

Do environmental and health concerns affect U.S consumers pro-sustainable food purchase behavior?

A thesis by

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Spring 2021

University of Stavanger



Universitetet
i Stavanger

**UNIVERSITY OF STAVANGER BUSINESS SCHOOL
MASTER'S THESIS**

STUDY PROGRAMME:

Master of Science in Business Administration

THIS THESIS HAS BEEN WRITTEN WITHIN THE
FOLLOWING FIELD OF SPECIALISATION:

Economics (Økonomisk analyse)
Strategic Marketing and Analytics (Strategisk
markedsføring)

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TITLE:

Do environmental and health concerns affect U.S consumers pro-sustainable food purchase behavior?

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Abstract

Food production and consumption have a major impact on human health and the environment we all share. In order to achieve food security for future generations, we are dependent on changing the current food consumption. Despite an increasing focus on food sustainability and healthy consumption, the chronic diseases and greenhouse gas emission is still increasing. The aim of this thesis is to establish how environmental and health attitudes affect U.S consumers' behavior towards a more pro-environmental change. Throughout an extensive review of previous studies, we found that pro-environmental behavior change was influenced by both environmental and health attitudes. The environmental and health benefits of changing the consumption pattern towards eating less beef and increasing plant-based meat consumption are highlighted. We developed a conceptual framework from these findings, which has been used to study behavior change due to environmental and health attitudes in the context of the U.S. We also considered how these attitudes could be used in strategic implications to achieve behavior change, which can be utilized by stakeholders.

This study uses data from a survey conducted as a part of a larger project funded by the Research Council of Norway. Results are estimated by logit models and average marginal effects. All estimated results show the hypothesized effects. The most exciting result was the difference between environmental and health-conscious consumers. These consumers were first discovered to be different people. Although the environmentally conscious consumers were likely to change in a pro-environmental food behavior, there was estimated no relationship between health-conscious consumers and the willingness to increased consumption of plant-based meat. This result indicates the need for extended research on these two groups of consumers to target them appropriately. Therefore, our findings are beneficial for the U.S government, stakeholders, and the food sector. This research can contribute to the literature on how environmental and health attitudes influence pro-environmental behavior change.

Foreword

This master thesis marks the fulfillment of the requirements for the Master of Science in Business Administration at the University of Stavanger Business School. The work with the thesis has been challenging yet interesting and educating, and we have acquired valuable knowledge and insight within our research area. Despite the COVID-19 pandemic and its challenges, great help and regular digital meetings with our thesis advisor have given us appreciative support along the way.

Firstly, we would like to express our gratitude to our thesis advisor Professor Yuko Onozaka, for the tremendous knowledge, ideas, support, and patience she has given us during this period. Her constructive feedback has been essential and is highly appreciated. Furthermore, we would like to thank our family members for their enormous support throughout this period.

Lastly, we are grateful for the patience and care our boyfriends Jørgen and Emil have shown during the past months.

Stavanger, Norway

June 2021

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1. Introduction

Climate change and future food security are some of the major challenges humanity faces today, and current dietary patterns are significantly influencing these problems (Asvatourian et al., 2018). Food consumption and production have a major impact on the environment. Simultaneous the changes in human diets are leading to health problems (Lazzarini et al., 2016). Therefore, there is a need for change in consumers' food consumption behavior to ensure a secure and healthy future for humans and the planet (Hartmann & Siegrist, 2017). During the past decades, there has been a significant increase in focus on sustainability and health in consumers' food purchase behavior, and in the context of this, several authors have studied and compared consumer's environmental and health attitudes and how it affects their food purchase behavior (e.g., Sun, 2008; Springmann et al., 2016; Sanchez-Sabate & Sabaté, 2019; Su et al., 2019; Willett et al., 2019). Consumers with positive attitudes towards sustainable consumption found it more beneficial for human health and the environment. However, the literature suggests a gap between consumers' positive attitudes and actual purchase behavior (Vermeir & Verbeke, 2006). With that said, changing consumers' purchase behavior is a challenging task (Sanchez-Sabate & Sabaté, 2019) because it is influenced by several factors like knowledge (Fransson & Gärling, 1999), values, attitudes, habits (Hauser, Nussbeck & Jonas, 2013), price (Lennernäs et al., 1997), social norms and current national and international food policies (Sabate & Soret, 2014).

In order to promote sustainable food behavior, the consumers need a greater knowledge about the environmental impact and consequences of their food behavior. (Hartmann & Siegrist, 2017). Without this knowledge, the consumers will most likely be less motivated to change their food behavior or to support policy measures (Tobler, Visschers & Siegrist, 2012). Studies have highlighted general environmental and health benefits of reducing animal-sourced consumption and shifting dietary patterns towards plant-based (Springmann et al., 2016; Willett et al., 2019). As regarding to the environment, the agricultural sector is the second largest contributor to greenhouse gas emissions (Intergovernmental Panel on Climate Change, 2014). Among others, meat production has six times higher production emissions than vegetarian products. Within meat products, beef is the most polluted type, as it has been proved to have ten times higher production emissions than chicken (Simon, 2020). Accordingly, in order to meet the expected food demand in 2050, we need to reduce the global production and consumption of animal products by 50 percent (Greenpeace, 2018). In addition, other studies

emphasize that replacing red meat with plant-based protein could reduce the risk of chronic diseases and total mortality (Zheng et al., 2019; Hu, Otis & McCarthy, 2019).

In the context of the U.S, there are several studies on behavior change due to climate and health concerns (e.g., Steger et al., 1989; Neff et al., 2018; Su et al., 2019; Leiserowitz et al., 2020). However, there is limited research on U.S consumers' preferences and perceptions about beef. Little is known about how environmental and health concerns affects U.S consumers change in beef consumption and plant-based meat consumption. Therefore, we found it fundamental to gain insight into how U.S consumers' attitudes towards the environment, health and perceptions about beef as a sustainable and healthy attribute affects their pro-sustainable food purchase behavior.

Due to the research gap presented above, we reason that it is essential to look at how marketers' and governments' use of environmental and health information can help change consumers' food consumption. Food consumption is a major issue in the politics of sustainable consumption due to the agriculture impact on the environment, individual and public health, social cohesion, and the economy (Reisch, Eberle & Lorek, 2013). Although people have become more aware of the negative environmental and health outcomes, meat consumption has increased (Godfray et al., 2018). This thesis is two folded, as it aims to investigate how consumers perceptions and attitudes towards environment and health affect their behavior change. The main research question for the thesis is as follows:

«Have consumers changed their food behavior towards a more pro-environmental direction due to the environmental and health concerns in the U.S? »

Since sustainability is no longer an option, but a necessity for companies, the correct use of segmentation is essential to their success, companies must offer products that fulfill their consumers' needs and preferences (Peattie, 2010). The second aim of the thesis is to develop recommendations and strategic implications that companies and the government can use to contribute to consumer behavior change, leading the sub-research question to be:

«How can environmental and health attitudes be used as strategic implications to contribute to consumer behavior change by stakeholders? »

Insight into how environmental and health attitudes affect consumers' pro-environmental food behavior change is crucial for the U.S food sector. We have reasons to believe that findings from this thesis will be of great interest to several stakeholders. Our research includes how environmental and health attitudes affect consumers' pro-environmental food purchase decisions and can contribute to further existing research.

The organization of this thesis is as follows: In chapter 2 we will present findings from previous literature on pro-sustainable behavior change and factors affecting behavior change, as well as further indications for the strategic purpose throughout a literature review. Chapter 3 presents our conceptual framework developed based on findings from the literature review and the development of our hypothesis. In Chapter 4 we will illustrate our empirical approach and describe our choice of data and models for further analysis. Chapter 5 introduces our results, while Chapter 6 presents our discussion and our recommendations. Finally, the conclusion is presented in Chapter 7.

2. Literature review

This chapter aims to identify existing information and findings from previous studies on pro-sustainable behavior change in food consumption. This will provide the basis for our conceptual framework and the analysis section.

2.1 Behavioral change

Due to the environmental and health issues resulted by today's food consumption, societies are facing challenges to improve the health and well-being of their citizens. These problems might be diminished substantially by eating healthier and wasting less food (Schifferstein, 2020). However, changing consumer food behavior is a challenging task (Sanchez-Sabate & Sabaté, 2019). Even though consumers have a clear sight of the desired behavior change, it may be unclear how consumers can get there, and a simple intervention will most likely not result in long term change (Schifferstein, 2020). Consumers cannot be categorized based on only one type of behavior. Instead, their behavior is shaped by their needs and what is available to meet their needs (Tory & Kerry, 2010). While health behavioral theorists state that behavior change can only occur by adopting positive attitudes based on motivations and reasons (Glanz et al., 2008), other argue that knowledge, consumers internal locus of control, personal responsibility, and consumer health concerns are factors affecting behavior (Fransson and Gärling, 1999). The interaction between values, attitudes, habits, impulses, and lifestyle has been studied as other relevant factors when understanding the interplay of consumers' patterns of food choices (Hauser, Nussbeck & Jonas, 2013).

What is more, information provided to the consumers has been argued to influence behavior change (Verbeke, 2005; Vermeir & Verbeke, 2006), because a lack of product information can lead to consumers not knowing enough about the products' sustainable properties (Verbeke, 2005). Conversely, Abrahamsen et al. (2005) claims that information does not necessarily influence behavior change but tends to increase knowledge.

In a recent study conducted by Leiserowitz et al. (2020) concerning the food behavior of U.S citizens, half of the respondents stated that they would have eaten more plant-based food if the information regarding the environmental consequences was more elaborate. According to the study, there is a considerable willingness to decrease meat consumption and increase plant-based meat consumption among the U.S respondents. The individual motivations behind

purchasing or eating plant-based food were health, taste, convenience, and price. Despite that U.S citizens are willing to change their diet, about half the respondents believed that a meal with a plant-based main course was more expensive than a meat-based main course, whereas some respondents even believed that preparing plant-based food was more time-consuming. From an international perspective Bryant et al. (2019) found a significant difference in purchase likelihood of plant-based meat among U.S respondents compared to India and China. The findings indicated that 25.3 percent of the respondents in the U.S were not at all likely to purchase plant-based meat, compared to 4.4 percent in China and 5.5 percent in India. On the other hand, 32.9 percent of the U.S respondents were very or extremely likely to purchase plant-based meat, compared to 62.4 percent in China and 62.8 percent in India. In addition, a study conducted by Kearney et al. (2000) found that cultural differences could play an important role in consumers food choices.

2.2 Attitude towards the environment

Over the past century, the earth's environment has undergone major changes and challenges due to human activities such as overconsumption of natural resources, pollution, and loss of agricultural land. These human activities pose a serious threat to sustainability in the natural environment (Chua et al., 2016). Environmental technologies, economic policies, production systems, and social initiatives will play a significant role in the chase of sustainability. Without changes in the current consumption pattern, their contribution will be undermined (Peattie, 2010). Therefore, individuals need to adopt changes in their behavior patterns to sustain the environment (Mainieri et al., 1997). Due to the increasing environmental degradation, people have become more aware of their environmental attitudes and purchases (Ramayah & Rahbar, 2013). The vast majority of recent research has presented environmental concern as a highly influencing factor for changing consumers' behavior (Vermeir & Verbeke, 2006; Ramayah & Rahbar, 2013; Chua et al., 2016; Su et al., 2019; Leiserowitz et al., 2020). Environmental concern is defined as "the influence of ecological concern, measured as a generalized or global attitude, is mediated by more specific attitudinal, normative, and behavioral intention variables" (Gill, Crosby & Taylor, 1986, p. 549).

There have been developed scales to measure consumers' concerns about different environmental issues (Zimmer, Stafford & Stafford, 1994). In this context, Dunlap and Van Liere (1978) presented a new way of thinking about environmental concerns called the New

Environmental Paradigm (NEP), which was developed after U.S citizens began to show their concern for the environment. This scale measured the level of relationship between humans and the environment, focusing on "beliefs about humanity's ability to upset the balance of nature, the existence of limits to growth for human societies, and humanity's right to rule over the rest of nature" (Dunlap et al., 2000, p.427). Even though NEP is considering the general belief on the environment, it has additionally shown a positive relationship with environmentally significant behavior (Chua et al., 2016). The NEP scale illustrated that consumers with a high level of environmental concern are more likely to engage in ecologically conscious consumer behavior (Antil, 1984). Moreover, the NEP scale also measured significant difference in ecologically consciousness in members of environmental groups compared to the general public (Dunlap & Van Liere, 1978). The same conclusion was drawn by Steger et al. (1989) when comparing citizens and environmental activists in Canada and the United States.

In a study among Dutch and U.S respondents, findings indicated that Dutch people believed that climate change was mainly due to human activities. On the other hand, U.S respondents reported that climate change issues are more crucial for them personally than for Dutch people (de Boer, de Witt & Aiking, 2016). Similarly, a study on Generation Z conducted by Su et al. (2019) discovered a difference among the U.S respondents' environmental consciousness based on their concern for environmental issues and pro-sustainability behaviors. On the other hand, Austgulen et al. (2018) found few consumers motivated to change their food consumption because of environmental- or climate reasons. Although studies have discovered a positive attitude towards sustainable consumption concerning the environment among consumers, there is suggested a gap between the positive attitudes and their actual purchase behavior (Vermeir & Verbeke, 2006; Liu et al., 2012; Hidalgo-Baz, Martos-Partal & González-Benito, 2017).

Studies have also discovered environmental attitudes as an influencing factor in reducing consumers' meat consumption (Izmirli & Phillips, 2011; Neff et al., 2018; Cheah et al., 2020) and increase plant-based meat consumption (Leiserowitz et al., 2020). Findings from Izmirli and Phillips (2011) show that 38 percent of the respondents reduce animal products because of environmental concerns. However, only twelve percent of the U.S respondents in the study conducted by Neff et al. (2018) were willing to reduce their meat consumption due to environmental concerns. On the other hand, U.S respondents stated their primary motivation for purchase or eating plant-based meat was the environmental impact and helping reduce global warming (Leiserowitz et al., 2020).

2.3 Perception about beef sustainability

Household consumption accounts for 72 percent of GHG emissions globally, of which 20 percent are related to food consumption, thereby significantly impact climate change (Hertwich & Peters, 2009). Even though consumers identify increasing household consumption as a negative influencer and a threat to the environment (Lorenzoni & Pidgeon, 2006), the actual individual actions are argued as limited and yield a minimal effect on climate change (Abrahamsen et al., 2005). On the other hand, Jungbluth, Tietje and Scholz (2000) claim that a change in food purchases, especially reducing beef consumption, is necessary to reduce the environmental impact. Dietary changes towards more plant-based food and less animal-based foods are significant benefits of reducing GHG emissions (Springmann et al., 2016). By replacing beef products, including meat and cheese, Simon (2020) estimates a reduction of GHG emissions by 34 percent. Moreover, Harwatt et al. (2017) state substituting beans for beef could have a substantial effect on the reduction of GHG emission.

The current literature on how consumers perceive the climate impact of beef reports contradicting results. On one hand, people appear to understand the environmental benefits by reducing their meat consumption. Previous studies have found consumers aware of the meat's climate impact and the environmental benefit by reducing meat intake (de Boer, Schösler & Aiking, 2014). In fact, according to de Boer, Schösler and Aiking (2014), 64 percent of the participants were aware of beef's climate impact and what difference it would make to nature and climate by avoiding meat one or more meals in a week. Similar findings are found in a study conducted by Lazzarini et al. (2016), where the respondents ranked beef as very environmentally unfriendly. On the other hand, people appear to underrate the environmental benefit and importance of reducing meat consumption. Studies have discovered that reducing meat intake due to climate concerns is the least chosen alternative by consumers to curb climate change (Lea & Worsley, 2008; Campbell-Arvai, 2015; Sanchez-Sabate & Sabaté, 2019). According to Campbell-Arvai (2015), about 10 percent of the respondents strongly agreed that eating less meat could help the environment. Also, after reviewing a reasonable number of articles on consumer attitudes and behavior towards meat consumption concerning the environment, Sanchez-Sabate and Sabaté (2019) discovered that 4 to 19 percent were willing to reduce or avoid eating meat due to environmental considerations. In addition, Leiserowitz et al. (2020) observed that only one-fourth of the respondents thought beef production contributes to global warming.

2.4 Health attitude

People's food consumption has a great impact on their health. A healthy diet is vital as it can reduce the risk of life-threatening diseases. The U.S government has provided Dietary Guidelines for their citizens to promote a healthy diet. Despite these recommendations, the chronic diseases have increased, and about 74 percent of U.S adults are overweight or obese (DGA, 2020).

According to earlier studies, health is identified as an important factor influencing consumer food choice (Hayes & Ross, 1987; Richardson, MacFie & Shepherd, 1994; Steptoe, Pollard & Wardle & Steptoe.,1995; Lennernäs et al., 1997; Pollard, Kirk & Cade, 2002; Sun, 2008; Lê et al., 2013; Su et al., 2019; Leiserowitz et al., 2020). In addition, Lennernäs et al. (1997) found quality, price, taste, family preferences and trying to eat healthy as the most important factors influencing food choice. Lê et al. (2013) discovered that French people with positive attitudes towards healthy eating had healthier diets. The same conclusion was also reached by Sun (2008), who discovered a relationship between healthy eating attitudes and health concerns among Taiwan students. The finding indicated that students with more health concerns placed more importance on choosing food that makes them physically healthier. Another study on Spanish consumers discovered food sensory appeals as the most important factor in food choice followed by price, convenience, natural content, ethical concern, health, weight control, mood and familiarity (Carrillo et al., 2011). Similar results were found by Kearney et al. (2000), where health was identified as an affecting factor within food choice. Moving towards a diet consisting more of vegetables, fruits, whole grains, legumes, nuts, and seeds, is healthier and will lead to a higher health benefit than the current global diet (Springmann et al., 2016; Swinburn et al., 2019; Willett et al., 2019). In the context of the U.S, Leiserowitz et al. (2020) found health to be the most important factor for eating plant-based food. Even though these studies have found positive attitudes towards sustainable consumption concerning human health, there is a difference between the positive attitudes and consumers' actual purchase behavior (Vermeir & Verbeke, 2006).

2.5 Perception about beef healthiness

Various factors influence consumers' perception about the healthiness of food, such as type and processing of raw materials, origin, conservation method, production date, packaging, use of additives, and so forth (Bech-Larsen & Grunert, 2003). It is argued that the use of different health claims on food products has been used to increase consumers' perception of food's healthiness (Bech-Larsen & Grunert, 2003; Verbeke, Scholderer & Lähteenmäki, 2009). Consumers can evaluate the nutritional content in food through nutritional labeling. Rimal (2005) argues that people who are more health-conscious and those who consume less beef are the ones being more aware of this information.

People's meat consumption and their health have a high correlation (Godfray et al., 2018) and authors state that consumers would have a major health benefit by changing to a diet consisting of less animal-sourced food and more of plant-based foods (Springmann et al., 2016; Swinburn et al., 2019; Willett et al., 2019). Studies have further linked the consumption of red and processed meat with a higher risk of cancer, stroke, higher mortality rate, and type 2 diabetes (Springmann et al., 2016; IARC, 2015; Song et al., 2016; Bernstein et al., 2010; Bernstein et al., 2012; Pan et al., 2011).

Previous studies have found consumers aware of the meat's health impact and the benefits of reducing the meat intake (Neff et al., 2018; Izmirlı & Phillips, 2011; Cheah et al., 2020). In particular, Australian respondents in a study conducted by Cheah et al. (2020) believed that reducing meat consumption could ultimately put them in better health, including greater weight control, decreasing the saturated fat intake, and preventing diseases. Neff et al. (2018) found that half of the U.S respondents reduced their meat consumption due to health concerns. The same conclusion was drawn by Izmirlı and Phillips (2011), where the majority of the respondents reasoned their health as the reason for avoiding meat, specifically beef and lamb.

Despite the research growth on health benefits, the total global consumption of meat is still increasing (Godfray et al., 2018). This change is driven by an increasing average individual income and population growth (Springmann et al., 2016). It can be assumed that people's perception of beef as a healthy attribute might be a reason for this consumption increase. More than half of the respondents in a study performed by Grimshaw (2013) considered beef as a healthy protein following fish and chicken. Other studies have also concluded that consumers believing meat to be healthy and an essential component of the diet (Verbeke et al., 2010).

Similar findings were discovered from a study conducted by Van Wezemael et al. (2010), where the majority of the participants perceived beef as healthful, while some participants expected both positive and negative effects of beef consumption on their health. Consumers defined a healthful diet as a diet containing a low amount of calories and fat. Therefore, moderate beef consumption is acceptable in a healthful diet (Van Wezemael et al., 2010).

Modern studies have highlighted the possible benefits of developing technologies to improve the health attributes of meat products (Verbeke et al., 2010). Research shows that consumers are skeptical about improving the healthiness of beef by applying unfamiliar or advanced processing methods (Van Wezemael et al., 2010), considering it as a lack of naturalness and excessive manipulation in the production of beef products (Verbeke et al., 2010). Other studies have also found that misinterpretation of dietary recommendations has also led consumers to believe that it is crucial to increase beef consumption for medical reasons (Gutkowska et al., 2018).

2.6 Socio-demographic factors

Socio-demographic factors often include age, gender, marital status, level of education, occupation, and household income. The abovementioned factors reflect the individual's socio-economic and demographic status (Mak et al., 2012). These factors are recognized as important variables to explain consumption behavior variations (Su et al., 2019; Lennernäs et al., 1997; Roininen, Lähteenmäki & Tuorila, 1999), but are alone not enough and not consistent in predicting environmentally friendly consumer behavior (Anderson & Cunningham, 1972; Kinnear, Taylor & Ahmed, 1974; Balderjahn, 1988; Minton & Rose, 1997).

Females and older consumers are frequently mentioned as more health conscious in a food purchase decision, as well as respondents with higher education (Lennernäs et al., 1997; Roininen et al., 1999). This was also discovered by Izmirlı and Phillips (2011), where females were found as more likely to cite their health as their main reason for avoiding eating animal products, while males were more likely to cite the environment as their main reason. Neff et al. (2018) discovered the health factor as more important for those with a lower income than those with high. According to Lê et al. (2013), people with higher education complied with dietary guidelines more closely and expressed a more positive attitude towards healthy eating than the less educated people. From a study conducted by Ricciuto, Tarasuk and Yatchew (2006), household size, income and education explained a significant part of the variation in food

purchasing. Furthermore, household size has been found to significantly influence food and nutrient consumption (Buse & Salathe, 1978; Chavas & Keplinger, 1983). Furthermore, Grasso et al. (2019) indicate a need for greater awareness and familiarity with more innovative and more technology-driven alternative protein sources among 65 years old participants and older.

Findings from Izmirli and Phillips (2011) show that female students were more likely than men to avoid meat, especially red meat. According to research conducted by Siegrist, Visschers and Hartmann (2015) female participants with higher education perceived reducing meat consumption as better for the environment than males and participants with lower education. Neff et al. (2018) found men as more likely to consider meat as a part of a healthy diet rather than females. In addition, men were also less likely to consider meatless meat than females. What is more, a Polish study concluded that medical recommendations did not contribute to a change in men's eating behavior, especially when it comes to reducing their consumption of meat (Gutkowska et al., 2018).

When investigating household behavior regarding meat consumption, Merlino et al. (2017) concluded that households without children had a weekly higher meat consumption habits than those with children. Moreover, household with higher education level purchased significantly more fruit and vegetables and less meat, compared to the household with lower education level (Ricciuto et al., 2006). According to Bryant et al. (2019), highly educated and high-income consumers in China and India had a significantly higher likelihood of purchasing plant-based meat compared to the consumers in the U.S.

2.7 Marketing and Segmentation

Through globalization, new and radical changes in food marketing and distribution systems have to a great extent affected the patterns of food consumption (Kearney, 2010). According to Thow (2009), the growth of supermarkets and transnational food corporations, such as KFC, McDonald's, Kraft, and Nestle, in developing countries are the main reason for this development.

The meat industry is argued to be one of the biggest industries in the world that are willing to do anything not to lose their profits. Researchers argue that the increased meat consumption around the globe and in the U.S is not demand-driven but supply-driven, meaning that it is pushed more by the actions of the meat industry and less of what we want (Zaraska, 2016).

Meat myths are prominent among the cluttered messages of contemporary food marketing, whether it relies on building up or changing and expanding present or future habits and consumer preferences. Additionally, it relies on our willingness to adopt or reject certain behaviors. Meat-eating behavior is a habit developed throughout the years, passed to children by socializations, including parents, friends, schooling, and reinforced by advertising (Bogueva & Phau, 2016). The tremendous amount of beef and meat advertisements in the U.S was so effective that when hearing the question "What is for dinner?" U.S citizens automatically answered, "beef" (Zaraska, 2016).

Due to the increasing environmental degradation and the fact that many recent studies have linked the consumption of red and processed meat with several types of diseases (e.g., Springmann et al., 2016; IARC, 2015; Song et al., 2016), consumers have become more aware of their environmental (Ramayah & Rahbar, 2012) and health concerns (Neff et al., 2018; Izmirlı & Phillips, 2011; Cheah et al., 2020). This has further led to consumers becoming more aware of the food they consume, demanding safe products with high quality and making their buying decisions based on the provided information. Consumers need for information must, according to Verbeke (2005), not be taken for granted because less information can cause an uncertainty among the consumer regarding which products to choose. Limited information regarding knowledge about agriculture often leads to consumers not understanding the consequence of their food purchase decisions on the food supply chain (Vermeir & Verbeke, 2006). On the other hand, there is a risk of information overload, resulting in loss of consumer confidence and indifference (Verbeke, 2005).

Increased demand for information and a greater awareness of health, well-being and the environment has led to new challenges and market segmentation opportunities for marketers. Sustainability is no longer an option but a necessity for companies, and the correct use of segmentation in a marketing strategy is essential to a company's success (Peattie, 2010). Market segmentation in the food retailing industry can, according to Su et al. (2019), be a customer-oriented process. The literature state that the guiding principle of segmentation is developing homogeneity and heterogeneity. Smith (1956) states that "Market segmentation involves viewing a heterogeneous market as a number of smaller homogeneous markets, in response to differing product preferences, attributable to the desires of customers for more precise satisfaction of their varying wants" (Smith, 1956, p.6). As concluded by Gutkowska et al. (2018), there is a need to verify marketing messages and to carry out general nutrition education

so that it is possible to reach consumers with information about the need to limit the consumption of meat products. Additionally, Onwezen et al. (2012) explains that one of the greatest challenges in consumer and marketing research is understanding the diversity of preferences and sensitivity among consumers in the market. When doing this, management can concentrate on the needs of the most profitable market segments. This can help companies to create offers that help them differentiate their product from its competitors.

There are several ways of providing information to food consumers through product labeling (Vermeir & Verbeke, 2006). One way of labeling is eco-labeling, where the intention is to help consumers choose the environmentally friendly product and influence consumers by informing them about production methods, ingredients, or in-use resource efficiency. Eco-labeling can also help marketers and manufacturers target the relevant consumers for their products. Moreover, the use of labels will help with converting the lack of environmental knowledge among consumers information asymmetric between producers and consumers (Rex & Baumann, 2007). Another way of labeling is through nutrition labeling, making it easier for consumers to make healthier dietary choices, which is an example of the rational choice paradigm based on reflective and conscious processing. The type of information provided varies regarding the nutrient content, including fat, sugar, salt, or energy. The way the information is provided also varies, from a single number or proportion, dietary guideline or colors viewing the relative healthiness of a product (Crockett et al., 2018).

2.8 Government politics

Economics and political economy influence diet, and in most countries, processing and retailing are essential in the economic sector. The reason is because the sector allocates large amounts of money to advertising and marketing and has a substantial political influence. Due to agriculture's impact on the environment, individual and public health, social cohesion, and the economy, food consumption is a crucial problem in the politics of sustainable consumption (Reich et al., 2013).

According to Nestle (2013), the governments dietary advice in the U.S has never been based purely on consideration of public health. Since the formation of the U.S Dietary Guidelines lobbying from the meat industry has been intensive, and civil society organizations have claimed that this influenced the American food recommendations. This is because the agencies that issue dietary advice have other constituencies and the public, most notably the agricultural

and food industries. When these industries interests' conflict with current thinking about nutrition, the results are controversy, confusion, and the invocation of science to support one or another point of view (Nestle, 2013). Even when advisers recommended scientific articles and evidence to limit the consumption of red meat in the U.S Dietary guideline plan for 2015 to 2020, the actual guidelines that were presented to the American public did not mention the scientific findings, instead recommending the consumers to eat lean meat. These recommendations from the U.S. Dietary guidelines should help U.S citizens choosing food that will keep them healthy. Unfortunately, their advice has often been vague or outright misleading (Willet & Skerrett, 2017)

Due to the external costs associated with meat consumption, numerous researchers examine mechanisms such as mitigation authorities to minimize global meat consumption. To influence the food sector and shape consumer demand, there is according to Godfray et al. (2018), a need for more evidence of effectiveness among various interventions that include the conscious, reflective decision-making system or unconscious, automatic processes. Furthermore, Godfray et al. (2018) claims that, although there is little direct evidence of the effectiveness of these interventions in reducing the demand for meat, there is a wealth of potentially relevant work that can inform how this can be implemented.

Another method of providing trusted evidence about welfare or environmental standards is the certification programs that the private sector or non-governmental organizations run. Moreover, Godfray et al. (2018) states that attempts to change diets through fiscal interventions also lies within a rational choice framework. An example is the tax Denmark operated in 2011 and 2012 on the saturated fat content of foods that raised the price of some meat products by 15 percent (Vallgård, Holm & Jensen., 2015). Research conducted by Jensen et al. (2016) shows that the tax was effective and accompanied reductions in consumption of products that were high in saturated fat, including minced beef.

Voluntary lifestyle changes toward meat consumption may not be sufficient to achieve a lower greenhouse gas emission. Instead, Nordgren (2012) suggests that environmental impact and the region-specific human health impact may require coercive measures, including a Pigouvian meat tax. Since it has been shown that the consumption of beef and sheep has a higher environmental impact than other types of meat, such as pork and chicken, the author therefore believes that there should be higher taxes on the consumption of these types of meat. In addition, Nordgren (2012) further suggest that this tax will be more accepted among the general public

than non-weighted tax and will finally be the first incentive to start changing the consumer pattern.

Throughout the literature background section, we have seen many possible ways to find consumers' behavior change. Our thesis will identify consumers' attitudes and perceptions and investigate how they affect their choices. Furthermore, in the next section we will examine the theory that is relevant for answering our research question.

3. Theory

This chapter presents our conceptual framework which is developed on basis of previous literature on behavior change in food consumption and aim to help us answer our research question. The main purpose of this thesis is to investigate if U.S consumers have changed their food behavior due to environmental and health concerns. Throughout the literature section, we found limited research on U.S consumers attitudes towards beef and how consumers rate beef as a sustainable and healthy attribute. Recent studies argue that shifting consumers' dietary patterns from beef to a more plant-based diet enhance the environment and human health. Thus, we needed to fill this research gap by broadening our research area by including the participants eating less beef due to environmental concerns and those likely to purchase or has already purchased plant-based meat in our dependent variable. At the same time, we found it relevant to explore the benefit of looking at people's perception of beef as a sustainable and healthy attribute to fill this gap. The conceptual framework can further be helpful to answer our sub research question where the investigated relationships between the dependent and independent variables can be used for strategic implications by stakeholders.

3.1 Conceptual Framework

Our conceptual framework is represented in Figure 1 below. The figure illustrates the relationship between the independent variables, which in our case are attitude towards the environment, health attitude, perception about beef healthiness and sustainability and demographic characteristics, and the dependent variable, pro-environmental behavior change. Pro-environmental behavior change is based on behavior change in general food consumption, behavior change in beef consumption and behavior change in plant-based meat consumption. Furthermore, there are conducted hypotheses corresponding to each independent variable to help us answer our research question. Moreover, aspects of the American food sector should be considered when evaluating our findings since our research takes place in the U.S.

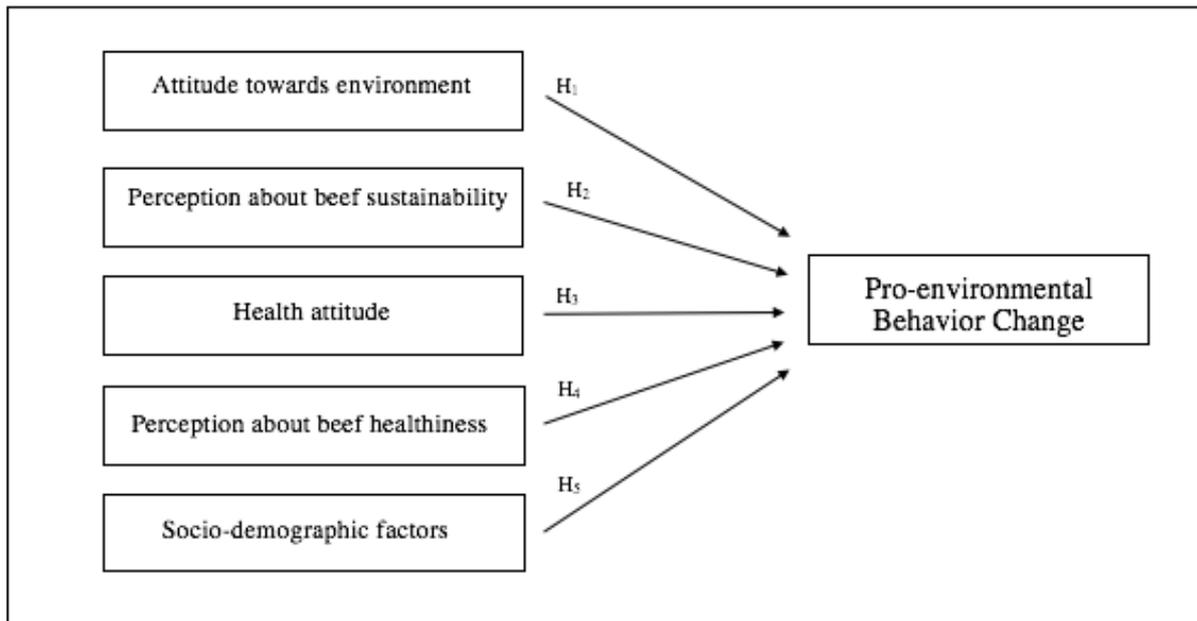


Figure 1: Conceptual framework

3.1.1 Behavioral change

Behavior change in this context refers to changing eating habits in a more sustainable direction such as eating less beef or more plant-based food. We hypothesize that such behavior changes are influenced by attitudes towards the environment, perception about beef sustainability, health attitude, perception about beef healthiness and socio-demographic factors. Although changing consumer's food behavior is a complex and challenging task, authors argue that behavior change will occur by adopting positive attitudes based on motivations and reasons (Glanz et al., 2008). Moreover, knowledge, consumer's internal locus of control, personal responsibility, and health concern are also stated as factors affecting behavior appearance (Fransson & Gärling, 1999). Further, authors state that consumers cannot be categorized based on only one type of behavior; instead, their behavior is shaped by their needs and what is available to meet their needs (Tory and Kerry, 2010).

3.1.2 Attitude towards environment

Attitude towards the environment refers to consumer's awareness and sensitivity about the environment (Su et al., 2019). The current literature identifies that the focus and interest on environmentally oriented topics have increased significantly over the past decades. Consequently, consumers are becoming more aware of their environmental attitudes and purchases (Ramayah & Rahbar, 2013). Environmental attitudes were argued to positively affect consumer behavior change, discovered through previous research that applied the NEP scale.

They found consumers with a higher level of environmental concern as more likely to engage in ecologically conscious consumer behavior (Dunlap and Van Liere, 1978; Antil, 1984; Steger et al., 1989). Similarly, researchers have found environmental concern as an influencing factor in reducing meat consumption (Izmirli & Phillips, 2011; Neff et al., 2018; Cheah et al., 2020). With regards to the U.S, Su et al. (2019) discovered differences among the respondents' environmental consciousness based on their concern for environmental issues and pro-sustainability behaviors. On the other side, studies identified few consumers motivated to change their food consumption due to climate- or environmental reasons (Austgulen et al., 2018). Even though U.S consumers identify climate change issues as essential for them personally, few believe climate change happens primarily because of human activities (de Boer, de Witt & Aiking, 2016). Based on the presented arguments, we hypothesize:

H1: Higher environmental concern is associated with pro-environmental behavior change.

3.1.3 Perception about beef sustainability

Perception about beef sustainability refers to how consumers perceive beef and its environmental impact. According to de Boer, Schösler and Aiking (2014), 64 percent of the participants were aware of beef's climate impact and what difference it would make to nature and climate by avoiding meat one or more meals in a week. Similar findings were found by Lazzarini et al. (2016), where the respondents ranked beef as very environmentally unfriendly. Further, findings from previous research show that reducing meat consumption due to climate concerns is the least chosen alternative to reduce the environmental impact (Lea & Worsley, 2008; Campbell-Arvai, 2015; Sanchez-Sabate & Sabaté, 2019). In fact, only ten percent of the respondents in a study conducted by Campbell-Arvai (2015) strongly agreed that eating less meat could curb climate change. In the context of the U.S, Leiserowitz et al. (2020) discovered that one-fourth of the American respondents believed that beef production contributed to global warming. These findings indicate that various consumers have different perceptions about agriculture's contribution to global warming. Thus, we have developed the following hypothesis:

H2: Stronger perception about negative sustainable impact of beef is associated with pro-environmental behavior change.

3.1.4 Health attitude

Health attitude refers to general health interest and relates to consumer's interest in eating healthy (Roininen, Lähteenmäki & Tuorila, 1999). Previous literature denotes health as an essential factor affecting food choice (e.g., Kearney et al., 2000; Pollard et al., 2002; Sun, 2008; Lê et al., 2013; Su et al., 2019; Leiserowitz et al., 2020). This is discovered by Kearney et al. (2000), which found health as an effecting factor within food choice. Similarly, Le et al. (2013) identified that people with positive attitudes towards healthy eating had healthier diets. This can further be compared to findings provided by Sun (2008), which discovered a relationship between healthy eating attitudes and health concerns. Moreover, according to Carrillo et al.'s (2011), health and weight control was found to be the least important factors in consumers food choice. When it comes to U.S consumers, Leiserowitz et al. (2020) identified health as the most important factor for eating plant-based food. Hence, we hypothesize the following:

H3: Higher level of health concern is associated with pro-environmental behavior change.

3.1.5 Perception about beef healthiness

Perception about beef healthiness refers to how consumers perceive beef and its health impact. People's meat consumption and their health have a high correlation (Godfray et al., 2018). In addition, Cheah et al. (2020) discovered that respondents believing that reducing meat consumption would ultimately put them in better health. Previous research also found health as an influencing factor for reducing meat consumption (Neff et al., 2018; Izmirlı & Phillips, 2011). Although some consumers perceive meat consumption as harmful to their health and aim to reduce it, some believe that meat is a healthy and essential component of their diet (Van Wezemael et al., 2010; Verbeke et al., 2010). A similar study found that more than half of the respondents considered beef a healthy protein behind fish and chicken (Grimshaw, 2013). Based on the presented arguments, we hypothesize:

H4: Stronger perception about the negative healthiness impact of beef is associated with pro-environmental behavior change.

3.1.6 Socio-demographic factors

Socio-demographic factors are important variables to explain food consumption variations in different contexts (Lennernäs et al., 1997; Roininen, Lähteenmäki & Tuorila, 1999; Su et al., 2019) and includes gender, age, household size, income and education. Studies have discovered household size, (Buse & Salathe, 1978; Chavas & Keplinger, 1983; Ricciuto, et al., 2006) education level and income as strong influencers on people's purchase decision where household with higher education level was further found to purchase more fruit and vegetables and less meat, compared to the household with lower education level (Ricciuto, et al., 2006). Also, Bryant et al. (2019) found higher likelihood of purchasing plant-based meat for highly educated and high-income consumers. Conversely, Mainieri et al. (1997) discovered that age, income, and education had no relation to any of the attitudinal and behavior variables presented in the research. Based on the findings reported, we propose the following hypothesis:

H5: Gender, age, household size, income and education are associated with the pro environmental behavior change.

4. Empirical Approach

This chapter presents our empirical approach and will describe the development of our methodical framework, data collection, sample characteristics, and our method of analysis.

4.1 Data

Our data is based on secondary data collected from a survey conducted in November 2020 and is a part of a larger project funded by the Research Council of Norway. The sample of 1000 respondents were selected from the consumer panel maintained by the company YouGov. The sample was stratified by age, gender and geographic distribution to reflect the national population. Only those who have purchased seafood products in the past 6 months and conduct at least 30% of the household food shopping were retained as qualified respondents. Moreover, the survey consisted of 377 different questions which further had sub-questions to answer.

4.1.2 Operationalization

The dependent variable, pro-environmental behavior change, in our model in Figure 2 consists of three outcome variables. The first variable is labeled as “*Behavior_Change*” and outlines the changes in food consumption behavior due to the concern for climate change. This is represented by responses to the question “Have you changed your eating habits due to the concern for climate change?”. The second variable is labeled as “*Beef*” and represents the changes in beef consumption due to the concern for climate change. This variable represents responses answered “yes” on the recent question and the follow-up question, “How did you change your eating habits?”. The third outcome variable is labeled “*Plant_Based*” and describes the likelihood of purchase plant-based meat. This is represented by responding very likely to purchase or have already purchased plant-based meat. These variables were transformed into binary variables. Thus, they take the value 1 if the respondents had changed their food behavior, 0 otherwise.

Attitudes towards the environment were labeled “*NEP*” in our dataset and were constructed to gauge the degree of environmental awareness. The six-item NEP scale developed by Dunlap and Van Liere (1978) rated on a 7-point Likert-type scale ranging from 1= strongly disagree to 7=strongly agree. The response statements were as follows: (1) The balance of nature is very delicate and easily upset by human activities, (2) The earth is like a spaceship with only limited room and resources, (3) Plants and animals do not exist primarily for human use, (4) Modifying

the environment for human use seldom causes serious problems, (5) There are no limits to growth for the nations like the USA, (6) Mankind was created to rule over the rest of nature. The three last statements were reversed, and the six statements were further transformed into one factor. The Cronbach's alfa coefficient was calculated to measure the internal consistency of attitudes towards the environment ($\alpha=0.78$) and were found to be within an acceptable range. The respondents were further divided into low and high NEP, where the respondents with average answers ranging from 1 to 4 were categorized as low NEP and those with higher average than 4, as high NEP. Thus, respondents take the value 1 if they have high NEP, 0 otherwise.

Perception about beef sustainability, labeled as "*Beef_Sust*" in our dataset elicits information on the respondents' perceptions about beef as a sustainable attribute. It is obtained from respondents rating beef as a sustainable attribute on a 7-point Likert-type scale ranging from 1=extremely poor to 7=superior. The respondents were divided into low and high based on their answers. Responses from 1 to 4 were categorized high and 5 or higher as low. Therefore, respondents take the value 1 if they rate beef as a poor sustainable attribute, 0 otherwise.

Health attitude is labeled as "*Health_Attitude*" in our dataset and elicits information regarding the respondents' attitudes towards healthy food. The eight statements were rated on a 7-point Likert-type scale ranging from 1=strongly disagree to 7=strongly agree. The statements were as follows: (1) The healthiness of food has little impact on my food choices, (2) I am very particular about the healthiness of food I eat (3) I eat what I like and I do not worry much about the healthiness of food, (4) It is important for me that my diet is low in fat, (5) I always follow a healthy and balanced diet, (6) It is important for me that my daily diet contains a lot of vitamins and minerals, (7) The healthiness of snacks makes no difference to me, (8) I do not avoid foods, even if they may raise my cholesterol. Statement 1, 3, 7 and 8 was reversed and all the eight statements was further transformed into one factor. The Cronbach's alfa coefficient was calculated to measure the internal consistency of attitudes towards the environment ($\alpha=0.79$) and were found to be within an acceptable range. The respondents were further divided into low and high by doing the same procedure as with NEP. Hence, respondents take the value 1 if they high health consciousness, 0 otherwise.

Perception about beef healthiness, labeled as "*Beef_Health*" in our dataset, represents information regarding the respondents' perceptions about beef as a healthy attribute. It is

obtained from respondents rating beef as a healthy attribute on a 7-point Likert-type scale ranging from 1=extremely poor to 7=superior. The respondents were divided into low and high based on their answers. Responses from 1 to 4 were categorized as high, and 5 or higher as low. Therefore, respondents take the value 1 if they rate beef as a poor healthy attribute, 0 otherwise. Lastly, we have selected some demographic characteristics, which we consider as essential variables for our analysis. These were also changed in the advantage for our further analysis. The variable “*Age*” consists of five age categories “1=18-29”, “2=30-39”, “3=40-49”, “4=50-59” and “5=60+” which was transformed into one factor. The variable “*Gender*” was originally equal to 1 if the respondents were male and 2 if female. Because the variables for gender often are valued as 0 or 1, we decided to set the value of females to 0.

We have also included the measure of household's gross income called “*Income*”. This variable had many options and to make our analysis more simple we divided the 16 previous alternatives into 5 alternatives. The first included household income from less than 10 000 dollars to 29 999 dollars, the second included income from 30 000 dollars to 59 999 dollars, the third included income from 60 000 dollars to 99 999 dollars, the fourth included income from 100 000 dollars to 199 999 dollars and finally the last included income from 200 000 dollars or more a year. The alternative “Don't know” or “Prefer not to answer” was excluded from the further analysis.

Furthermore, household size is included and labeled as “*HH_Size*”. This variable did also have many alternatives and we decided to simplify by dividing the 13 alternatives into 4 alternatives. The first included one person per household, the second included two persons, the third included three or four persons and the fourth included five or more persons per household. Lastly, we included a variable for the level of education called “*Educ*”. This variable was transformed from 8 different alternatives into 4 alternatives. The first included respondents with less than high school or high school/GED, the second included respondents with some college or 2-year college, the third included 4-year college or master's degree and the last included respondents with doctoral degree or professional degree (JD, MD). We also transformed all these demographic variables into factors before running the logit models.

4.2 Logit Model

Since our dependent variable is valued 1 if chosen by the respondents and 0 otherwise, makes a binary response model the most appropriate for our estimation since it only takes two values. In a binary response model, does the interest lie primarily in the response probability (Wooldridge, 2009, p.575). Where x denotes the full set of explanatory variables:

$$P(y = 1|x) = P(y = 1|x_1, x_2, \dots, x_k),$$

Let us denote Y as a binary indicator which takes a value one if behavior change is reported and zero otherwise, where x contains of various individual characteristics and other factors affecting the dependent variable (Wooldridge, 2009). The probability of the behavior change can be modeled as:

$$P(y = 1|x) = G(\beta_0 + \beta_1 x_1 + \dots + \beta_k x_k) = G(\beta_0 + x\beta),$$

Where G is a function taking values between zero and one: $0 < G(z) < 1$. There are two standard binary response models, the logit model and the probit model. These two models overcome the shortcomings of the linear probability model, but on the other hand they are more difficult to interpret (Wooldridge, 2009, p.574). For our econometric estimation, we chose the logit model. In the logit model, G is the logistic function which is between zero and one for all real numbers z :

$$G(z) = \frac{\exp(z)}{[1 + \exp(z)]} = \Lambda(z),$$

Where z is specified as a linear function:

$$z = \beta_0 + \beta_1 NEP + \beta_2 Beef_Sust + \beta_3 Health_Attitude + \beta_4 Beef_Health \\ + \beta_5 Gender + \beta_6 Age + \beta_7 Income + \beta_8 HHSize + \beta_9 Educ$$

The statistical tests can be conducted on the parameters β 's, which will be the basis to empirically test the hypotheses we posted in the previous section.

5. Results

In the following part of the thesis, the results from our statistical estimates will be presented. Moreover, our findings will be analyzed as background preparation for the discussion and strategic implication in the upcoming chapter.

5.1 Descriptive statistics

After completing the following steps presented in the operationalization selection, we end up with the following variables presented in Table 1 below:

	Profile	Frequency	Percentage
Gender	Male	497	49.1
	Female	515	50.9
Age	18-29	168	16.6
	30-39	220	21.7
	40-49	170	16.8
	50-59	192	19.0
	60 and older	262	25.9
Income	\$10 000 - 29 999	150	14.8
	\$30 000 - 59 000	198	19.6
	\$60 000 - 99 999	228	26.5
	\$100 000 - 199 999	215	21.2
	\$200 000 and over	73	7.2
Household size	1	182	18.0
	2	381	37.6
	3-4	342	33.8
	5 or more	107	10.6
Education	Less than high school or high school/GED	127	12.5
	collage or 2-year college	286	28.3
	4-year college or master's degree	514	50.8
	doctoral degree or professional degree (JD, MD)	85	8.4
NEP	High	674	66.6
	Low	310	30.6
Health_Attitude	High	666	65.8
	Low	338	33.4
Beef_Sust	High	527	52.1
	Low	399	39.4
Beef_Health	High	554	54.7
	Low	429	42.4

Table 1: Frequency table

As represented in Table 1, there are no especial differ in the gender distribution. Participants in the sample (n=1012) consisted of female (50.9%) and male (49.1%). There are no significant differences in the age distribution, however the category 60 years and older (25.9%) are the one with highest respondent rate while the youngest (16.6%) category represent the lowest

respondent rate. In terms of income the largest proportion of respondents are those who earn between \$ 60 000 and \$99 999 (26.5%). When it comes to household size, 37.6 percent of the respondents live in a household consisting of two persons. A total of 50.8 percent had 4-years college or master’s degree. Regarding the NEP variable, 66.6 percent are categorized as environmental conscious and a total of 39.4 percent rated beef as a negative sustainable attribute. As for health attitude, 65.8 percent are categorized as health conscious and a total of 42.4 percent rated beef as a negative healthy attribute.

The first section of the questionnaire we found interesting for our thesis included questions regarding consumers’ food lifestyle, attitudes, and values. We believe these questions are crucial to consider, although they will not be estimated in the logit model. On the question of how concerned the respondents were about the climate impact of Salomon products transported by air, 33.8 percent of the 1012 respondents answered: “never thought about it before.” Further, 4.6 percent answered: “don’t know,” 17.2 percent answered: “not at all concerned,” 14.4 percent answered, “a little concerned,” 14.6 percent “moderately concerned,” and 9.8 percent answered, “very concerned.” In comparison, only 5.5 percent of 1012 respondents answered that they were “extremely concerned.” Further on, the next question was if the respondents had changed their eating habits due to climate change concerns. Out of the 1012 respondents, only 32.4 percent said they had changed their eating habits due to concerns about climate change.

Out of the 328 that said “yes” to changing their eating habits due to concerns regarding climate change, they were further questioned on how they have changed their eating habits. The question contained if they have eaten less, no change in eating, or if they have been eating more of beef, pork, chicken, seafood, vegetables, domestically produced food, domestic wild-captured seafood, domestic farmed seafood, domestic land-based farmed seafood, frozen/refreshed seafood transported by ship and food in general. As expected, most of the respondents have eaten less beef and pork, 83.5 percent and 66.5 percent, respectively. The respondents have eaten 75.3 percent more vegetables and 56.4 percent more domestically produced food, and 32 percent domestic wild-captured seafood.

Out of the 684 respondents answering “no” on if they have changed their eating habits due to climate change, were further asked if they are planning to change their eating habits—the respondents were to answer “yes” or “no” to this question. Only 26.5 percent answered “yes,” and 73.5 percent answered “no.”

Further on, the 181 respondents answering “yes” on if they are likely to change their eating habits in the near future due to the concern for climate change were asked how they plan to change it. Again, we see the same pattern as before. Most of the respondents plan to change their eating habits by eating less beef and pork, 69.6 percent and 59.7 percent, respectively. The respondents were to eat 76.4 percent more vegetables and 56.4 percent more domestically produced food, and 35.4 percent domestic wild-captured seafood. Further on, the respondents were further asked how likely they are to purchase the following: plant-based meat, plant-based fish, animal meat grown from cells in labs, fish meat grown from cells in labs or insect-based, meals and snacks from a Likert-scale from 1 to 7. Where 1 is “never” and 7 are “extremely likely or have already purchased” or choose 0, what is “I do not know.” All the answers have the highest percentage significantly on “never.” The insect-based meals and snacks are higher than the others, with 47.2 percent answering never. The plant-based meat had the highest respondent rate on “extremely likely or have already purchased” with 14.6 percent.

Further on, we have performed a correlation analysis presented in Table 2 to get an overview of how all the dependent and independent variables are related to each other. As expected, there is a relationship between all the independent and dependent variables. There are some differences in how related they are, and whether they are positive or negative related. Our outcome shows that there is a high correlation between the variables “Beef” and “NEP” and between “Beef” and “Beef_Sust,” which is in line with our expectations, given results from previous research. Therefore, we can presume that people who tend to reduce their beef consumption might do it due to their environmental conciseness and how they perceive beef and its health impact. Additionally, the strongest correlation is founded between “Beef_Sust” and “Beef_Health”, so we can assume that those who believe that beef contributes to a negative effect on the environment also believe it contributes to negative health effects. One remarkable outcome is the low correlation between the variables “NEP” and “Health_Attitude”. Thus, this implies that those who are conscious about the environment and those who are conscious about health are not the same people.

	Behavior_Change	Beef	Plant_Based	NEP	Beef_Sust	Health_Attitude	Beef_Health	Gender	Age	Income	HHSize	Education
Behavior_Change	1.000											
Beef	-	1.000										
Plant_Based	.271**	.111	1.000									
NEP	.216**	.327**	.094**	1.000								
Beef_Sust	.284**	.373**	.118**	.331**	1.000							
Health_Attitude	.121**	.107	.033	.056	.115**	1.000						
Beef_Health	.231**	.246**	.095**	.264**	.560**	.119**	1.000					
Gender	.055	-.039	-.043	.116**	.056	.083**	.076*	1.000				
Age	-.168**	.112*	-.106**	.010	-.101**	.054	-.051	-.047	1.000			
Income	.115**	.130*	.115**	.032	.167**	.104**	.048	-.135**	.025	1.000		
HHSize	.077*	-.184**	.035	-.072*	-.068*	-.013	-.085**	0.74*	-.246**	.147**	1.000	
Education	.190**	.169**	.111**	.074*	.193**	.073*	.110**	-.122**	-.085**	.430**	-.015	1.000

Table 2: Correlation analysis

5.3 Logit model estimation

We have estimated three logit models for behavior change in general food consumption, behavior change in beef consumption and behavior change in plant-based meat consumption. The regression result is presented in Table 3 below.

<i>Dependent variable:</i>			
	Behavior_Change	Beef	Plant_Based
	(1)	(2)	(3)
NEP	0.756*** (0.201)	0.981** (0.464)	0.710*** (0.267)
Beef_Sust	0.579*** (0.198)	1.487*** (0.500)	0.031 (0.263)
Health_Attitude	0.384** (0.178)	0.823* (0.425)	-0.078 (0.220)
Beef_Health	0.608*** (0.192)	0.385 (0.457)	0.242 (0.250)
Gender	0.205 (0.166)	-0.051 (0.401)	-0.285 (0.214)
Age2	0.151 (0.250)	-0.349 (0.570)	-0.023 (0.309)
Age3	-0.375 (0.274)	-0.441 (0.681)	0.036 (0.329)
Age4	-0.595** (0.284)	0.222 (0.783)	-0.604* (0.367)
Age5	-0.623** (0.268)	0.181 (0.723)	-0.869** (0.359)
Income2	-0.365 (0.285)	0.262 (0.669)	0.278 (0.424)
Income3	0.071 (0.272)	0.321 (0.610)	0.617 (0.406)
Income4	-0.099 (0.291)	0.462 (0.664)	0.658 (0.423)
Income5	0.231 (0.367)	0.745 (0.921)	1.095** (0.491)
HHSize2	0.073 (0.252)	-1.456* (0.815)	0.416 (0.342)
HHSize3	0.387 (0.261)	-1.436* (0.779)	0.152 (0.357)
HHSize4	0.471 (0.341)	-1.561* (0.912)	0.459 (0.442)
Educ2	0.524 (0.349)	1.568** (0.798)	0.118 (0.445)
Educ3	0.978*** (0.344)	2.301*** (0.796)	0.159 (0.434)
Educ4	1.047** (0.421)	1.376 (0.951)	0.675 (0.502)
Constant	-2.801*** (0.454)	-1.237 (1.122)	-2.897*** (0.602)
Observations	823	278	783
Log Likelihood	-452.780	-92.985	-312.916
Akaike Inf. Crit.	945.560	225.970	665.831

Note:

*p**p***p<0.01

Table 3: Estimation Logit Model

5.3.1 Attitudes towards the environment

Hypothesis 1 states that higher environmental concern is associated with pro-environmental behavior change. The estimated coefficients associated with the three outcome variables describing behavior change are positive and significant ($\hat{\beta}=0.756$, $p<.001$), ($\hat{\beta}=0.981$, $p<.01$), ($\hat{\beta}=0.710$, $p<.001$), meaning our hypothesis is supported by the data.

5.3.2 Perception about beef sustainability

Hypothesis 2 state that stronger perception about negative sustainable impact of beef is associated with pro-environmental behavior change. Behavior change in general ($\hat{\beta} = 0.579$, $p<.001$) and behavior change in beef consumption ($\hat{\beta}=1.487$, $p<.001$) are positive and significant. On the other hand, behavior change in plant-based meat consumption is not significant. We can therefore conclude that the hypothesis is supported in two out of our three outcomes by the data.

5.3.3 Health attitude

Hypothesis 3 state that higher level of health concern is associated with pro-environmental behavior change. Health attitude is positive and significant in both the first variables general behavior change ($\hat{\beta} = 0.384$, $p <.01$) and behavior change in beef consumption ($\hat{\beta}=0.823$, $p <.05$). Conversely, our dependent variable for behavior change in plant-based meat consumption is not significant. Therefore, we can conclude that the hypothesis is partly supported by the data.

5.3.4 Perception about beef healthiness

Hypothesis 4 states that that stronger perception about negative healthiness impact of beef is associated with pro-environmental behavior change. Behavior change in general ($\hat{\beta} = 0.608$, $p <.01$) are positive and significant. On the other hand, behavior change in beef consumption and change in plant-based meat consumption is not significant. However, we can conclude that the hypothesis is supported in one out of three outcomes by the data.

5.3.5 Demographic characteristics

Hypothesis 5 states that gender, age, household size, income and education are associated with the pro-environmental behavior change. “*Behavior_Change*” is negative and significant between the variables “*Age4*” ($\hat{\beta} = -0.595$, $p <.01$) and “*Age5*” ($\hat{\beta} = -0.623$, $p <.01$). However, the education variable “*Educ3*” ($\hat{\beta} = 0.978$, $p <.001$) and “*Educ4*” ($\hat{\beta} = 1.047$, $p <.01$) are

positive and significant. The “Beef” variable is negative and significant in the three variables “HHSize2” ($\hat{\beta} = -1.456, p < .05$), “HHSize3” ($\hat{\beta} = -1.436, p < .05$) and “HHSize4” ($\hat{\beta} = -1.561, p < .05$). While on the other hand, the “Educ2” ($\hat{\beta} = 1.568, p < .01$) and “Educ3” ($\hat{\beta} = 2.301, p < .001$) are both positive and significant. The output “Plant_based” signify that “Age4” ($\hat{\beta} = -0.604, p < .05$) and “Age5” ($\hat{\beta} = -0.869, p < .01$) is negative and significant, and the “Income5” ($\hat{\beta} = 1.095, p < .01$) variable is positive and significant. We can therefore conclude that our hypothesis is partly supported.

5.4 Average Marginal Effects

As the magnitude of the estimated coefficients are difficult to interpret in logit models, we estimated the average marginal effect (AME) for all the three models. We did this to explore the magnitude of how the variables affect pro-environmental behavior change. The results are presented in Table 4.

Variable	Behavior_Change	Beef	Plant_Based
	AME	AME	AME
NEP	.141***	.101*	.087**
Beef_Sust	.108**	.152**	.004
Health_Attitude	.071*	.084*	-.010
Beef_Health	.113**	.039	.029
Gender	.038	-.005	-.035
Age2	.031	-.036	-.003
Age3	-.073	-.047	-.005
Age4	-.112*	.020	-.074
Age5	-.117*	.017	-.098*
Income2	-.066	.029	.026
Income3	.013	.036	.066
Income4	-.019	.049	.072
Income5	.045	.076	.137*
HHSize2	.013	-.117*	.0492
HHSize3	.072	-.115*	.017
HHSize4	.088	-.129	.055
Education2	.085	.242	.013
Education3	.172**	.319*	.018
Education4	.186*	.218	.091

Table 4: Estimating average marginal effects (AME)

5.4.1 Attitudes towards the environment

Attitudes towards the environment have been revealed to show a great influence on general behavior change in food consumption, beef consumption, and plant-based meat consumption. These positive effects support hypothesis 1. Our result shows that if the environmental concern increase by one unit, the probability of changing their behavior will increase by 14.1 percent. The probability of changing their beef consumption will further increase by 10.1 percent, while there will be an 8.7 percent increase in chance that the person will change their plant-based meat consumption. This is partly supported by findings from Izmirli and Phillips (2011) study, who found their respondents willing to reduce animal products due to environmental concerns.

5.4.2 Perceptions about beef sustainability

Perceptions about beef sustainability are estimated to have a positive effect on behavior change in general and behavior change in beef consumption. Nevertheless, we see no relationship between perceptions about beef sustainability and behavior change in plant-based meat consumption. Furthermore, our result show that if negative perceptions about beef sustainability increases by one unit, the probability of changing eating habit increase by 10.8 percent and probability of changing beef consumption increases by 15.2 percent. This result is consistent with de Boer, Schösler and Aiking (2014), where they found a big part of the participants aware of beef's climate impact and the difference it would make by avoiding meat several times a week.

5.4.3 Health attitude

Health attitude is also revealed to positively affect behavior change in general and behavior change in beef consumption, but no relationship with change in plant-based meat consumption. The result show that if health concerns increase by one unit the probability of changing eating habits increases by 7.1 percent and probability of changing beef consumption increases by 8.4 percent. Our findings align with earlier studies conducted by Lê et al. (2013) and Sun (2008), where they found that consumers with positive attitudes towards healthy eating and those with health concerns had healthier diets.

5.4.4 Perceptions about beef healthiness

Perceptions about beef healthiness resulted in having positive effect on behavior change in general and behavior change in beef consumption. However, there is no relationship with change in plant-based meat consumption. The findings indicate that if negative perceptions about beef healthiness increases by one unit, the probability of changing eating habit increases by 11.3 percent while the probability of changing beef consumption increases by 3.9 percent. This is partly in line with previous research, where health was the reason for reducing meat consumption (Neff et al., 2018; Izmirli & Phillips, 2011).

5.4.5 Demographic characteristics

Lastly, our hypothesis on demographic characteristics is partly supported. We see that several characteristics as an effect on the three variables behavior change in general, behavior change in beef consumption, and change in plant-based meat consumption. When it comes to the variable "Age," we see that by increase the variable by one unit, the probability of changing consumers eating habits in the age group 50-59 years decreases by 11.2 percent. Furthermore, the probability of changing consumers' beef consumption and plant-based meat consumption in the age group 60 years and older decreases by 11.7 percent and 9.8 percent, respectively. These findings indicate that the probability of not changing their eating behavior will increase as the older the consumer becomes. The findings here are in line with the study conducted by Grasso et al. (2019), where they concluded that older consumers need to become more aware and familiar with the alternative protein sources in order to change their eating habits. The variable "Education" indicates that if the respondents are highly educated with 4-years of a college degree or master's degree, the probability of changing their eating behavior or beef consumption increases by 17.2 percent and 31.9 percent. We further see that there will be an 18.6 percent probability that respondents with a doctor and professional degree are willing to change their eating habits. The findings here align with Lê et al. (2013) study where they stated that people with higher education complied more closely with dietary guidelines and expressed a more positive attitude towards healthy eating than the less educated.

On the other hand, we see a negative relationship between household size and change in beef consumption. This outcome indicates that a one-unit increase in household size will lead to less probability of changing beef consumption. We can therefore conclude that the chance to reduce beef consumption is higher in a smaller household. We see old studies (Buse & Salathe, 1978;

Chavas & Keplinger, 1983) has also found household size to significantly influence food and nutrient consumption.

Lastly, the result shows that with a household income of 200 000 dollars or more, there will be a 13.7 percent chance that the consumers will be willing to consume plant-based meat. The finding here is also in line with the study conducted by Ricciuto et al. (2006) where they stated that income explained a significant part of the variation in food purchasing.

5.5 Policy and marketing implications

Our result indicates that the consumers who are environmental and health-conscious are not the same people. They have different preferences, and to understand the diversity among these consumers, stakeholders need to use different strategic implications to target them and divide them into different segment groups. Since our result implies that consumers with higher attitudes towards the environment are more likely to change to a more sustainable food behavior, stakeholders can target them by using eco-labeling because these consumers intend to reduce the environmental impact. This can be implemented by informing the consumers about the product's production method, the ingredients the product consists of, and in-use resource efficiency. Besides, these labels could help cover the lack of environmental knowledge among consumers, information asymmetry between producer and consumers (Rex & Baumann, 2007). Our results further indicate that consumers with higher health attitudes are more willing to change their eating habits and reduce their beef consumption. These health-conscious consumers can be targeted by the use of nutritional labeling because it enables them to make healthier dietary choices. The type of information can be the product's nutrient content and can be provided in dietary guidelines, single numbers, or with the use of colors indicating the healthiness of a product (Crockett et al., 2018).

6. Discussion

Food consumption is a major issue in the politics of sustainable consumption because of the agriculture impact on the environment, public health, social cohesion, and the economy (Reisch et al., 2013). Due to this matter, several researchers state that it is essential to reduce beef consumption to lower environmental impact (Jungbluth, Tietje & Scholz, 2000). However, Nestlé (2013) stated that the U.S. government's dietary advice has never been based purely on consideration of public health and has instead been vague or misleading (Willet & Skerrett, 2017). Since several studies have shown a connection between beef consumption with different types of diseases, the demand for information is increasing, and access to clear and reliable information is an essential factor in consumer purchase decisions (Vermeir & Verbeke, 2006). Due to diet-related diseases, 74 percent of American adults are overweight or have obesity (DGA, 2020). Therefore, there is a reason to believe that there is a lack of information regarding the food consumed in the U.S. Simultaneously, studies have found that the majority of U.S consumers are not willing to reduce their meat consumption due to environmental concerns (Neff et al., 2018). However, regarding results from our study, we can offer further recommendations that could be useful and beneficial for the food sector.

Primarily, our results identify that higher environmental concern is associated with behavior change in a more sustainable food purchase direction. These findings imply that the consumers concerned about climate change are more willing to change their food consumption, reduce their beef consumption, and eat more plant-based meat. Previous research has confirmed similar findings on environmentally oriented topics where they discovered a relationship between consumers with a high level of environmental concern and ecologically conscious consumer behavior (Dunlap & Van Liere, 1978; Antil, 1984; Steger et al., 1989). Since a dietary change in consuming less animal-based food and more plant-based food is associated with environmental benefits (Springmann et al., 2016), our result is expected. However, Neff et al. (2018) found that only twelve percent of U.S consumers reduced their meat consumption due to environmental considerations. We see that this is somewhat similar to our result, which implies that environmentally conscious are more willing to reduce beef consumption. Regarding the consumption of plant-based foods, we see that consumers' willingness to buy or eat plant-based meat is correlated with high environmental considerations in our findings. These are aligned with Leiserwoitz et al. (2020), where U.S respondents stated

that their primary motivation for buying or eating plant-based meat was the environmental impact and helped reduce global warming. Although our results show that environmentally conscious consumers are more willing to change their eating habits, a third of our respondents are not environmentally conscious. Since a lack of product information can lead to consumers not knowing enough about their sustainable properties (Fransson and Gärling, 1999), our results suggest that more information and knowledge regarding foods' environmental impact make consumers more aware of their food purchase.

When it comes to consumers' perception of beef's climate impact, it is expected that people who consider beef as a negative sustainable attribute are more willing to change their eating habits and reduce their consumption of beef. Since studies have found that consumers are aware of the climate impact of meat and the environmental benefits of reducing their meat intake (de Boer, Schösler & Aiking, 2014; Izmirlı & Phillips, 2011). Therefore, it is no surprise that people who consider beef a negative sustainable trait in our study are more willing to change their eating habits and reduce their beef consumption. In fact, one of the most exciting and prominent findings is the strong correlation between people rating beef as a critical sustainable attribute and eating less beef. However, we see that there is no relationship between the consumption of plant-based meat and negative perception of beef sustainability in our research. Since over half of our respondents did not consider beef as a negative sustainable attribute, there are therefore reasons to believe U.S consumers are poorly informed regarding agriculture's contribution to global warming (Leiserowitz et al., 2020).

As for the effect of health attitude, the extent of the estimated effects can seem unexpected in the context of plant-based meat, because health was found to be the most important factor affecting consumption of plant-based food in the U.S according to Leiserowitz et al. (2020) because moving towards a more plant-based diet would be beneficial for the human health (Springmann et al., 2016; Swinburn et al., 2019; Willett et al., 2019). However, as expected, our result implies that higher level of health concern is associated with general behavior change and behavior change in beef consumption. These findings are in line with previous research, where the majority found health as an influencing factor influencing food choice (e.g., Steptoe et al., 1995; Lennernäs et al., 1997; Sun, 2008; Su et al., 2019; Leiserowitz et al., 2020) and for reducing meat consumption (Izmirlı & Phillips, 2011; Godfray et al., 2018; Neff et al., 2018). We can further suggest that the linked consumption of red and processed meat with a higher risk of diseases (Springmann et al., 2016; IARC, 2015; Song et al., 2016;

Bernstein et al., 2010; Bernstein et al., 2012; Pan et al., 2011) might be one reason people reduce their meat consumption. Lastly, since a third of our respondents consider themselves not health conscious, we can therefore suggest that this might be because of the misleading and lack of information provided by the U.S Dietary Guidelines (Willet & Skerrett, 2017).

Our findings further indicate that the consumers considering beef as a negative healthy attribute are more willing to change their eating habits. Since previous research discovered a high correlation between people's meat consumption and health (Godfray et al., 2018), we expected a somewhat relationship between consumers' negative perception of beef healthiness and their reduction in beef consumption. However, this is not the case. In fact, there is no relationship between neither change in beef consumption nor plant-based meat consumption, and consumers' perception of beef as a healthy attribute. Moreover, since previous research highlight the health benefits of reducing meat consumption and increase plant-based food consumption (Springmann et al., 2016; Swinburn et al., 2019; Willett et al., 2019), our result suggests consumers are not aware regarding beef's negative health effect. Actually, more than half of the respondents in our research considered beef as a healthy attribute. This is somewhat in line with other findings, where consumers believed meat to be healthy and an essential component of the diet (Verbeke et al., 2010) and rated beef as a healthy protein (Grimshaw, 2013).

Our analysis revealed that the age socio-demographic characteristics had an influence on the change in food consumption and consumption of plant-based meat. Our result implies that the older the consumer becomes, the less likely will they be to change their food purchase behavior and purchase plant-based meat. Household income is also related to consumption of plant-based meat, implicating that higher household income is associated with a higher willingness to consume plant-based meat. These patterns are partly consistent with an analysis of food purchase, where higher income was associated with purchasing more of all food groups, including fruits and vegetables (Ricciuto et al., 2006). Similarly, Bryant et al. (2019) found a significantly higher likelihood of purchasing plant-based meat among high-income consumers in China and India compared to the U.S.

Moreover, household size was revealed to have an influence on the change in beef consumption. Our result implies that the more people living in a household, the less likely are they to reduce their beef consumption. These findings align with earlier studies, which discovered household

size as a significant influencer in food and nutrient consumption (Buse & Salathe, 1978; Chavas & Keplinger, 1983). Since the American participants in the study conducted by Leiserowitz et al. (2020) believed that preparing plant-based food was time-consuming, we can suppose that this might be why households consisting of more participants are less willing to change their beef consumption. Our analysis implies that education had a somewhat strong influence on the change in food consumption and beef consumption. Therefore, these results indicate that a higher education level is associated with a change in food consumption and consuming less beef. These results correspond with Ricciuto et al. (2006), who found households with higher education levels purchasing significantly more fruit and vegetables and less meat than households with lower education levels. Further findings indicated also that people with higher education were found to comply more closely with dietary guidelines (Lê et al., 2013).

Despite consumers' increased awareness of sustainability and health in their food purchase decisions in recent years (Wild et al., 2014), our result indicates that two-thirds of the respondents are health and environmentally conscious, and only one-third have actually changed their eating behavior. In addition, only a few of the respondents answered that they had been eating less beef and more plant-based meat. Therefore, our result suggests a gap between consumers' positive health and environmental attitudes and their actual purchase behavior. This is consistent with findings from Vermeir and Verbeke (2006), where they propose a gap between consumers positive attitudes and their purchase behavior. Due to the suggested gap, our result implies that consumers are not well informed about agriculture and do not understand the consequences of their food purchase decisions on the food supply chain (Vermeir & Verbeke, 2006). Simultaneous, the U.S government's dietary advice has never been based purely on consideration for public health (Nestlé, 2013), which could be another reason that U.S citizens are left with incorrect guiding information.

Our result indicates that the consumers have different preferences in their purchase decision, it is therefore important for stakeholders to use segmentation in order to target them, because the correct use of segmentation is essential to a company's success (Peattie, 2010). Since the environmental and health-conscious consumers were non-identical in our findings, the governments and stakeholders need to understand the diversity of preferences and sensitivity among these consumers in the market. This has been one of the most significant consumer and marketing research challenges (Onwezen et al., 2012) which enables stakeholders to target the preferred consumers and concentrate on the most

profitable consumers. The tool will additionally help the stakeholders create offers to their consumers to differentiate their products from their competitors. Stakeholders can provide this essential information by label their products in order to provide information to their food consumers (Vermeir & Verbeke, 2006) The use of eco-labeling can additionally be used in order to target the environmentally conscious consumers. In this case, stakeholders can provide information regarding the products' production methods, ingredients in the products, and in-use resources efficiency to target these consumers (Rex & Baumann, 2007). On the other hand, the health-conscious consumers can be targeted using nutritional labeling to help them take healthier dietary choices, which is an example within the rational choice paradigm based on reflective, conscious processing (Crockett et al., 2018). The use of certification programs run by the private sector or non-governmental organizations is another method to provide reliable evidence of welfare or environmental standards (Godfray et al., 2018), which can help the stakeholders with targeting the needed consumers.

Since changing consumer behavior is a challenging task (Sanchez-Sabate & Sabaté, 2019) and the voluntary lifestyle changes toward meat consumption may not be enough to achieve lower greenhouse gas, it is argued that this might require coercive measures. Therefore, it is stated that attempts to change diets through fiscal interventions also lie within a rational choice framework (Godfray et al., 2018) and that this might be an intervention that governments can use to reduce the increasing consumption of beef and its environmental and health contribution.

6.1 Limitations in our study

Since our research is based on secondary data and collected as a part of a larger project, there are some limitations here. The most common limitation is of secondary data and how the questions are structured and formulated. However, we found it beneficial to apply data that was collected from a reliable source. On the other hand, there could be bias crept while obtaining and constructing the data, which may inadvertently affect our result, especially when transforming our variable for attitudes towards the environment and health attitudes from ordinal to binary variables. These variables were developed from several statements rated on a 7-point Likert-type scale. To simplify, the average answers above 4 was set as 1, average answers from 1 to 4 set as 0. The same procedure was done with the perceptions about beef sustainability and healthiness, only here was answers from 1 to 4 set as 1, and answers above 4 was set as 0. It can be discussed whether this is the best way of distributing the statements.

Similarly, some of the demographic variables are also simplified by computing categories together to have fewer alternatives to deal with. This could be a weakness in our dataset. As mentioned earlier, there is a lack of research on beef preferences and perceptions; there is, therefore, a small amount of research to compare with this.

Additionally, authors have different definitions of red meat, where some define it as pork, sheep, and cattle, and others define it as cattle. Likewise, we have also discussed literature on plant-based food in general because we thought it was relevant for our purpose. Therefore, some of the previous studies we have discussed are not specified on beef and plant-based meat, which can be a limitation in comparing. Lastly, most of the literature presented and discussed is based on findings from other countries. This could be a weakness because there is a significant difference from country to country regarding governmental policies.

7. Conclusion

This thesis investigates how environmental and health attitudes affect U.S consumers' pro-environmental food purchase decisions and provides relevant strategic implications using comprehensive survey data from a representative sample of U.S consumers. We found that environmental attitudes and health attitudes affect pro-environmental food purchase decisions. Nevertheless, different preferences among environmental and health-conscious consumers determine which choices they take.

In order to answer our main research question, we developed a conceptual framework presenting the expected relationship between pro-environmental behavior change and independent variables, and hypotheses corresponding to each independent variable. The first hypothesis stated that higher environmental concern is associated with pro-environmental behavior change, which is supported. Indicating that environmentally conscious consumers are more willing to change their eating habits, reduce their beef intake, and increase their consumption of plant-based meat. The second hypothesis states that stronger perception about negative sustainable impact of beef is associated with pro-environmental behavior change which is partly supported which means that consumers aware of the negative sustainable impact of beef are more willing to change their eating habits and reduce beef consumption. The third hypothesis states that higher level of health concern is associated with pro-environmental behavior change which is partly supported and designate that health-conscious people are willing to change their eating habits and reduce their beef consumption. The fourth hypothesis states that stronger perception about the negative healthiness impact of beef is associated with pro-environmental behavior change. This implies that consumers aware of the negative health impact of beef are more willing to reduce their eating habits. The fifth hypothesis states that gender, age, household size, income and education are associated with the pro environmental behavior change, which is partly supported. The result indicates a relationship between some of the socio-demographic factors and change in food consumption, reduced beef consumption, and increase in plant-based meat consumption.

Our results suggest a gap between the consumers' positive environmental and health attitudes and their actual purchase behavior. In the context of this gap, our results indicate a possibility a lack of information provided by the government and stakeholders to consumers. Since the

environmental and health-conscious consumers were non-identical in our findings, there is a need to target them differently for stakeholders to reach the desired consumers. Regarding our research question, one of our strategic recommendations for stakeholders is to use segmentation to differentiate their consumers from each other, which can be done by labeling their products to reach the right target audience. Since U.S citizens have not met the dietary recommendations provided by the government, our sub-research question suggests that the U.S government and politics should be more transparent and truthful with the information they provide to the citizens. If this implementation does not work, and if the voluntary choices are not enough to change consumers' behavior, the U.S government might consider introducing coercive and fiscal measures in order to change the populations' consumption of meat and its impact on the environment and human health.

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Appendix

Question number	Question	Sub question	Answer options
SP4	In general, how would you rate beef on the following attributes?	2. Healthiness 7. Sustainability	1 – Extremely poor 2 3 4 5 6 7 – Superior 8 Don't know
SP8	Please read each statement and answer using a scale from 1 (=strongly disagree) to 7 (=strongly agree).	1. The healthiness of food has little impact on my food choices. 2. I am very particular about the healthiness of food I eat. 3. I eat what I like and I do not worry much about the healthiness of food. 4. It is important for me that my diet is low in fat. 5. I always follow a healthy and balanced diet. 6. It is important for me that my daily diet contains a lot of vitamins and minerals. 7. The healthiness of snacks makes no difference to me. 8. I do not avoid foods, even if they may raise my cholesterol.	1 – Strongly disagree 2 3 4 5 6 7 – Strongly agree 8 Don't know
SP10	Please read each statement and answer using a scale from 1 (=strongly disagree) to 5 (=strongly agree).	1. The balance of nature is very delicate and easily upset by human activities 2. The earth is like a spaceship with only limited room and resources 3. Plants and animals do not exist primarily for human use 4. Modifying the environment for human use seldom causes serious problems 5. There are no limits to growth for the nations like the USA	1 – Strongly disagree 2 3 4 5 6 7 – Strongly agree 8 Don't know

		6. Mankind was created to rule over the rest of nature.	
SP15	<p>To ensure the access to fresh seafood (including salmon) among consumers, seafood is commonly transported to distant markets by airplanes. However, this can also produce greenhouse gases.</p> <p>How concerned are you about climate impact of salmon products transported by air?</p> <p>Please select the one that applies the best to you:</p>		<p>1 Never thought about it before</p> <p>2 Don't know</p> <p>3 Not at all concerned</p> <p>4 A little concerned</p> <p>5 Moderately concerned</p> <p>6 Very concerned</p> <p>7 Extremely concerned</p>
SP16	Have you changed your eating habits due to the concern for climate change?		<p>Yes</p> <p>No</p>
SP17	<p>How did you change your eating habits?</p> <p>Please indicate by the scale below:</p>	<p>1. Beef</p> <p>2. Pork</p> <p>3. Chicken</p> <p>4. Seafood</p> <p>5. Vegetables</p> <p>6. Domestically produced food</p> <p>7. Domestic wild-captured seafood</p> <p>8. Domestic farmed seafood</p> <p>9. Domestic land-based farmed seafood</p> <p>10. Frozen/refreshed seafood transported by ship</p> <p>11. Food in general</p>	<p>1. Eat less</p> <p>2. No change</p> <p>3. Eat more</p>
SP19	Are you likely to change your eating habits in the near future due to the		<p>Yes</p> <p>No</p>

	concern for climate change?		
SP20	How do you plan to change your eating habits? Please indicate by the scale below:	1. Beef 2. Pork 3. Chicken 4. Seafood 5. Vegetables 6. Domestically produced food 7. Domestic wild-captured seafood 8. Domestic farmed seafood 9. Domestic land-based farmed seafood 10. Frozen/refreshed seafood transported by ship 11. Food in general	1. Eat less 2. No change 3. Eat more
SP22	How likely are you to purchase the following food items using a scale from 1 (=Never) to 7 (=extremely likely or have already purchased) or 0 (=I do not know)?	1. Plant based meat (e.g., impossible meat, beyond meat)	1 – Never 2 3 4 5 6 7 – Extremely likely 8 Don't know
hhsz	How many people occupy your residence (including yourself)? This includes related family members and all the unrelated people, if any, who live with you.		1 = "1" 2 = "2" 3 = "3" 4 = "4" 5 = "5" 6 = "6" 7 = "7" 8 = "8" 11 = "11" 13 = "13" 20 = "20" 22 = "22" 25 = "25"
profile_gross_household	Gross household income		1 = "Less than \$10,000" 2 = "\$10,000-\$19,999" 3 = "\$20,000-\$29,999" 4 = "\$30,000-\$39,999" 5 = "\$40,000-\$49,999" 6 = "\$50,000-\$59,999" 7 = "\$60,000-\$69,999"

			8 = "\$70,000-\$79,999" 9 = "\$80,000-\$99,999" 10 = "\$100,000-\$119,999" 11 = "\$120,000-\$149,999" 12 = "\$150,000-\$199,999" 13 = "\$200,000-\$249,999" 14 = "\$250,000-\$349,999" 15 = "\$350,000-\$499,999" 16 = "\$500,000 or more" 98 = "Don't know" 99 = "Prefer not to answer"
BACK10	What is the highest level of education you have completed?		1 = "Less than high school" 2 = "High school / GED" 3 = "Some college" 4 = "2-year college" 5 = "4-year college" 6 = "Masters degree" 7 = "Doctoral degree" 8 = "Professional degree (JD, MD)"
Gender	Gender		1 = "Male" 2 = "Female"
Profile_age	Age		1 = "18-29" 2 = "30-39" 3 = "40-49" 4 = "50-59" 5 = "60+"