

ABSTRACT

Lappeenranta-Lahti University of Technology LUT
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Consumers' willingness to purchase plant-based meat substitutes.

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Meat consumption is globally growing, and the levels of consumption are extremely high especially in wealthy western countries. As the population is growing, more and more resources are required to fulfill the increasing demand for meat products. On the contrary, many consumers want to reduce their meat consumption and are shifting towards more plant-based diets. Plant-based eating is a prominent food trend, which is clearly visible also in the Finnish market. Many companies have launched plant-based meat substitute products, which aim to imitate the taste, consistency and use purpose of meat. By mimicking meat, the plant-based alternatives lower the threshold for consumers to eat more plant-based foods without any radical dietary changes. Meat substitutes are still relatively new products to the market, yet they have gained popularity fast in the recent years.

This research aims to map out the factors which impact consumers' willingness to purchase plant-based meat substitutes. The role of consumers' values is also examined because meat substitutes are differentiated and sustainable products. The theoretical framework used in this research is expanded theory of planned behavior, which provides a basis for the quantitative empirical part of this research. Six hypotheses were formulated based on the literature review. The primary data was collected with an online questionnaire via social media from Finnish consumers. The questionnaire consisted of multiple-choice closed ended questions utilizing a 6-point Likert scale. The questions were based on the theory of planned behavior and Schwartz's environmental portrait value questionnaire. An opportunity to leave open comment was also provided. The collected survey data was examined, and the hypotheses were tested with probit regression analysis. Open comments submitted by the respondents were analyzed with content analysis to provide additional insight into the topic.

The results of the research indicate that consumers' attitude and egoistic value orientation impact their willingness to purchase plant-based meat substitutes. Attitude consists of underlying beliefs regarding meat substitutes attributes regarding: healthiness, sustainability, taste and the ability to provide variety to one's diet. Consumers with egoistic value orientation find self-enhancement values and things like power, money, and control important.

The quantitative analysis failed to provide statistically significant evidence for the other factors under examination. The key findings of this research are that a positive attitude towards meat substitutes positively impacts consumers' willingness to purchase the products in the future and egoistic values can hinder it. Transparent and fact-driven communication of the benefits of meat substitutes can help consumers form positive beliefs and attitudes, which increases the market potential of the products. The results indicate that consumer values can impact willingness to purchase meat substitutes, yet further research is recommended to gain a deeper understanding on the role of values.

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Kuluttajien halukkuus ostaa kasvipohjaisia lihankorvikkeita.

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Maailmanlaajuinen lihan kulutus kasvaa ja kulutuksen taso on erittäin korkealla etenkin rikkaissa länsimaissa. Väestönkasvun takia lihatuotteiden kysyntään vastaaminen vaatii jatkuvasti enemmän resursseja ja luonnonvaroja. Vastakohtaisesti, monet kuluttajat haluavat vähentää lihankulutustaan ja ovat alkaneet suosia kasvipohjaisia ruokavaliota. Kasvipohjainen ruoka on merkittävä trendi, joka on selkeästi havaittavissa myös Suomessa. Monet yritykset ovat tuoneet markkinoille uusia kasvipohjaisia lihankorvikkeita, jotka imitoivat lihatuotteiden makua, rakennetta ja käyttötarkoituksia. Lihatuotteiden jäljitteleminen alentaa kynnystä vähentää lihan kulutusta ja suosia kasvisruokaa ilman suuria muutoksia ruokailutottumuksissa. Lihankorvikkeet ovat uusia tuotteita markkinoilla, mutta viime vuosina niiden suosio on kasvanut nopeasti.

Tämän tutkimuksen tavoite on kartoittaa tekijät, jotka vaikuttavat kuluttajan halukkuuteen ostaa lihankorvikkeita. Myös arvojen roolia tarkastellaan, koska lihankorvikkeet ovat erilaistuneita ja ympäristön näkökulmasta kestäviä tuotteita. Teoreettinen viitekehys on laajennettu suunnitellun käyttäytymisen teoria, joka luo pohjan tutkimuksen määrälliselle empiiriselle osiolle. Kuusi tutkimushypoteesia muodostettiin kirjallisuuskatsauksen perusteella. Primääridata kerättiin kyselyllä sosiaalisen median suomalaisilta kuluttajilta. Kysymykset olivat suljettuja monivalintakysymyksiä, joissa käytettiin kuusiportaista Likert-asteikkoa. Kysymykset perustuivat suunnitellun käyttäytymisen teoriaan ja Schwartzin environment portrait value -kyselyyn. Vastaajille annettiin myös mahdollisuus jättää avoin kommentti. Kerätty data analysoitiin ja hypoteesit testattiin probit-regressiolla. Avointen kommenttien analysointiin käytettiin sisällönanalyysia.

Tutkimuksen tulokset osoittavat, että kuluttajan asenne ja egoistinen arvo-orientaatio vaikuttavat halukkuuteen ostaa lihankorvikkeita. Asenne rakentuu kuluttajan uskomuksista liittyen lihankorvikkeiden seuraaviin ominaisuuksiin: terveellisyys, ympäristöystävällisyys, maku ja ruokavaliioon tuotu vaihtelu. Kuluttajat, joilla on egoistinen arvo-orientaatio pitävät itsensäkorostamisarvoja ja asioita kuten valta, raha ja kontrolli tärkeinä.

Määrällinen analyysi ei tuottanut tilastollisesti merkittäviä tuloksia muiden tekijöiden osalta. Tutkimuksen merkittävin tulos on se, että positiivisen asenne lihankorvikkeita kohtaan vaikuttaa positiivisesti kuluttajan halukkuuteen ostaa tuotteita tulevaisuudessa. Läpinäkyvä ja faktoihin perustuva viestintä lihankorvikkeiden hyödyistä voi auttaa positiivisten uskomusten ja asenteen muodostumisessa, mikä osaltaan kasvattaa tuotteiden markkinapotentiaalia tulevaisuudessa. Tulosten perusteella kuluttajan arvot voivat vaikuttaa ostohalukkuuteen, mutta lisätutkimusta arvojen roolista suositellaan kokonaisvaltaisemman kuvan saavuttamiseksi.

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1. INTRODUCTION

Global meat consumption has increased during the recent years, especially in wealthy western countries. As the population is growing, more and more resources are required to fulfill the growing demand for meat products. Currently, there is a conflict between high meat consumption and the increasing scientific consensus, which indicates that plant-based diets promote environmental sustainability and a healthy lifestyle (Graça, Oliveira & Calheiros, 2015).

In contrast however, an opposite food trend is simultaneously surfacing. Many consumers want to reduce their meat consumption and are shifting towards more plant-based diets. This trend is also clearly visible in the Finnish market, where consumers are starting to demand new alternatives to foods that have traditionally been predominantly made from animal products (Kesko, 2017a; Kesko, 2019). Many companies that are established meat or dairy product providers in Finland have recently introduced plant-based alternatives into their product portfolios. New companies have also been established and new plant-based products are launched in Finland at a growing rate. This trend indicates that plant-based meat substitutes as a product category has promising market potential in the future. The purpose of this thesis research is to examine the factors that influence consumers' willingness to purchase meat substitutes and the role of values regarding purchase intention among Finnish consumers. This research focuses on plant-based products that specifically imitate meat's sensory properties and are used for similar purposes. Plant-based meat substitutes are still a relatively new product category and the products are unfamiliar to many consumers. This topic has not been previously researched among Finnish consumers.

1.2 Background

During the last decades, meat consumption has experienced a global increase. In the wealthy western countries' consumption is peaking, and at the same time, the growing middle-class in the developing world is eating more meat as they are

gaining more purchase power (OECD, 2019). In the most affluent countries, the annual average meat consumption has years ago surpassed the average human body weight (Smil, 2002). In 2018, Finnish people consumed on average 81kg of meat per capita (Natural Resources Institute Finland, 2018). The growing demand for meat products requires a lot of resources such as freshwater, land, and energy. In addition to this, the production process releases emissions that negatively impact water-, soil- and air quality. In terms of the environment, general human health, and animal welfare the peaking meat consumption is not a favorable development. (De Vries & De Boer, 2010) The conversion rate of feed to animal protein appropriate for human consumption is very inefficient, which is at the core of this issue. In beef production, for example, it has been estimated that less than 20% of all the protein contained in feed cereal and leguminous grains fed to animals are converted to protein and fat for human consumption. If the same amount of resources were used to produce plant protein for human consumption, the process would be much more efficient. (Smil, 2002)

Even though consumers are becoming aware of the detrimental environmental impacts, health disbenefits, and animal welfare issues related to meat, the majority of them still seem unwilling to change their eating habits. In the western food culture meat is a crucial element of most meals and it also carries historical and cultural meaning. Historically, meat has been seen to represent wealth, power, and masculinity. Throughout the development of mankind, meat has gained a certain status of appreciation. Most traditional meals in the western food culture are built around meat and other animal products like dairy and cheese. Even though plant-based eating and a flexitarian diet is gaining more interest among consumers, the overall meat consumption is still growing. (Pohjonen, Vinnari & Jokinen, 2015)

As a potential pathway to decrease meat consumption, researchers and companies have started to develop plant-based alternatives that could encourage consumers to eat less meat without any radical dietary changes. Many plant-based meat substitute products, also known as novel protein foods, have been introduced to the market. The basic premise of these products is that they aim to imitate the sensory properties of meat in order to make it easy for consumers to replace meat with plants

in their everyday meals. The products are manufactured from many different ingredients like for example soy, oats, beans, wheat gluten, and fungi, which are processed to resemble meats texture and taste. These products are relatively new and represent only a small share of the current market. Meat substitutes are still unfamiliar for many, and there are technological challenges to achieving the sensory properties of meat accurately. (Hoek, Luning & Stafleu, 2014) For the purpose of this research, plant-based protein sources such as tofu, beans, and legumes are not included in the category of meat substitutes.

Meat substitutes provide a low-threshold approach to reducing meat consumption without making radical changes to established habits. Using meat substitutes enables consumers to turn familiar meals into meat-free ones by only changing one component. According to previous research, eating a familiar food with an unfamiliar component is experienced as more positive than dramatic dietary change (Hartman & Siegrist, 2017). In order for these plant-based products to be perceived as potential alternatives to replace meat in a meal, they should have similarities to meat. When a consumer is making a purchase decision, it is necessary that they can categorize the meat substitute in the same product category as meat-based on product attributes and the purpose of use. By mimicking these attributes of meat products, substitutes can be perceived as actually viable alternatives to purchasing meat. (Hoek, Van Boekelb, Voordouwaa & Luningb, 2011)

In order to encourage consumers to reduce their meat intake, it is important to understand how these new alternatives are currently perceived among consumers. Understanding the factors that influence consumers' willingness to purchase meat substitutes can help in positioning, promotion, and future development of the products. Food-related purchase decisions are impacted by a set of physical, psychological, economic, social, and cultural factors (Maleka, Umbergera, & Goddardb, 2019). Customers' willingness to reduce meat consumption has been studied before, but the attitudes regarding meat substitutes have not been paid much academic attention in the past. The overall results of previous research indicate that even though a growing segment of consumers is interested in reducing meat consumption, the majority is still unwilling to make changes to their dietary

habits. (Graça, Calheirosa & Oliveira, 2015; Latvala, Niva, Mäkelä, Pouta, Heikkilä, Kotroa & Forsman-Hugg, 2012)

According to research conducted by Pohjanen, Vinnari & Jokinen in 2015, the most common barriers for adopting plant-based diets are routines, meat enjoyment, perceived difficulty of cooking vegetarian foods, and conceptions about health. In order to promote meat substitutes to non-vegetarian consumers, the focus should not be placed too heavily on health and sustainability as vegetarian consumers are often more health-conscious than meat-eaters (Hoek, Luning, Stafleu & De Graaf, 2014). Some consumer studies about meat substitutes have been conducted mainly in the Netherlands, which can be considered an advanced country in terms of the availability of these novel protein products. The results of research conducted in the Netherlands indicate, that consumers are more likely to try and enjoy plant-based substitutes if they resemble meat (Hoek, Luning, Weijzen, Engels, Kok & De Graaf, 2011). Familiar meal context and the perceived convenience of preparation were also found to encourage consumers to buy meat substitutes. However, the overall image and familiarity of the products is still low among Dutch consumers and meat substitutes are not yet perceived as absolute alternatives to meat. (Hoek et al., 2014; Elzerman, Van Boekel, & Luning, 2013)

The aim of this thesis is to examine the factors that impact consumer willingness to purchase meat substitutes and the role of underlying consumer values regarding purchase intention. The research focuses on the Finnish market, where meat substitutes are a fast-growing product category. Meat substitutes as a specific product category has not been studied in the Finnish market, which presents the research gap for this thesis. Conducting a study among Finnish consumers will provide valuable information about the market potential of meat substitutes in the future, which can be used by companies for development and communication purposes. In the next chapter, the research questions for this thesis are presented.

1.3 Research questions

The aim of this research is to identify the main factors that impact consumer

willingness to purchase plant-based meat substitutes. As meat substitutes can be categorized as differentiated and environmentally sustainable products, it is expected that consumers' values play a role in purchase intention. Based on the background and the purpose of the research, the following research questions are defined:

Q1. What factors impact consumers' willingness to purchase plant-based meat substitutes?

Q2. What is the role of consumer values in willingness to purchase meat substitutes?

By answering these two research questions, this thesis will provide an overview of Finnish consumers' willingness to consume meat substitutes and the influence of consumer values and other underlying factors regarding purchase intention. Mapping out the factors that impact purchase intention and examining their relative importance can offer valuable insight into future development and effective promotion of meat substitutes in the future. The results will provide valuable insight for companies that produce plant-based meat substitutes as well as for researchers interested in this topic. The results will provide useful insight into consumer behavior, which can be used to encourage more environmentally sustainable and healthy diets. The first question provides an overview of the influential factor that impact consumers' willingness in general. The second question focuses on values, which is included as an additional element to the main framework of this research. The limitations and the overall structure of the research are presented in the following chapters.

This research is focused on Finnish consumers, which means that the results cannot be generalized to a wider extent. The research is specifically focusing on products that aim to imitate the sensory properties and consistency of meat. Because of this, the focus is not on reducing meat consumption in general, but on examining the willingness to purchase meat substitutes. Meat-free meals without meat substitutes are not included in the scope of this study. This can influence the results as not all meat-free meals require the use of meat substitutes.

1.4 Structure of the study

Firstly, a literature review of the relevant theory and previous research is conducted. Previous research and theoretical background of the environmental impacts of food production, consumer behavior, consumer values, and meat substitute consumption is collected and reviewed in chapter two. This is followed by an introduction of the chosen research framework the extended theory of planned behavior in chapter three. In addition to this, hypotheses are formatted and introduced. The research design and the selected data collection and analysis methods are described in chapters four and five, after which the results are presented. In chapter six the results and descriptive statistics are presented before hypothesis testing with probit regression analysis.

This is followed by an in-depth discussion of the findings with answers to the research questions provided. The theoretical and practical contributions of the research are presented based on the results. To conclude, an evaluation of reliability and validity is provided alongside suggestions for future research on the topic of consumer behavior regarding plant-based meat substitutes.

2 LITERATURE REVIEW

In this chapter literature and research publications about the environmental impact of food production and the consumer attitudes towards plant-based food are examined. Previous research and background information on the key topics is collected and reviewed. The attitudes and beliefs about meat substitute products are further investigated to form a preliminary understanding of consumers' willingness to purchase meat substitutes. This is followed by an overview of the current situation of meat substitutes availability and popularity in Finland, and the cultural and social influence of meat. Theoretical frameworks about consumer values and purchase intention are introduced to form an understanding of the psychological process and predictability of specific consumption patterns and preferences.

2.1 Environmental impacts of food production

What we eat has a substantial impact on the natural environment. Food production requires a multitude of natural resources and with the global population growing the demand for food products is peaking. It is estimated that global food production requires more than a third of the earth's land surface and accounts for over 30% of all greenhouse gas (GHG) emissions (Hallström, Carlsson-Kanyama & Börjesson, 2015). According to the Food and Agriculture Organization, livestock contributes nearly two thirds of agriculture's total greenhouse gas emissions and 78% of methane emissions, which are mainly caused by the digestive system of livestock (FAO, 2020). Because of the vast impact food production has on the environment and climate change progression, it is necessary to move towards more efficient and sustainable practices. Adopting more efficient production procedures and shifting toward more plant-based foods is recommended to address these issues.

According to life cycle analysis research, especially meat production has a significant impact on the natural environment. Life cycle analysis (LCA) is a method that measures the environmental impact of a product throughout its life cycle all the way from raw materials extraction to disposal of the product. Production of meat

requires vast amounts of water, land, and energy because animals are fed large quantities of feed that needs cropland and water to grow. In addition to this, animal agriculture requires a lot of pastureland for the animals and causes harm to air- and water quality near the pastures (Smil, 2002). The conversion rate of feed to animal protein suitable for human consumption is very inefficient as the production of one kilogram of meat can require up to 10kg of grain, which could be directly consumed by humans (Hoek et al., 2004). This is the case for all meat products compared to plants, yet there are differences in the severity of environmental impact between different types of meat. The production of beef has an especially high impact because of vast areas of pastureland, cropland, and water requirements. As ruminant animals, cattle are the least efficient to turn feed into edible animal protein. (De Vries & De Boer 2010)

As demand for meat is growing, more and more land is allocated to crops and pastureland. Livestock production is the predominant driver of habitat loss which presents a threat to biodiversity in areas where more and more land is used for agriculture (Machovina, Feeley & Ripple, 2015). By changing their dietary habits and consumption patterns, consumers can reduce their environmental impact. Consumers can decrease the land use requirement and GHG emissions caused by their dietary choices by cutting down meat consumption. Although replacing ruminant meat with monogastric meat or dairy products can reduce environmental impact, the most effective way is to replace meat products with plant-based alternatives. Research suggests, that shifting to a vegetarian or vegan diet can help reduce GHG emissions by 20 – 50% and reduce the land-use demanded to produce the food by 50-60%. (Hallström et al., 2015)

Meat substitutes are often highly processed products, which means that they also have a negative environmental impact as the processing requires energy and other resources. Despite this, according to LCA analysis, the most common meat substitutes still have a significantly lower environmental impact than equivalent meat products. Mycoprotein-based meat substitutes (eg. Quorn) have the highest environmental impact out of the commonly known meat substitutes. Other alternatives have low to medium impact depending on the level of processing and

main ingredient used. It can be concluded that meat substitutes, in general, are more environmentally sustainable than both ruminant and monastic meat. (Smetana, Mathys, Knoch & Heinz, 2015)

In addition to environmental impact, growing meat consumption presents challenges for human health and animal welfare. Meat-heavy western diets have led to increasing levels of chronic diseases. According to the World health organization's study eating large amounts of processed red meat increases the risk of cancer (WHO, 2015). Consuming less animal-based products and moving to a more plant-based diet have positive impacts on the environment and public health (Van Loo, Hoefkens & Verbeke, 2017). Eating a more plant-based diet decreases the risk of conditions like heart disease, cancer, and type two diabetes (Lea, Crawford & Worsley, 2006).

In 2019 EAT-Lancet commission, a global non-profit organization focusing on scientific research regarding climate and diets published a report which introduced the planetary health diet. According to their research, the planetary health diet is the optimal diet for the environment and for health. The goals of adopting the diet are to feed the world's population of 10 billion people in 2050, reduce the number of deaths caused by poor diets, and be environmentally sustainable. The planetary health diet places heavy restrictions on meat and dairy consumption and promotes plant-based eating as a way to enforce health and sustainability. The dietary recommendations are based on the planetary boundaries and general health guidelines. According to the report, European consumers should decrease their meat consumption by 77% from the current averages to reach the planetary health diet limits. (EAT-Lancet Commission, 2019) This study shows, that changes are needed to achieve a sustainable and healthy food system.

The undesirable impacts of meat production and consumption can be minimized by developing and promoting compelling plant-based alternatives to meat products. It is important to understand how consumers behave and what factors impact their willingness to purchase certain products in order to optimize the development and promotion of meat substitutes. In the following chapters theory about consumer

behavior, consumer values, and Finnish consumers is provided to establish the context and the theoretical frame for this research.

2.2 Consumer behavior

Consumer behavior includes the process in which individuals and groups choose, use and dispose of products to satisfy their needs. A multitude of personal, social, psychological, and cultural factors impact consumer behavior and purchase decisions. Consumer behavior can be difficult to predict because individual consumers can be motivated and impacted by very different things. The focus of this thesis is on the values, attitudes, subjective norms, and perceived behavioral control that is expected to impact purchase intention towards meat substitutes. A traditional way to segment consumer groups is demographic segmentation. Segmentation makes it easier to understand the needs and wants of groups of similar consumers. (Solomon 2009,33). When it comes to modern consumers however, the demographic segmentation might not be the most suitable. Consumer behavior is becoming more complex and purchases are guided by much more than the core functionality of a product, or the primitive drive to satisfy a pressing need. Emotions, values, beliefs, and the level of involvement play an important role in purchase intention and decisions. (Dagevos, 2005)

Theory of planned behavior

One of the most widely applied theories in behavioral research is the theory of planned behavior (TPB) developed by Icek Ajzen (1985). The theory is an extension to Ajzen and Fishbein's previous pioneering framework the theory of reasoned action (TRA) (1975). The theory is used to predict future behaviors based on behavioral intentions which are impacted by attitude and subjective norms. As a new element to TRA, TPB includes the perceived behavioral control as a new element alongside attitude and subjective norms. The TPB model has been widely applied to consumer behavior studies and research about green consumer behavior. The theory of planned behavior is presented in figure 1. below:

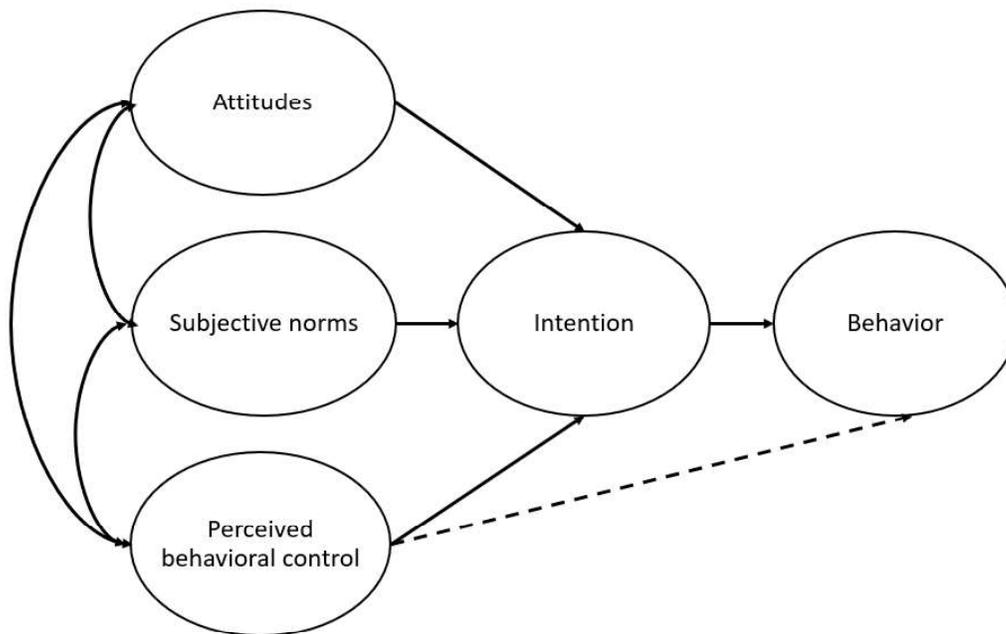


Figure 1. Theory of planned behavior. (Ajzen, 1985)

The theory of planned behavior suggests that behavioral intention is impacted by three factors: one's attitude towards the behavior, feeling that one's significant others want them to perform the behavior, and the level of perceived control they have over the behavior. Attitudes, subjective norms, and perceived behavioral control (PBC) are based on the underlying beliefs the consumer has about how favorable the behavior is, how favorable other people think the behavior is and how easy or difficult it is to perform. Attitude, subjective norms and PBC can all impact one another depending on the behavior and situation in question. For example, a negative attitude towards a behavior itself can change if the consumer feels that important people in their social circle want them to perform the behavior of that it would be very easy for them to do it. All of the three elements have a direct impact on behavioral intention but also on each other. When attitude, subjective norms, and PBC are combined, the model enables predictions of behavioral intention which strongly correlates with actualized behavior. In figure 1 PBC is also connected to actualized behavior with a weaker connection. This is because the theory suggests, that PBC can be indirectly used to predict actualized behavior. Even if the behavioral intention is high, the absence of PBC makes the actualization of the behavior very unlikely. (Ajzen, 1985; Vermeir & Verbeke, 2006)

TPB model was chosen for this research as it provides a good basis for predicting the purchase intention of sustainable and specialized products. Underlying factors like the environmental concerns and behavioral beliefs about environmental impacts of purchases influence consumers' attitudes towards sustainable products (Mostafa, 2007). The elements of TPB are suitable for examining and predicting the purchase intention of meat substitutes, as they are specialized and sustainable products. The model has been widely applied to study organic and green consumption patterns in previous research (Chekima, Wafa, Igau & Sondoh, 2016). In the following chapters, the elements of TPB are examined in more detail in the context of meat substitutes.

Attitudes

One of the main arguments for meat substitute consumption is the increasing awareness of the harmful environmental impacts of meat. Replacing meat with plant-based substitutes can be categorized as environmentally significant behavior because of the lower environmental impact of the products (Smetana, Mathys, Knoch & Heinz, 2015). *Sustainability* motivates many consumers to rethink the way they eat and shift towards more plant-based diets. However, consumers often have subconscious internal biases that impact the willingness to change their ways. For example, people who are very attached to the taste of meat are likely to underestimate the environmental impacts of animal agriculture. Internal biases shape consumer attitudes and beliefs regarding different products and behaviors. (Kusch & Fiebelkorn, 2019)

In the modern era where information is easily available, more consumers are aware of the issues related to meat. Awareness of the consequences of purchase decisions increases the positivity towards plant-based products (Hartmann & Siegrist, 2017). Misconceptions and the lack of awareness of environmental impacts of meat consumption can negatively impact consumers' attitudes toward meat replacement and substitute products. Many consumers overestimate the impact of food miles and for example, the environmental impact of soy cultivation, which can lead them to believe that meat substitutes are not sustainable. Consumers also have

a tendency to feel more positive about their own country's products compared to imported goods. Because of this, consumers might prefer domestic meat products over substitutes manufactured from foreign ingredients. However, locality alone does not equal sustainability. The environmental impact depends on the production method, product category, and seasonality. According to LCA research, transportation accounts for only a small portion of the overall environmental impact. (Lazzarina, Visschers, & Siegrist, 2017) The vast majority of all cultivated soy is used to feed the animals for meat production (Hartman & Siegrist, 2017). The beliefs about the sustainability of meat substitutes are therefore expected to influence consumers' attitudes towards the products.

Another crucial element that impacts attitude and food choices is the beliefs regarding *healthiness*. According to research high levels of meat consumption, especially red meat, are connected to chronic diseases and cancer. In 2015 World health organization published a report which classified red meat in group 2A, potentially carcinogenic to humans, and processed red meat in group 1A, carcinogenic to humans. The report recommended limiting the consumption of processed red meat to 500g a week. (WHO, 2015) Avoiding the harmful health aspect and for example, the trans fats in meat can motivate health-conscious consumers to look for alternatives for meat.

Plant-based eating has become a trend also in popular culture, which can impact consumer perception. Many popular documentaries, celebrities, and athletes are promoting plant-based eating. Platforms like Netflix and social media provide information that is easily accessible. Beliefs that categorize meat substitutes as healthy products are expected to enforce a positive attitude. In contrast, consumers who do not believe meat substitutes to be healthy are expected to have a more negative attitude towards them. When it comes to meat substitutes, the level of processing can also arise concerns. The plant ingredients are highly processed in order to achieve a meat-like taste and texture, which can hinder the image of healthiness. Health-conscious consumers often favor natural and unprocessed foods (Ahmad & Anders, 2012).

There is also a strong historical and cultural tradition that associates meat with high nutritional value, wealth, power, and masculinity (Pohjanen et al., 2015). In addition to this, consumers are attached to the familiar sensory attributes of meat which can act as a strong barriers for change. *Unwillingness to try new foods* or change established habits also negatively impacts consumers' attitude towards meat substitutes which are still new and unfamiliar products for many (Hoek, Luning & Stafleu, 2014). The current price level of meat substitutes is similar to meat or even higher in certain products, which can negatively impact the attitude of price-sensitive consumers (Paananen, 2019). Previous research suggests that also demographic factors can influence attitude. Most often males and consumers with lower levels of education demonstrate high levels of meat attachment and negative attitudes toward plant-based diets. (Graçaa et al., 2015)

Perceived behavioral control

Perceived behavioral control (PBC) is determined by how easy or difficult it is for the consumer to perform a certain behavior. If a product is not easily available or the consumer cannot afford it, it hinders behavioral intention because of a lack of perceived control (Liobikiene, Mandravickaite & Bernatoniene, 2016). In the context of meat substitutes, PBC is dependent on how easy it is for the consumers to obtain the products. This includes factors like whether the consumer has enough money and time to consume these products and what kind of selection convenient grocery stores provide. If the consumer feels that the purchase decision is not completely up to them it hinders the perceived behavioral control. Not finding meat substitutes in stores, not being able to afford them, not having the time or ability to cook them, or for example restricted decision-making power because of family members can reduce PBC. According to the theory of planned behavior, the level of perceived behavioral control significantly influences consumers' purchase intention (Ajzen, 1985).

Subjective norms

Subjective norms represent the perceived social pressure consumers experience to

behave in a certain way. When it comes to sustainability for example, subjective norms can impact consumers' intention to buy eco-friendly products to build and improve their social image. However, some consumers might not feel any pressure for sustainable behavior if they do not perceive sustainability to increase social approval in their social circle. The perceived attitude of family, friends, and significant others construct subjective norms. The social impacts such as vegetarian family members and friends can encourage people to explore new alternatives. In contrast however, also negative responses from one's social circle can act as a barrier for meat substitute consumption. (Hoek, Elzermanb, Hagemana, Koka, Luningb & De Graaf, 2013)

According to the theory of planned behavior, subjective norms are impacted by the behavior of one's social circle as well as the experienced level of expectations and social pressure to behave in a certain way (Ajzen, 1985). Subjective norms are expected to influence consumers' purchase intentions which often translates to actualized behavior.

According to Ajzen (1991), the theory of planned behavior is open to the inclusion of additional normative variables, which enables the inclusion of values into the theoretical framework of this thesis. In the next chapters, consumer values are examined in more detail. Based on the literary review, an extended model of TPB is later presented as the theoretical framework for this research.

2.3 Consumer values

The importance of values is highlighted especially when it comes to purchasing sustainable products. Some consumers are impacted by personal values and beliefs much more than others. According to Schwartz's value theory (1992) values are defined as desirable trans situational goals varying in importance, which serve as guiding principles in the life of a person or other social entity. By this definition, values reflect what people see as being desirable. In a situation where two values are conflicted, they are placed in order according to importance. Schwartz's value theory defines ten different value domains, which guide behavior. These values are

benevolence, universalism, self-direction, stimulation, hedonism, achievement, power, security, conformity, and tradition. The values are placed in a circle with a two-dimension axis: 1. Openness to change versus conservation. 2. Self-transcendence versus self-enhancement (Schwartz, 1992). Schwartz's value theory is presented in figure 2 below.

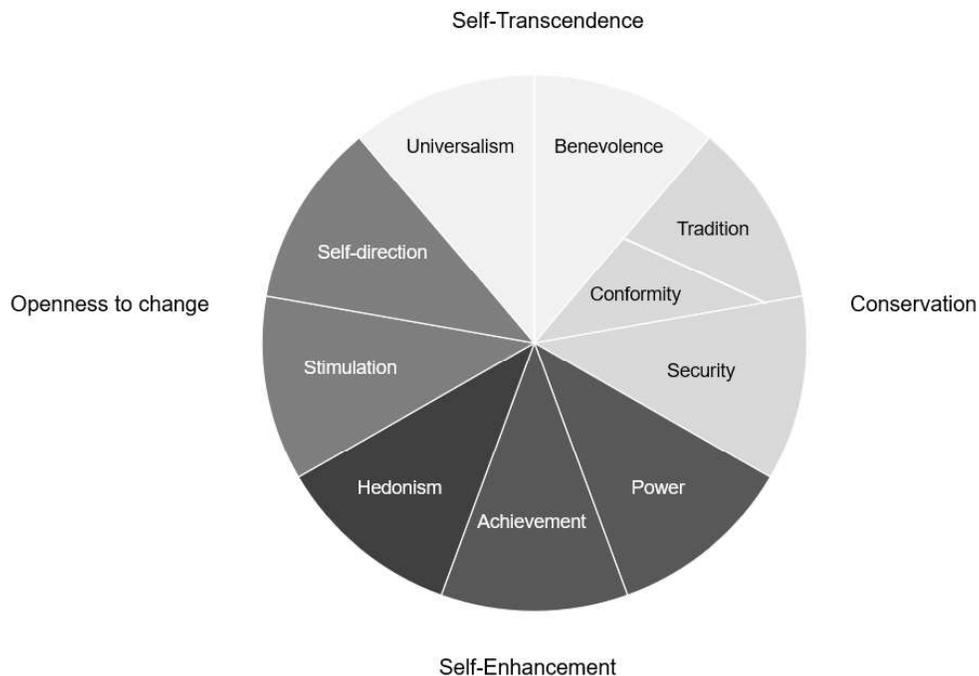


Figure 2. Schwartz's value theory. (Adapted from Schwartz, 1992).

When it comes to consumer behavior, it is expected that consumers with different types of value structures demonstrate different purchase behaviors. This theory has been used as a basis for previous research on differentiated products like meat substitutes. Because of this, it is expected that it also fits the context of this research. According to previous research on the topic, consumers with strong self-enhancement values like power, hedonism, and authority are more likely to have positive attitudes towards meat consumption (Allen & Hung Ng, 2003). In contrast, consumers with strong self-transcendence values like benevolence, universalism, and environmental protection are more likely to be open to plant-based products. Some consumers connect their purchase decisions with universal consequences like climate change, where others are more driven by hedonistic values like personal sensory pleasure and convenience. Consuming plant-based products can be seen

as sustainable behavior, as the environmental impact is lower compared to meat consumption. Meat consumption is often motivated by more personal benefits like the taste, convenience, and the lack of willingness to change established habits. (Allen, Wilson, Hung Ng & Dunne, 2000)

Value orientations

Schwartz's value theory is widely used in consumer behavior research. The two dimensions of self-enhancement and self-transcendence form a base for different value orientations. When it comes to environmental psychology, researchers have defined three different value orientation types that impact the environmentally significant behavior (ESB) of consumers: egoistic, altruistic, and biospheric. Egoistic value orientation emphasized similar values as the self-enhancement dimension in Schwartz's circle of values. People who have egoistic value orientation are guided by the belief that behavior should benefit them personally. Egoistic value orientation guides consumers to make environmentally friendly choices only when the perceived personal benefits outweigh the perceived personal cost. Altruistic value orientation in contrast emphasizes the perceived cost and benefit for other people. In addition to these two orientations stemming from Schwartz's theory, a third value orientation has been recognized. People with biospheric value orientation base their behavior on the perceived cost and benefit for the environment, other species and the biosphere as a whole. (de Groot & Steg, 2008) The three value orientations are presented in figure 3 below.

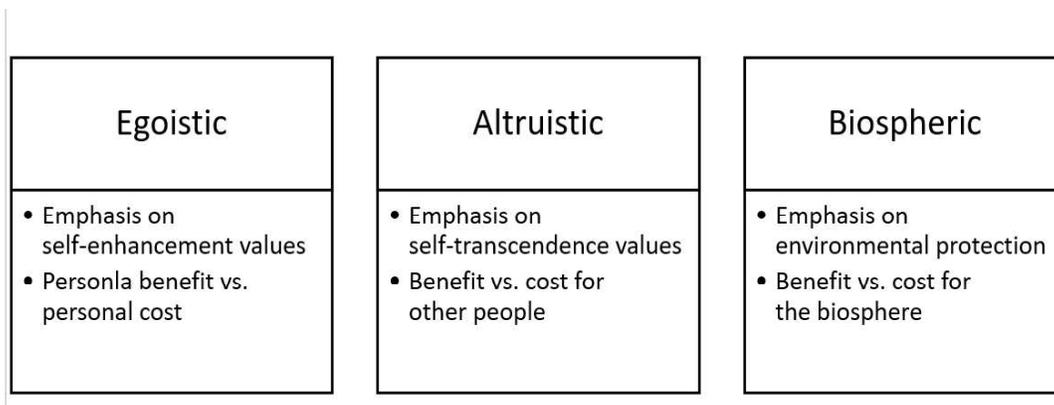


Figure 3. Value orientations (Adapted from De Groot & Steg, 2008).

According to the value-belief-norm theory of environmentally significant behavior, people with biospheric and altruistic value orientations are more likely to form personal norms to behave in sustainable ways (Stern et al. 1999; Dietz et al. 2005). These consumers have beliefs and attitudes that guide their consumption towards sustainable alternatives. In contrast, people with egoistic value orientation form personal norms that emphasize personal benefits. People with egoistic value orientation are likely to have a positive attitude towards behaviors that enhance their own benefits such as convenience, price, taste, and health. It has been established, that personal value constructs impact specific dietary choices and attitudes towards nutrition (Fotopoulos, Krystallis & Anastasios, 2011).

In the context of meat substitutes, these findings indicate that egoistic consumers are attached to their established consumption habits and are less likely to try meat substitutes unless they perceive the personal benefit to outweigh the personal cost. People with altruistic and biospheric value orientations are more likely to have negative attitudes towards meat consumption and therefore expected to be more open to sustainable plant-protein alternatives (Allen et al. 2000; Allen & Hung Ng, 2003). These three value orientations are incorporated into this thesis in order to determine if there are detectable connections between values and the willingness to purchase meat substitutes. In the next chapter, a brief overview of meat substitutes in the Finnish market is provided to introduce the context of this research.

2.4 The Finnish market

A lot of meat substitutes have been launching in the Finnish market in the recent years. As a response to the increasing consumer interest in plant-based products, also companies whose core business is meat and dairy have started to develop plant-based alternatives. For example, Atria, Pouttu, and Valio have launched new plant-based product lines. Completely new innovative products made from domestic ingredients like oats and fava beans have been introduced to consumers. According to statistics published by one of the largest food retailers in Finland Kesko, the sales of meat substitutes grew a staggering 159% in the year 2017 (Kesko, 2017a). The growth has since stabilized but the trend is still growing, and new plant-based

products are launched regularly.

According to consumer research conducted by Kesko in 2019, 37% of Finnish consumers reported that they occasionally replace meat (including fish) with plant-based alternatives and purposely eat meat-free meals. Only 3% of the respondents reported avoiding meat completely but a growing segment was interested in moving towards a flexitarian diet, which consists mostly of vegetarian foods with the occasional inclusion of meat. (Kesko, 2019) In Finland, many people are eating less red meat, which has reflected in the growth in demand for poultry, fish, and plant-based products. In the recent years, the prices of meat products have increased which also impacts consumer behavior, especially among price-sensitive consumers. The growth of meat consumption is estimated to stop in 2020 and take a turn to a slow decrease. (Yle, 2019)

The selection of meat substitutes in stores is expanding fast and the products are promoted heavily. Currently, the majority of meat substitutes are made from soy, but domestic products made from oats and fava beans are expected to gain more market share in the future. Finnish consumers often favor domestic products and ingredients which drives innovation of these new products (Isaokangas, Rautio, Solala & Åström, 2018). Stores often place meat substitutes in the meat aisle in order for consumers to see them as a viable alternative to buying meat. In many Kesko locations however, vegetarian and vegan products are sold in a separate section to make it easy for customers to find all of them in one place. (Tuominen, 2017) To promote plant-based eating, campaigns like meatless October and vegan January have been launched in Finland they are gaining more participants every year. Based on this, it appears that meat substitutes have market potential in the future.

When it comes to purchase decisions, price is often a very important factor for most consumers. This is the case even with wealthy consumers who have a lot of disposable income. Despite this, according to consumer research conducted in Finland in 2017, consumers are making more conscious decisions when it comes to food choices. A new generation of consumers led by millennials have become so-

called hybrid consumers. Hybrid consumers are very price-conscious regarding most products, but with some specific products, they are willing to pay more and only accept high-quality. In this sense, hybrid consumers are simultaneously rational and irrational decision-makers. According to consumer research, approximately half of Finnish consumers are hybrid consumers. Hybrid consumers are value-driven and reflect their purchases to their own perception and aspirations regarding health and the environment. Hybrid consumption was detected in all different income segments. (Kesko, 2017b)

The price point of meat substitutes varies, but especially plant-proteins made from domestic ingredients are often in the same price range or even slightly more expensive than meat products depending on the category. 67% percent of the respondents in the consumer research (Kesko, 2017b) reported that they are often looking for variation to their diets and want to try new food products. Variation seeking is a potential driver for purchasing meat substitutes which are relatively new products to the market. In contrast however, consumers who are not willing to change habits or have food neophobia might have reservations about testing new products.

To conclude, consumers are a heterogeneous group and purchase behavior is impacted by a multitude of personal and product-related factors. According to the literary review, meat substitutes are still new and relatively unfamiliar products for many consumers. Many consumers want to reduce their meat consumption for various reasons related to for example sustainability concerns, health or social pressures. Substituting meat with plant-based alternatives is a convenient way for consumers to make a change. The trend of plant-based eating is visible in Finnish grocery stores where the sales and the selections of meat substitutes have experienced growth during recent years. According to previous research, purchase behavior of sustainable food products is heavily impacted by consumers' values (Stern et al. 1999; Dietz et al. 2005). In the next chapter, the research framework is presented, and the hypotheses are formatted based on the literature review.

3 RESEARCH FRAMEWORK AND HYPOTHESES

According to Ajzen (1991), the theory of planned behavior is open to the inclusion of additional variables. Based on the conducted literary review, an expanded version of the theory of planned behavior was formulated as the theoretical frame for this thesis research. The expanded model incorporates value orientations as an additional element, which is expected to impact purchase intention. According to the theory of planned behavior, attitudes are determined by accessible beliefs about a behavior. Beliefs refer to the perceived probability of certain outcomes of the behavior. In the context of meat substitutes, this includes for example beliefs about the health and sustainability impacts of meat substitutes. Subjective norms and PBC are impacted by consumer beliefs regarding what their social circle thinks about the behavior and how easy or difficult it is to perform the behavior. Value orientations are included in the model because previous research indicates that values play a central role in dietary choices and sustainable consumption intention (Fotopoulos et al., 2011; Vermeir & Verbeke, 2008).

In this extended model attitudes, subjective norms, perceived behavioral control and value orientations impact behavioral intention of purchasing meat substitutes. Value orientations are introduced as a new element to the theory of planned behavior because meat substitutes are specialized and sustainable products. The extended model of planned behavior with embedded hypotheses is presented in figure 4 below.

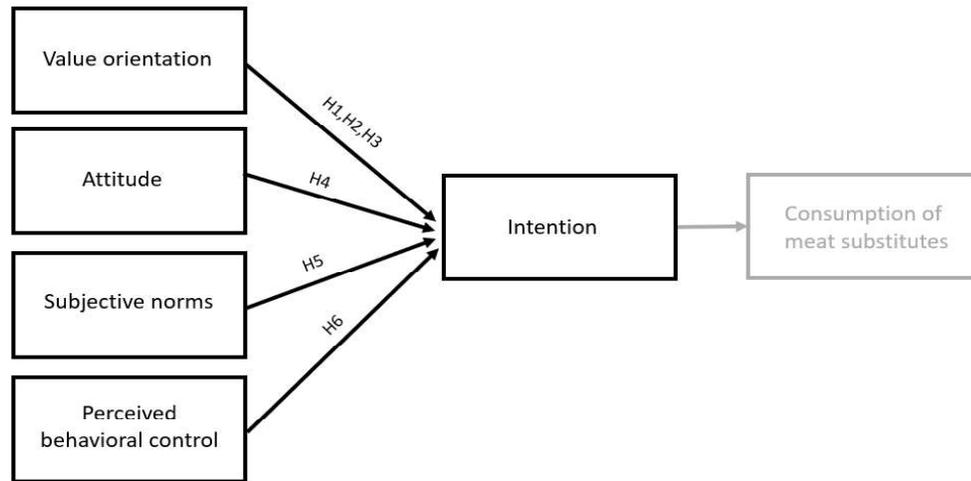


Figure 4. Extended theory of planned behavior with hypotheses (Adapted from Ajzen, 1985).

Consumer values are in a central role when it comes to sustainable consumption. Consumers' beliefs impact values, attitudes and for example, the internal biases the consumer might have. For example, people who believe that their own consumption impacts the environment, are more likely to have a positive attitude towards sustainable products like meat substitutes. Similarly, people whose beliefs contradict the positive impact of using meat substitutes are more likely to have a negative attitude towards purchasing them. Beliefs also create a base for the value structure, subjective norms, and perceived behavioral control. (Fotopoulos, et al., 2011; Chekima et al., 2016)

The aim of this research is to find out what factors influence consumers' willingness to use meat substitutes and to examine the role of values regarding purchase intention. The factors in the theory of planned behavior are combined with value orientations to examine and predict purchase intention. In the following chapters, research hypotheses are formatted based on the literature review.

Hypotheses

According to previous research, there is a connection between biospheric and altruistic value orientations and environmentally significant behavior (Stern et al. 1999; Dietz et al. 2005). This indicates that consumers that have either biospheric or altruistic value orientations are more likely to manifest sustainable consumer behavior than consumers with egoistic value orientation (Allen et al. 2000 & 2003). Consuming meat substitutes instead of meat is considered sustainable behavior because the environmental impact is significantly lower. Because of this, the following hypotheses H1 and H2 are formed:

H1. Biospheric value orientation has a positive effect on purchase intention of meat substitutes.

H2. Altruistic value orientation has a positive effect on purchase intention of meat substitutes.

People with egoistic value orientations emphasize personal benefit and are expected to be motivated by hedonistic values. Egoistic value orientation combines the self-transcendence values and conservation from Schwartz's value theory (de Groot & Steg, 2008). Because of this, they are expected to be less willing to make changes to their existing behaviors and routines. Egoistic consumers are driven by factors like taste, convenience, and price more than sustainability. Consumers develop attitudes and beliefs that support and justify their behavior (Kusch & Fiebelkorn, 2019). To support their behaviors, egoistic consumers can for internal biases and for example underestimate the environmental impact of their consumption. Meat substitutes are relatively new and unfamiliar products for consumers. Replacing meat with plant-based alternatives requires the willingness to change established dietary habits. Based on this information, the following hypothesis H3 is formed:

H3. Egoistic value orientation has a negative effect on purchase intention of meat substitutes.

Testing hypotheses H1, H2, and H3 will help answer research Q2: *What is the role of consumer values in willingness to purchase meat substitutes?*

Personal and product-related beliefs determine what kind of attitude consumers have towards meat substitutes. Consumption of meat substitutes is environmentally significant behavior and therefore is expected that consumers whose beliefs about the attributes and impact of meat substitutes are positive are more likely to have a positive attitude towards purchasing them. Consumers develop different beliefs and attitudes that support their own value structure and personal behavior patterns. In contrast, consumers who believe that meat substitutes are not particularly sustainable or healthy are expected to have a more negative attitude. Beliefs about taste, nutritional value, and whether the consumer thinks meat substitutes provide good variation to their diets, influence the overall attitude towards purchasing meat substitutes. Therefore, it is expected that consumers with a positive attitude regarding meat substitutes are more willing to purchase them. In contrast, a negative attitude decreases the willingness to purchase meat substitutes. Based on this, the following hypothesis H4 is formed:

H4. Attitude impacts purchase intention of meat substitutes.

Testing hypothesis H4 will help provide a comprehensive answer to research question Q1: *What factors impact willingness to consume plant-based meat substitutes?*

In addition to attitudes and values, the impact of the other elements of the theory on planned behavior is tested. TPB suggests that subjective norms impact consumers' behavioral intentions. Based on this, the following hypothesis H6. Is formed:

H5. Subjective norms impact the purchase intention of meat substitutes.

This hypothesis is tested to examine whether social impact and the perceived attitude of family, friends and significant others influences purchase intention of meat substitutes. The impact of subjective norms is determined by the perceived

attitude of consumers' social circle and experienced social pressure. In combination with other hypotheses, testing H7 will help provide a comprehensive answer for research question Q1.

The last element of TPB is perceived behavioral control. To examine all the elements of the theoretical model perceived behavioral control is also measured. Perceived behavioral control is determined by consumers' feelings about their level of control over purchase decisions. This is impacted by factors like availability of resources like time and money, convenience, and perceived decision-making power. To examine the impact of subjective norms the following hypothesis H6 is formed:

H6. Perceived behavioral control impacts the purchase intention of meat substitutes.

Testing H6 in addition to the previously presented hypotheses enables providing a comprehensive answer for research question Q1.

The accuracy of the presented hypotheses is tested in the empirical part of this thesis by analyzing the collected questionnaire data. In the following chapters, the research design and methodology are described in more detail.

4 RESERACH DESIGN AND METHODS

The chosen research method for this thesis is quantitative. The theoretical background established in the literary review is reflected to the primary data collected in the empirical part of this thesis. A quantitative approach was chosen because it provides appropriate data for statistical analysis and prediction of consumer behavior and enables a larger sample size than qualitative research.

The aim of this thesis is to examine the factors that influence consumers' willingness to purchase meat substitutes and the role of value orientation regarding purchase intention. The quantitative research approach fits these goals, as it enables the examination of causal relationships and regression between fixed variables in the expanded TPB model. This approach is also required for hypothesis testing, which is a fundamental part of this research. Quantitative methods are standardized procedures, which enable a statistical analysis of the collected primary data. The research approach is deductive, as the hypotheses are developed based on existing literature and tested by analyzing the questionnaire data. (Saunders, Lewis & Thornhill, 2012, 472; Metsämuuronen, 2017, 54)

4.1 Data collection methods

The popularity of plant-based food is a global trend, but the context of this research is the Finnish market. The primary data is collected from Finnish consumers to examine the factors that impact consumer willingness to purchase meat substitutes. The research is limited to specifically products that are perceived as plant protein meat substitutes instead of all vegan products.

The data collection method for primary data is a survey. A questionnaire was chosen because it provides appropriate data for comparing and predicting consumer behavior, which fits the goal of this research well. The questions were closed-ended which enables the codification of the data into a numerical format and performing statistical analysis (Saunders et al., 2012, 458). The questionnaire was distributed online via social media. The chosen platform for the questionnaire was google

forms, which is a reliable and user-friendly option. Before publishing the final version of the questionnaire, it was tested with 10 respondents to confirm that it was easy to understand and functioned well. Some minor adjustments were made in the beginning disclaimer and wording based on the feedback from the group of pilot respondents. The answers collected in the pilot phase are not included in the analysis. The questionnaire design is described in more detail in the following chapter.

4.2 Questionnaire design

The questionnaire consisted of multiple-choice closed-ended questions. In the beginning of the questionnaire, a short description of the purpose of the questionnaire, statement of anonymity, and estimated completion time were provided. A short definition of meat substitutes was also provided to ensure that the respondents were familiar with the products in question.

The first set of questions focused on collecting data on the *demographic elements* of the respondents. The demographics included gender, age, and level of education. After demographic questions, the current usage level of meat and meat substitutes was measured by collecting data on how often the respondents eat meat and how often they are using meat substitutes.

The background questions were followed by the questions that were designed to measure the respondents' *value orientation*. Value orientations were measured by using a validated instrument: the environmental portrait values questionnaire (E-PVQ) (Bouman, Steg & Kiers, 2018). The E-PVQ was chosen because it has been widely validated by previous research. The E-PVQ is an adapted version of the commonly used environmental Schwartz value survey (E-SVS). The questions in E-PVQ measure same things as E-SVS, but they are worded in a more respondent-friendly way. According to Bouman et al. (2018) both the E-SVS and Q-PVQ are sufficient tools for measuring value orientation. However, according to their study, some respondents found the E-SVS questions more difficult to answer because the values are presented more abstractly. (Bouman et al., 2018) The E-SVS questions

are presented in table 1 below.

Table 1. E-PVQ measures. (Bouman et. Al., 2018).

	E-PVQ measures
Biospheric	
Bio 1	It is important to prevent environmental pollution
Bio 2	It is important to protect the environment
Bio 3	It is important to respect nature
Bio 4	It is important to be in unity with nature
Altruistic	
Alt 1	It is important that every person has equal opportunities
Alt 2	It is important to take care of those who are worse off
Alt 3	It is important that every person is treated justly
Alt 4	It is important that there is no war or conflict
Alt 5	It is important to be helpful to others
Egoistic	
Ego 1	It is important to have control over others' actions
Ego 2	It is important to have authority over others
Ego 3	It is important to be influential
Ego 4	It is important to have money and possessions
Ego 5	It is important to work hard and be ambitious

In the E-PVQ questions, the respondents were asked to evaluate each statement on a scale of 1 to 6 (1= not like me at all 6= very much like me). The E-SVS uses an unsymmetrical nine-point Likert scale (from -1 to 7), which can make it difficult for respondents to differentiate answers between items in their scoring. Asking about values in a direct and abstract way places the original E-SVS questionnaire vulnerable to self-enhancement bias. The E-PVQ has been validated by previous research as an instrument to predict attitudes and behaviors. (Bouman et al., 2018; Fotopulos et al., 2011) Because of these factors, the E-PVQ questions were chosen for measuring value orientations.

The respondents' *attitudes*, *subjective norms* and *perceived behavioral control* regarding meat substitutes were measured by a set of statement evaluation. To measure attitude, statements about the perceived qualities of meat substitutes were presented and the respondents were asked to rank each statement on a scale of one to six (1= completely disagree 6=completely agree). The six-point scale was selected to complement the measure for the E-PVQ questions. Subjective norms were measured with statements about the perceived social pressure and attitudes of friends' family and significant others. Perceived behavioral control was measured with statements about experienced convenience, decision-making power, and available resources. All of the statements were formed based on the literary review and theory of planned behavior. Each variable was measured with a set of three or more questions, which were later combined to sum variables for data analysis.

Finally, the behavioral intention was measured by asking the respondents to estimate if they are willing to consume meat substitutes in the future. This question was presented as binary value (yes or no). An open question was added to the end of the questionnaire to enable respondents to elaborate on their answers or to provide additional insights to the topic. All questions apart from the open questions were set as mandatory in order to avoid missing data.

The questionnaire was distributed online via social media. Facebook was chosen as the main channel for distribution because it was expected to provide a wide range of respondents from different age categories. As the targeted respondents were

Finnish consumers, all questions were translated into the Finnish language. The questionnaire is presented in full as Appendix 1 at the end of this thesis. The questionnaire was open for one week. The questionnaire was shared on the author's personal profile and reached 11 additional shares. In total 287 answers were collected during one week. As the sample for the questionnaire was collected mainly from the social circle of the author, the sampling was not completely random. The data collection method did not enable random sampling which can lower the reliability of the results. The demographic profile and descriptive statistics of the responses' distribution are provided in more detail in the following chapters.

4.3 Data analysis methods

In this chapter, the data analysis methods used in this thesis are presented. The questions in the questionnaire are closed-ended which enables quantitative statistical analysis. STATA software is used to conduct the quantitative data analysis. In order to analyze the collected data, all of the multiple-choice question answers are codified into numerical data in an excel file.

The numerical data is used to format the sum variables are formatted from the data based on the extended theory of planned behavior components. In order to test the hypotheses presented earlier, probit regression analysis is conducted with the sum variables to find out whether the independent variables impact the dependent variable which is binary. The dependent variable in this research is the consumer willingness to purchase meat substitutes in the future. The respondents were asked to evaluate their willingness by answering either yes or no. The independent variables are sum variables each formatted from a set of multiple questions designed to measure: biospheric value orientation, altruistic value orientation, egoistic value orientation, attitude, subjective norms, and perceived behavioral control. The sum variables were pre-planned according to the theoretical framework. generation of the sum variables is described in more detail in the results chapter.

Probit regression is used to determine whether respondents' values, attitude,

subjective norms and PBC impact the probability that they are willing to purchase plant-based meat substitutes. Probit regression was chosen as the analysis method because it fits the purpose of this research well. The dependent variable in the model is consumers' willingness to purchase meat substitutes, which is codified as a binary value for statistical analysis. A probit regression model is commonly used in quantitative research when the dependent variable is binary, and the aim is to examine how independent variables influence it. The results will indicate whether the sum variables based on the extended theory of planned behavior impact the probability that a consumer is willing to purchase meat substitutes in the future.

The responses from the open question are analyzed with data-driven content analysis. Content analysis is a qualitative data analysis method, which is applied to the qualitative answers collected from the questionnaire. The purpose of content analysis is to summarize the open comments in a meaningful and concise way (Metsämuuronen, 2017, 230). The most central themes from the qualitative answers are identified and divided into relevant categories. Each category is given a name and a description based on commonalities within the comments. The frequency of each theme emerging in the open comments is reported and examples from the data are presented in paraphrased form. The open comments are analyzed in order to gain additional insights into the respondents' perspectives on the topic. The open comments are included to provide support to the main data, which is the quantitative data from the multiple-choice questions. The results of the research are presented in the following chapter.

4.4 Reliability and validity

The reliability and validity of research is evaluated based on how consistent the results are with the used research methods or data collection methods, where similar observations could be made by other researchers (Saunders, et al., 2012, 725). The overall reliability and validity of this research are expected to be good as the appropriate steps in the research process are taken and reported according to guidelines. The used analysis methods probit regression analysis and content analysis are appropriate for the collected data and fit the purpose of the research

well. The resources used in this research are all collected from high-quality academic publications and otherwise reliable sources like books and news articles. Using high-quality sources ensures that the information is reliable and relevant for academic research purposes. There are however some factors that can decrease the reliability and validity.

Because of the data collection method, it is expected that the sample for primary data collection is not representative of the demographic elements of the total population of Finland. The data is collected online by the author, which means that some respondent bias in terms of age and other demographic characteristics is likely to occur. Answering the questionnaire is voluntary, which might result in data that focuses on the opinions of those consumers who are already familiar with meat substitutes. Because of this, the result might not represent all viewpoints and opinions equally.

The primary data is collected with an online survey with closed-ended multiple-choice questions. With the chosen data collection method, some reliability issues might arise. The wording of the questions or the context of the questionnaire might impact the truthfulness of the answers. As the questions are related to sustainability and values, it is expected that some respondents might choose the answer they see as “socially acceptable” rather than their actual thoughts. (Auger & Devinney, 2007) To minimize this risk, it is important to format the questions to be as neutral as possible. For measuring values, established methods are utilized to increase credibility. According to previous research, there is often a gap between consumers’ intentions and actual behavior when it comes to sustainable consumption (Vermeir & Verbeke, 2006). Because of this, it is acknowledged that the results reflect consumers’ willingness to purchase on the level of behavioral intention instead of actualized behavior.

5. RESULTS

In this chapter, the results of the research are presented and analyzed. Firstly, the descriptive statistics of the questionnaire results are presented to give an overview of the demographic profile of the respondents and their overall opinions. The distribution of the answers for the multiple-choice questions is presented to gain an understanding of the mindset of the sample and to identify the most common beliefs related to meat substitutes, values, subjective norms, and PBC. This helps to provide perspective for further data analysis. After descriptive statistics are presented, the responses are codified, and sum variables are formatted. The sum variables are formatted based on E-PVQ questions and theory of planned behavior components, and their internal consistency is tested to ensure reliable results. After the sum variables are formatted and analyzed, a content analysis of the open comments is conducted. The open comments are analyzed to gain additional insight from the respondents in support of the quantitative analysis. The results of this research are then concluded with hypothesis testing, where the six research hypotheses are tested with probit regression analysis utilizing the generated sum variables.

5.1 Descriptive statistic

In this chapter, the demographic profile of the respondents is examined and the distribution of answers for the multiple-choice questions is analyzed. The distribution of answers is presented in order to form an understanding of the general characteristics and opinions of the sample. Gaining an understanding of the sample characteristics and the respondents' values and beliefs provides a solid background for further data analysis and interpretation of the results

In total, the number of responses collected for the questionnaire was 287. The questionnaire link was shared by the author on Facebook and it was open for a period of one week. The answers were anonymous but some descriptive demographic information was collected to form an understanding of the sample characteristics. For the purpose of this research, the sample size of 287 provides a

good basis for making conclusions about the behavior of the types of consumers best represented in the sample. The demographic profile of the respondents is summarized in table 2 below.

Table 2. The demographic profile of the respondents.

Gender	Frequency (n)	Age	Frequency (n)	Education level	Frequency (n)
Male	31,70% (91)	18-29	37,30% (107)	Comprehensive school	4,90% (14)
Female	67,60% (194)	30-43	18,10% (52)	High school / Vocational school	26,10% (75)
Other	0,70% (2)	44-54	28,60% (82)	Bachelor's degree	38,7% (111)
		55-65	12,20% (35)	Master's degree or PhD	30,30% (87)
		65 or over	3,80% (11)		

The majority of respondents were female, and the largest age group was 18-29. This division is likely due to the distribution channel as the respondents' characteristics match the authors. The sample does not represent the age and gender structure of the total Finnish population, which was expected with the chosen data collection method. There were only a few responses from people in the highest age group (65 or over) and lowest education group (comprehensive school), which further indicates that the results of this research do not represent the entire population. According to Statista, the largest age group in Finland is people from ages 40-59 and the distribution of education levels is much more even than in this sample (Statista, 2020; Tilastokeskus, 2020).

The sample is biased, because of the data collection method and voluntary nature of the response. Only respondents who are connected to the extended social circle of the author and chose to answer the survey voluntarily are represented in the data.

Because of this, the results of this research cannot be generalized to a wide extent. In order to gain more credible results in the future, the sample size should be increased, and the sampling method changed towards a more random sample. However, as the sample size of 287 respondents is large and the answers include variation, for the purpose of this thesis research conclusions can be made.

The respondents were asked about their current behavior regarding meat consumption and the use of meat substitutes. According to the literary review, people who consume large amounts of meat and are unfamiliar with meat substitutes are more likely to have more negative attitudes than for example consumers who avoid meat and are frequent users of meat substitutes. The distribution of answers regarding respondents' current consumption is presented in figure 5 below.

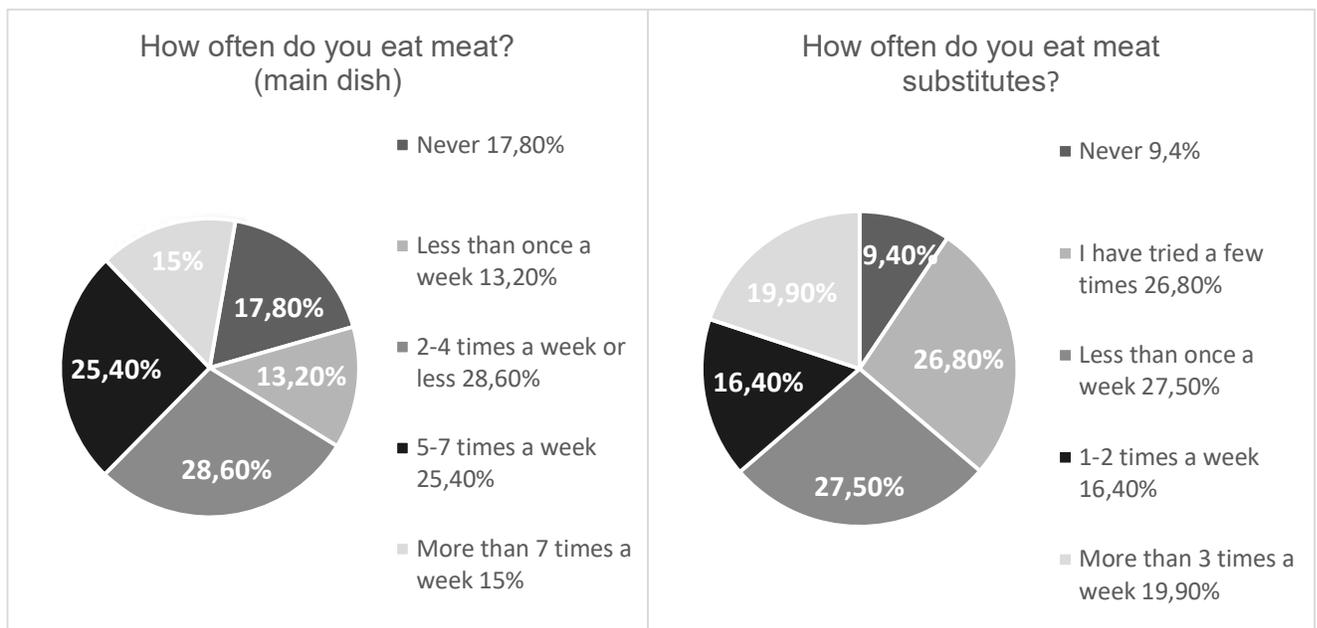


Figure 5. Respondents' current consumption habits.

Figure 5 above demonstrates the distribution of answers regarding respondents' current consumption levels of meat and meat substitutes. 17,80% percent of respondents reported that they do not eat meat, which is a relatively high percentage of vegetarian/vegan respondents in the sample. The answers were distributed

among all frequencies, with the majority of respondents eating meat as a main dish either 2-4 times or 5-7 times a week.

When it comes to meat substitutes, the majority of the respondents reported that meat substitutes are familiar, but they are not used regularly. The most common answers were that respondents have tried meat substitutes a few times or that they use them less than once a week. A lot of answers from more regular users were also collected. The response rate of people who do not use meat substitutes at all was low. These results are likely impacted by the data collection method and voluntary answering. People who have not tried meat substitutes are less likely to finish the questionnaire or even click on it.

Distribution of answers

The questions about value orientations, attitude, subjective norms, and perceived behavioral control were multiple-choice questions measured on a 6-point Likert scale. More detailed data on the descriptive statistics and the distribution of answers is presented in appendix 2 and figure 6 below.

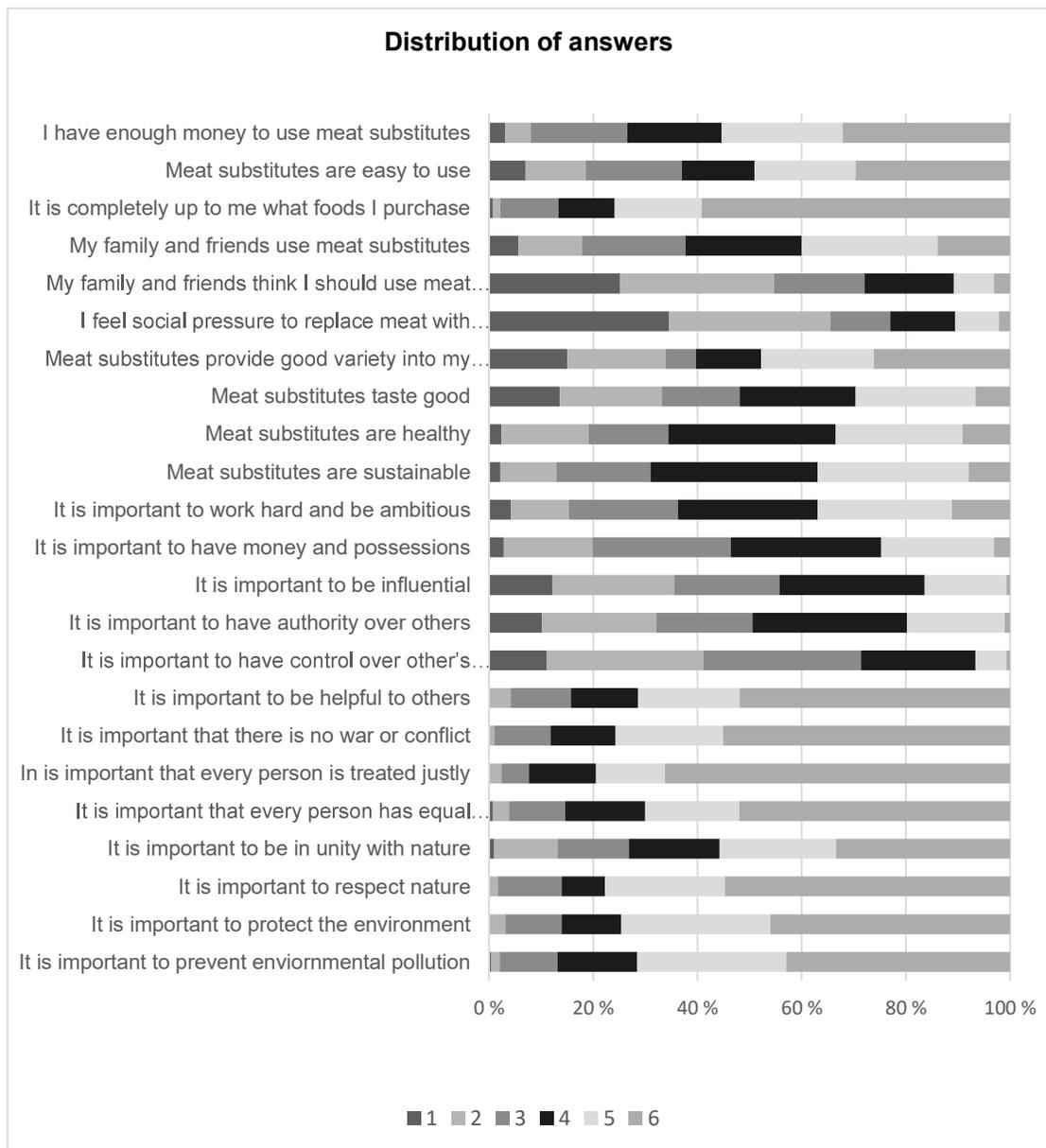


Figure 6. Distribution of answers. Likert-scale questions.

The three different value orientations: biospheric, altruistic, and egoistic were measured using environmental portrait value questionnaire questions. The first set of questions measured biospheric value orientation. The questions measuring values were directly translated from the environmental portrait value questionnaire (E-PVQ). The mean values for all biospheric questions were very high. In two of the questions, the minimum value was 2, which means that not one of the respondents

rated the statements as “not important at all”. As the questions are related to the protection of the environment, it seems that most of the respondents in the sample feel strongly about environmental values.

The second set of questions measured the respondents’ altruistic value orientation. answers divided similarly to the biospheric value questions, with the mean values being very high. The results for altruistic value orientation are also heavily skewed towards the high values. The questions were about topics such as equality, justice, and helping others which seem to be extremely important values for most.

The third set of question measured the egoistic value orientation. The distribution of answers in the egoistic value orientation was much more even than in the other two value orientations. The questions measured the importance of values like money, power, ambition and authority. These values are not perceived as directly positive or negative, which seemed to be the case with biospheric and altruistic values.

The next set of questions measured the respondents’ attitude towards meat substitutes. The questions were designed based on the literature review findings. The respondents were asked to evaluate statements about meat substitutes’ attributes regarding sustainability, health, and taste and the ability to provide variation to one’s diet in order to formulate a comprehensive measure of beliefs and attitudes. The aim was to map out whether the respondents’ overall attitude towards the products is positive or negative. A question about price was excluded from the sum variable based on factor analysis and Cronbach’s alpha test. According to the results, the majority of the respondents perceive meat substitutes as moderately sustainable and healthy yet are very divided when it comes to rating the taste of the products.

The respondents’ subjective norms were measured with three questions related to friends, family, and social pressure. Respondents reported quite evenly distributed levels of their family and friends using meat substitutes but answer distribution about their perceived preference for using meat substitutes and social pressure were skewed more towards the lower ratings. Only very few of the respondents felt any

social pressure to replace meat with plant-based alternatives. It appears that in this case, the behavior of friends and family does not necessarily translate to behavioral pressures for the respondents.

The last set of questions measured the respondents perceived behavioral control. According to the sum variable analysis, perceived behavioral controls showed the lowest level of internal consistency among questions. The vast majority of respondents felt that they are completely in charge when it comes to their food purchases. Answers to the other questions were distributed more evenly. The aim was to map out whether the respondents feel like there are obstacles in their way when it comes to purchasing meat substitutes. For example, lack of money, perceived difficulty of use, or feeling of lack of decision-making power could become barriers for purchasing. These measures were not successful, as demonstrated by the analysis of internal consistency previously. For future research, the measures for perceived behavioral control should be re-formulated to ensure higher internal consistency and reliability.

Lastly, the respondents were asked whether or not they are willing to purchase plant-based meat substitutes in the future. The majority of respondents with 74,60% responded that they are willing to purchase meat substitutes in the future. The remaining 25,40% responded that they are not willing to purchase meat substitutes in the future. The distribution of answers for the willingness to purchase meat substitutes reflects the results collected about the current behavior of the respondents well. The vast majority are potential consumers of plant-based meat substitutes also in the future. As mentioned before, it is likely that the chosen data collection method impacted the sample in a way, that most responses came from consumers who are already familiar with plant-based meat substitutes.

In the next chapter, the data collected with the questionnaire is turned into a numerical format and sum variables are formatted. The sum variables are used in the hypothesis testing with probit regression.

5.2 Generating sum variables

The variables in the expanded theory of planned behavior were measured with closed-ended questions in the questionnaire. To increase the reliability of the measures, the independent variables were measured with multiple closely related questions. The sum variables were pre-planned based on the literary review and the portrait value questionnaire items. The reliability of the sum variables was tested with Cronbach's coefficient alpha. In order to test the reliability of the sum variables, factor analysis was also conducted to examine the factor loadings. The results of the rotated factor loading are presented in appendix 3. One of the pre-planned items was removed in order to increase the internal consistency and reliability of the sum variables based on factor analysis and Cronbach's alpha results. The sum variables and the Cronbach's alpha results are presented in Table 3 below.

Table 3. Sum variables.

Sum variable	Average inter-item correlation	Alpha if deleted	Cronbach's alpha
BIOSPHERIC (Sum variable 1)			0.92
Q6 It is important to prevent environmental pollution	0.76	0.89	
Q7 It is important to protect the environment	0.72	0.88	
Q8 It is important to respect nature	0.74	0.88	
Q9 It is important to be in unity with nature	0.83	0.93	
ALTRUISTIC (Sum variable 2)			0.93
Q10 It is important that every person has equal opportunities	0.77	0.91	
Q11 it is important that every person is treated justly	0.75	0.89	
Q12 It is important that there is no war or conflict	0.81	0.92	
Q13 It is important to be helpful to others	0.75	0.89	
EGOISTIC (Sum variable 3)			0.84
Q14 It is important to have control over others' actions	0.58	0.84	
Q15 It is important to have authority over others	0.46	0.78	
Q16 It is important to be influential	0.46	0.77	
Q17 It is important to have money and possessions	0.53	0.82	
Q18 It is important to work hard and be ambitious	0.51	0.81	
ATTITUDE (Sum variable 4)			0.88

Q19 I believe that meat substitutes are sustainable	0.54	0.83
Q20 I believe that meat substitutes are healthy	0.54	0.82
Q21 Meat substitutes taste good	0.51	0.79
Q22 Meat substitutes offer good variety into my diet	0.51	0.80
SUBJECTIVE NORMS (Sum variable 5)		0.64
Q24 My family and friends use meat substitutes	0.42	0.59
Q25 My family and friends think I should use meat substitutes	0.22	0.37
Q26 I feel social pressure to replace meat with plant-based products	0.47	0.64
PERCEIVED BEHAVIORAL CONTROL (Sum variable 6)		0.53
Q27 It is completely up to me what foods I purchase	0.24	0.59
Q28 Meat substitutes are easy to use	0.41	0.33
Q29 I have enough money to use meat substitutes	0.40	0.33

Based on factor analysis and Cronbach's alpha the above items were included in the sum variables. The internal consistency of the sum variables was tested with the STATA software. The value of alpha increases when the internal consistency between the items increases. Cronbach's alpha is a commonly used test to evaluate the reliability of sum variables generated from multiple questions that aim to measure the same thing. An acceptable level for Cronbach's alpha value should exceed 0.60 in order for the variable to be reliable. (Saunders, et al., 2012, 451)

The alpha for sum variables 1-3 measuring value orientations was high. Internal consistency for these variables was expected because the value orientations were measured with an existing set of E-PVQ questions which are validated by previous research. The E-PVQ items were all included in the sum variables. Removing questions Q9 and Q27 would increase the alpha, but the decision to include them in the sum variables was made based on the factor loadings and because they are fundamental components of the theoretical framework. The Cronbach's alpha for sum variable 4 attitude was also high. The items in sum variable 4 were based on previous research and the components identified in the literary review. The value for sum variable 5 subjective norms was lower, yet still reached the level of a reliable measure of over 0.6. The items in sum variable 5 were formatted based on previous research utilizing the theory of planned behavior framework, where respondents are

commonly asked to evaluate the perceived reaction of their friends and family towards a certain behavior.

Out of all the sum variables, sum variable 6 perceived behavioral control is the least reliable, as Cronbach's alpha is lower than 0.6. Even though the alpha was low, Q27 was not removed, because according to the conducted factor analysis the remaining questions Q28 and Q29 were loading on different factors. Based on this, removing Q27 would not have increased the consistency of the sum variable in any significant way. For the purpose of this thesis research, the variable was not excluded from the model as perceived behavioral control is a fundamental part of the theory of planned behavior framework. However, it is recognized that the results regarding the PBC component are not as reliable as the other elements, because of the low internal consistency of the measured items. The PBC items were formatted to measure the level of power the consumers feel they have over their own purchase decision regarding meat substitutes. The results of the Cronbach's alpha test and factor analysis indicate that the goal with sum variable 6 was not met and respondents did not find the questions intended to measure PBC to be consistent.

Other sum variables are highly reliable and consistent according to the conducted tests. Sum variables measuring altruistic and biospheric value loaded on the same factor, because they are strongly correlated with one another. This was expected, as according to the literary review the two value orientations are closely related even though they are proven to measure different things. (de Groot & Steg, 2008).

The age and gender of the respondents were included in the model as control variables. Age and gender categories are included as dummy variables with age categories codified with numbers between 1-5, and gender options with numbers from 1-3. Correlation of the sum- and control variables were tested in STATA software with Pearson correlation formula. The correlation matrix of the sum variables and control variables is presented in table 4 below.

Table 4. Correlation matrix for sum variables and control variables.

	Age	Gender	Biospheric	Altruistic	Egoistic	Attitude	SN	PBC
Age	1							
Gender	0.12	1						
Biospheric	-0.08	-0.53	1					
Altruistic	-0.12	-0.63	0.78	1				
Egoistic	-0.03	0.28	-0.37	-0.35	1			
Attitude	-0.21	-0.41	0.57	0.58	-0.30	1		
SN	-0.07	-0.11	0.20	0.16	-0.01	0.41	1	
PBC	-0.15	-0.45	0.55	0.50	-0.27	0.67	0.34	1

*SN= subjective norms PBC= Perceived behavioral control

As presented in the table above, biospheric and altruistic value orientations are strongly correlated. Both of these value orientations also showcase a moderate correlation with attitude and perceived behavioral control. The questions measuring biospheric and altruistic value orientations relate to value topics that are likely to be rated highly by most respondents. This is also visible in the descriptive statistics of the sum variables presented in table 5 below.

Table 5. Descriptive statistics of the sum variables.

Variable	Mean	SD	Variance	Min	Max	Obs.
Biospheric	4.91	1.08	1.18	1.75	6	287
Altruistic	5.14	1.04	1.08	2	6	287
Egoistic	3.35	0.97	0.95	1.4	5.4	287
Attitude	3.78	1.27	1.61	1	6	287
PBC	4.61	1.01	1.03	1.66	6	287
Willingness	0.74	0.43	0.19	0	1	287
Subjective norms	2.97	1.06	1.13	1	5.7	287

The mean values for both biospheric and altruistic value orientation are extremely high. This indicates that the data for these two sum variables are skewed towards the higher ratings. This is most likely due to the nature of the questions. It can appear unintuitive to rate values like equality, appreciation for nature, justice, and

sustainability low in importance. The distribution of answers for individual questions is presented in further detail in appendices 2 and 3.

The normality of the data was tested with the Shapiro-Wilk test. The data is normally distributed if the p-value is greater than 0.05 (Shapiro & Wilk, 1965). The results of the Shapiro-Wilk test are presented in table 6 below.

Table 6. Shapiro-Wilk test for normality.

Variable	W	V	z	Prob>z
Biospheric	0.91984	16.420	6.555	0.00000
Altruistic	0.89800	20.894	7.119	0.00000
Egoistic	0.97962	4.176	3.348	0.00041
Attitude	0.95474	9.272	5.216	0.00000
Subjective norms	0.97677	4.760	3.645	0.00013
PBC	0.97258	5.617	4.043	0.00003

As the table above shows, none of the variables are normally distributed. The p-values are very low, which indicates that the data deviates significantly from a normal distribution. The distribution of each sum variable is described in a graphical format in appendix 4. The graphical presentations clearly demonstrate that biospheric and altruistic value orientations are strongly focused on the high values.

5.3 Content analysis of the open comments

At the end of the questionnaire, the respondents were given the opportunity to leave additional comments or elaborate their answers with a general open question. Out of 287 respondents, 42 left an additional comment to the open question. In this chapter, the comments left in the open question are analyzed with data-driven content analysis. Firstly, all the comments were reviewed by the author, and all relevant parts of the comments were highlighted. This was followed by categorization of each comment according to relevant points mentioned. There were many general comments addressed to the researcher, but also valuable additions to the topic itself and the questionnaire design. Some comments were excluded from

the analysis as they were not relevant to the research questions but addressed the method, questionnaire design, and general comments, and well-wishes for the author. Therefore, only 33 comments out of the 42 were included in further content analysis. The content analysis of the open question comments is summarized in table 7 below.

Table 7. Content analysis of the open question responses.

Content	Description	Example responses	Frequency
Dietary restrictions	Responses including a description of dietary restrictions and allergies which prevent respondents from using certain meat substitutes.	<p>“Many meat substitutes are made from ingredients that are not suitable for me”</p> <p>“I am allergic to wheat, soy, and most nuts”</p> <p>“I would gladly eat meat substitutes, but my stomach issues prevent it”</p> <p>“If someone came up with meat substitutes that are soy, wheat, onion, and milk-free my answers would be different”</p> <p>“My diet is very restricted, I cannot have ingredients like peas, lentils, and corn”.</p>	6
Health	Responses including statements about the healthiness of meat substitutes. Negative and positive.	<p>“Meat substitutes are too high in carbs”</p> <p>“Meat substitutes have too high sodium content”</p> <p>“I do not want to eat processed foods”</p> <p>“I choose meat substitutes because my health comes first”</p> <p>“I am afraid that increasing meat consumption can cause pandemics like corona”</p>	6
Environment	Responses including evaluation about	<p>“I support meat substitutes, we have</p>	4

	environmental impact and sustainability of meat substitutes. Negative and positive	to reduce meat consumption because of environmental reasons” “I question the sustainability of meat substitutes as they are processed. For the average consumer, it is difficult to determine what is true and what is marketing” “When it comes to sustainability, you have to consider the whole supply chain. Meat substitutes are not always more sustainable” “Imported vegetarian products are not sustainable”	
Taste	Responses about the taste of meat substitutes. Negative.	“The taste of meat substitutes is not good” “The taste, consistency, and outlook of meat substitutes are not appealing” “I would much rather eat vegetables than bad-tasting meat substitutes”	4
Unfamiliarity	Responses addressing the unfamiliarity of meat substitutes.	“I avoid meat substitutes because they are strange” “I don’t use meat substitutes and I’m not interested in using them in the future” “I have never used meat substitutes before”	3
Price	Responses addressing the price of meat substitutes.	“I would use meat substitutes if they were cheaper. Now I often think that I might as well buy meat as it is the same price”	1
Necessity	Responses questioning the necessity of products	“Meat substitutes are not necessary because people can eat plant-based without them”	6

	imitating meat in comparison to eating vegetables.	<p>“Meat substitutes are rarely as good as other plant-based foods”</p> <p>“I like to eat my vegetables as vegetables rather than processed meat substitutes”</p> <p>“As I vegetarian I don’t find meat substitutes important. Maybe people who eat meat might buy them”</p>	
Social	Responses addressing social influence impacting their eating habits.	<p>“It is challenging because my family eats meat and are not into meat substitutes”</p> <p>“My family prefers me to eat meat”</p>	3

The first clear category of comments was about dietary restrictions and allergies, which might impact willingness to purchase meat substitutes. The respondents mentioned that many meat substitutes are manufactured from ingredients like soy, beans, wheat, and nuts which can cause allergic reactions or stomach issues for some consumers. Some consumers might be willing to purchase meat substitutes but feel limited by their dietary restrictions. There were also some concerns about the healthiness of meat substitutes. Respondents pointed out issues like high carb and sodium content of meat substitutes and the high level of processing as negative aspects. However, there were also responses from people who believe meat substitutes to be healthy, which was established in the multiple-choice question as well. Based on this, it can be said that consumers have different opinions and perceptions about the healthiness of meat substitutes compared to meat. This is consistent with previous research findings covered in the literary review. According to the result of the multiple-choice questions however, the majority of the respondents rated meat substitutes to be relatively healthy.

The next category is sustainability, which also resulted in mixed opinions. Some respondents pointed out that it is difficult for consumers to know for sure if meat substitutes are truly sustainable because of the long and sometimes international

supply chains. There were also a few mentions about bad taste and unfamiliarity of meat substitutes, which was included as a separate category. The results of the multiple-choice questions showed that the respondents' opinions about meat substitutes' taste were quite evenly divided and the majority of the respondents had used meat substitutes before. The necessity of meat substitutes that specifically imitate meat was also questioned by many respondents in the open comments. All of the responses in this category argued that plant-based products that imitate meat are not necessary because there are so many foods that can be made from vegetables. The willingness to reduce meat consumption is therefore not equal to the willingness to use meat substitutes. Some comments also addressed the social aspect of family influence on eating habits.

Compared to the overall results of the questionnaire and the division of multiple-choice question answers, it appears that respondents who left comments on the open question are generally more critical of meat substitutes than the sample as a whole. The respondents who have negative thoughts about meat substitutes are better represented in the open comments than the positive ones. The majority of the comments included in the content analysis address points that impact negatively to the willingness to purchase meat substitutes. However, compared to the quantitative data, the vast majority (74,60%) of respondents are willing to purchase meat substitutes in the future. The open comments give some insight into the reasons why some respondents might have evaluated meat substitute attributes like sustainability, healthiness, and taste low.

Comments addressing the questionnaire design and methodology and general well-wishes addressed to the researcher and general comments, which were excluded from the analysis. Some of the comments questioned the connection between the E-PVQ question and meat substitutes. Only 14,6% out of all 287 respondents left open comments. Because of this, the open comments are analyzed with the purpose of added insight rather than the main data which was collected for quantitative analysis. The majority of the open comments are aligned with the literary review and the theory however, the topic of food allergies and dietary restrictions was not addressed in the multiple-choice questions.

5.4 Hypothesis testing

In this chapter, the hypotheses are tested using statistical analysis method probit regression. In total six hypotheses were formatted based on the theoretical framework elements. The chosen method for data analysis for this research is regression analysis, which fits the research design and purpose. Probit regression is a suitable method for analyzing quantitative data in which the dependent variable is binary. Regression analysis will help determine whether the different elements in the theoretical framework impact the likelihood that a consumer is willing to purchase plant-based meat substitutes in the future.

The hypotheses were tested with probit regression conducted with STATA software. The dependent binary variable in the model is consumers' willingness to purchase meat substitutes in the future. The independent variables in the model were the previously formatted sum variables: biospheric value orientation, altruistic value orientation, egoistic value orientation, attitude, subjective norms, and perceived behavioral control. Each of these variables reflects one element in the extended theory of planned behavior. Each sum variable in the model was set to examine one of the six hypotheses. In addition to independent variables, age, and gender of the respondents were also included in the model as control variables to test whether demographic characteristics have an impact on the dependent variable. According to the literature review, demographic characteristics can impact consumer behavior especially when it comes to specialized and sustainable products like meat substitutes (Graçaa et al., 2015). The level of significance is set to 0.10 because of the relatively small sample and the exploratory nature of this study. The results of probit regression are presented in table 8 below.

Table 8. Probit regression results.

Independent variable: Willingness to purchase meat substitutes	
Log likelihood	-39.666
<i>Number of obs.</i>	287
<i>LR chi2(7)</i>	246.16

<i>Prob > chi2</i>	0.0000			
<i>Pseudo R2</i>	0.7563			
	Coefficient	Std. error.	z	P-value
Age	-0.027	0.128	-0.21	0.831
Gender	-0.076	0.420	-0.18	0.856
Biospheric	0.303	0.241	1.25	0.210
Altruistic	-0.020	0.286	-0.07	0.944
Egoistic	-0.324	0.169	-1.91	0.056*
Attitude	1.468	0.241	6.08	0.000***
Subjective norms	0.270	0.169	1.59	0.111
PBC	-0.034	0.219	-0.16	0.875

Significance level * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The results for log likelihood and $\text{prob} > \chi^2$ values indicate that the model is significant and fits the used data. As table 8 above demonstrates, the probit regression result for variables attitude and egoistic value orientation are statistically significant with p-value below the set level of significance 0.10. The coefficient for attitude is strong and positive. This result indicates that a higher value in attitude, which indicates a more positive attitude, impacts positively to the likelihood that a consumer is willing to purchase meat substitutes. The measure for attitude sum variable consisted of the respondent's evaluation of meat substitutes attributes related to healthiness, taste, sustainability, and positive variation provided to ones' diet. The coefficient for egoistic value orientation is negative and statistically significant, which indicates that egoistic value orientation negatively impacts the likelihood that a consumer is willing to purchase meat substitutes. The measures for egoistic value orientation were directly translated from the E-PVQ questions. These results provide support for hypotheses H3 and H4.

Other variables in the model did not result in statistically significant results in this research with the used sample. Therefore, hypotheses H1, H2, H5, and H6 are not supported. Also, the control variables age and gender did not provide any statistically significant result for the regression. As mentioned in the demographic profile of the respondents, young females were the largest group represented in the sample for this research. The reasons for the lack of statistical support for the other

hypotheses are found in the collected data sample and the used measures. The theoretical and practical implications of the results are analyzed further in the discussion chapter. Suggestions for future research are presented at the end of this research based on this result. The results for the hypothesis testing based on the probit values are presented in table 9 below.

Table 9. Hypothesis testing results.

Hypothesis	
H1 Biospheric value orientation has a positive effect on willingness to purchase meat substitutes	Not supported
H2 Altruistic value orientation has a positive effect on willingness to purchase meat substitutes	Not supported
H3 Egoistic value orientation has a negative effect on willingness to purchase meat substitutes	Supported
H4 Attitude impacts the willingness to purchase meat substitutes	Supported
H5 Subjective norms impact willingness to purchase meat substitutes	Not supported
H6 Perceived behavioral control impacts the willingness to purchase meat substitutes	Not supported

As the table indicates, two out of the six hypotheses H3 and H4 were supported. The data collected and analyzed in the empirical part of this research did not result in any statistically significant findings to reject the null hypotheses for H1, H2, H5, and H6. The reason and potential implications of these results are discussed in more detail in the following chapter.

6. DISCUSSION AND CONCLUSION

In this chapter, the results of the research are summarized and the implications are discussed. Answers to the research questions are provided based on the findings. This is followed by an overview of the theoretical and practical contributions of this thesis research. Lastly, the limitations of the research are examined and some suggestions for future research direction are provided.

The purpose of this research was to examine the factors that influence consumers' willingness to purchase meat substitutes and the role of values regarding purchase intention among Finnish consumers. In Finland, the levels of meat consumption have been high in the recent years, but the growing consumption has started to slow down, and the sales of meat substitutes have started to grow (Natural Resources Institute Finland, 2018; Kesko, 2017a). Plant-based meat substitutes are a relatively new product category which offers consumers an easy way to move towards a more plant-based diet without making any radical dietary changes. Meat substitutes allow consumers to turn their meals into plant-based ones by only changing one component. This trend has resulted in many companies launching new plant-based products that imitate the taste, structure, and the purpose for use of meat.

The growing interest in meat substitutes and decreasing meat consumption was visible among the respondents in the sample of this research. Quantitative data was collected with an online survey via social media. The majority of the respondents were familiar with meat substitutes as a product category. The theory of planned behavior was chosen as the main theoretical framework for examining consumer behavior and purchase intention. Based on previous research on sustainable consumer behavior, value orientations were added in the model to examine the potential role of values in willingness to purchase meat substitutes. Identification of the factors that influence consumers' willingness to purchase meat substitutes can provide valuable information for product development and strategic promotion of the products. Insight into consumers' purchase intention can also be valuable in efforts to encourage a more sustainable and healthy lifestyle in accordance with the planetary health diet recommendations.

In total 287 responses from Finnish consumers were collected with an online survey, which consisted of multiple-choice questions measuring the elements of the theoretical framework. Value orientations were measured with existing E-PVQ questions and other elements were measured with question sets designed based on the assumptions of the literature review and theory of planned behavior. Six hypotheses were formatted based on the literature review findings. In addition to the quantitative results, 42 open comments were collected from the respondents. The collected data was codified into a numerical format and further analyzed with probit regression analysis to test the hypotheses and determine whether the different elements in the extended theory of planned behavior impact the likelihood that a consumer is willing to purchase plant-based meat substitutes in the future. Two of the six hypotheses H3 and H4 were supported by the probit regression results. The other hypotheses were not supported, as the analysis results failed to provide statistically significant evidence to reject the null hypotheses.

The key findings of this research are, that consumers' attitude and egoistic value orientation impacts consumers' willingness to purchase meat substitutes. This was indicated by the quantitative data evidence which provided statistically significant support for H3 and H4. Attitude is impacted by consumer beliefs regarding meat substitutes sustainability, healthiness, taste, and the ability to provide variation to a diet. Egoistic value orientation is impacted by consumers' beliefs regarding the importance of values regarding money, power, and ambition. Egoistic value orientation was measured with the E-PVQ questions directly. The results indicate that a positive attitude increases the likelihood that a consumer is willing to purchase meat substitutes and egoistic value orientation decreases it. Further implications of the findings are discussed in more detail in the following chapters.

The reason for non-significant results that lead to rejection of the hypotheses H1, H2, H5, and H6 are likely due to the sample and the data collection method. When it comes to hypotheses 1-2 regarding biospheric and altruistic value orientations, there were some issues with the used measures and the collected data. The median values for these variables were extremely high across all the respondents and the two sum variables *biospheric* and *altruistic* were strongly correlated with one

another. Based on the skewed results and some of the open comments left by respondents, it can be concluded that the measures for these value orientations did not function as expected. The respondents rated most of the statements very highly in terms of importance, which resulted in a low level of variation. Also, there was no clear differentiation between the two value orientations according to the results. Some open comments addressed the fact that the value questions felt leading towards a green mindset. The topics of the questions in the biospheric and altruistic values section are likely to be rated highly, as it can feel counterintuitive to rate things like equality, nature, and harmony as non-important. As the value questions dealt with the issues on a very general level, the respondents did not necessarily connect them with meat substitutes. The results for questions *Q19 Meat substitutes are sustainable* demonstrates that some respondents do not perceive meat substitutes as sustainable products, which also explains why a strong connection between biospheric value orientation and willingness to purchase meat substitutes was not detected in this sample. The E-VPQ questions were directly translated to Finnish by the author, which could also impact the way they were perceived by respondents. The E-PVQ questionnaire had prior academic validation as a functional tool in value measurement yet may function differently in other languages. However, the measures did not function as well with this sample and some of the questions were perceived as guiding towards the higher values. The results for egoistic value orientation questions were much more varied, which provided statistical support for hypothesis H3. The questions measuring egoistic value orientation focused on values that were more neutrally perceived by respondents.

A sample with more variation in respondents' opinions and values could have resulted in more significant findings. As mentioned in the data collection chapter, the data was collected by the author via social media. Because the sample was not random and responding was voluntary, the sample was biased. The people in the authors extended social circle and people who chose to open and to finish the survey, were likely to be more familiar with and open towards meat substitutes. Also, the demographic characteristics of the sample were biased towards younger, highly educated female respondents. This was also reflected in the result where 74,60% reported that they are willing to purchase meat substitutes in the future. If the sample

would have been more varied in terms of demographic characteristics and opinions, it could have resulted in more significant results for the other variables included in the model.

The measures for subjective norms and perceived behavioral control did not function as planned. The results for the sum variables showed that some of the questions that were intended to measure the same thing, were not perceived as consistent by the respondents. For example, in the subjective norms measures, respondents reported that their friends and family use meat substitutes, yet they did not feel social pressure to replace meat with plant-based alternatives. The questions were designed based on the assumption according to the theory of planned behavior, that behavior and expectations of friends and family create social pressure and impact consumption. For most respondents in the sample however, this was not the case. Similarly, in the perceived behavioral control measures results for question Q27, *It is completely up to me which foods I purchase* were not consistent with the other two.

Neither of the variables subjective norms or PBC resulted in significant results in the probit regression and H5 and H6 were therefore not supported. In future research, the questions for these two variables should be re-formatted in order to ensure higher internal consistency. The results of the probit regression fail to provide statistically significant evidence to indicate that perceived behavioral control, subjective norms, and biospheric and altruistic value orientations impact consumers' willingness to purchase meat substitutes. This result is not entirely consistent with the literature review, based on which the framework and the measures were formatted. Attitude and egoistic value orientation were the only factors in the model that yielded statistically significant results. The result and their indications are further discussed in the following chapter. Suggestions for future research are also made in order to examine other potential factors more extensively.

6.1 Answers to research questions

In this chapter answers to the research questions are provided based on the overall findings of the research. The first research question focuses on the overall purpose of this research. Answering Q1 will help identify the key factors that influence consumers' willingness to purchase meat substitutes.

Q1. What factors impact consumers' willingness to purchase plant-based meat substitutes?

According to the results of this research, egoistic value orientation and attitude towards meat substitutes impact consumers' willingness to purchase meat substitutes. It appears that consumers who have a positive attitude towards meat substitutes are more likely to be willing to purchase them in the future. In turn, a negative attitude reduces the likelihood of purchase intention. According to the literary review and the measures used in the questionnaire, attitude is constructed from a set of underlying beliefs that the consumer has about the following attributes of meat substitutes: healthiness, sustainability, taste, and the ability to provide good variation to one's diet. The results also indicate that consumers who have egoistic value orientations are less likely to purchase meat substitutes. Value orientation that emphasizes the importance of values such as power, influence, money, and control negatively impacts purchase intention.

Based on the results it can be concluded that a combination of positive beliefs about meat substitutes' attributes results in a generally positive attitude towards them. A positive attitude increases the likelihood that a consumer is willing to purchase the products. Consumers who generally believe that meat substitutes taste good are healthy, are good for the environment, and provide good dietary variation have a positive attitude towards them. Attitude was measured with statement evaluation about these attributes with a 6-point Likert scale and transformed into a sum variable. Consumers who rated the statements about the same factors low, have a more negative attitude and are therefore less likely to purchase the products.

According to the literary review, there are other factors that impact consumer behavior and consumers' willingness to purchase certain products and services. However, in this research, other statistically significant factors besides attitude and egoistic value orientation did not emerge. The hypotheses for the other elements in the extended theory of planned behavior were not supported based on the quantitative data analysis. In the open comments left by the respondents, some additional factors also came up. Some respondents pointed out that dietary restrictions and allergies can lower the willingness to purchase for consumers who might otherwise have a positive attitude towards meat substitutes. Some respondents also felt that it is difficult to determine whether meat substitutes are sustainable or not. This is due to lack of information, lack of transparency in supply chains, and mistrust towards marketing communication. Lack of knowledge, misconceptions and internal biases can make consumers develop a negative attitude towards meat substitutes. All in all, the result that attitude and the underlying beliefs impact consumers' willingness to purchase meat substitutes is a significant one, as it provides an opportunity to address the beliefs and potentially impact attitude. Raising awareness of the sustainability and health benefits of meat substitutes as well as focusing on providing a wide variety of tasty products can help create more positive beliefs and attitudes among consumers.

Q2. What is the role of consumer values in willingness to purchase meat substitutes?

According to the literature review and previous research in the field of consumer behavior, consumers' values do impact their consumption and purchase decisions. Especially when it comes to sustainable or otherwise specialized products like meat substitutes. According to the results of this study, consumers with egoistic value orientation are less willing to purchase meat substitutes. This result is consistent with the literature review, as egoistic consumers are more likely to focus on self-enhancement values and appreciate convenience, taste and personal comfort over others or the environment. Because of this, behavior which requires changes in established habits is less likely to be adopted.

The empirical findings of this research failed to provide any statistically significant evidence that biospheric and altruistic value orientations impact the willingness to purchase meat substitutes. However, the scope of this research is not extensive enough to prove that biospheric and altruistic values do not impact the purchase intention at all. The role of values is a topic that should be explored further in the context of meat substitutes. The results provided support for H3, which indicates that values have an influence when it comes to purchase intention of meat substitutes. However, as no significant results were achieved for biospheric and altruistic value orientations, any comprehensive conclusions on the overall role of values in willingness to purchase meat substitutes cannot be made without further research.

6.2 Theoretical and practical contributions

This thesis provides theoretical and practical contributions, which can be valuable for companies producing plant-based meat substitutes as well as researchers interested in the topic. The promotion of plant-based diets is beneficial for environmental sustainability and human health, which makes it an important topic in the future.

The topic of consumer behavior regarding meat substitutes has not been studied among Finnish consumers before. Previous research has focused more on meat consumption and consumers' willingness to reduce it, rather than plant-based meat substitutes as a specific product category. This thesis provides an overview of Finnish consumers' opinions and perceptions regarding specifically meat substitutes. Meat substitutes are still relatively new products to the market and unfamiliar to many consumers. However, they have gained popularity in the recent years which indicates, that they have the potential to become an important category of food products in the future. Because of the novelty of meat substitutes as a product category, it is important to research consumers' attitudes and opinions to map out the potential customer base for the future. This research provides a good basis for future research by establishing a basic understanding of the current situation within the Finnish market and by identifying the main factors the consumers

find relevant.

Another theoretical contribution is the use of the extended theory of planned behavior for examining consumers' purchase intention. Value orientations were included in the theory of planned behavior framework as additional components to examine the role of values in purchase intention. This research approach can be implemented to other topics, which focus on value-driven consumer behavior and sustainable consumption.

This thesis also provides practical contributions, which can be useful to companies that manufacture and market plant-based meat substitutes. The results provide insight into the general beliefs and opinions Finnish consumers currently have about meat substitutes as a product category. The key finding of this research is that a positive attitude increases the likelihood that a consumer is willing to purchase meat substitutes. Attitude is impacted by consumers' beliefs about product attributes regarding sustainability, healthiness, taste, and the ability to provide dietary variety. In turn, negative beliefs and attitudes lower the likelihood that a consumer is willing to purchase the products. This discovery is significant, and it provides strategic insight that can be utilized by companies. Focusing on transparency and marketing efforts that emphasize the positive health and sustainability attributes of meat substitutes can increase positive attitudes among consumers. Increasing the awareness of these positive attributes in combination with creating tasty products that offer variety with alternatives can help grow the potential customer base in the future. Promoting plant-based eating and foods that fit the planetary health diet standards can help mitigate the environmental and health impacts of food production and consumption in the future.

The results indicate that consumers with egoistic value orientation are less willing to purchase meat substitutes. This finding is also significant, as it indicates that consumer values play a role in purchase decision-making regarding meat substitutes. Consumers whose value structures are egoistic are probably not the ideal target group for meat substitute products. This research provides a good basis for more extensive research about the more specific role of values in purchase

intention of plant-based foods. Even though the other value orientations did not yield statistically significant results, the findings indicate that values can be influential.

Additional insights from the collected open comments also pointed out that meat substitutes should take into account food allergies and dietary restrictions in order to better cater to a wider audience of consumers in the future. In the open comments, there was mentioned that consumers find it difficult to differentiate between marketing efforts and factual information about sustainability. Communication needs to be transparent and fact-driven in order to enforce trust between companies and consumers.

6.3 Limitations

The results of this research are expected to be valid and reliable as the research process was carefully conducted and reported to ensure the integrity of the results. However, there are also some limitations to this research. Firstly, the data collection method caused bias in the sample. The data was collected by the author on social media, which led to the sample being biased instead of representative of the Finnish population. As mentioned before, answering the questionnaire was voluntary and only people in the extended social circle of the author had access to the questionnaire. Because of this, the respondents' demographics characteristics and responses did not have enough variation to yield ideal results. Although the sample size of 278 respondents is sufficient for research of this scope, a larger sample might have yielded more significant results. Some consumer groups and opinions were not well enough represented in the sample. The vast majority of respondents were highly educated females who already consumed meat substitutes quite regularly. Because of the biased sample, the results might not represent all opinions and factors that impact consumers' willingness to purchase meat substitutes. The lack of variation also might have impacted the fact that most of the results failed to provide statistically significant results.

In addition to data collection, the questionnaire design had characteristics that can lower the reliability and validity. The measures for some of the sum variables did not

function in the expected way. Especially with the sum variables subjective norms and PBC, the internal consistency of the measures was not ideal. In the open comments, some respondents commented that some of the E-PVQ questions felt guiding towards a green mindset which can also influence the honesty of answers.

The quantitative approach and data analysis methods as well as the choice of the theoretical framework were justified and fit the topic of the research well. Multiple tests were conducted, and different models were tested in order to ensure the integrity of the data. The tests were performed several times and the results were checked to avoid any errors in the final results.

6.4 Suggestions for future research

The topic of consumer behavior related to plant-based meat substitutes as a specific product category has not been researched widely, as the products are relatively new to the market. Especially in the Finnish market, the topic has not received much academic attention. As meat substitutes are gaining popularity and market share and plant-based diets become more popular, the products could have great market potential in the future. This research gives a brief overview of the topic and some of the most prominent beliefs and attitudes consumers have about meat substitutes. However, the scope of this research is small, and the sample is not representative of the Finnish population. In order to gain a better understanding and more generalizable result, a similar study should be conducted with a wider and more randomized sample. Also, as only egoistic value orientation yielded statistically significant results in this study, the value aspect could be studied more in future research. The results of this research indicate that values are influential, yet the role of different values is not clearly defined. The measures for values, PBC, and subjective norms might need modifying to ensure a higher internal consistency and reliability. The respondents brought up the topic of food allergies and dietary restrictions, which can impact their willingness to purchase meat substitutes. This point of view should be considered in future studies.

Some of the respondents found the directly translated E-PVQ questions guiding and

out of touch with the topic of the research. Especially the data regarding biospheric and altruistic value orientations did not have much variation and the median values were extremely high. To avoid this, it is recommended that alternative measures for consumer values should be explored. Although the E-PVQ questions are validated by previous research, they did not seem to function as well among the Finnish sample. More discrete and indirect questions might be better perceived by respondents and thus result in more variation in answers. Refining the measures regarding value orientations and collecting data from a wider and more randomized sample could provide more significant results. According to this research attitude and egoistic value orientation impacts consumers' willingness to purchase meat substitutes in the future but did not provide evidence for the other factors included. In order to gain a comprehensive understanding of all the factors that impact consumers' willingness to purchase meat substitutes, further research is recommended.

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Appendices

Appendix 1. The questionnaire

About the questionnaire and use of data.

This questionnaire is a part of master's thesis in strategy, innovation and sustainability in LUT School of Business and Management. The purpose is to map out consumers attitudes and consumption behavior regarding plant-based meat substitutes in Finland.

The answers will be anonymous and personal information is not collected. By answering this questionnaire, you consent to the collection and use of the answers anonymously for the thesis research. In this study, plant-based meat substitutes are defined as products made from plant ingredients that aim to mimic the sensory properties and use purposes of meat. Products like Nyhtökaura, Härkis and different soy- pea and mycoprotein products like burgers, sausages, strips etc. The questionnaire consists of 30 questions and takes maximum of 5 minutes to complete.

Thank You!
Siiri Laukkanen.

1. Gender

Male
Female
Other

2. Age

18-29
30 - 43
44 - 54
55 – 65
65 or above

3. Education

Comprehensive school
Highschool / vocational school
Bachelor's degree
Master's degree or PhD

4. How frequently do you eat meat (in main dish)?

Never
Less than once a week
1-2 times a week or less
3-5 times a week
More than 5 times a week

5. How frequently do you eat meat substitutes?

Never
I have tried them a few times
Less than once a week
1-2 times a week
3 times or more in a week

Rate the following statement in a scale from 1 to 6 (1= not like me at all 6= very much like me). Try to variate between the ratings as much as possible.

6. It is important to prevent environmental pollution
7. It is important to protect the environment
8. It is important to respect nature
9. It is important to be in unity with nature
10. It is important that every person has equal opportunities
11. It is important that every person is treated justly
12. It is important that there is no war or conflict
13. It is important to be helpful to others
14. It is important to have control over others' actions
15. It is important to have authority over others
16. It is important to be influential
17. It is important to have money and possessions
18. It is important to work hard and be ambitious

From one to six, rate the next statements about factors impacting your likeliness to purchase meat substitutes from 1 to 6. (1= completely disagree 6=completely agree)

19. Meat substitutes are sustainable
20. Meat substitutes are healthy
21. Meat substitutes taste good
22. Meat substitutes offer good variety into my diet
23. The price of meat substitutes is suitable
24. My family and friends use meat substitutes
25. My family and friends think I should use meat substitute
26. I feel social pressure to replace meat with plant-based alternatives
27. It is completely up to me what foods I purchase
28. Meat substitutes are easy to use
29. I have enough money to use meat substitutes

30. Are you interested in using meat substitutes in the future?

Yes
No

You may leave additional comment here: (open question) *not mandatory

Thank you!

Appendix 2. Summary of variable descriptive statistics

Variable	Mean	SD	Variance	Min	Max	Used in sum variable
Q6 It is important to prevent environmental pollution	4.98	1.11	1.24	1	6	1
Q7 It is important to protect the environment	5.03	1.13	1.29	2	6	1
Q8 It is important to respect nature	5.16	1.11	1.25	2	6	1
Q9 It is important to be in unity with nature	4.48	1.43	2.05	1	6	1
Q10 It is important that every person has equal opportunities	5.02	1.22	1.50	1	6	2
Q11 It is important that every person is treated justly	5.35	1.04	1.09	2	6	2
Q12 It is important that there is no war or conflict	5.1	1.08	1.17	1	6	2
Q13 It is important to be helpful to others	5.03	1.21	1.48	2	6	2
Q14 It is important to have control over others' actions	2,83	1,11	1,24	1	6	3
Q15 It is important to have authority over others	3.28	1.30	1.69	1	6	3
Q16 It is important to be influential	3.13	1.29	1.67	1	6	3
Q17 It is important to have money and possessions	3.58	1.17	1.37	1	6	3
Q18 It is important to work hard and be ambitious	3.92	1.31	1.73	1	6	3
Q19 Meat substitutes are sustainable	3.98	1.18	1.41	1	6	4
Q20 Meat substitutes are healthy	3.86	1.27	1.63	1	6	4
Q21 Meat substitutes taste good	3.41	1.52	2.31	1	6	4
Q22 Meat substitutes provide good variety into my diet	3.85	1.84	3.41	1	6	4
Q23 The price of meat substitutes is suitable	3.24	1.25	1.56	1	6	removed
Q24 My family and friends use meat substitutes	3.93	1.41	2.00	1	6	5
Q25 My family and friends think I should use meat substitutes	2.62	1.38	1.92	1	6	5
Q26 I feel social pressure to replace meat products with plant-based alternatives	2.35	1.38	1.92	1	6	5
Q27 It is completely up to me what food products I purchase	5.19	1.16	1.35	1	6	6
Q28 Meat substitutes are easy to use	4.16	1.62	2.63	1	6	6
Q29 I have enough money to use meat substitutes	4.49	1.39	1.93	1	6	6

N=287 for all questions

Appendix 3. Rotated factor loadings.

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
BIO_Q8	0.8674	0.1960	-0.1846	0.0866	0.0341
ALT_Q13	0.8393	0.2134	-0.0568	0.1069	-0.0747
ALT_Q12	0.8309	0.1749	-0.1161	0.1197	0.0144
ALT_Q11	0.8260	0.2262	-0.0861	0.1622	-0.0558
BIO_Q9	0.8234	0.0737	-0.1128	0.1173	0.0720
ALT_Q10	0.7601	0.3224	-0.0730	0.136	-0.1001
BIO_Q6	0.7432	0.3467	-0.0802	0.0561	0.1372
PBC_Q27	0.4521	0.4980	-0.1888	0.0523	-0.0769
ATT_Q21	0.2800	0.8242	-0.0828	0.1977	0.0743
ATT_Q22	0.2617	0.7956	-0.1121	0.2450	0.0336
PBC_28	0.2432	0.7515	-0.0816	0.3132	0.0747
ATT_Q19	0.4058	0.7345	-0.0891	-0.0366	0.0738
ATT_Q20	0.3704	0.7292	-0.1249	0.0004	0.0532
EGO_Q15	-0.0640	-0.0913	0.8675	-0.0394	0.0422
EGO_Q18	-0.2752	-0.1323	0.7236	0.0532	-0.1107
EGO_Q14	-0.0620	-0.0280	0.6905	-0.1066	0.1834
EGO_Q17	-0.3416	-0.1720	0.6776	0.0182	-0.0042
PBC_Q29	0.1735	0.2314	-0.0692	0.7682	0.0451
ATT_Q23	0.2847	0.2695	0.0377	0.7263	0.0173
SN_Q24	0.1582	0.4295	-0.0547	0.4585	0.4176
SN_Q26	0.0601	-0.0531	0.0288	-0.0052	0.8666
SN_Q25	-0.0898	0.4161	0.0629	0.1072	0.7218

Appendix 4. Shapiro-Wilk test for normality. Graphical presentations of sum variables.

