al., 2014). As highlighted by Richter et al. (2018, pp. 2848–2849), though, *"we still know too little about the processes steering consumers towards pro-environmental food choices".*

A promising approach is the introduction of an eco-label. While several types of eco-label exist, there is one approach that stands out: carbon labeling. Based on a measurement of GHG emissions along a product's lifecycle, the purpose of a carbon label is to inform consumers about how their product choices affect the climate (Meyerding et al., 2019). However, such carbon labels have rarely been used and, where they have, they have failed to achieve the desired results (Demarque, Charalambides, Hilton, & Waroquier, 2015). Authors have argued that these labels, such as the Carbon Trust label used by Tesco in 2007, are too

complex for consumers to make sense of (e.g., Hartikainen et al., 2014; Meyerding et al., 2019; Thøgersen & Nielsen, 2016).

Therefore, our aim is to identify (1) what eco-label design might be the most promising in influencing grocery shoppers' product choices, (2) whether the introduction of an eco-label leads to a higher number of (a) sustainable food choices, (b) organic food choices, and (c) choices of organic food that complies with even stricter (sustainability) regulations than required by organic minimum standards, and (3) whether the effect size depends on shopper characteristics.

We first provide the theoretical background on food-related product choices and develop our hypotheses. In addressing them, we followed a two-stage, mixed-method approach. In the first stage, we conducted an online survey testing eco-label design alternatives with regard to shopper preferences and effectiveness in steering product choices (Section 4.3). In the second stage, we ran a randomized online experiment on online grocery shopping, testing the eco-label's impact on choices of sustainable and organic food products (Section 4.4). Finally, we provide an overarching conclusion by linking the findings from the two stages (Section 4.5) and suggest directions for future research (Section 4.6).

4.2 Theoretical Background and Hypotheses Development

4.2.1 Theoretical Background

Despite many shoppers underestimating the impact of their everyday consumption choices (Camilleri et al., 2019; Scalco et al., 2017), individuals play a decisive role in the transition towards a more sustainable food system (e.g., Klöckner, 2013; Maki et al., 2016; Poore & Nemecek, 2018). However, increased recognition of the need to act more sustainably has not resulted in major behavioral changes (Schmuck et al., 2018), leading to a value-action gap (e.g., Cerri et al., 2018; Reczek et al., 2018; Trivedi et al., 2018). People might be held back by barriers such as a premium price (e.g., Gleim et al., 2013; Hansen et al., 2018) or they might not see the connection between their own behavior and the negative impact on the environment and thus *"seem to act against their own moral standards"* (Bacon & Krpan, 2018; Falk & Szech, 2013, p. 707).

Effective communication of environmental information is one promising means of reducing this gap (Vlaeminck et al., 2014). Consumers have frequently been found to have little knowledge about sustainable or organic food products (e.g., Camilleri et al., 2019; Nuttavuthisit & Thøgersen, 2017; Vittersø & Tangeland, 2015). Hence, they often do not even realize which product alternative is the most sustainable (Cerri et al., 2018; Jungbluth et al., 2000) or else they do not understand what they are paying the premium for (e.g., Akaichi et al., 2019; Nuttavuthisit & Thøgersen, 2017). Even shoppers who plan to buy more eco-friendly products have to rely on individual factors, such as whether a product is locally-sourced, even though such indicators tend to be imperfect and, at times, even misleading, when it comes to assessing a product's environmental impact (Pedersen et al., 2018; Vlaeminck et al., 2014). Policy tools thus utilize comprehensive information campaigns, with the aim of increasing the level of knowledge and awareness among consumers (Byerly et al., 2018; Lehner et al., 2016).

However, food-related behavior is often not based on a deliberate evaluation of information (Kahneman, 2011). Rather, it is intuitive reasoning that prevails (Dijksterhuis et al., 2005; Puska et al., 2018). Grocery shoppers tend to make swift decisions and are not particularly involved (Thøgersen & Nielsen, 2016; Vega-Zamora et al., 2019). They have been shown to disregard the ethical or sustainable implications of their food choices, if not primed directly at the point of purchase (Grunert, Hieke, & Wills, 2014; Reczek et al., 2018). It is against this background that Thaler and Sunstein (2008, p. 8) coined the term *"nudge"*, defined as an act of purposefully altering people's behavior *"without forbidding any options or significantly changing their economic incentives"*. An eco-label might provide shoppers with additional information without taking up too much of their time or mental effort (Costanigro, Kroll, Thilmany, & Bunning, 2014; Wobker et al., 2015). The aim is that by simplifying the information about a product's environmental impact, it might become more salient, fitting in better with shoppers' information processing capabilities (Lehner et al., 2016). This could contribute to making the environmental issue *"seem near and relevant to personal behavior"* (Stoknes, 2014, pp. 170–171).

In one of the first studies on the subject, Vlaeminck et al. (2014) explored whether the introduction of an eco-label, which includes a comprehensive set of information, promotes eco-friendly choices. They indeed found that it had a positive effect, which triggered further research in this field. Thøgersen and Nielsen (2016) were among the first to study traffic light eco-labels by showing that extending the Carbon Trust label with traffic light colors increased

choices of sustainable ground coffee. This is supported by Meyerding et al. (2019) and Muller, Lacroix, and Ruffieux (2019), who showed that environmental front-of-pack labeling, particularly when using traffic light coloring, reduces the negative environmental impact of tomatoes and food baskets. However, not all studies found a significant effect. Emberger-Klein and Menrad (2018) and Grunert et al. (2014) argued that an eco-label is not a major decision factor for shoppers, and Hornibrook, May, and Fearne (2015) even found that carbon labels had no impact at all on sustainable choices.

Hence, while initial evidence does exist, research gaps remain. Importantly, there is no consensus yet on what concrete eco-label design is the most effective in steering sustainable food choices. Further, the effect of eco-labels on sales of organic food has only rarely been investigated. In particular, no study has explored a possible link to sales of organic food that is subject to additional (sustainability) regulation (e.g., Demeter). Finally, to our best knowledge, the present study is the first to investigate the effects of an eco-label in an online grocery shopping setting, something which is rapidly gaining in momentum and has experienced a further boost fueled by the COVID-19 lockdown restrictions (Harris et al., 2017; Singh & Rosengren, 2020).

4.2.2 Hypotheses Development

Labeling is essential for decreasing the information asymmetry between producers and shoppers (e.g., Janssen & Hamm, 2012; Perrini et al., 2010), and hence increasing the willingness of the latter to pay (Akaichi et al., 2019; Feucht & Zander, 2018). For labels to be effective, their design is crucial (Feucht & Zander, 2018; Meyerding et al., 2019). While some studies have argued that consumers display a more favorable attitude towards food products displaying detailed nutritional information (Rana & Paul, 2017) and that shoppers are usually interested in detailed information about a product's origin and environmental footprint (Cerri et al., 2018), the majority of studies have suggested that an eco-label should be comprehensible at a glance (e.g., Meyerding et al., 2019; Thorndike, Riis, Sonnenberg, & Levy, 2014; Vlaeminck et al., 2014). Hence, we postulate that effective eco-label designs should be kept as simple as possible. Shoppers lack both the ability and the willingness to engage in conscious deliberation (e.g., Lehner et al., 2016). We thus argue that shoppers will not be prepared to consider a diverse set of information for every choice they make in an everyday (online) grocery shopping setting.

Label intuitiveness might be further facilitated by utilizing traffic light colors (e.g., Feucht & Zander, 2018; Thorndike et al., 2014; Wilson et al., 2016). Such a color scheme is commonly used to communicate messages like 'stop', 'go' and 'be careful'. We can thus expect shoppers to be familiar with these colors and to regard them as intuitive (Reisch, Sunstein, & Gwozdz, 2017; Roberto et al., 2012). Traffic light colors could enable a facilitated comparison between product alternatives by creating mental shortcuts in a shopper's decision making. Unlike binary labeling schemes, which only award labels to products that surpass a given threshold, a traffic light eco-label indicates all product alternatives, including those with relatively inferior performance (Thøgersen & Nielsen, 2016). This may have an even stronger effect on product choice, as the shopper's attention is then explicitly drawn to a product's adverse attributes (Meyerding et al., 2019; Thøgersen & Nielsen, 2016). In this case, the eco-label might be perceived as a sort of 'stigma'.

H1 Shoppers prefer intuitive, traffic light eco-label designs to descriptive, monochrome eco-label designs as indicators of a food product's environmental friendliness.

While most (food) consumption is guided by purely egoistic motivations, organic food purchases are associated with a blend of egoistic and altruistic purposes (e.g., Hansen et al., 2018; Kareklas et al., 2014; Septianto et al., 2019). Indeed, many authors identify claims regarding organic food's healthiness (egoistic) and environmental friendliness (altruistic) as consumers' main motives to buy it (e.g., Hughner et al., 2007; Juhl et al., 2017; Teng & Wang, 2015). However, consumers continue to have doubts and question whether organic food is actually more sustainable than conventional food, and thus worth the premium price charged, since they find it difficult to judge organic food's actual level of sustainability (e.g., Nuttavuthisit & Thøgersen, 2017; Olson, 2017; Padel & Foster, 2005). Indeed, while recognized in general to be more sustainable than conventionally-produced food (Reganold & Wachter, 2016), not every organic product is necessarily more sustainable than its conventional alternative. While organic standards dictate sustainable production practices, factors like product origin or transport are not covered (Vittersø & Tangeland, 2015).

Without the option to rely on the eco-label, the environmental aspect of a purchasing decision should be both less salient and more difficult to assess for grocery shoppers. Consequently, the eco-label could have two positive effects on the number of sustainable

products chosen. For one thing, it could prime shoppers to include sustainability considerations into their product choices. For another, it could facilitate shoppers' assessments of which product alternatives are more sustainable than others. Without an eco-label, shoppers assess product sustainability by combining information on country-of-origin, organic or non-organic quality, seasonality, and similar factors, which can be cumbersome and prone to errors (Vlaeminck et al., 2014). We thus expect that an eco-label leads to higher choice probabilities for organic and sustainable food. Before postulating a corresponding hypothesis, however, one has to note that adding an eco-label to food choices will most likely lead to interaction effects between the eco-label and organic labels.

On the one hand, assuming a low to non-existing eco-label effect, it could be argued that organic labels already cover environmental information and shoppers would thus not benefit from the partly duplicated information provided by an eco-label design that is deliberately kept simple. While we do not expect this to be the case for the majority of grocery shoppers since many do have doubts about the environmental performance of organic food despite the existence of organic labels, we investigate this thought further in H6 when exploring eco-label effects on shopper sub-groups. On the other hand, it could be argued that the introduction of a salient eco-label could shift a shopper's attention away from the organic labels, potentially resulting in a negative effect on organic food sales. We do not expect such an effect either as, even if the shifted attention was true, the organic product should represent the more sustainable option in most cases anyhow. Still, this thought does pose the question of the eco-label's importance for a shopper's decision making process relative to organic labels and additional factors. As part of our investigation, we thus included a corresponding item into our experiment (Section 4.4).

Notwithstanding the above, we expect a positive eco-label effect on organic and sustainable food sales also due to an additional factor. Puska et al. (2018) argued that eliciting positive emotions in shoppers engaged in buying organic products can be a way to boost organic sales. While they recommend such means as emojis, we argue that a similar effect can be observed with eco-labels utilizing a traffic light color scheme. As postulated in H1, we expect traffic light designs to be preferred by shoppers, and we thus base our subsequent hypotheses on this notion. A shopper may experience a positive sensation by avoiding a red-labeled product and choosing a green-labeled one instead. We further argue that these effects should be observable both for products labeled as organic and for products having a small

environmental footprint despite not being certified as organic. Overall, we thus hypothesize the following:

H2 Introducing a traffic light eco-label in online grocery shopping leads to an increased choice of organic food products.

H3 Introducing a traffic light eco-label in online grocery shopping leads to an increased choice of sustainable food products.

Organic food standards are not homogenous. While policy regulation has led to binding minimum standards for all products labeled as organic, some farmers and producers voluntarily comply with additional certification guidelines set up by public or private organizations requiring stricter standards (Janssen & Hamm, 2012). Such labels are gaining momentum as convinced organic shoppers increasingly fear a *"conventionalization"* of organic agriculture (Desquilbet et al., 2018, p. 195). The oldest of these organizations is the biodynamic agriculture movement, recognizable by the Demeter label (Reganold & Wachter, 2016). Demeter and similar organizations attach even higher significance to soil quality, farm autonomy, animal welfare, and environmental requirements (Desquilbet et al., 2018). However, only a fraction of organic products are labeled by these organizations and the majority of shoppers do not know what kind of production method they are supporting by buying such a premium-priced product. Thus, they tend to choose familiar, cheaper products instead. In a related study, Gerini et al. (2016, p. 486) investigated the effects of product labeling in relation to choices of eggs, however not including stricter organic labels, and found a *"diminishing marginal utility for added attributes"*. They argued that shoppers prefer a labeled product over a non-labeled one but, at the same time, they are not ready to pay a further mark-up for eggs labeled according to an even higher standard. While no study has previously explored the effect of eco-labels on sales of organic food that complies with additional regulations, we postulate that an eco-label could communicate these products' positive (environmental) attributes more effectively and thus promote sales.

H4 Introducing a traffic light eco-label in online grocery shopping leads to an increased choice of organic food products that comply with stricter sustainability regulations than required by organic minimum standards.

Lastly, we hypothesize that an eco-label's effect is dependent on the shopper's characteristics. We cover three characteristics in particular: organic share, level of knowledge about organic labels, and environmental concern (EC). As hypothesized by Trivedi et al. (2018) and Cerri et al. (2018), there may be differences in receptivity to sustainable product information claims, depending on the consumer's level of EC. Similarly, Richter et al. (2018) and Hansen et al. (2018) argued that shoppers with experience of sustainable or organic food are more likely to be both willing and able to process product information, which should decrease the experienced benefit of an intuitive eco-label for this group. The same should be true for shoppers possessing high knowledge about organic labels since these shoppers could recognize that organic labels already include environmental information. In line with this argumentation, both Lehner et al. (2016) and Cerri et al. (2018) postulated that nudging is a promising strategy for people with little prior involvement with the respective subject, making environmental information more accessible to them. Still, while green shoppers may indeed be more involved in food shopping, Thøgersen, Jørgensen, and Sandager (2012, p. 194) found that these consumers are *"as motivated as everybody else to minimize time and effort at the point of purchase"*. Thøgersen and Nielsen (2016) even found that an eco-label has a greater effect on shoppers with a high EC. However, given the rather non-intuitive eco-label design studied, this could have been caused by the label's design and might not be applicable generally. Consequently, we postulate that while the introduction of an intuitive eco-label should have a positive effect across sub-groups of shoppers, the effect may be particularly pronounced among certain shoppers.

H5 Introducing a traffic light eco-label in online grocery shopping has a stronger effect on shoppers having a low organic share.

H6 Introducing a traffic light eco-label in online grocery shopping has a stronger effect on shoppers possessing a low level of knowledge about organic labels.

H7 Introducing a traffic light eco-label in online grocery shopping has a stronger effect on shoppers having low levels of EC.

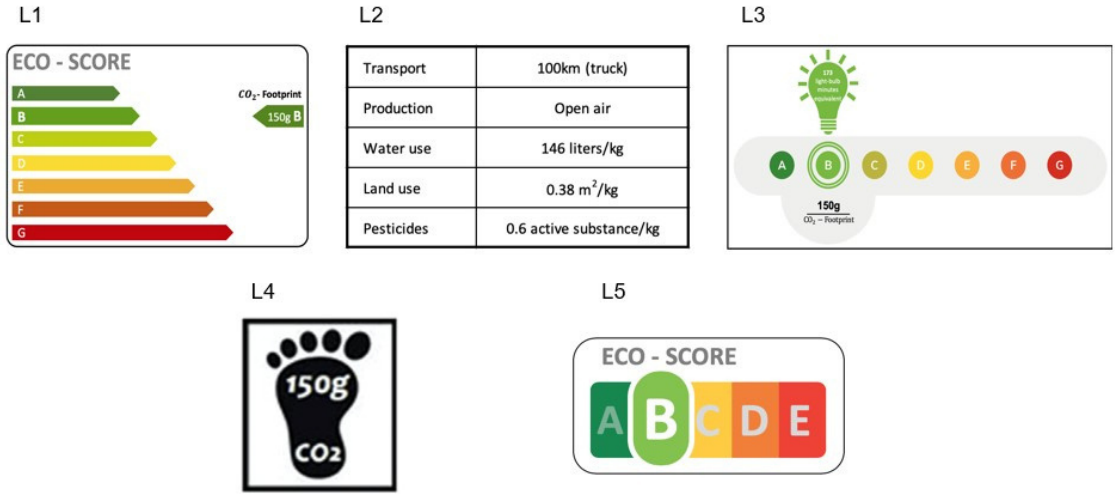
4.3 Online Survey

4.3.1 Data Collection and Study Design

The survey was conducted in Germany in April 2020 using Qualtrics software. We pursued a quota sampling approach with the aim of reaching a sample of 50 grocery shoppers characterized by an even distribution across gender and age groups (e.g., Sarstedt, Bengart, Shaltoni, & Lehmann, 2018; Tarkiainen & Sundqvist, 2005; Trivedi et al., 2018). Due to the within-subject design chosen (Charness, Gneezy, & Kuhn, 2012), a high number of data points was gathered per respondent, which allowed for meaningful analyses despite the comparatively low specified number of respondents.

The survey consisted of three parts. The first part assessed the respondents' EC and socio-demographic characteristics. EC was measured using a five-item scale adopted from Thøgersen, Haugaard, and Olesen (2010). Respondents had to indicate their level of agreement with five statements concerning their personal habits and opinions on environmental issues. In the second part, respondents were confronted with five product choice screens containing two apples each. Respondents had to choose one apple over the other on each screen. The apple image was the same each time; the only difference was the design of the attached label. The approach is outlined by Vlaeminck et al. (2014). The designs used are reported in Figure 3 and comprise both previously used labels (L1, L2, L4) (e.g., Feucht & Zander, 2018; Meyerding et al., 2019; Vlaeminck et al., 2014) and self-designed labels informed by insights on potentially effective label characteristics obtained from the literature (L3, L5) (Camilleri et al., 2019; Egnell, Talati, Hercberg, Pettigrew, & Julia, 2018; Feucht & Zander, 2018). Each label was presented twice, once indicating high environmental friendliness (150g CO2e, Meyerding et al., 2019) and once indicating low environmental friendliness (918g CO2e, Feucht & Zander, 2018). As not all labels included a specific CO2e value, high environmental friendliness was illustrated by a 'B'-classification, while low environmental friendliness corresponded to a 'D'. Finally, respondents had to indicate their level of agreement with six usability statements for each label design. The statements were translated from INFO (2019) and included statements such as 'the label is informative' or 'the label is quick and intuitive to understand'. The survey can be found in Appendix B.

Figure 3: Eco-Label Design Alternatives



Note: All five labels in the figure indicate the same (high) level of environmental friendliness. Respondents were additionally confronted with the same labels indicating a low level of environmental friendliness instead.

4.3.2 Results and Discussion

We analyzed the respondents' eco-label design ratings first. Calculating paired sample t-tests, we found that traffic light labels (L1 = 1,224, L3 = 1,305, L5 = 1,276) received significantly higher scores than descriptive, monochrome labels (L2 = 812, L4 = 836; $p < .001$ each). Respondents indeed preferred traffic light designs as indicators of environmental friendliness, supporting H1. This result confirms findings by Vlaeminck et al. (2014), who concluded that the tabular and descriptive design of L2 is of low effectiveness, and the findings by Thøgersen and Nielsen (2016), Meyerding et al. (2019), and Muller et al. (2019), who argued that color coding improves label effectiveness.

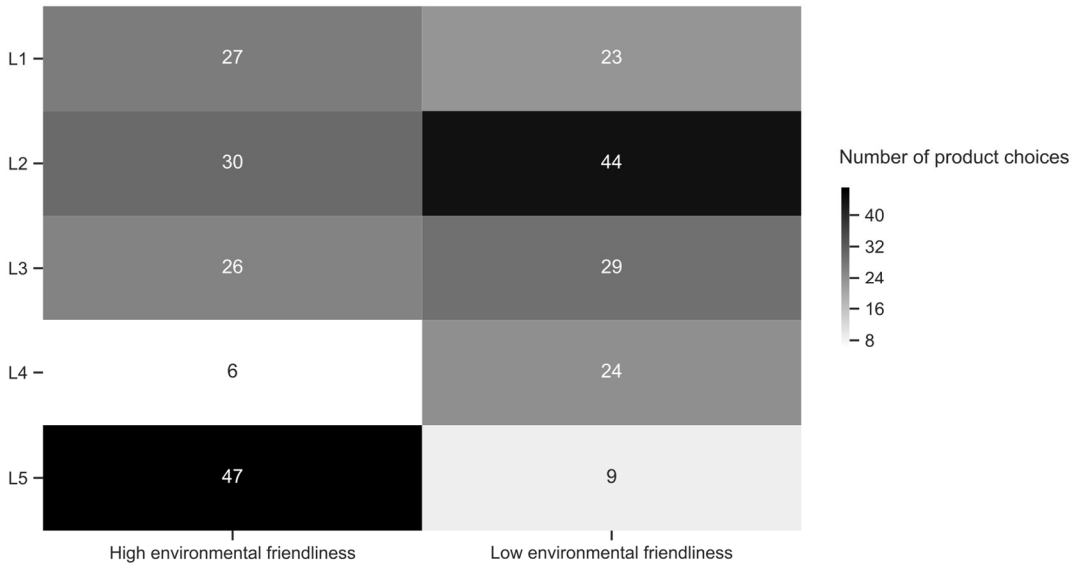
Analyzing the differences between the traffic light labels, L1 was rated below both L3 and L5. The scores of L3 and L5 were not significantly different to each other ($p = .40$ (n.s.)). Hence, respondents preferred these two labels over the remaining ones, although they had no strong preference for either of the two. L5 had the highest ratings with regard to the use of clear colors and symbols and having a simple graphic design. These scores came at the expense of a slightly lower informativeness rating. However, given that L5 was the only label without any concrete information, such as a CO2e value, perceived informativeness was still surprisingly high, particularly as the respondents were under no time pressure and were thus considered more likely to process the information presented, which should have favored descriptive labels (Richter et al., 2018; Thøgersen et al., 2012). The positive reception of L5 supported findings

from the nutritional research domain, where the Nutri-Score label was identified as the best-performing front-of-package design (Egnell et al., 2018; INFO, 2019), and is consistent with Richter et al. (2018) and Thøgersen and Nielsen (2016), who argued that information presented to grocery shoppers should be short and simple to be effective.

Performing a correlation analysis between a respondent's EC and his or her rating of labels yielded low to moderate associations. There was a positive correlation between high-EC respondents and scores of L2 and L3, but a low negative correlation to L5's score. This leads to the interpretation that high-EC respondents had a better understanding of the food's environmental impact and valued the additional information provided by L2 and L3. In turn, these respondents might have had fewer positive attitudes towards L5, due to the label's limited specific information, which would be consistent with Cerri et al. (2018). We explore these indications further in Section 4.4.3.3.

Product choices were additional data points used together with respondents' ratings of design alternatives in deciding which label to include in the online experiment (Figure 4). An eco-label that is effective in influencing a respondent's behavior should promote a product choice when the label indicates high environmental friendliness and deter the same choice when indicating low environmental friendliness.

Figure 4: Number of Product Choices per Eco-Label Design Alternative



Note: Each respondent made five choices, resulting in a total of 265 choices. Each label was included twice, leading to a maximum of 53 attainable choices at each indicated level of environmental friendliness for the respective label.

Several findings stood out. L5 was by far the most effective label. While the apple labeled L5 was chosen 47 times when the label indicated high environmental friendliness, the apple was only chosen 9 times when it indicated low environmental friendliness. Respondents thus understood the information provided by the label and also acted upon it. Given the simple design of the product choice screens, it is possible that respondents made swift, non-deliberate choices, such as shoppers generally do in everyday settings (Thøgersen et al., 2012; Vega-Zamora et al., 2019). In this context, an intuitive signal is often more effective at influencing decisions than detailed information (Costanigro et al., 2014; Reczek et al., 2018; Richter et al., 2018). In contrast, L1 and L3 were regularly chosen, whether they indicated high or low environmental friendliness. Hence, while respondents seemed to prefer traffic light labels and thus chose products labeled accordingly, L1 and L3 were not effective in deterring low-sustainability choices. Apples labeled with L2 were chosen even more often. However, contrary to the aim pursued by an eco-label, respondents chose apples labeled L2 more often when the label indicated low environmental friendliness. The same was true for L4. Respondents were thus arguably not able to make sense of the information presented by these labels (Hartikainen et al., 2014; Meyerding et al., 2019; Thøgersen & Nielsen, 2016).

Consequently, label L5 was selected for the online experiment, based on a combination of a high respondent rating and the most effective influence on product choices.

4.4 Online Experiment

4.4.1 Data Collection and Sample Characteristics

Data was collected in Germany and Austria from May to June 2020. Due to the COVID-19 pandemic and the study's focus on online grocery shopping, an online experiment using the software Unipark was preferred over alternate methods (Horton, Rand, & Zeckhauser, 2011). As recommended by several authors (e.g., Harrison & List, 2004; Takahashi, Todo, & Funaki, 2018; Viktoria Rampl et al., 2012), we did not use a student sample, since students were found not to be representative of the target population of grocery shoppers and to not have sufficient experience of grocery shopping. Rather, we recruited subjects through social media channels, employing a quota sampling approach similar to that used in previous studies investigating the effectiveness of labels (e.g., Egnell et al., 2018; Feucht & Zander, 2018; Thøgersen & Nielsen, 2016).

Table 12: Sample Characteristics, Including Chi-Square Tests of Independence

Characteristics	Total		Control		Treatment			
	n	%	n	%	n	%	Chi-square	*p*
Gender								
Male	163	42	85	43	78	41	X^2= 0.08	.77
Female	225	58	114	57	111	58		
Age group								
18-24	68	17	38	19	30	16		
25-34	75	19	32	16	43	23		
35-44	68	17	42	21	26	14	X^2= 8.20	.15
45-54	95	24	51	26	44	23		
55-64	42	11	20	10	22	12		
Over 65	42	11	17	9	25	13		
Household net income								
Below 1,000	30	8	15	8	15	8		
1,000 - 1,999	65	17	36	18	29	15		
2,000 - 2,999	76	19	40	20	36	19		
3,000 - 3,999	55	14	22	11	33	17	X^2= 5.70	.58
4,000 - 4,999	55	14	27	14	28	15		
5,000 - 5,999	32	8	16	8	16	8		
Over 6,000	30	8	19	10	11	6		
Environmental concern								
Low	102	26	48	24	54	29		
Medium	122	31	66	33	56	30	X^2= 1.45	.70
High	69	18	34	17	35	19		
Very high	95	24	51	26	44	23		
Segment (organic share, %)								
Non-organic (0-25)	79	20	45	23	34	18		
Light organic (26-45)	82	21	41	21	41	22	X^2= 1.49	.69
Occasional organic (46-69)	128	33	62	31	66	35		
Regular organic (70-100)	101	26	52	26	49	26		
Knowledge								
Low	296	76	152	80	144	76	X^2= 0.00	.96
High	94	24	48	25	46	24		
Grocery shopping								
Somewhat responsible	93	24	45	23	48	25		
Mostly responsible	141	36	71	36	70	37	X^2= 0.77	.68
Fully responsible	156	40	84	42	72	38		

*Note: N = 390 (control: n = 200; treatment: n = 190). Non-responses excluded. *p < .1; **p < .05; ***p < .01.*

Quotas were set to align the sample's distribution to the age distribution of online grocery shoppers in Germany, whereby the youngest age group ('18-24') was slightly overrepresented at the expense of the oldest age group ('over 65'). To prevent self-selection by the subjects, for instance, when subjects have distinctly favorable or unfavorable attitudes towards sustainability or organic food, the topic communicated in the study was kept neutral (Pedersen et al., 2018). Further, we did not offer any participation incentive other than a small charitable contribution for each experiment completed. To be included in the sample, subjects had to be over 18 years old and to have at least some responsibility for grocery shopping (e.g., Akaichi et al., 2019; Julia et al., 2016). We also screened for completion time outliers. Implementing these conditions on 402 completed experiments resulted in a sample size of 390 subjects (Table 12). Chi-square tests of independence revealed that there were no significant differences in the control variables between the control and the treatment groups. This maximized the validity of the randomized design and eliminated the risk of confounders (e.g., Charness et al., 2012; Podsakoff & Podsakoff, 2019; Vlaeminck et al., 2014).

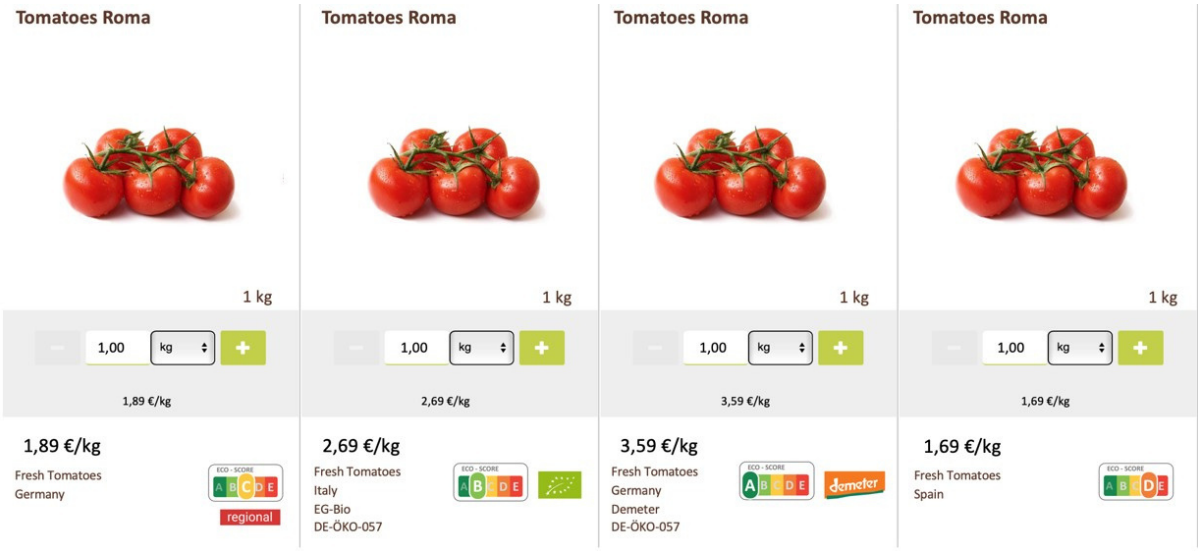
4.4.2 Study Design

We employed a randomized between-subject design with one control condition (n = 200) and one treatment condition (n = 190). After making reference to the anonymity and confidentiality of the responses, we asked the subjects to imagine as accurately as possible that they were in an online grocery shopping situation; this was facilitated by visuals and contextual questions (Harrison & List, 2004). Subsequently, subjects were confronted with four product choice screens, one screen at a time, in which they had to choose one product per screen. Since shopper decisions can depend on the type of product (Bezawada & Pauwels, 2013), we included several different products, these being tomatoes, apples, pasta, and milk (e.g., Emberger-Klein & Menrad, 2018; Meyerding et al., 2019; Vlaeminck et al., 2014). The screens were designed to resemble an actual online shopping interface. Subjects under both conditions saw exactly the same screens, the only distinction being that the treatment group was additionally presented with the eco-label from the online survey alongside each product alternative (Figure 5), while the control group saw no eco-label. Importantly, the treatment group was not explicitly made aware of the eco-label at any point.

Each screen contained two organic products, one that met EU organic labeling requirements ('*organic (low)*') and one that met even stricter standards, as required by Demeter

('*organic (high)*'), as well as two conventional products, referred to either as '*conventional (low)*' for low sustainability or '*conventional (high)*' for comparatively high sustainability. Based on Vlaeminck et al. (2014), the set price levels corresponded to actual prices in German supermarkets and online food shops at the time of the study. Additional information given included product origin and a self-designed label highlighting regional produce. In the case of the treatment condition, the product classification on the eco-label scale followed a calculation of life-cycle GHG emissions, which can be found in Appendix D.

Figure 5: Product Choice Screen for Tomatoes



Note: First of four product choice screens in the treatment condition, i.e., including the eco-label.

Upon completion of the product choice tasks, we asked the subjects to rank the relative importance of the factors of price, origin, and the presence of an organic label, eco-label (treatment condition) and regional label in their decision making process. Further, we asked them to rank the product alternatives from the choice task concerning milk from most sustainable to least sustainable. Finally, we assessed several control variables. We measured EC by using the same scale as in the pre-study (Thøgersen et al., 2010) and obtained a Cronbach's alpha value of .86, indicating high construct reliability. Based on the subjects' ratings, we calculated quartiles to segment the subjects into low, medium, high, and very-high EC segments. We assessed organic share by utilizing a scale from Nuttavuthisit & Thøgersen (2017), asking subjects, for five different product categories, how often in the last five times they bought the respective products they chose organic ones (Cronbach's alpha = .88). Based on the resulting scores, we divided subjects into similar segments as did Bartels and van den Berg (2011) and Pedersen et al. (2018) (see Table 12). We examined subjects' levels of

knowledge of organic labels by presenting them with three statements about different organic guidelines (EU organic label, Bioland, and Demeter), which they had to assign to the corresponding labels. Subjects were considered to have either high knowledge (two or three correct answers) or low knowledge (less than two correct answers). Lastly, we asked for socio-demographic characteristics such as age, gender, and household income. The experiment can be found in Appendix C.

4.4.3 Results and Discussion

We used a broad set of analyses and statistical procedures in testing our hypotheses. First, we investigated whether the introduction of the eco-label led to a higher number of different types of organic food choices by using t-tests and Mann-Whitney U tests (e.g., Muller et al., 2019). Second, we examined the eco-label's effectiveness depending on the concrete product studied and the provided sustainability information by utilizing Mann-Whitney U tests and Chi-square tests of independence (e.g., Vlaeminck et al., 2014). Subsequently, we used Mann-Whitney U tests and descriptive statistics to explore whether and how the overall results extended to different sub-groups. Lastly, we analyzed the relative importance of the product choice determinants and gathered insights on the eco-label's principle of operation in affecting subjects' product choices by relying on Poisson and multiple regressions models (e.g., Cameron & Trivedi, 2013) and Friedman rank tests (e.g., Feucht & Zander, 2018).

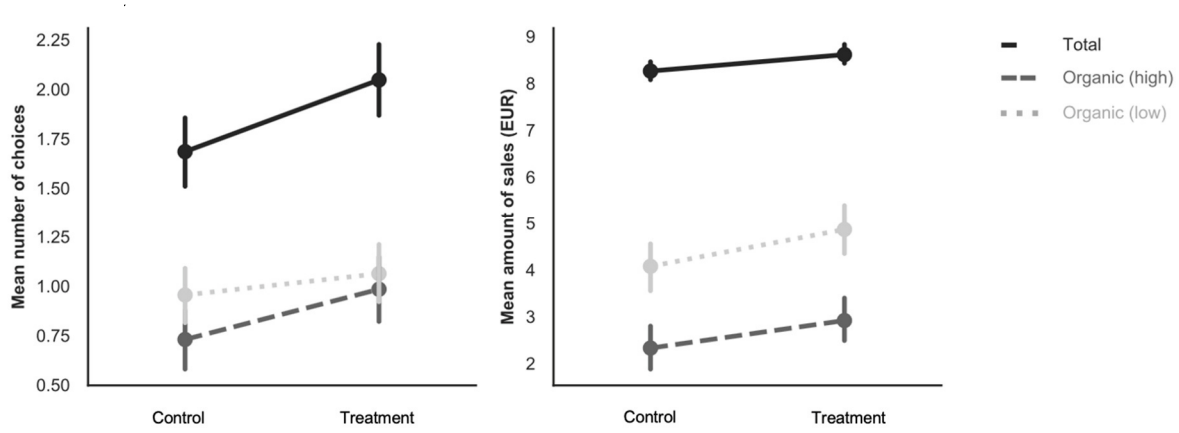
4.4.3.1 Choices of Organic Products

First of all, we compared the total organic product choices for each of the conditions, in which we combined choices of *organic (low)* and *organic (high)* products. As reported in Figure 6, organic choices in the treatment condition (M = 2.05, SD = 1.30) were higher than in the control condition (M = 1.69, SD = 1.30). The difference was highly significant, $t(388) = 2.76$, $p = .006$, supporting H2. The inclusion of the eco-label indeed led to a higher number of organic choices. We then analyzed *organic (low)* and *organic (high)* choices separately. While *organic (low)* choices were slightly higher for the treatment group (M = 1.06, SD = 1.01) than for the control group (M = 0.96, SD = 0.97), the difference was particularly noteworthy for *organic (high)* choices (M = 0.98, SD = 1.12 vs M = 0.73, SD = 1.05). A Mann-Whitney U test, confirmed the significant difference, $U = 16284$, $p = .007$, thereby supporting H4. The inclusion of the eco-label indeed resulted in additional *organic (high)* choices. In contrast, the absolute number of choices of *conventional (low)* products was considerably lower in the treatment condition (108) than in the control condition (170). *Conventional (high)* choices

yielded a similar, yet less pronounced, difference (263 vs 293). Taken together, these results indicate that while the inclusion of the eco-label leads to similar effects across product alternatives, the eco-label tends to steer subjects away from distinctly environmentally unfriendly products and towards particularly environmentally friendly ones. Put differently, the introduction of an eco-label may increase trust in organic food as a more sustainable alternative to conventional produce (Crowder & Reganold, 2015; Septianto et al., 2019), which could increase demand for organic food even further.

Due to the premium price of the organic products chosen, we also observed significantly higher sales. While sales stood at M = EUR 8.26 (SD = EUR 1.34) in the control condition, they amounted to M = EUR 8.61 (SD = EUR 1.37, $p = .022$) for the treatment group. Consequently, while the introduction of an eco-label would come at a cost for producers and retailers, these stakeholders might in fact benefit from the resulting increase in sales of organic and sustainable products (Gleim et al., 2013; Vittersø & Tangeland, 2015), particularly as margins on organic products tend to be higher than on conventional alternatives (Crowder & Reganold, 2015).

Figure 6: Comparison of Organic Product Choices and Sales Between Groups



*Note: N = 390. Total comprises both organic (low) and organic (high) products. Sales calculated as products chosen * price per product.*

4.4.3.2 Choices of Sustainable Products

As illustrated in Table 13, we analyzed whether eco-label effectiveness depends on product category (Septianto et al., 2019) and provided sustainability information. Chi-square tests of independence confirmed significant associations between the eco-label and all four categories. In the treatment condition, organic products were chosen more often than in the

control condition in the categories of tomatoes, pasta, and milk. With tomatoes, the difference between conditions was about the same (8% each) for both *organic (low)* and *organic (high)*. Indeed, these two alternatives had an identical GHG emission level. For pasta, the *organic (low)* alternative showed a considerably higher difference between conditions (12%) than the *organic (high)* alternative (3%). Subjects might not have valued the additional benefit of choosing the *organic (high)* product, since most subjects rarely buy pasta in organic quality. The opposite was true for milk, where the *organic (high)* product showed the biggest difference of all production methods (14%).

The only exception to the pattern of a higher number of organic choices in the treatment condition was the category of apples. Although the treatment group chose *organic (low)* apples less often (-8%), they chose the *conventional (high)* alternative to a significantly higher extent (15%). This might in fact be further evidence of the eco-label's effectiveness. Taking into account that *organic (low)* apples had a worse eco-label score than *conventional (high)* apples, subjects were again steered towards the more environmentally friendly option. While the control group was possibly misguided by the EU organic label, the treatment group, who additionally saw the eco-label, made a different decision. This was the only incidence built into the experiment in which the indicated sustainability did not increase steadily from *conventional (low)* to *organic (high)*. Subjects' product choices indeed changed correspondingly. This result might be both an indication of the eco-label's effectiveness and for the interpretation that subjects based their decisions more on products' environmental friendliness than on organic quality, providing first support for the raised assumption that an intuitive and salient eco-label could overlay organic labels. Therefore, potential boomerang effects have to be taken into account in cases where the organic alternative is the inferior choice to a conventional product in terms of sustainability (Richter et al., 2018).

We made comparable observations for product choices concerning tomatoes and milk. The control group chose the product with an attached regional label more often than the treatment group did, which additionally saw the eco-label that indicated a higher sustainability for a different product. Subjects in the control group may have mistakenly assumed that the regional label indicated the most sustainable choice. Hence, it seems as if subjects used both the regional and the organic label as heuristics for environmental friendliness (Costanigro et al., 2014; Vlaeminck et al., 2014). The inclusion of an eco-label might thus reveal information that would otherwise either be disregarded or (potentially wrongly) derived on the basis of

other product attributes. This is a noteworthy finding, particularly since no subject was familiar with the eco-label, as it was being used for the first time and had not been introduced as part of the experiment either.

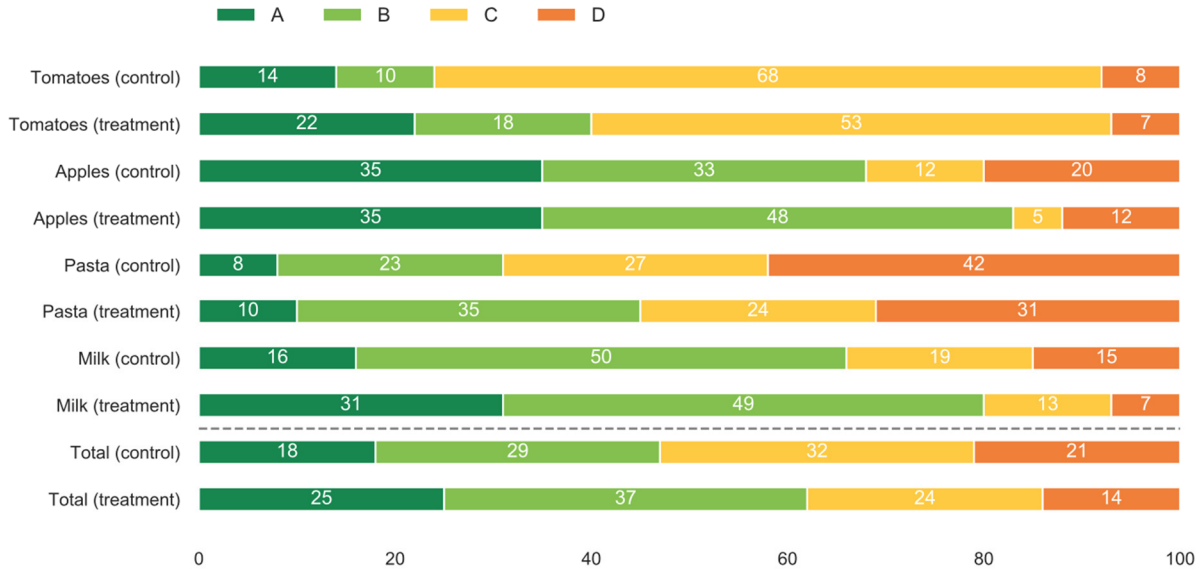
Table 13: Comparison of Product Choices Between Conditions, Product Categories, and Production Methods

Product	Price	GHG (kg CO2e)	Frequency		Share		
			Control	Treatment	Control	Treatment	Delta
Tomatoes	*per kg*						
Conventional (low)	1.69 €	0.43	15	13	8%	7%	-1%
Conventional (high)	1.89 €	0.41	136	101	68%	53%	-15%
Organic (low)	2.69 €	0.38	20	34	10%	18%	8%
Organic (high)	3.59 €	0.38	29	42	15%	22%	8%
			$\chi2$ (3, 390) = 11.07, p = .01**				
Apples	*per kg*						
Conventional (low)	2.49 €	0.37	41	23	21%	12%	-8%
Conventional (high)	2.69 €	0.25	65	91	33%	48%	15%
Organic (low)	2.99 €	0.35	25	9	13%	5%	-8%
Organic (high)	3.99 €	0.24	69	67	34%	35%	1%
			$\chi2$ (3, 390) = 16.71, p = .001***				
Pasta	*per 0.5kg*						
Conventional (low)	1.39 €	1	84	58	42%	31%	-11%
Conventional (high)	1.59 €	0.95	55	46	28%	24%	-3%
Organic (low)	1.99 €	0.9	46	66	23%	35%	12%
Organic (high)	2.49 €	0.85	15	20	8%	11%	3%
			$\chi2$ (3, 390) = 9.60, p = .02**				
Milk	*per piece*						
Conventional (low)	0.99 €	1.1	30	14	15%	7%	-8%
Conventional (high)	1.19 €	1	37	25	19%	13%	-5%
Organic (low)	1.29 €	0.95	100	93	50%	49%	-1%
Organic (high)	1.49 €	0.9	33	58	17%	31%	14%
			$\chi2$ (3, 390) = 15.02, p = .002***				
Total							
Conventional (low)			170	108	21%	14%	-7%
Conventional (high)			293	263	37%	35%	-2%
Organic (low)			191	202	24%	27%	3%
Organic (high)			146	187	18%	25%	7%
			$\chi2$ (3, 390) = 19.79, p < .001***				

*Note: N = 390. *p < .1, **p < .05, ***p < .01.*

To investigate this further, product choices were compared on the basis of their eco-label classifications (Figure 7). Indeed, classifications indicating higher sustainability were chosen more often in the treatment condition than in the control condition across all product categories. Emissions in the treatment condition were significantly lower (Mdn = 2.53kg CO2e) than in the control condition (Mdn = 2.61kg CO2e), $U = 13573$, $p < .001$. This was a considerable difference, given that GHG emissions only ranged from 2.37kg to 2.90kg. Thus, the eco-label indeed steered subjects towards more sustainable alternatives, leading to support for H3. This result confirms findings by Vlaeminck et al. (2014), Thøgersen and Nielsen (2016), and Muller et al. (2019), who also found that a simplified labeling scheme positively influenced environmentally friendly food choices.

Figure 7: Comparison of Product Choices Between Groups, Product Categories, and Label Classifications

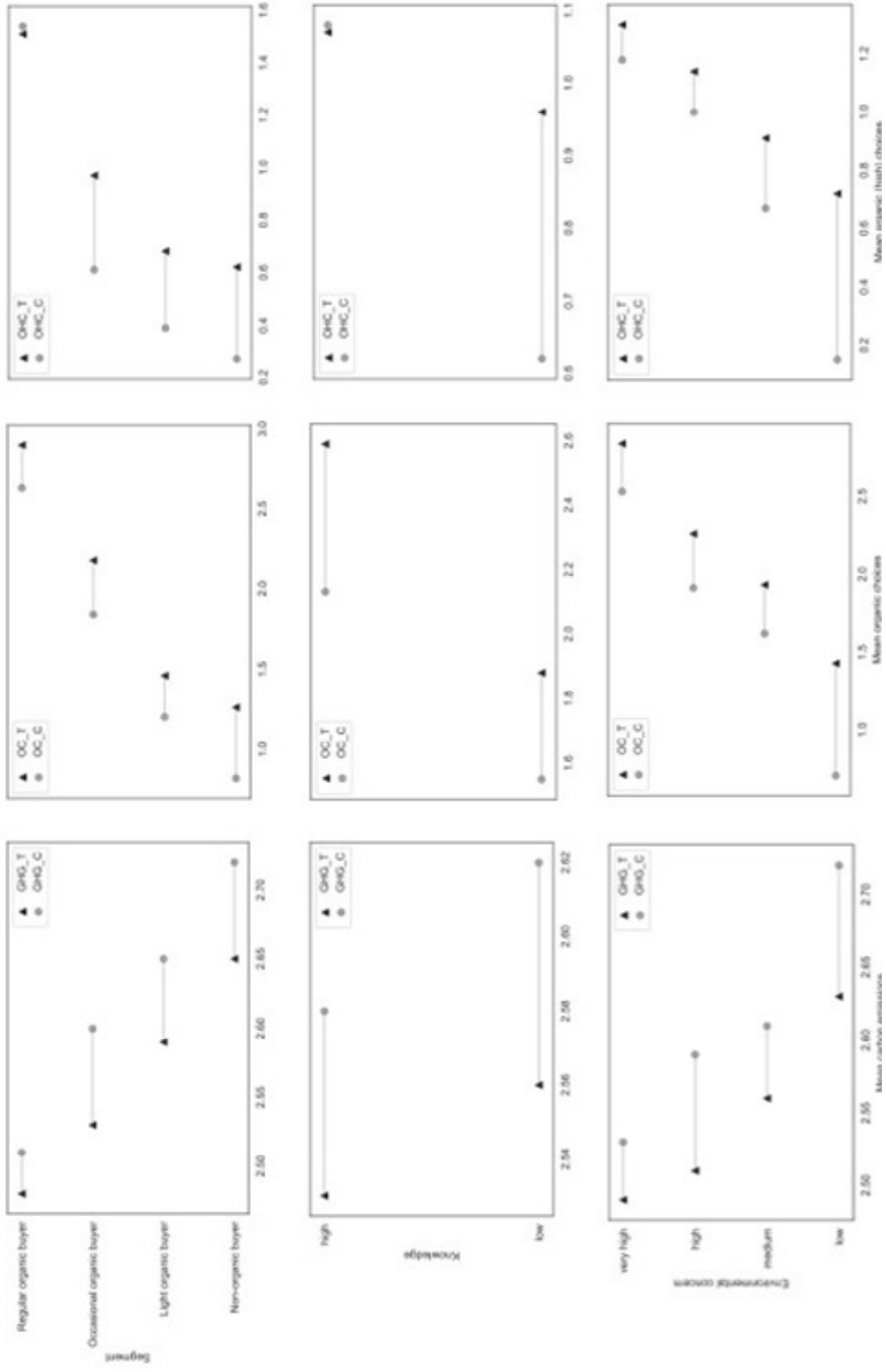


Note: Numbers indicate the percentage of total product choices per condition and label classification. Label classification range from A = most sustainable to E = least sustainable. E was not attributed to any product.

4.4.3.3 Eco-Label Effectiveness on Sub-Group Level

We further explored whether the overall significant results applied to different extents to sub-groups (Figure 8). First, we analyzed the effect of a subject's organic share. We validated that regular organic consumers (REG) (M = 2.76, SD = 1.06) chose more organic products than occasional organic consumers (OCC) (M = 2.02, SD = 1.17), light organic consumers (LGT) (M= 1.33, SD = 1.12), or non-organic consumers (NON) (M = 1.01, SD = 1.20). Correspondingly, the emissions increased gradually from REG (M = 2.50, SD = 0.08),

Figure 8: Comparison of Product Choices Between Groups and Subject Characteristics



Note: OC = organic choices overall, OHC = organic (high) choices, _T = treatment, _C = control. Mean carbon emissions in kg of CO2e, mean organic choices and mean organic (high) choices in counts.

to OCC (M= 2.56, SD = 0.09), LGT (M =2.62, SD = 0.11), and NON (M = 2.69, SD = 0.14). We then observed that subjects in the treatment condition displayed lower GHG emissions than subjects in the control condition across all four segments ($p < .05$ for NON, LGT, OCC). Interestingly, though, the absolute difference between conditions was lowest, and even non-significant ($p = .18$ (n.s.)), for REG. Hence, the displayed eco-label tended to have a lower, if any, effect on REG than on shoppers with a lower organic share, supporting H5. There could be several explanations for this finding. For one thing, REG tend to buy organic products on a regular basis. The potential for an increased number of organic choices is thus lower. Also, REG might have trusted the familiar organic labels more than the eco-label that they had never seen before (Thøgersen & Nielsen, 2016). In addition, as identified in the pre-study, the eco-label may have provided a lower-than-desired amount of information for these experienced organic shoppers (Richter et al., 2018).

Exploring the subjects' level of knowledge about organic products led us to a similar conclusion. Low-knowledge subjects chose fewer organic products in general (M = 1.71, SD = 1.25), and fewer *organic (high)* products in particular (M = 0.78, SD = 0.98), than high-knowledge subjects (M = 2.35, SD = 1.38 and M = 1.07, SD = 1.38 respectively). Lower knowledge correlated with higher GHG emissions (M = 2.59, SD = 0.13 vs. M = 2.55, SD = 0.12). While the inclusion of the eco-label led to a higher number of organic product choices ($p = .03$) and a lower level of GHG emissions for low-knowledge subjects ($p < .001$), the difference between groups was smaller for high-knowledge subjects. For them, GHG emissions were lower too ($p = .04$) and they also tended to choose more organic products, but the difference was non-significant ($p = .15$ (n.s.)). The pattern that subjects experienced with sustainable and organic food were steered to a lesser extent by the eco-label was confirmed again, which supported H6. This leads us to the interpretation that non-experienced shoppers are more likely to use the traffic light eco-label as an intuitive heuristic for decision making, e.g., *"choose green, avoid red"* (Thøgersen & Nielsen, 2016, p. 93), without necessarily being aware of any underlying factors, while knowledgeable shoppers might prefer a deliberate and informed choice (Hansen et al., 2018; Richter et al., 2018).

Analysis of product choice differences among subjects with different levels of EC showed an even steadier trend. The higher a sub-group's EC, the smaller the eco-label's effect. While GHG emissions of very high-EC subjects were significantly affected as well (Mdn = 2.48 vs 2.55kg CO2e, $p = .01$), the effect was smaller than for low-EC subjects (Mdn = 2.60

vs 2.73kg CO2e, $p < .001$). This finding is consistent with Cerri et al. (2018) and with the pre-test results, where high-EC respondents rated the eco-label design lower than other respondents, possibly due to the lower informativeness. H7 is hence also supported. In turn, this finding contradicts Thøgersen and Nielsen (2016), who argued that carbon label effectiveness increases with a consumer's EC. A possible explanation for the divergent result may be the different eco-label design that they studied (this was the Carbon Trust label, i.e., a label that has been shown to be difficult to understand (Meyerding et al., 2019), while we tried to maximize intuitiveness). Hence, only experienced consumers may have been able to make sense of the Carbon Trust label, which potentially caused the higher effectiveness for high-EC shoppers.

4.4.3.4 Relative Importance of Product Choice Determinants

To judge the relative importance of subject characteristics both with respect to each other and in comparison to the eco-label effect itself, we ran Poisson regression models. We also ran a multiple regression analysis on GHG emissions. The model outcomes are set out in Table 14. All included variables made a positive and significant prediction of the number of organic choices. The same was true when analyzing choices of *organic (high)* products separately. For GHG emissions, the predictors explained 41% of the variance (F (4, 384) = 65.55, $p < .001$), while all predictors apart from knowledge were significant. Concerning the relative effect size of the included predictors to each other, the eco-label was the most important determinant of organic and *organic (high)* choices next to the subject's organic share. A salient eco-label may thus indeed steer a shopper's attention away from other, possibly even more comprehensive, labels.

Such a strong eco-label effect is remarkable, especially bearing in mind that an analysis of how the subjects themselves assessed the relative importance of the decision factors resulted in a largely different outcome. The self-reported order of importance was the same for both conditions. While non-significant to each other ($p = .15$ (n.s.)), product origin and regional label both ranked significantly higher than all other factors (e.g., when regional label is compared to price: $Z = -2.63$, $p = .009$). This result is consistent with findings by Emberger-Klein and Menrad (2018) and Feucht and Zander (2018), who found that local production has become a crucial factor in a shopper's buying decision. Price was consistently ranked in third place, while organic labels were ranked last or last-but-one, all ranks being significant. Only

subjects in the treatment condition were additionally presented with the eco-label. They ranked it last.

Hence, subjects attached only minor importance to the eco-label regarding their product choices, which was in line with Grunert et al. (2014) and Hartikainen et al. (2014), who found that environmental friendliness in general, and carbon labels in particular, were of low relative importance for shoppers. Based solely on this result, it could be concluded that the eco-label had either no or only a negligible effect on subjects' choices. However, as demonstrated in detail, the eco-label did in fact have a significant effect in steering subjects' choices towards organic and more environmentally friendly product alternatives. In line with the behavioral theory on food shopping (e.g., Bacon & Krpan, 2018; Wansink & Sobal, 2007), a change in behavior does not necessarily imply conscious decision making. This finding might thus be interpreted as an indication that the eco-label acted as a (partly) subconscious nudge (Bradu et al., 2014; Dijksterhuis et al., 2005). While subjects did not attribute a strong conscious role to the eco-label for their decisions, they may still have been influenced on a subliminal level (Wansink & Sobal, 2007). The label might have thus indeed addressed their peripheral thinking. Hence, this finding adds to the contested state of literature whether eco-labels are in fact nudges or simply information-provision tools (Lehner et al., 2016) by providing support for the former.

Extending this analysis by investigating differences between sub-groups gave further interesting results. Friedman tests showed significant ranking differences for all sub-groups ($p < .05$ each). Highly knowledgeable subjects, for instance, ranked organic labels as the most important factor in their decision making. This was in stark contrast to the low importance assigned to organic labels overall. However, the importance attributed to labels by knowledge-able subjects did not extend to the eco-label. Organic labels ranked significantly higher than the eco-label ($p = .001$). Hence, high-knowledge subjects preferred organic labels to the eco-label they had never seen prior to the experiment. Low-knowledge subjects, in contrast, prioritized origin and price over organic labels ($p < .001$ each). The importance they attributed to price was thus highest when they did not know what they are paying the premium for.

Similarly, while low-EC subjects in the treatment group ranked price as the most important factor in their decisions (M = 3.98), the relative importance of price decreased steadily to last-but-one place for very high-EC subjects (M = 2.64). In turn, the importance of

Table 14: Investigation of the Relative Importance of Subject Characteristics and the Eco-Label for the Number of Organic and Organic (High) Choices

	Poisson regression model 1				Poisson regression model 2				Multiple regression model				
Variables	*B*	*SE*	*Exp(B)*	*p*	*B*	*SE*	*Exp(B)*	*p*	*B*	*SE*	*Beta*	*t*	*p*
Intercept	-1.251	.246	.286	.000	-2.225	.368	.108	.000	2.772	.031		88.86	.000
Segment	.227	.045	1.255	.000***	.374	.070	1.453	.000***	-.007	.001	-.387	-8.08	.000***
Knowledge	.090	.036	1.094	.011**	.133	.052	1.143	.010**	-.005	.005	-.037	-.92	.361
EC	.257	.069	1.293	.000***	.171	.102	1.187	.092*	-.047	.008	-.271	-5.66	.000***
Eco-label	.199	.075	1.220	.008***	.292	.111	1.339	.008***	.059	.010	.232	5.86	.000***

*Note: N = 388. DV in Poisson regression 1: organic choices; DV in Poisson regression 2: organic (high) choices; DV in multiple regression: GHG emissions. $R^2 = .41$. Organic choices used instead of segment as continuous IV in multiple regression. * $p < .1$, ** $p < .05$, *** $p < .01$.*

product origin and the regional label increased in importance for this group. The same was true for the organic label, though consistently ranking only fourth or third. The eco-label, however, consistently ranked last. Not even very high-EC subjects reported attaching significant importance to the eco-label, further highlighting subconscious effect of the eco-label.

Still, the self-reported importance of the eco-label was low, and other studies argued that shoppers had problems making sense of previously used labels (e.g., Hartikainen et al., 2014; Meyerding et al., 2019). Did subjects actually understand the information communicated by the eco-label? To obtain initial evidence, we asked subjects to rank the four milk products presented to them in order of environmental friendliness. Subjects in the treatment group (42% correct answers) were significantly more likely to be able to do this than subjects in the control group, who did not see the eco-label (28%, $p = .006$). Hence, it appears that a significant number of subjects in the treatment condition recognized and understood the sustainability ranking of the eco-label and incorporated the label information in their answer. Used in an actual (online) shop, the traffic light eco-label might thus indeed be an effective way of reducing information asymmetry (Perrini et al., 2010).

Such an eco-label may also be well-received by shoppers. We found that 82% of subjects either somewhat or strongly agreed that they would welcome an eco-label that assesses and classifies products in terms of their level of sustainability. This result is similar to findings by other studies investigating carbon labels (e.g., Hartikainen et al., 2014; Reisch et al., 2017). There indeed appears to be a high interest among shoppers in time-saving solutions that help them to make more informed purchasing decisions.

4.5 Conclusion

We conclude that a promising way of increasing the demand for sustainable and organic food without limiting freedom of choice is for a food product to display an easy-to-understand eco-label that highlights its sustainability. Ideally, a uniform eco-label design should be chosen, as consumers already experience a feeling of being lost in a *"jungle"* of labels (Perrini et al., 2010; Vittersø & Tangeland, 2015, p. 96). The introduction of several eco-labels may thus undermine their desired effect.

We find that respondents prefer intuitive eco-label designs that are supplemented by traffic light colors. The design that is most effective in steering product choices is based on the Nutri-Score label (e.g., Egnell et al., 2018; Julia et al., 2016). The use of this eco-label design indeed directed subjects towards sustainable and organic products, which led to higher overall sales. It is also noteworthy that subjects were steered away from the least sustainable products and towards making product choices involving the most sustainable alternatives. This led to products being frequently chosen that are subject to stricter requirements than those laid down by common organic standards (e.g., Demeter). In an attempt to increase the very low market share of these products, stakeholders are thus well-advised to emphasize the products' environmental benefits in particular. While the eco-label had positive effects across sub-groups, a particularly high effectiveness was noted for subjects characterized by a low organic share, a low level of knowledge about organic labels, and a low EC. A promising result, given that these groups of shoppers have so far been difficult to target with regard to pro-environmental behavior.

Our findings highlight the significant effect that an eco-label can have on subjects' food choices. However, when asked directly, subjects attribute a low importance to the eco-label. The label might thus act as a partly subconscious nudge. Given that shopping is a largely automated activity (e.g., Dijksterhuis et al., 2005), intuitive heuristics such as a simple eco-label design might be promising in nudging shoppers towards buying green products (Costanigro et al., 2014). As consumers increasingly show a willingness to act more sustainably but lack the knowledge of how to do so (Feucht & Zander, 2018), an eco-label could be an important part of the solution.

4.6 Limitations and Future Directions

The present study is subject to certain limitations. While the number of subjects completing the online experiment was high, only a limited number of respondents took part in the pre-study. While the differences identified between label designs were statistically significant, further validation is encouraged. In the online experiment, we aligned product choice screens as closely as possible to an actual online grocery shop and asked subjects to imagine the situation of online shopping in as much detail as possible (Bradu et al., 2014). Also, subjects were explicitly asked to make product choices in the same way as they would in

an actual setting to minimize hypothetical bias (List, 2001). Nevertheless, subjects were aware that they were taking part in an experiment, the graphical salience of the eco-label was comparatively high, and the product choices had no monetary effect (Falk & Heckman, 2009). The existence of biases or inflated effect sizes thus cannot be ruled out. Still, the random allocation of subjects and the decision to not making subjects explicitly aware of the eco-label at any point should have minimized potential biases (Ariely, Loewenstein, & Prelec, 2003; Horton et al., 2011; Vlaeminck et al., 2014).

The present study provides a solid basis for further consolidation of the obtained findings. One area in which we encourage future research is in the exploration of the concrete implications of our findings for different stakeholder groups, such as policy makers or retailers. Given potentially divergent target functions, the use of a specific research frame to suit the respective group is recommended. While we investigated the eco-label's relative importance for subjects' product choices using both regression analyses and self-ranking tasks, future research could utilize an eye-tracking method. This will make it possible to measure the amount of attention paid to each of the product attributes (Guyader et al., 2017). Also, we found that the eco-label can be particularly effective for shoppers engaging in non-deliberate decision making. Future research could examine potential differences in eco-label effectiveness depending on varying conditions of self-control and cognitive capacity, perhaps in the form of a field experiment.

Another potential research stream could be to identify the most appropriate reference category of a product's environmental friendliness. Should shoppers be enabled to compare only eco-scores within the same product category, e.g., several types of apples with each other, or should they be enabled to compare between product categories, such as plant-based protein with red meat (Richter et al., 2018; Thøgersen & Nielsen, 2016)? Some authors have questioned whether resource-intensive products should even be allowed to carry a high eco-score when they perform relatively well compared with other products of the same category but considerably worse than those of alternate categories (Bacon & Krpan, 2018; Clark & Tilman, 2017). Further, we identified a concrete eco-label design that proved to be effective in steering product choices. As the design was based on the health-oriented Nutri-Score label, a combination of these two labels might be examined. This would bring together the two main motives of buying organic food, namely personal health and sustainability considerations (Kareklas et al., 2014; Septianto et al., 2019). Merging these labels could be a promising path

in future research as it attempts to foster both nutritionally adequate and environmentally friendly diets.

5 Conclusion

5.1 Main Findings and Implications

Private household behavior accounts for the lion share of global GHG emissions and other environmental problems, while food is often cited as the biggest consumption category (e.g., Hertwich & Peters, 2009). In an attempt to act more consciously on an everyday basis, a growing number of consumers are turning to organic food. Indeed, *"by opting for organic products, the consumer through his/her purchasing power promotes a less polluting agricultural system"* (FAO, 2021c). Increasing sales of organic food, however, not only benefit the environment and peoples' conscience. Major retail chains have entered the market for organic food, seeing it as an attractive opportunity to portray a green image while benefiting both from differentiated product offerings and higher margins (e.g., Crowder & Reganold, 2015; Gleim et al., 2013). This increased demand for organic food, in turn, has resulted in farmers transitioning into organic production methods since they are attracted by higher prices, better long-term soil quality, and fewer health risks stemming from the production process (e.g., Crowder & Reganold, 2015; FAO, 2021d; Reganold & Wachter, 2016). These developments are both welcomed and promoted by policy makers, who have set concrete targets to increase the share of organic farming land considerably within the next decade (e.g., European Commission, 2021a). Thus, a broad alliance of consumers, retailers, farmers, and policy makers aim to promote additional sales of organic food. Against this background, research efforts concerning organic food have soared too, which provide further evidence of the topic's growing relevance (Akaichi et al., 2019; Scalco et al., 2017).

In this thesis, I examine three aspects of organic food retailing in particular, each in a self-contained essay. Each essay is contributing to the thesis' overarching research question of "how to induce further organic food sales?". Essay 1 sheds light on the 'status quo' of the grocery shoppers' perspectives on organic food retailing and demonstrates that different shopper groups should be targeted with tailored approaches to increase the likelihood of additional (organic) sales in the respective retail format. As such, Essay 1 forms the basis for the investigations conducted in Essay 2 and Essay 3, in which two different means of inducing

further organic food sales are explored. Based on Kahneman (2011), peoples' thinking and decision making is either guided by deliberate and conscious thought processes or by heuristics and intuition. In Essay 2, I focus on the former, while Essay 3 is focused on the latter. Taken together, these research efforts further our understanding of how to induce organic food sales, making important distinctions between grocery shopper segments. In the following, the findings and implications of each essay are summarized and subsequently linked to each other to additionally provide overarching conclusions.

In Essay 1, I investigate who the consumers are that shop at organic stores and supermarkets. Moreover, I explore consumers' shopping behavior inside these stores and identify consumers' reasons for their retail format choice. The essay contributes to existing research by addressing the literature's key limitation of a lack of focus on the retail context in which organic food is purchased. While studies have examined the links between the consumer and the product, the links between the consumer and the retailer have received scant attention.

I find that organic store shoppers place great importance on quality, atmosphere, and personal relations when deciding where to shop. Further, organic store shoppers are predominantly female and in an older age group, allocate a higher income share to grocery shopping, and possess higher levels of knowledge about organic food. They invest considerably more time in grocery shopping than supermarket shoppers and obtain information about products on a more regular basis. For supermarkets, the respective opposites tend to be true, while they are also less trusted by consumers compared with organic stores. While even supermarket shoppers trust organic stores more than they trust supermarkets, competitive prices paired with a convenient one-stop-shopping experience are too important benefits to trade off against. Supermarket shoppers' preference for efficiency in grocery shopping thus outweighs other factors.

As highlighted by Rhee and Bell (2002), retailers need to find a balance between retaining their existing customers and attracting new ones. As the two identified shopper types value widely differing factors, finding such a balance can be a challenging endeavor. Supermarkets are well-advised to continue building on their strength of the transactional efficiency they are valued for. At the same time, they ought to increase the level of trust they are met with by consumers. One way to address this issue could be to add more organic products to the assortment. This may result in positive spillover to the perceived quality of

other products, at least by the supermarket's target group of occasional organic consumers. Another way could be to conduct marketing activities highlighting that all products sold as 'organic' have to comply with the same legal requirements set out by official certification bodies like the European Union, irrespective of where they are sold. This could address the issue that particularly committed organic consumers do not trust in the quality of the organic products offered at supermarkets.

For organic stores, on the other hand, the findings suggest that they should remain in the market niche they already occupy. Despite the proposed efforts outlined, supermarkets are not in a position to offer a similar level of trust and personal service, coupled with a more intimate atmosphere. Indeed, a knowledgeable and approachable staff might represent a unique characteristic of an organic store and thus a competitive advantage. Organic store owners are thus well-advised to invest in the search for and education of employees. Further, organic stores would be ill-advised to compromise the quality of the products offered to achieve slightly lower prices. This would mean fighting uphill battles against supermarkets' economies of scale. Lower prices may even backfire as organic store shoppers tend to see price as a sign of quality and value for money. Similarly, expanding may harm the very image that organic stores currently benefit from. The more 'supermarket-like' an organic store becomes, the higher the potential risk to lose its unique characteristics of an intimate atmosphere and personalized attention to customers. In contrast, as derived from the finding that knowledgeable consumers tend to prefer organic stores, it could pay off to engage in information campaigns. In an attempt to win new (and younger) customers, organic stores could promote their products as well as their personal relations to farmers and producers by highlighting the products' unique attributes and by sharing relatable stories from farms. The more consumers know about organic food and the differences between the product offerings of organic stores and supermarkets, the greater the chance that more consumers will pick organic stores as their main grocery shopping outlet.

In Essay 2, I examine the barrier of consumers' limited level of knowledge about organic food. What is more, I segment consumers based on their organic share and explore how consumers differ in which channels they use and trust to obtain information about food. Finally, I gather initial evidence on what message type might be the most effective in increasing a consumer's intention to purchase (more) organic food. The essay provides contributions to the existing literature by addressing the research gap of a lack of focus on targeted communication.

Many consumers are not able to make their daily grocery shopping decisions in an educated manner. They thus tend to make purchasing decisions without much deliberation and mainly based on price considerations (Gleim et al., 2013; Reczek et al., 2018). Indeed, I find that shoppers who possess only little knowledge about organic food tend to have a low organic share. I conclude that raising consumers' levels of knowledge could be an important lever in inducing organic food sales. When categorizing shoppers into segments, I find that regular organic consumers inform themselves about food more often – and via different channels – than consumers buying organic food less regularly. It stands out that most consumers collect food-related information only sporadically, but tend to trust the provided information. This is a further indication that targeted messages, which get a consumer's attention, could be effective in raising the consumer's level of knowledge, and, in turn, in inducing organic food sales.

Exploring the concrete channels the consumer segments use and trust, I find indications that non-organic consumers and occasional organic consumers tend not to actively inform themselves about food, particularly not outside the retail store. These segments only focus on food during the grocery shopping activity itself. They thus most often use means such as posters and information signs when informing themselves about food. In contrast, food plays a major role in most regular organic consumers' lives. This group tends to actively look out for information on food, both when grocery shopping and when at home. These shoppers watch documentaries about food, talk to peers and retail staff members, and regularly read the product package information.

Similar to the insights on individual channels, I find indications that educational messages conveyed tend to be effective only if tailored to consumer segments. Explored for the example of milk, I find that regular organic consumers have a high intention to choose the organic alternative independent of the message conveyed to them. In contrast, occasional organic consumers tend to be receptive for educational messages. Their intention to choose organic milk is elevated both by positive information about organic milk and by negative information about conventional milk. For non-organic consumers, on the other hand, I show that negative information about conventional milk can trigger a response of defiance. They do tend to welcome positive information about organic milk though. Also, the group of non-organic consumers is the only group for which the emotionality of the presented message had any effect. Hence, I find that the literature's previous assumption of emotional messages being more effective in influencing consumers with regard to organic food than rational ones may

not apply to all consumer segments equally. Similarly, contradicting earlier expectation by Aertsens, Verbeke et al. (2009), I find indications that confronting non-organic consumers with negative information about conventional produce could prove counterproductive, rather than breaking their habit of buying conventional food.

Consequently, implications of the obtained findings vary by consumer segment. Regular organic consumers should be reassured of their shopping behavior. Policy makers could reach them by (financially) supporting well-researched documentaries since these consumers indicated that they do look out for information about food proactively, mentioning documentaries as one of their favorite channels. In turn, grocery retailers could reach this consumer segment through competent staff, valuable product information, and positive word-of-mouth as this segment tends to place high importance on the opinions of their peers and trustworthy staff members. Nevertheless, the findings suggest that no extensive marketing measures are required for this segment. In fact, due to their established convictions, they may not be appreciative of information they perceive as forced upon them.

In contrast, marketers should engage in cost-benefit analyses when deciding whether and how to target the segment of non-organic consumers. Among this segment, skepticism and barriers towards organic food are high. Policy makers might be more likely to focus on this segment than private corporations since public institutions are not purely guided by a return-on-investment perspective, but aim to promote sustainable behavior among all conditions of society. However, reaching these consumers could be a challenge for policy makers since these consumers do not tend to inform themselves about food outside of the retail store. Entering into a cooperation with retailers to convey desired information might thus prove promising. When targeting non-organic consumers, providing positive information about organic food appears most effective, particularly when utilizing posters and information signs inside retail stores. While it is important to inform these consumers about the benefits of organic food, pressure and 'finger wagging' might only have the opposite effect.

Importantly, the findings suggest that occasional organic consumers are the most promising target segment for inducing organic food sales. These consumers display a positive attitude towards buying organic food, process more information about food than non-organic consumers, and have already engaged in the actual behavior of purchasing organic food. These shoppers typically lack the conviction or confidence, though, to buy (premium-priced) organic

products more regularly (Buder et al., 2014). I expect that this barrier can be reduced by employing targeted information efforts since I find that occasional organic consumers welcome information conveyed to them. While both policy makers and grocery retailers are in a position to reach this segment, the findings suggest to mainly target these shoppers directly inside retail stores. Occasional organic consumers absorb provided information, if the information is relevant to them. However, they rarely do so outside of the grocery shopping activity itself. Hence, highlighting benefits of organic food to these consumers can be an important lever in reducing the often-experienced barrier of price, potentially turning price concerns into value-for-money considerations.

In Essay 3, we identify what eco-label design might be the most promising in influencing online grocery shoppers' product choices. Further, we analyze whether the introduction of an eco-label leads to a higher number of sustainable and organic food choices, and we explore whether the effect size depends on shopper characteristics. Based on the obtained findings, we recommend introducing an universal eco-label design for food products as one of several actions aimed at reducing the negative environmental footprint of private household consumption.

We conclude that a promising way of increasing the demand for sustainable and organic food – without limiting a consumer's freedom of choice – is for a food product to display an eco-label that highlights its sustainability rating. We find that online grocery shoppers prefer intuitive eco-label designs that are supplemented by traffic light colors. The design that is most effective in steering product choices towards sustainable and organic products – from the selection of eco-label designs we analyzed – is based on the Nutri-Score label (e.g., Egnell et al., 2018; Julia et al., 2016). It is also noteworthy that subjects were steered away from the least sustainable products and towards making product choices involving the most sustainable alternatives. This led to higher sales of products that are subject to stricter requirements than those laid down by common organic standards.

Our study also elaborates on potential interaction effects between the newly introduced eco-label and existing organic labels. One might argue that a simple eco-label design may provide only little additional value to shoppers when used together with an organic label as the latter already includes environmental information. Based on our findings, however, shoppers seem to be guided significantly more by the newly introduced eco-label than by the organic

labels. The eco-label could thus indeed be a promising means to highlight the environmental performance of (food) products to shoppers in a fast and intuitive manner. As a result, sales of sustainable organic products would probably increase and shoppers would be enabled to make a more informed product choice that explicitly includes different factors than price alone.

While the eco-label had a significant positive effect across sub-groups, we noted a particularly high effectiveness for subjects characterized by low prior involvement in sustainable and organic food shopping. A promising result, given that this group of shoppers has so far been difficult to target with regard to pro-environmental behavior. Despite the revealed significant effect that an eco-label can have on product choices across shopper segments, subjects attributed only minor importance to the eco-label when reflecting on the most important factors for their product choices. The label might thus act as a (partly) subconscious nudge.

Policy makers frequently face the challenge of how to guide citizens' behaviors in their own best interest and/or society's best interest, without limiting the freedom of choice of the individual (e.g., Hausman & Welch, 2010; Lehner et al., 2016; Marteau, Ogilvie, Roland, Suhrcke, & Kelly, 2011). Against this background, we find that policy makers are well-advised to introduce an intuitive and universal eco-label, including traffic light coloring, for nudging grocery shoppers towards sustainable and organic food products. This intervention could be particularly promising for reaching low-involvement shoppers that are otherwise difficult to reach effectively. Further, our findings suggest that this eco-label could also be a means of increasing the low market share of those organic products additionally labeled by private organizations requiring even stricter standards than the EU's common organic label. Producers and (re-)sellers of these products are thus well-advised to particularly emphasize the products' environmental benefits to justify their higher price.

To sum up, each of the three essays in this thesis furthers our understanding of different aspects of organic food retailing and grocery shopper behavior, while contributing to the overarching research question of "how to induce further organic food sales?". In addition to their individual contributions, the findings presented in the individual essays can also be linked to provide combined implications.

For one thing, I have shown that supermarket shoppers differ from organic store shoppers in terms of socio-demographic factors, retail format characteristics they value, and

shopping behavior (Essay 1). It thus stands to reason that these shopper groups will also differ in their receptiveness to retailer interventions aimed at increasing organic food sales. I expect that interventions addressing the intuitive decision making of grocery shoppers, such as the eco-label investigated in Essay 3, could be more effective in supermarkets than in organic stores, since I find supermarket shoppers to be less involved in grocery shopping and to spend significantly less time on the activity. The purchasing decisions of these shoppers could be more spontaneous and thus more susceptible to nudging than those of organic store shoppers. Indeed, such less-involved shoppers have been shown to be particularly affected by the eco-label in the experiment outlined in Essay 3. On the contrary, organic store shoppers might be more susceptible for informational or promotional means that address the deliberate and conscious decision making, such as those investigated in Essay 2. These shoppers place a considerable importance on food in their daily life and regularly look out for additional information on food, even outside the grocery shopping activity itself. Building up the level of knowledge about organic food with targeted informational messages could thus prove particularly effective in reassuring these shoppers of their organic food choices.

For another, nudges and labels have been shown to be most effective when the respective issue is relevant to the consumer, the consumer holds a positive attitude towards the behavior, and the consumer possesses at least some knowledge about the subject (e.g., Lehner et al., 2016). It could thus prove particularly promising for policy makers to combine the means of information provision in the form of targeted educational messages (Essay 2) with the introduction of an intuitive and universal eco-label (Essay 3). Policy makers could thus first engage in targeted information campaigns to increase shoppers' knowledge about organic food and to prime shoppers by highlighting their important role in reducing the negative environmental impact of the agricultural sector, followed by the introduction of an eco-label shoppers can look out for as a fast and intuitive signal about the environmental performance of a given food item. Such an interdependent campaign could prove highly effective in inducing further organic food sales and might also be well-received by the shoppers themselves as they have been shown to wish for means enabling them to accurately judge the sustainability level of food products.

Overall, this thesis contributes to a better understanding of organic food retailing, (organic) grocery shoppers, and means to induce further organic food sales. At the same time,

the obtained findings form the basis for several potential future research avenues. These avenues are outlined in the following section.

5.2 Avenues for Future Research

In Essay 1, I provide a set of insights into consumer perspectives of supermarkets and organic stores. Based on these insights, one could argue that supermarket shoppers differ from organic store shoppers not only in their socio-demographic characteristics and shopping behaviors but also in their receptiveness to retailer interventions aimed at increasing organic food sales. One such option for intervention is nudging (Essay 3). It could be explored, whether different nudge alternatives display different levels of effectiveness between retail formats. I postulate that supermarkets could be more successful in utilizing nudge interventions that target shoppers' price perceptions. On the contrary, nudge interventions concerning quality perceptions could be more effective in organic stores. It could also be argued that supermarkets may be even better suited for nudge interventions in general, since I find supermarket shoppers to be less involved in grocery shopping. Future research is encouraged to test these expectations.

Moreover, Essay 1 is exclusively focused on the two retail formats of (conventional) supermarkets and organic stores. I recommend future research efforts to additionally include organic supermarkets when comparing the consumer perspectives of retailers selling organic food. Based on the findings presented, I expect organic supermarket shoppers to place greater importance on selection and price than organic store shoppers, but less importance on atmosphere and personal attention. At the same time, the difference may not be as significant as when comparing organic store shoppers and (conventional) supermarket shoppers. It would be interesting to find out whether organic supermarket shoppers are a distinct shopper group – potentially characterized by a blend of the preferences displayed by organic store shoppers and (conventional) supermarket shoppers – or merely a sub-group of one of these shopper groups.

Further, the retail landscape of organic food differs across countries and regions (Willer & Lernoud, 2019). While supermarkets have become the dominant sales channel in most developed organic food markets, organic stores typically play a leading role in less mature markets (Aertsens, Verbeke et al., 2009; Willer & Lernoud, 2019). The results obtained in Essay 1 may not be generalizable to other countries or cultures, particularly to those that

currently have a lower organic market share than Austria. Future research could replicate the present study in such a setting to explore the sensitivity of results to the maturity of the organic market in a country and to its culture. The same applies to the insights provided in Essay 2 and Essay 3. Alternatively, future research would also contribute to the scientific discourse by conducting similar studies in a cross-country setting (Hansen et al., 2018; Rana & Paul, 2017; Trivedi et al., 2018). Most research studies on organic food have either focused on a developed *or* on a developing country, which has made it difficult to compare findings.

In Essay 2, I explore how to induce further organic food sales by persuading consumers via the ELM's central route of thoughtful information processing. One area in which I encourage future research is in conducting field experiments inside grocery stores to validate the obtained survey findings. This would also facilitate the measurement of the changes in a shoppers' actual behavior triggered by the respective information provided. While I study changes in *intention* to buy organic food, the TPB shows that there can be a certain gap between shoppers' intentions and their behaviors. Insights on the effectiveness of targeted informational messages in actual grocery shopping settings would thus enrich the obtained results.

Further, Essay 2 provides initial evidence on which channels consumers use and trust to obtain information about food. While I intend to provide a general overview, future research endeavors should focus on particular channels to obtain detailed insights. Which type of information to convey via which channel (by whom) to which consumer? This question could warrant several future research efforts and Essay 2 aims to be a basis for them.

In Essay 3, we explore another means to change consumers' behaviors. While Essay 2 focuses on information provision and the build-up of knowledge among consumers following the ELM's central route, Essay 3 is concerned with the ELM's peripheral route of non-deliberate decision making. We encourage future research to validate and enrich our findings by conducting field experiments in both online grocery shops and brick and mortar retail formats. Future research could examine potential differences in eco-label effectiveness depending on varying conditions of self-control and cognitive capacity. We postulate that the traffic light eco-label we used could have an even greater effect in a crowded, information-heavy physical retail store setting; that is if the eco-label is salient enough in such a setting. Similarly, it would be interesting to find out more about a shopper's level of attention placed

on each of a product's attributes. For this, an eye-tracking method could be utilized (Guyader et al., 2017).

Another potential research stream could be to identify the most appropriate reference category of a product's environmental friendliness. Should shoppers be enabled to compare eco-scores only within the same product category or should they be enabled to compare between product categories? Should particularly resource-intensive products even be allowed to carry a high eco-score when they perform relatively well compared with other products of the same category but considerably worse than those of alternate categories? Hence, ample room for future research efforts – but also for political discussion – remains.

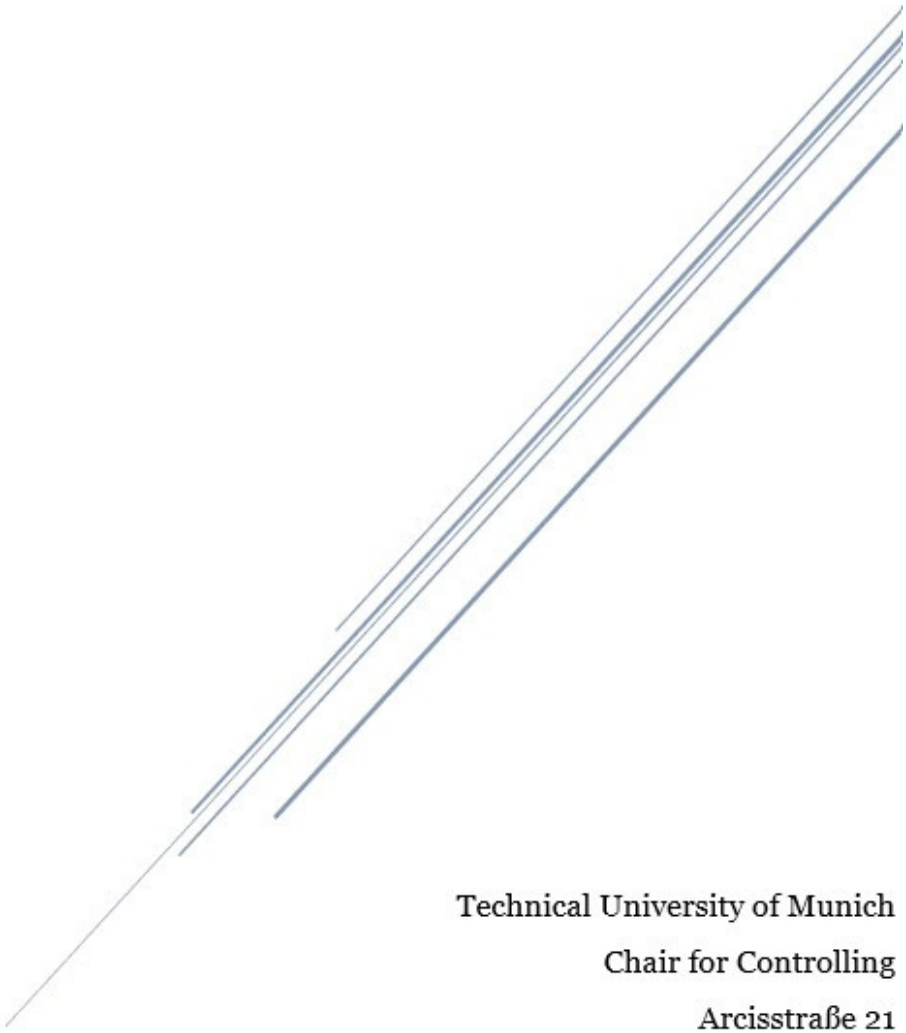
Finally, we provide a concrete eco-label design that proved to be effective in steering product choices in our study. As the design was based on the health-oriented Nutri-Score label, a combination of these two labels might be examined. Merging the eco-label and the Nutri-Score label could be a promising path as it attempts to foster both nutritionally adequate and environmentally friendly diets, two of the main motives for consumers to buy organic food as well as for policy makers to endorse it.

Appendix

Appendix to Essay 1 and Essay 2

Appendix A: Questionnaire[19]

Grocery Shopping – The Consumer Perspective



Technical University of Munich
Chair for Controlling
Arcisstraße 21
80333 Munich

Survey conductor: Lambert Neumayr, MSc, MIB
Email: lambert.neumayr@tum.de

[19] Note: The survey was conducted in German. Since the thesis is written in English, screenshots of the original English version are included in this appendix.

Welcome to one of the first scientific studies in Austria on the consumer perspective regarding grocery shopping.

All answers are obtained anonymously. Data will be used confidentially, will not be shared with others, and will be used for the specified purpose only.

Declaration of consent

○ *I agree and participate in the survey.*

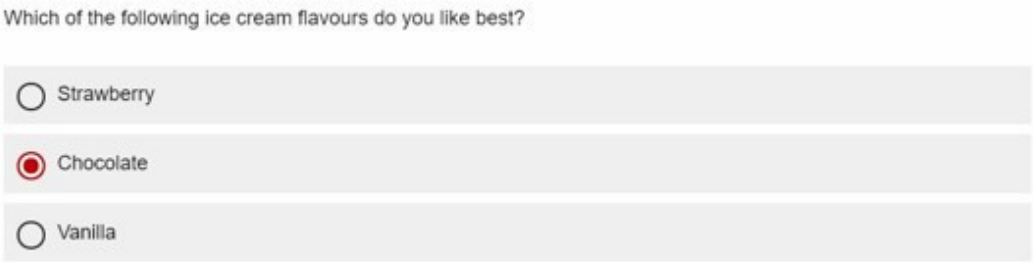
Thank you for participating. Please make sure to answer all questions and to read them carefully.

To help you filling out the survey, please find below 2 short examples.

Example 1: You are asked to rate how much you agree with the statement "I enjoy today's weather very much."
If you were to enjoy today's weather *very much* indeed, you might answer like this:

In contrast, if you were to somewhat dislike today's weather, you might answer like this:

Example 2: You are presented with 3 ice cream flavours and you are asked which of these flavours you like best.
If you were to like "Chocolate" the best, you would answer like this:



Should you, at any point, not find an answer alternative fully matching your personal opinion or behavior, please select the alternative coming closest or – should there be an alternative "Other: _____" – fill in an additional field yourself.

Should any questions arise, please do not hesitate to ask for clarification.

There are no right or wrong answers. Your honest personal perspective counts.

Please start the survey now.

Part I

Where do you do most of your grocery shopping at?

Please tick your single main grocery shopping place only.

- ○ Bakery
- ○ Billa
- ○ Butchery
- ○ Farm-gate sale
- ○ Farmer's market
- ○ Hofer
- ○ Lidl
- ○ Merkur
- ○ Online grocery shopping
- ○ Organic store
- ○ Organic supermarket
- ○ Penny Markt
- ○ Spar
- ○ Sutterlüty
- ○ Other: _____

Where else do you regularly do your grocery shopping at?

Please tick as many grocery shopping places as apply to you. Please leave empty should you do all of your grocery shopping at your main grocery shopping place only.

- ○ Bakery
- ○ Billa
- ○ Butchery
- ○ Farm-gate sale
- ○ Farmer's market
- ○ Hofer
- ○ Lidl
- ○ Merkur
- ○ Online grocery shopping
- ○ Organic store
- ○ Organic supermarket
- ○ Penny Markt
- ○ Spar
- ○ Sutterlüty
- ○ Other: _____

How often do you go grocery shopping?

- ○ Less than weekly
- ○ Weekly
- ○ Several times a week
- ○ (Nearly) Daily

Per week, how much time does it take you to complete your grocery shopping?

Including time needed for getting to and away from your grocery shopping place(s).

- ○ Less than 1 hour
- ○ 1 - 2 hours
- ○ 2 - 3 hours
- ○ More than 3 hours

Please rate the importance each of the following factors has for you when deciding where to go grocery shopping.

	Not important				Very important
Atmosphere	○	○	○	○	○
Image	○	○	○	○	○
Knowledgeable staff	○	○	○	○	○
Location	○	○	○	○	○
Personalized attention	○	○	○	○	○
Price level	○	○	○	○	○
Quality	○	○	○	○	○
Selection	○	○	○	○	○
Service	○	○	○	○	○

Please rate how often you perform the following behaviors.

	(Nearly) Never				Very often
I read the product package information.	○	○	○	○	○
I ask staff members for additional information.	○	○	○	○	○
I make my buying decisions spontaneously.	○	○	○	○	○
I try to minimize the time spent in the grocery shopping place.	○	○	○	○	○

In the last 5 times you bought items from the following product categories, how often did you choose organic ones?

Should you not be familiar with the term "organic", please ask for clarification.

How to answer this question:
N/A = I (nearly) never buy items of this category.
0 = Out of the last 5 times I bought an item of this category, I bought organic 0 times.
1 = Out of the last 5 times I bought an item of this category, I bought organic 1 time.
...
5 = Out of the last 5 times I bought an item of this category, I bought organic 5 times.

	N/A	0	1	2	3	4	5
Fruits & vegetables	○	○	○	○	○	○	○
Meat & meat products	○	○	○	○	○	○	○
Milk & milk products	○	○	○	○	○	○	○
Noodles & rice	○	○	○	○	○	○	○
Sauces (pesto, mustard, …)	○	○	○	○	○	○	○
Sweets & munchies	○	○	○	○	○	○	○

Part II

You already completed more than 30% of the survey.

Please rate how much you agree with each of the following statements.

	Strongly disagree				Strongly agree
I know pretty much about organic food.	○	○	○	○	○
Among my circle of family & friends I am one of the "experts" on organic food.	○	○	○	○	○
Compared to most other people, I know more about organic food.	○	○	○	○	○

Dou you happen to know which of the following labels is the official label for organic products in the European Union?

Please tick the option "Do not know" in case you have doubts or would have to guess. This also applies to both consecutive questions.

Do not know							
						
○	○	○	○	○	○	○

As far as you know, please indicate for each of the following labels whether the statement "This label certifies that the respective product has been produced in accordance with organic standards." is true or false.

	True	False	Do not know
	○	○	○
	○	○	○
	○	○	○
	○	○	○
	○	○	○
	○	○	○

Below you find 3 statements concerning organic food and farming. For each, please indicate whether you believe the statement to be true or false.

	True	False	Do not know
Organic farmers may use genetically modified seeds.	○	○	○
Organic food is produced making use of "traditional" farming systems.	○	○	○
Organic farmers do not use synthetic pesticides.	○	○	○

Part III

Please rate how much you agree with each of the following statements.

	Strongly disagree				Strongly agree
I think that buying organic food is beneficial.	○	○	○	○	○
I think that buying organic food is worthless.	○	○	○	○	○
I think that buying organic food is wise.	○	○	○	○	○

Please rate how much you agree with each of the following statements.

	Strongly disagree				Strongly agree
Most people I value buy organic food rather than conventional food.	○	○	○	○	○
It is expected of me that I buy organic food.	○	○	○	○	○
My family thinks that I should buy organic food rather than conventional food.	○	○	○	○	○

Please rate how much you agree with each of the following statements.

	Strongly disagree				Strongly agree
I think it is easy for me to buy organic food.	○	○	○	○	○
Organic food is hard to find.	○	○	○	○	○
If I wanted to, I could afford organic food.	○	○	○	○	○

Please rate how much you agree with each of the following statements.

	Strongly disagree				Strongly agree
I intend to buy organic food on a regular basis.	○	○	○	○	○
I definitely want to buy organic food in the near future.	○	○	○	○	○
I intend to spend more on organic food rather than on conventional food.	○	○	○	○	○

How much do you trust your main grocery shopping place with regards to the following aspects.

	Do not trust at all				Trust very much
The price of the offered organic products is reasonable.	○	○	○	○	○
The quality of the offered organic products is high.	○	○	○	○	○
The staff is knowledgeable.	○	○	○	○	○
Ecological standards in the production of the offered organic products are complied to.	○	○	○	○	○

Please rate how much you trust each of the following actors in the organic food market.

	Do not trust at all				Trust very much
Certification bodies	○	○	○	○	○
Organic stores	○	○	○	○	○
Farmers	○	○	○	○	○
Supermarkets	○	○	○	○	○

Part IV

You already completed more than 80% of the survey.

How often do you use each of the following sources of information when collecting information about food?

	(Nearly) Never				Very often
Documentaries	○	○	○	○	○
Family & friends	○	○	○	○	○
Newspapers & magazines	○	○	○	○	○
Posters & information signs inside retail outlet	○	○	○	○	○
Product packages	○	○	○	○	○
Scientific reports	○	○	○	○	○
Staff of retail outlet	○	○	○	○	○
Websites & info campaigns of public institutions (ministries, EU, …)	○	○	○	○	○
Websites of individuals (blogs, social media profiles, …)	○	○	○	○	○

How much do you trust information about food by each of these sources?

	(Nearly) Never				Very often
Documentaries	○	○	○	○	○
Family & friends	○	○	○	○	○
Newspapers & magazines	○	○	○	○	○
Posters & information signs inside retail outlet	○	○	○	○	○
Product packages	○	○	○	○	○
Scientific reports	○	○	○	○	○
Staff of retail outlet	○	○	○	○	○
Websites & info campaigns of public institutions (ministries, EU, …)	○	○	○	○	○
Websites of individuals (blogs, social media profiles, …)	○	○	○	○	○

In the following, we focus on a particular food item: milk.[20]

[Control group: No message]

[Message 1]
In a scientific study, organic milk has been found to contain up to 50% more omega-3 fatty acids than conventionally produced milk. These healthy fatty acids help in preventing cardiovascular diseases. Also the risk to fall ill with dementia or diabetes is reduced by a regular consumption of omega-3 fatty acids.

[Message 2]
Science found: Drinking organic milk prevents widespread diseases such as strokes, dementia or diabetes! The reason lies in organic milk's high omega-3 fatty acid concentration that is found to be up to 50% higher than for conventional milk.

[Message 3]
In conventional agriculture, cows are often kept in crowded conditions without run. This leads to unnatural, unsanitary conditions and increases the risk of large-scale diseases. To prevent this, cows are often fed antibiotics. Residues of these antibiotics in milk can find its way into the human body, potentially leading to, among others, antibiotic resistance among humans.

[Message 4]
Antibiotic resistance owing to consumption of conventional milk? In conventional agriculture, cows are often kept in crowded conditions without run. The resulting risk of diseases is often addressed by feeding antibiotics to the cows. Scientists have now found that residues of these antibiotics in milk can cause, among others, antibiotic resistance among humans!

[20] Note: No respondent was shown the entire page. Instead, each respondent was shown one message only (or no message at all if the respondent was part of the control group).

Please rate how much you agree with each of the following statements.

"N/A" indicates that you intend to (nearly) never buy any milk, neither non-organic nor organic.

	N/A	Strongly disagree				Strongly agree
I intend to buy organic milk on a regular basis.	○	○	○	○	○	○
I definitely want to buy organic milk in the near future.	○	○	○	○	○	○
I intend to spend more on organic milk rather than on conventional milk.	○	○	○	○	○	○

Part V

Finally, please provide some details concerning your person and current living situation.

Gender

- ○ Male
- ○ Female
- ○ Other

Age group (in years)

18 - 24 ○ 25 - 29 ○ 30 - 34 ○ 35 - 39 ○ 40 - 44 ○ 45 - 49 ○ 50 - 54 ○ 55 - 59 ○

60 - 64 ○ 65 - 69 ○ 70 - 74 ○ 75 - 79 ○ 80 - 84 ○ 85 - 89 ○ 90 or above ○

Number of household members, including yourself, whom you are regularly sharing your grocery expenses with or doing shopping for.

Illustrative examples:

A person with no children, living in a shared flat without sharing grocery expenses with roommates, answers "Adults: 1".
A person with no children, living in the same household with his/her significant other with whom he/she is regularly sharing grocery expenses, answers "Adults: 2".
A single parent living with his/her 2 children (2 and 5 years old) and is doing shopping for them, answers "Adults: 1" and "Children (0-9 years): 2".

- ○ Adults (18 years or older): _____
- ○ Children (10 - 17 years): _____
- ○ Children (0 - 9 years): _____

Household net income (in EUR per month)

Includes your own net income and the net income of all other household members whom you are regularly sharing your grocery expenses with – see previous question.
'Income' includes wages and salaries, income from business, pensions, alimonies and unemployment benefits.

Below 1,000	1,000 - 1,499	1,500 - 1,999	2,000 - 2,499	2,500 - 2,999	3,000 - 3,499	3,500 - 3,999
○	○	○	○	○	○	○

4,000 - 4,499	4,500 - 4,999	5,000 - 5,499	5,500 - 5,999	Above 6,000	Prefer not to say
○	○	○	○	○	○

Household grocery shopping budget (in EUR per month)

Includes money spent for food and drinks bought at grocery shopping places such as supermarkets or stores. Does not include money spent for dining out in restaurants, cafés, bars, canteens, or take-aways.

Please insert amount (in EUR per month): _____

Highest completed level of formal education

- ○ No compulsory schooling degree
- ○ Compulsary schooling ("Hauptschule", "Neue Mittelschule", ...)
- ○ Apprenticeship
- ○ Secondary school ("Gymnasium", "HAK", "HTL", ...)
- ○ University / University of Applied Sciences

Time you invest for gainful employment and/or education (in hours per week)

- ○ Less than 10
- ○ 10 - 20
- ○ 21 - 30
- ○ 31 - 40
- ○ More than 40

Congratulations – you have completed 100% of the survey!

Optional: Should you be interested in the outcome of this study, feel free to insert your email address in the separately provided paper form.

Optional: Below you find 2 "bonus" questions. You do not have to answer them to successfully complete the study. Of course, your perspective on them would be much appreciated.

Otherwise please hand in your survey now by throwing it into the provided ballot box.

Thank you once again for your time and have a beautiful day!

Optional: What was the main reason for you to engage in organic food shopping in the first place?

Leave empty if you have (nearly) never engaged in organic food shopping.

_____

Optional: From your personal point of view, what would need to happen for you to start buying organic food or to buy more organic food than you already do?

_____

Thank you very much for your time!

Optional: Now, after having successfully completed the study, is there anything you would like to comment on or draw our attention to?

Appendix to Essay 3

Appendix B: Online Survey

Hello, welcome to a short survey on consumer behavior regarding grocery shopping.

In the following, your opinion and feedback on different consumption-related topics is examined.

Be assured that all answers you provide are obtained anonymously and will be kept in the strictest confidentiality.

Thank you!

Declaration of consent

- ○ I agree and participate in the survey.

Part I

What is your age?

- ○ Under 18
- ○ 18 - 24 years old
- ○ 25 - 34 years old
- ○ 35 - 44 years old
- ○ 45 - 54 years old
- ○ Over 55

What is your gender?

- ○ male
- ○ female
- ○ other
- ○ Prefer not to respond

What is your responsibility for food shopping in your household?

- ○ Not at all responsible
- ○ Somewhat responsible
- ○ Mostly responsible
- ○ Completely responsible

I often buy eco-labeled products for the sake of the environment.

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

Part II

Now please imagine you are grocery shopping in your usual supermarket. Think of the noises you might hear, the employees and other shoppers you might see. Imagine the situation as accurately as possible and consider whether you are in a hurry or not.

In the following, you are presented with choices between products. The products are identical in terms of price and other characteristics, but may differ in their environmental friendliness.

In each comparison, please select one product.

Please select one product.[21]

○ Product 1

Transport	400km (truck)
Production	Open air
Water use	376 liters/kg
Land use	0.76 m^2/kg
Pesticides	1.1 active substance/kg

○ Product 2

[21] Note: After this choice screen, respondents were shown four additional choice screens. The image of the apples was always the same, only the attached label designs and the indicated sustainability rating differed.

Part III

Please have a look at the following label and answer the corresponding questions below.[22]

"The label is quick and intuitive to understand."

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

"The label uses clear colors and symbols."

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

[22] Note: Each respondent had to answer the same six questions for each of the five presented labels, not only for the one label presented here in the appendix.

"The label shows at a glance whether the food contributes to sustainable nutrition."

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

"The label has a simple graphic design."

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

"The label helps well when comparing different products."

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

"The label is informative."

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

Thank you for your participation!

Appendix C: Online Experiment[23]

Welcome to this scientific study of the TU Munich on consumer behavior regarding grocery shopping!

This study is about your individual opinion. There are no "right or wrong" answers – your personal perspective counts.

All answers are obtained anonymously. Data cannot be assigned to your person and will be treated strictly confidential.

With your participation you consent to the processing of this data.

Thank you very much for your participation!

[23] Note: The online experiment was conducted in German. Since the thesis is written in English, screenshots of the experiment's English translation are included in this appendix.

When shopping for groceries online…

Please imagine that you are buying groceries online.

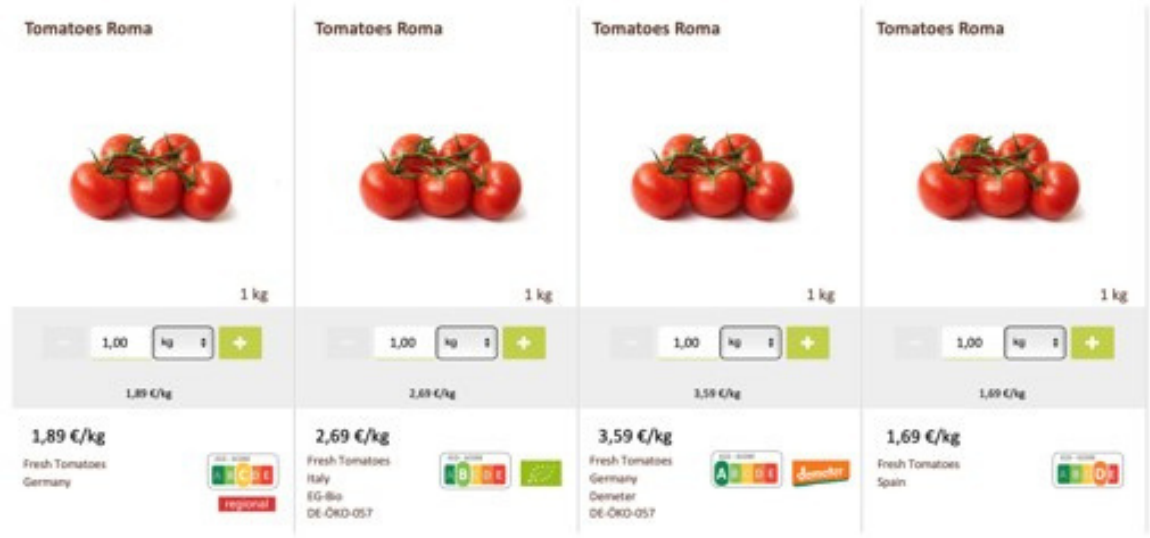
Try to put yourself in the shopping situation as accurately as possible. At what time of the day are you doing your shopping? Are you exhausted and you want to get the shopping done as quickly as possible or do you have time to do it calmly? Do you use a smartphone, tablet, laptop, or PC for your purchase? Have you made yourself comfortable on the couch or are you sitting at your desk? How much are you planning to buy? Do you have a shopping list or do you decide spontaneously? Are you distracted or fully focused on the shopping?

Click “continue” when you have put yourself in the situation in detail.

In the following, you will be faced 4 times with a purchase decision for food.

For each comparison, please select the product that you would buy in a **real shopping situation**. Therefore, keep in mind the situation you have just put yourself in.

Please select a product.



Please select a product.

Please rank the following factors you based your purchasing decision on. From 1 (most important for you) to 5 (least important for you).

Select the respective factors in your preferred order from 1-5. If you want to change your selection, you can undo it by clicking the respective factor again.

Price

Organic Label

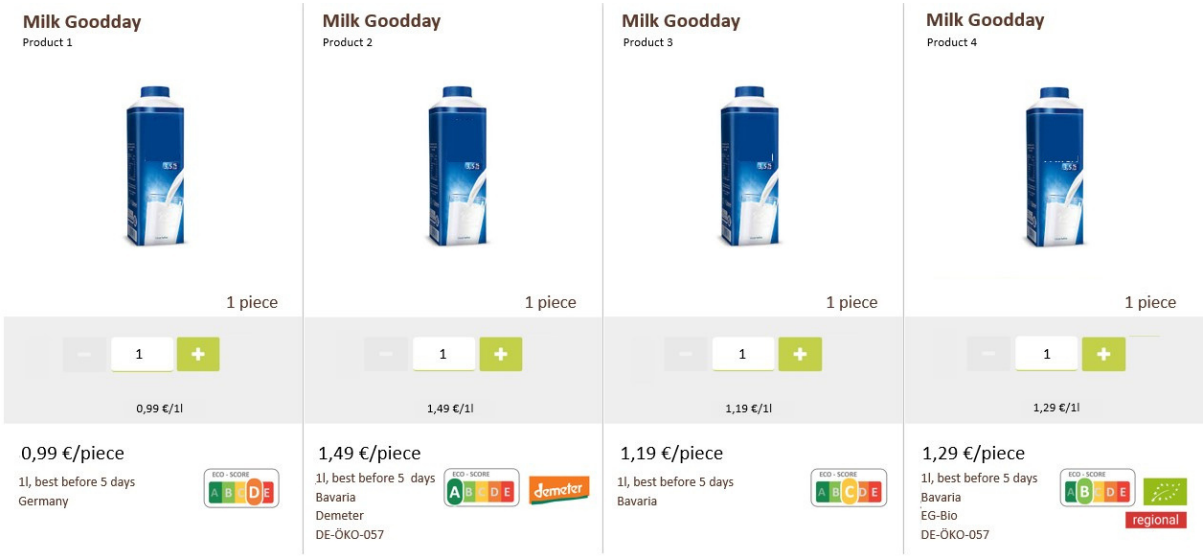
Eco-Label

Regional Label

Origin

Please select a product.

Please select a product.



Please rank the products according to their sustainability from 1 (most sustainable) to 4 (least sustainable).

Select the respective product in your preferred order from 1-4. If you want to change your selection, you can undo it by clicking on the respective product again. The alternatives correspond to the above products from product 1 (left) to product 4 (right).

Congratulations! You have already completed more than 60% of the study.

Please indicate – in the following questions on environmental aspects – to what extent you agree or disagree with the respective statement.

I am concerned about the development of the global environment.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

I feel it is a moral obligation to use environment-friendly products.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

It concerns me that people do not care enough for the environment.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

I have changed from one brand to another for the sake of the environment.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

I often buy eco-labeled products for the sake of the environment.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

With reference to your last 5 purchases, how often have you bought the following products in "organic"?

How to answer this question:
N/A = I (almost) never buy items of this category, neither organic nor conventional.
0 = Out of the last 5 times I bought an item of this category, I bought organic 0 times.
1 = Out of the last 5 times I bought an item of this category, I bought organic 1 time.
…
5 = Out of the last 5 times I bought an item of this category, I bought organic 5 times.

	N/A	0	1	2	3	4	5
Fruits	○	○	○	○	○	○	○
Vegetables	○	○	○	○	○	○	○
Milk & dairy products	○	○	○	○	○	○	○
Rice & pasta	○	○	○	○	○	○	○
Meat & meat products	○	○	○	○	○	○	○

In the following, some definitions of food labels are presented. Please select the label to which the statement is most likely to apply.

Introduced throughout Europe in 2010, legal minimum standard for organic certification within the EU. Five percent of the ingredients and ten percent of the pork and poultry feed from conventional farming are permitted. Maximum number of animals per hectare: 230 laying hens, 580 broilers, 14 pigs.

To select a label, simply click on the respective image. If you want to change your selection, you can undo it by clicking again.

Largest German eco-association, stricter guidelines than EU organic certification. Maximum number of animals per hectare: 140 laying hens, 280 broilers or ten pigs - attention is paid to resistant breeds. Sustainable regional agriculture with changing crops instead of artificial fertilizers and pesticides.

To select a label, simply click on the respective image. If you want to change your selection, you can undo it by clicking again.

Germany's oldest and strictest organic label. Only 13 additives allowed, no dehorning of cows, transport route of animals for slaughter no more than 200 kilometers, exclusively organic animal feed. Maximum 112 kg of total nitrogen fertilizer per hectare and year.

To select a label, simply click on the respective image. If you want to change your selection, you can undo it by clicking again.



Don't know

Please indicate to what extent you agree or disagree with the following statement.

I welcome the introduction of an universal eco-label that assesses and classifies products in terms of their sustainability.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Finally, a few short questions about yourself or your current life situation.

How old are you?

- ○ 18 - 24 years old
- ○ 25 - 34 years old
- ○ 35 - 44 years old
- ○ 45 - 54 years old
- ○ 55 - 64 years old
- ○ 65 years or older

What is your gender?

- ○ Male
- ○ Female
- ○ Other
- ○ No Response

What is he highest degree or school level you have completed?

- ○ No compulsory degree
- ○ Compulsory degree
- ○ Apprenticeship
- ○ A-levels
- ○ University

What is your monthly household income? (Net income in Euro)

Includes your own net income and the net income of all other household members.

- ○ Below 1.000
- ○ 1.000 - 1.999
- ○ 2.000 - 2.999
- ○ 3.000 - 3.999
- ○ 4.000 - 4.999
- ○ 5.000 - 5.999
- ○ Over 6.000
- ○ No response

What is your responsibility for food shopping in your household?

- ○ Not at all responsible
- ○ Somewhat responsible
- ○ Mostly responsible
- ○ Completely responsible

Have you ever bought food online?

- ○ Yes
- ○ No

Congratulations – you have completed 100% of the study!

Thank you very much for your participation!

The study is now finished. You can close the window.

If you have any questions or comments, please contact me by e-mail:
christoph.moosauer@tum.de

Appendix D: Product Classification on the Eco-Label Scale and the Approximation of Life-Cycle GHG Emissions

Product Classifications on the Eco-Label Scale

Price Matrix (in € pro kg)	Product Choice 1*				Product Choice 2**			
	1	2	3	4	1	2	3	4
	1.89	2.69	3.59	1.69	2.99	2.49	2.69	3.99
GHG Matrix (kg of CO2e)	**Product Choice 1**				**Product Choice 2**			
	1	2	3	4	1	2	3	4
	0.41	0.38	0.38	0.43	0.35	0.37	0.25	0.24
Label Score	C	B	A[a]	D	C	D	B	A
Price Matrix (in € pro kg)	**Product Choice 3*** **				**Product Choice 4**** **			
	1	2	3	4	1	2	3	4
	2.49	1.99	1.39	1.59	0.99	1.49	1.19	1.29
GHG Matrix (kg of CO2e)	**Product Choice 3**				**Product Choice 4**			
	1	2	3	4	1	2	3	4
	0.85	0.9	1	0.95	1.1	0.9	1	0.95
Label Score	A	B	D	C	D	A	C	B

Conventional

Organic

Approximation of Life-Cycle GHG Emissions

For calculating GHG emissions, we used a mixed-method approach. For one thing, we engaged in literature research. For another, we utilized carbon calculators[24]. Given specific and constant information on GHG emissions of individual food products is scarce, this approach allowed an acceptable approximation of actual values, which was sufficient for our analysis. Still, it must be taken into account that reported values are approximations only. Future research aiming to extend our analyses is encouraged to use producer-reported actual data for specific products or brands to increase confidence in the GHG emission values. Based on the derived GHG emission values relative to each other, we classified the product alternatives included in our experiment on the eco-label scale, ranging from most sustainable (A) to least sustainable (D).

Product category	Source	Finding	Approximation	Note
Product choice 1: Tomatoe	Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (2018)	Approx. 0.3 kg CO2e	Used Food Carbon Scope as a web-based software tool in modelling GHG emissions. The tool included a detailed calculation similar to product choice option 4 (conventional tomatoes (Spain)), which	Confident that approximations are realistic. Still, literature identified a wide range of GHG emission values. No
	Theurl (2008)	Range from 0.1 - 1.5 kg CO2e; organic		

[24] https://www.cleanmetrics.com/foodcarbonscope/DefineModelTree.aspx and https://www.foodemissions.com/Calculator, both sources last accessed on 20th of September 2021.

		better than conventional	included packaging and transport. We compared the results with results from a simplified calculator, which yielded high agreement. Thus, the simplified calculator was used for options 2 and 3 as well. Option 1 was assumed to be characterized by GHG emissions between the two previous options since it was a regional choice, but used less sustainable production conditions, e.g., a heated greenhouse.	consistent values existing. Further, the sustainability score should be largely dependent on season and production method.
	Reinhardt, Gärtner, & Wagner (2020)	Range from 0.3 - 2.9 kg CO2e; organic worse than conventional		
Product choice 2: Apple	Reinhardt, Gärtner, Münch, & Häfele (2009)	Lowest GHG emissions if bought in-season and foregoing long transport	We utilized the simplified calculator. The comparison of our results with the literature indicated good fit of GHG emission values. Option 4 (organic apples (Germany)) was the most sustainable option and assumed to be closely matching Reinhardt et al.'s (2020) 0.2 kg CO2e value. We assumed higher GHG emissions for options 1 and 3 given the longer transportation distance.	The range of GHG emission values identified by literature was narrower than for tomatoes. It was generally recommended to buy regional and in-season products. Thus, we assumed the *organic (low)* alternative to be less sustainable than the *conventional (high)* option in this specific case. In doing so, we illustrate that organic alternatives are not necessarily more sustainable than their conventional counterparts, at least if the conventional product is sourced regionally for example.
	Blanke (2010)	Range from approx. 0.3 - 0.4 kg CO2e; regional apple always better than import apple		
	Reinhardt et al. (2020)	Range from approx. 0.2 - 0.8 kg CO2e; organic better than conventional		
Product choice 3: Pasta	Barilla (2015)	A pack of the brand Barilla accounts for approx. 1 kg CO2e for a German consumer	We based our calculations on the concrete life-cycle CO2e value for imported Barilla pasta. Assuming a German production for the second conventional product alternative, we set its GHG value slightly lower than	As a processed product, GHG emissions for pasta may vary between producers. The determined GHG emission values are seen as

		(production, transport, packaging)	Barilla's due to the lower transportation distance. Since most sources indicate that organic pasta is more sustainable than conventional pasta due to lower emissions during production, both organic product options were characterized by slightly lower GHG emissions than their conventional counterparts. We set the *organic (high)* option close to an existing approximation by Reinhardt et al. (2020).	approximations, which were based on the concrete case of Barilla pasta.
	Recchia, Cappelli, Cini, Garbati Pegna, & Boncinelli (2019)	Organic farming reduces CO2 emissions of pasta products in comparison to conv. farming		
	Cimini, Cibelli, & Moresi (2019)	Use of organic wheat and renewable energy reduced impact by 58%		
Product choice 4: Milk	Frank, Schmid, & Hülsbergen (2013)	Organic per liter approx. 1 kg CO2e: conventional approx. 1.1 kg CO2e	Common conclusion that organic milk is responsible for less GHG per liter of milk than conventional milk. Based on the concrete values in the literature, we set the conventional option to 1.1 kg CO2e and adjusted downwards or upwards depending on production method (organic/ conv.), transport distance, and packaging (carton, glass, ...).	While actual absolute GHG emission values of milk may again vary, we are confident in the relative sustainability rank of product alternatives presented to subjects.
	Lindenthal, Markut, Hörtenhuber, Rudolph, & Hanz (2010)	Organic CO2e values approx. 10-20% lower per kg compared to conventional milk		
	Reinhardt et al. (2020)	Conv. milk. per liter: 1.1 kg CO2e		
	KliBA gGmbH Klimaschutz- und Energie-Beratungsagentur (2015)	Organic per liter: 0.881 kg CO2e; conv.: 0.938 kg CO2e		

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