



Maybe meat, maybe not?

Analysing Swedish consumers' preferences for plant-based meat alternatives

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Abstract

Plant-based meat alternatives (PBMAs) have grown in both demand and diversified supply. As follows, there has recently been an increase in research studying consumers' behaviour towards these products. This thesis aimed to add to the growing literature by analysing Swedish consumers' preferences for PBMAs. To do so, a discrete choice experiment (DCE) was conducted to estimate the willingness to pay (WTP) for various products. Using an online survey distributed to a panel of Swedish consumers, the respondents (n = 517) were asked to choose between different protein products (pea-based mince, soy-based mince, mixed mince, and red lentils) for cooking Bolognese sauce. The products varied in price and geographical origin.

The results found that the WTP was the highest for the meat option. The main reasons for choosing meat were meat being tasty and a good protein source, not wanting to change one's diet, and knowing what to expect when buying meat. Secondly, there was no significant difference in WTP between the two plant-based minces. Still, pea protein was perceived as more natural, healthy and environmentally friendly. Thirdly, the origin influenced the WTP as respondents were willing to pay more the more proximate the origin of protein for plant-based mince. And, lastly, the respondents who preferred the plant-based minces the most were female, younger, highly educated, and had low food neophobia. To conclude, while the price and other product attributes are important for increasing plant-based food consumption, so are understanding the differences between and barriers for consumers.

Keywords: willingness to pay, plant-based meat alternatives, discrete choice experiment, random utility theory, consumer behaviour

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Abbreviations

DCE	Discrete choice experiment
EU	European Union
FNS	Food neophobia scale
GHG	Greenhouse gas
PBMA	Plant-based meat alternative
RUT	Random Utility Theory
WTP	Willingness to pay

1. Introduction

1.1 Background

According to Willett *et al.* (2019), “food production is the largest cause of global environmental change” (p. 461), contributing to several environmental problems, such as global warming, biodiversity loss and altered biochemical flows (UNEP 2016; Willett *et al.* 2019). For instance, IPCC (2022) claims that food production accounts for around 21 to 37% of global greenhouse gas (GHG) emissions. These problems, moreover, impact food systems negatively, as food production depends on ecosystem services and the condition of the environment (UNEP 2016; Willett *et al.* 2019). There have, to illustrate, been several instances where increased temperature and frequency of droughts caused by climate change have limited crop production (IPCC 2022). It is, therefore, essential to reduce the negative impact of food systems, not least in light of the need to feed a growing global population (UNEP 2016; Willett *et al.* 2019; IPCC 2022).

Due to population and economic growth, global meat consumption has increased significantly over the past decades, contributing to environmental degradation (Tilman & Clark 2014; UNEP 2016; Willett *et al.* 2019). Previous studies have found that meat production has a higher impact on the environment than plant-based food production, such as emitting more GHGs and requiring more land- and water use (Tilman & Clark 2014; Poore & Nemecek 2018). In addition, high meat consumption has been found to negatively influence health, as it, for instance, increases the risk for coronary heart disease and some cancer types (Tilman & Clark 2014; Willett *et al.* 2019; IPCC 2022). In affluent countries where meat consumption tends to be high, the advice is, for both environmental and health reasons, to reduce meat consumption and increase the consumption of plant-based foods (UNEP 2016; Willett *et al.* 2019; European Commission 2020).

1.2 Aim

According to market analyses, plant-based food consumption has increased in Sweden over the past years (Axfood 2022), whereas meat consumption has

decreased (Swedish Board of Agriculture 2022). Relating to this shift in diets, there has been a growth in plant-based meat alternatives (PBMA)s. This product group have not only grown in demand (National Board of Trade 2020) but also in terms of a diversified supply with continued product development (RISE 2021).

Similarly, there has recently been an increase in scientific articles on consumers' acceptance of and preferences for PBMA)s (Onwezen *et al.* 2021). While the number continues to rise, there are, as of now, few articles that have studied Swedish consumers specifically. Therefore, this thesis aims to add to the growing literature by analysing Swedish consumers' preferences for PBMA)s. To analyse the preferences, the respondents' willingness to pay (WTP) will be estimated for different PBMA)s.

1.3 Research questions

In light of the increasingly diversified supply, it is relevant to study whether the WTP varies between PBMA)s made from different proteins. In addition, although Swedish consumers tend to value domestically produced food (ICA & LRF 2019; WWF 2021) there is a limited supply of Swedish PBMA)s (RISE 2021). It is, thus, further relevant to study whether the proteins' geographical origin influences the WTP. Furthermore, to better understand potential differences between consumer segments, this thesis will also investigate which personal characteristics interact with preferences. As such, the research questions for this thesis are:

- RQ1** What difference is there in Swedish consumers' WTP for meat alternatives based on different proteins?
- RQ2** How does the geographical origin of PBMA)s proteins influence Swedish consumers' WTP?
- RQ3** Which personal characteristics interact with Swedish consumers' preferences for PBMA)s?

1.4 Disposition

Following this introduction, chapter 2 will provide an overview of previous literature on consumers' behaviour towards PBMA)s to provide a context for this thesis. Thereafter, chapter 3 will describe the methodology of this thesis, which includes the theoretical framework. The results will then be presented and summarised in chapter 4, after which chapter 5 and 6 will finish the thesis with a discussion and conclusion, respectively.

2. Previous literature

This chapter's purpose is to provide an overview of the factors influencing consumers' behaviour towards PBMA. Consumer behaviour is a broad term including the processes that take place before, during and after the purchase of food (Solomon *et al.* 2016), which could include, to exemplify, consumers' acceptance of products, their intention to purchase them, and how much they are willing to pay. The articles included in this chapter are consisting of literature reviews and studies on Swedish and other European consumers. After presenting the findings, divided into consumer- and product-related factors, a brief conclusion will end the chapter.

2.1 Consumer-related factors influencing behaviour towards PBMA

Several studies have demonstrated a correlation between demography and consumers' behaviour toward PBMA, such as intention to purchase and acceptance. In general, results show that female, younger, highly educated, and high-income consumers display more positive behaviour toward PBMA (Cliceri *et al.* 2018; Onwezen *et al.* 2021; Carlsson *et al.* 2022; Rööös *et al.* 2022; Spendrup & Hovmalm 2022; Szenderák *et al.* 2022). Moreover, Szenderák *et al.* (2022) identified in their review that political views correlate with the likelihood of purchasing PBMA, with liberal consumers being more likely.

Furthermore, low familiarity can be a barrier to consuming PBMA (Hoek *et al.* 2011; He *et al.* 2020; Onwezen *et al.* 2021; Rööös *et al.* 2022). When exploring this topic in focus groups with Swedish consumers, Collier *et al.* (2021) found that low familiarity may limit consumption due to scepticism towards an unknown sensory experience and the lack of skills for food preparation. The latter was also found to limit the consumption by German, French and Dutch consumers (Weinrich 2018). In addition, Hoek *et al.* (2013) found that among Dutch consumers, the acceptance of PBMA might increase if recurrently exposed to the product. However, they further argued that such recurrent exposure is unlikely to occur in reality, highlighting the need to increase willingness to try and to ensure a positive first experience. In line with this, Michel *et al.* (2021) argued that a possible barrier to increasing familiarity could be if previous experiences with PBMA have been

negative. In addition, previous research has found lacking convenience to be a barrier to consuming PBMA (Weinrich 2018; He *et al.* 2020; Collier *et al.* 2021). However, as Collier *et al.* (2021) and Weinrich (2018) argued, plenty of PBMA are contrastingly easy to prepare. Instead, the perceived inconvenience might be due to low familiarity and the lack of skills (Weinrich 2018).

Defined by Pliner and Salvy (2006) as the "reluctance to ingest novel foods" (p. 75), food neophobia is a potential barrier to consuming or trying PBMA (Onwezen *et al.* 2021; Spendrup & Hovmalm 2022; Szenderák *et al.* 2022). When comparing different consumer segments, Spendrup and Hovmalm (2022) found that Swedish consumers who ate meat and avoided vegetarian food had more severe food neophobia. In contrast, consumers who aimed to reduce their meat intake had less food neophobia. In addition, they found a negative correlation between food neophobia and consumption of PBMA among consumers who neither avoided vegetarian food nor attempted to reduce their meat intake. In line with this, Collier *et al.* (2021) identified scepticism towards PBMA as a barrier to consumption amongst Swedish consumers. For example, some of the participants questioned the naturalness and safety of PBMA.

Moreover, consumers have different motives driving their food choices, influencing their behaviour toward PBMA (Weinrich 2018; He *et al.* 2020; Collier *et al.* 2021; Onwezen *et al.* 2021). For instance, three commonly identified motives for consuming PBMA include health, animal welfare, and environmental concern (Hartmann & Siegrist 2017; Weinrich 2018; He *et al.* 2020; Szenderák *et al.* 2022). Relating to these motives, other significant personal characteristics include beliefs (Hoek *et al.* 2011; Clicerri *et al.* 2018; Collier *et al.* 2021; Onwezen *et al.* 2021; Kopplin & Rausch 2022), awareness (Siegrist & Hartmann 2019; Collier *et al.* 2021; Carfora *et al.* 2022) and attitudes (Hoek *et al.* 2011; De Boer *et al.* 2013; Clicerri *et al.* 2018; Onwezen *et al.* 2021; Carfora *et al.* 2022; Kopplin & Rausch 2022). To illustrate, Collier *et al.* (2021) identified health as a motive for both consuming and avoiding PBMA among Swedish consumers, as the participants had different beliefs about whether PBMA or meat was the healthiest. Furthermore, higher awareness of the environmental impact of meat has been found to correlate with more positive behaviour towards PBMA (Siegrist & Hartmann 2019; Carfora *et al.* 2022). According to Röös *et al.* (2022), Swedish consumers are highly aware of meat's environmental impact. However, although consumers might be aware of that, Collier *et al.* (2021) found that some Swedish consumers nonetheless did not believe it. Moreover, in a study comparing different food preference groups in Sweden, Spendrup and Hovmalm (2022) found that the group included in the study with the highest consumption of PBMA, namely flexitarians, also had the most positive attitudes toward PBMA. The behaviour toward PBMA is influenced by attitudes toward other topics too, such as toward climate change,

food neophobia and meat (Hoek *et al.* 2011; De Boer *et al.* 2013; Weinrich 2018; Collier *et al.* 2021)

Socio-cultural factors have been identified as influencing the behaviour towards PBMA's both positively and negatively (Weinrich 2018; He *et al.* 2020; Collier *et al.* 2021; Onwezen *et al.* 2021; Carfora *et al.* 2022). For instance, societal approval can motivate consumers to choose PBMA's (Carfora *et al.* 2022). On the other hand, consumers might not consume PBMA's to avoid having to justify their decision (Collier *et al.* 2021) or because they feel socially obligated to eat meat (Weinrich 2018). Concerning culture and tradition, some consumers find PBMA's unsuitable for certain contexts where meat products are deemed irreplaceable for a meal, such as Swedish Christmas ham (Collier *et al.* 2021). Michel *et al.* (2021) further found that their German respondents considered PBMA's as appropriate in situations with low peer pressure, such as when eating alone or with friends and family, compared to situations with high peer pressure, such as business dinners or barbecue parties.

2.2 Product-related factors influencing behaviour towards PBMA

Taste and texture are essential intrinsic attributes and can both be a barrier (Hoek *et al.* 2011; Weinrich 2018; He *et al.* 2020; Collier *et al.* 2021; Röö's *et al.* 2022; Spendrup & Hovmalm 2022; Szenderák *et al.* 2022) and a reason (Hoek *et al.* 2011; He *et al.* 2020; Onwezen *et al.* 2021; Spendrup & Hovmalm 2022; Szenderák *et al.* 2022) for consuming PBMA's. As taste and texture differ between different PBMA's, so does consumers' liking and acceptance of these products. For instance, the ingredient that a PBMA is based on (*e.g.*, soy, oat, mycoprotein) influences the liking of the product (Hoek *et al.* 2013; Elzerman *et al.* 2015; Michel *et al.* 2021; Onwezen *et al.* 2021; Niimi *et al.* 2022). Moreover, Michel *et al.* (2021) found that German consumers preferred PBMA's that substitute highly processed meat, such as sausage, rather than unprocessed meat, such as steak.

Relating to taste and texture, a commonly raised question is whether the sensory attributes of PBMA's should be similar to those of meat. According to He *et al.* (2020), PBMA's were initially not intended to mimic those attributes but have developed to do so more recently to increase popularity among a wider range of consumers. Previous studies have, similarly, found that consumers generally prefer products similar to meat in taste and texture (Hoek *et al.* 2011; Elzerman *et al.* 2015; Michel *et al.* 2021). While Collier *et al.* (2021) found this to be true for some of the Swedish participants, others disliked products that were too similar.

The price of a product is a significant extrinsic attribute, which several studies have identified as a potential barrier to the consumption of PBMA's (Hoek *et al.* 2011; Weinrich 2018; He *et al.* 2020; Collier *et al.* 2021; Onwezen *et al.* 2021).

Hence, it has been suggested to either reduce the price of PBMA or increase the price of meat to improve the competitiveness of the former (Collier *et al.* 2021; Michel *et al.* 2021; Szenderák *et al.* 2022). Furthermore, some respondents in the focus group study by Collier *et al.* (2021) questioned the high price of PBMA, as they doubted the products were worth that much. In addition, some respondents suggested smaller packaging of PBMA to reduce the price barrier, as this would decrease the value and food lost to consumers if disliking the product.

The accessibility of PBMA can also impact consumption. For instance, if there are limited options for PBMA when eating out, consumers might be discouraged from choosing them (He *et al.* 2020; Szenderák *et al.* 2022). Furthermore, some respondents in the study by Collier *et al.* (2021) argued that PBMA should be easier to find in stores, such as by positioning them closely or next to meat products.

Lacking or unclear labels and information on packaging might limit the consumption of PBMA (He *et al.* 2020; Collier *et al.* 2021; Onwezen *et al.* 2021; Szenderák *et al.* 2022). Szenderák *et al.* (2022) argued for the importance of clear information on packaging as PBMA “are not necessarily more natural, healthier, or sustainable than their conventional counterparts” (p. 18). In line with this, the impact on health and the environment varies between different PBMA (He *et al.* 2020; Karlsson Potter *et al.* 2020; Szenderák *et al.* 2022), further demonstrating the need for clear information to enable sustainable food choices. While more information on, for example, sustainability could influence behaviour positively (Collier *et al.* 2021; Carlsson *et al.* 2022; Szenderák *et al.* 2022), too much information could have a negative effect instead (Collier *et al.* 2021). Nevertheless, previous research has found some labels to be considered important by consumers, including ones associated with health (*e.g.*, naturalness, being a good source of protein, nutritional content) (Collier *et al.* 2021; Szenderák *et al.* 2022) and the environment (*e.g.*, organic label, locally produced) (Onwezen *et al.* 2021; Rööös *et al.* 2022; Spendrup & Hovmalm 2022; Szenderák *et al.* 2022). Lastly, previous studies have found that Swedish consumers generally prefer PBMA produced domestically (Collier *et al.* 2021; Rööös *et al.* 2022; Spendrup & Hovmalm 2022).

2.3 Conclusion

Various consumer- and product-related factors have been identified as influencing behaviour towards PBMA, of which a summary is presented in Table 1 below. Overall, these findings indicate that the behaviour towards these products is complicated as many different factors influence the behaviour. Compared to the research questions of this thesis, these findings suggest that the liking of PBMA differs depending on what they are based on and that both the geographical origin of the product, as well as various personal characteristics, could influence behaviour towards PBMA.

Table 1. A summary of the factors, identified in previous literature, that influence consumers' behaviour towards PBMA

Factors influencing behaviour	
Consumer-related	Demographics Familiarity and skills Food neophobia Motives, awareness, attitudes, and beliefs Socio-cultural factors
Product-related	Taste and texture; sensory similarity to meat Protein type Product type Price Accessibility Labels and information Geographical origin

3. Method

This chapter will begin by introducing the method selected for estimating the WTP, including a description of the study design and an outline of the hypotheses. Then, the tool for data collection will be described, followed by an overview of the sampling strategy and sample. Thereafter, the theoretical framework will be introduced followed by a description of the data analysis process.

3.1 Method for estimating the WTP

Two types of methods can be used for estimating WTP: revealed preference, such as using market data, and stated preference, where respondents are directly or indirectly asked what they are willing to pay (Breidert *et al.* 2006). As the latter allows for creating hypothetical scenarios and estimating the WTP for attributes that have high collinearity on the market (Louviere *et al.* 2000; Breidert *et al.* 2006) it was deemed suitable in relation to the research questions.

In specific, a discrete choice experiment (DCE) was conducted, which is when respondents are provided with a discrete set of options, that are varying in attributes such as price, and asked to state which they would purchase (Breidert *et al.* 2006). According to Brown *et al.* (1996, as cited in Breidert *et al.* 2006), a strength of this method is that it is easier for respondents to evaluate different prices provided to them than come up with a price themselves. As such, the validity tends to be higher for indirect survey methods (*e.g.*, DCE) than for direct ones (Breidert *et al.* 2006).

3.1.1 Study design

For the DCE, a concrete scenario was created to make the decision-making process more tangible for the respondents. The scenario was to hypothetically purchase a protein product for making four portions of Bolognese sauce ("köttfärssås" in Swedish), as this is a common Swedish dish (Niimi *et al.* 2022). In this scenario, the respondents were provided with four alternative products, including three plant-based options (pea-based mince, soy-based mince, and red lentils in a Tetra Pak) and one meat option (mixed mince, a mix of pork and beef). This means that each choice set consisted of these four options and a fifth option of not choosing any of the products. The protein types for the plant-based minces were selected to also

account for different geographical origins, as peas can be grown in Sweden, whereas soy often is imported from outside the European Union (EU) (Naturskyddsforeningen 2023).

Based on the research questions, the products varied in two attributes: price (in SEK) and geographical origin. Using the websites of several retailers (*e.g.*, ICA, Coop, Mathem) and producers (*e.g.*, Anamma, Peas of Heaven, Hälsans Kök), the attribute levels were based on the prices and origins of existing products (see Table 2 below for a summary of the attributes and levels). The same price levels were used for the plant-based and mixed minces to make the products more comparable. These prices were for 500 g of product. However, the drained weight of lentils is often 230 g. Therefore, the price for the lentils was for two packages, giving a total of 460 g. Due to the weight difference and lentils generally having a lower price, the attribute levels for the price were somewhat lower than for the other products.

Table 2. Attributes and attribute levels for each product in the DCE

Attribute	Product	Attribute levels
Price (in SEK)	Soy-based mince (500 g)	24, 32, 40, 48, 56, and 64
	Pea-based mince (500 g)	24, 32, 40, 48, 56, and 64
	Mixed mince (500 g)	24, 32, 40, 48, 56, and 64
	Lentils (460 g)	10, 18, 26, 34, 42, and 50
Geographical origin	Soy-based mince (500 g)	Non-EU or the EU
	Pea-based mince (500 g)	Sweden or the EU
	Mixed mince (500 g)	Sweden or the EU
	Lentils (460 g)	Sweden or the EU

The number of products, attributes, and attribute levels in this study resulted in too many choice sets (*i.e.*, combinations) to study them all. Therefore, a fractional factorial design was generated using the software Ngene. The design consisted of 24 choice sets, which were divided into three blocks to reduce the number of choice sets exposed to each respondent, meaning eight choice sets per respondent. An overview of the study design is summarised in Appendix 1.

3.1.2 Hypotheses

Based on the research questions and previous literature, the following are the hypotheses of this thesis:

- H₁** The respondents' WTP for pea-based mince is different from the WTP for soy-based mince.

- H₂** The respondents' WTP for soy-based mince is higher if the protein is from the EU than if imported from outside the EU.
- H₃** The respondents' WTP for pea-based mince is higher if the protein is from Sweden than if imported from the EU.
- H₄** Plant-based minces are more preferred by female respondents than by male respondents.
- H₅** Plant-based minces are more preferred by younger respondents than by older respondents.
- H₆** Plant-based minces are more preferred by respondents with a high educational level than by respondents with a lower educational level.
- H₇** Plant-based minces are less preferred by respondents with a high food neophobia than by respondents with a lower food neophobia.

3.2 Data collection tool

The DCE was conducted using an online survey, which was created using Qualtrics. The survey was, to reduce the costs, shared with another student writing a thesis on a similar topic. After preparing the questions for each thesis separately, a meeting was held to discuss possible overlaps and in which order the questions should be put, as the order of the questions could influence the respondents' responses (Kumar 2018). The survey was tested on friends, family and acquaintances to ensure that the questions were clear and easy to understand (*Ibid.*). The feedback from the pilot led to minor changes in some formulations. The final structure of the survey (see Appendix 2) is summarised in the subchapters below.

3.2.1 Informed consent, validation and screening

The survey began with informed consent, providing essential information about the survey to the respondents. This included the aim, the respondent's right to anonymity and to withdraw, the estimated time of participation, and contact information. The aim was, moreover, described in broad terms to reduce the risk of self-selection bias, where only those interested in the specific topic agree to participate. The respondents were, therefore, aware that the aim concerned food choice and attitudes, but not about which product categories were included. Thereafter, a validation question was included where respondents' attention to the question was tested by asking them to answer a stated option. Following that were questions used for the screening process, which included age, gender and how much of the household food purchasing they were responsible for (see Subchapter 3.5. for more about the screening process).

3.2.2 DCE with follow-up questions

The next part of the survey was the DCE for this thesis, which began with a short introduction to the task (*i.e.*, to choose between various products for making four portions of a meat- or plant-based Bolognese sauce). To reduce the risk of response bias the respondents were informed that there were no right or wrong answers. They were asked to choose the option that they, as honestly as possible, believed they would have chosen in real life, such as when grocery shopping in a store or online (Carlsson *et al.* 2022).

The respondents were, thereafter, randomly divided into the three blocks of choice sets, where each was presented on a separate page to avoid direct comparison between the choice sets (to illustrate, see Figure 1 below). For the PBMA and the mixed mince, the same picture was used as previous research indicated that consumers generally prefer PBMA with similar sensory attributes to meat (Hoek *et al.* 2011; Elzerman *et al.* 2015; Michel *et al.* 2021). For the lentils, a picture of a rather neutral package was created.

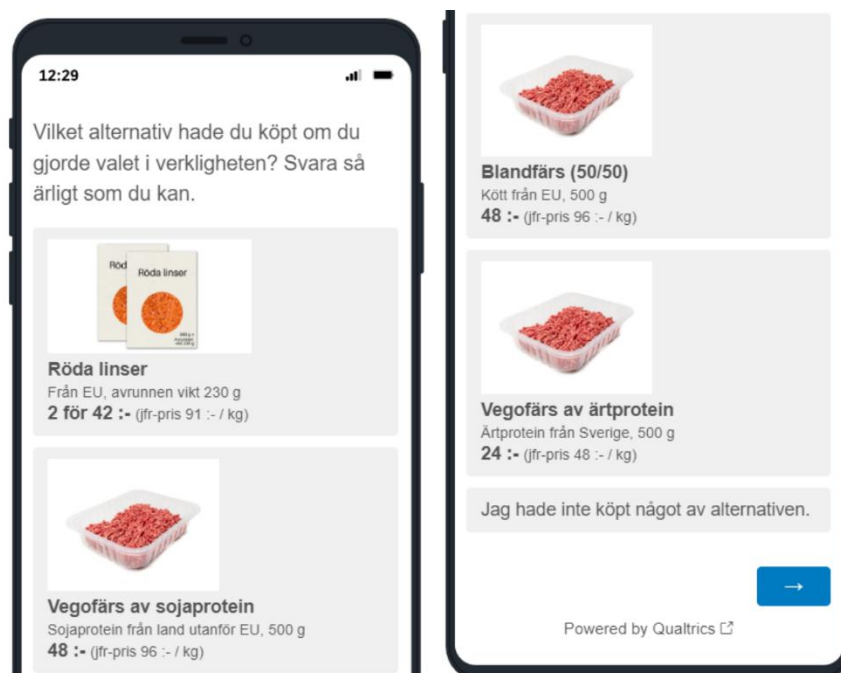


Figure 1. Example of how the choice sets were presented in the survey for smartphone users.

If a respondent chose only meat and no plant-based products or vice versa, they were asked a follow-up question about the main reasons for choosing or not choosing meat. *I.e.*, any respondent who chose both meat and plant-based products was not asked these follow-up questions. Based on the focus group study by Collier *et al.* (2021), whose results were further compared with the findings by Rööb *et al.* (2022) and Spendrup and Hovmalm (2022), two lists were compiled with possible reasons for making either decision. The respondents were then asked to select

which reasons, as most three, that were most important for their decision. It was also possible to choose “Other” and type any other reasons.

In addition, all respondents were asked a follow-up question about how they perceived four different product types: meat products, non-processed legumes, and meat alternatives based on either peas or soy. On a 5-point Likert scale, the respondents were asked to rate the products according to five attributes: taste, healthiness, environmental impact, ease of preparation, and naturalness. The attributes were chosen based on the studies by Rööös *et al.* (2022) and Michel *et al.* (2021) and were limited to five due to the scope of the survey and thesis. The respondents were informed that the question focused on their perceptions and that there were no right or wrong answers. To account for that some respondents might not have tried all product types, "I do not know" was included as a response option.

3.2.3 Questions about personal characteristics

Following some questions for the other student's thesis, the food neophobia of the respondents was assessed using an adapted version of Pliner and Hobden's (1992, as cited in Spendrup and Hovmalm, 2022) Food Neophobia Scale (FNS). This adaptation was used by Spendrup and Hovmalm (2022) (see Table 3 below), where two statements had been removed from the original scale, both regarding ethnic food, as they were considered irrelevant and possibly confusing in a Swedish context. Each statement was translated into Swedish, and the respondents were asked to state how much they agreed with each statement on a 5-point Likert scale.

Table 3. Statements in the adapted version of the FNS (Spendrup & Hovmalm 2022)

Number	Statement
1.	I am constantly trying new and different foods (R)
2.	I am sceptical of new types of food
3.	If I do not know what is in a food, I will not eat it
4.	I like food from different countries (R)
5.	At a dinner party, I like to try new foods (R)
6.	I am afraid of eating things I have never eaten before
7.	I am very picky about what food I eat
8.	I eat almost anything (R)

Note: Some were coded reversely (R) so that a high score corresponds to a high level of food neophobia

The formulations of the questions regarding the respondents' diets and frequency of eating PBMA were based on Rööös *et al.* (2022) and Spendrup and Hovmalm (2022). The respondents were asked to base their answers on their behaviour for the past 12 months. First, the respondents were asked to select which option best

described their diet (meat-eater, omnivore, flexitarian, pescetarian, vegetarian, and vegan), for which each option had a brief description (see Table 4 below). Then, they were asked how often they ate PBMA, and to clarify what was meant by PBMA, examples were included. The response options were "Daily", "4-6 times a week", "1-3 times a week", "1-3 times a month", and "Rarely or never". Thereafter, the survey finished with some demographical questions, where the question about educational level was used for this thesis.

Table 4. Descriptions of diets

Diet	Description
Meat-eater	I avoid vegetarian food
Omnivore	I eat both meat, fish, and vegetarian food
Flexitarian	I mostly eat vegetarian food and eat meat and fish sometimes
Pescetarian	I mostly eat vegetarian food and eat fish sometimes
Vegetarian	I only eat vegetarian food and avoid meat and fish
Vegan	I only eat vegan food and avoid all animal-based food

3.3 Sample

The survey was distributed to a panel by Norstat in April 2023. As mentioned above, a validation question was asked early in the survey to test the respondents' awareness. Those who answered the validation question incorrectly (*i.e.*, did not select the specific response option the question asked for) were excluded from the sample. In addition, only respondents who were 18 years or older, and at least partly responsible for purchasing food for their household, were included.

Due to the nonprobability sampling method, the sample is not generalisable to the population (*i.e.*, Swedish consumers). To make the sample more representative still, a quota sampling method was used by screening the respondents in terms of age and gender (Kumar 2018). That is, the sample's proportions of age and gender are similar to the proportions of the Swedish population. The final sample consisted of 517 respondents who had finished the survey (see Table 5 below).

Most respondents had either high school (40.23%) or university (52.42%) as their highest level of completed education. Compared to statistics of the Swedish population (see Spendrup & Hovmalm, 2022), there is a slight overrepresentation of respondents who had graduated from university. In addition, the largest diet group were the omnivores (72.09%), followed by meat-eaters (15.86%) and flexitarians (7.74%). There were few respondents with the diets pescetarian (2.31%), vegetarian (1.35%) and vegan (0.58%). Furthermore, roughly half of the respondents rarely or never eat PBMA (54.16%). Thereafter, the most common

frequency was 1-3 times a month (24.95%), followed by 1-3 times a week (16.05%), 4-6 a week (3.48%) and lastly daily (1.35%).

Table 5. Descriptive statistics of the sample (n = 517)

	n	%
Gender		
Female	261	50.48
Male	254	49.13
Non-binary	2	0.39
Age		
18-38 years	174	33.66
39-61 years	178	34.43
62-76 years	159	30.75
Did not want to say	6	0.01
Educational level		
Elementary school	25	4.84
High school	208	40.23
University	271	52.42
Did not want to say	13	2.51
Diet		
Meat-eater	82	15.86
Omnivore	372	71.95
Flexitarian	40	7.74
Pescetarian	12	2.31
Vegetarian	7	1.35
Vegan	3	0.58
Did not want to say	1	0.19
Frequency of eating PBMAAs		
Daily	7	1.35
4-6 times a week	18	3.48
1-3 times a week	83	16.05
1-3 times a month	129	24.95
Rarely or never	280	54.16

3.4 Theoretical framework

As a DCE was conducted for estimating the respondents' WTP, the theoretical framework of this thesis is Random Utility Theory (RUT). In a DCE, a group of decision-makers (1, ..., N) are asked to choose between a discrete set of options (1, ..., J). The utility experienced by an individual when choosing one of those options does not come from the option itself. Instead, as argued by Lancaster (1966), it is the attributes which the option consists of which provide the individual with utility. As such, the observable utility (V) for individual n of choosing option i can be expressed as (Horowitz *et al.* 1994; Train 2009):

$$V_{ni} = \beta' x_{ni} \quad (1)$$

Where:

β is a vector of parameters

x_{ni} is a vector of the observable attributes of option i for the individual n

According to RUT, the total utility (U) of making a given choice not only consists of this observable utility, which can be explained, but also of an unobservable component (ε), which is random (McFadden 1973; Train 2009). The total utility of choosing option i can for individual n , thus, be written as:

$$U_{ni} = V_{ni} + \varepsilon_{ni} \quad (2)$$

The core assumption of the theory is that when faced with making a decision, an individual will choose the option that results in the highest utility (McFadden 1973). To illustrate, if having two options, individual n would choose option i over option j , given that the following is true (Louviere *et al.* 2000):

$$U_{ni} = V_{ni} + \varepsilon_{ni} > U_{nj} = V_{nj} + \varepsilon_{nj} \quad (3)$$

Due to the random unobservable component of utility, it is not possible to neither know the total utility of an option nor to know which decision an individual will make. Instead, the probability that individual n would choose option i over option j is calculated, which can be expressed by the following equation (Train 2009):

$$\begin{aligned} P_{ni} &= P(U_{ni} > U_{nj} \quad \forall j \neq i) \\ &= P(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj} \quad \forall j \neq i) \\ &= P(\varepsilon_{nj} - \varepsilon_{ni} < V_{ni} - V_{nj} \quad \forall j \neq i) \end{aligned} \quad (4)$$

Where:

$\forall j \neq i$ means for all instances where options j and i are not the same

As explained by Train (2009), the distribution of this probability takes a cumulative form and can also be expressed using the following equation:

$$P_{ni} = \int_{\varepsilon} I(\varepsilon_{nj} - \varepsilon_{ni} < V_{ni} - V_{nj} \quad \forall j \neq i) f(\varepsilon_n) d\varepsilon_n \quad (5)$$

Where $I(\varepsilon_{nj} - \varepsilon_{ni} < V_{ni} - V_{nj} \quad \forall j \neq i)$ is an indicator function which is given the value 1 if the assumption in the parenthesis holds true, and 0 if it does not. To calculate this probability, an assumption needs to be made about the density of the random and unobservable component of utility, which is annotated $f(\varepsilon_n)$.

There are different models for this, such as the widely applied logit model which assumes that the random unobservable component takes a type I extreme value distribution. This implies that the difference in error terms takes a logistic distribution (Train 2009). According to this model, the probability that individual n would chose option i in a DCE can be expressed by the following equation (*Ibid.*):

$$P_{ni} = e^{\beta'x_{ni}} / \sum_j e^{\beta'x_{nj}} \quad (6)$$

When conducting a DCE, this model can be used to estimate the impact of an attribute level on utility (Train 2009). As RUT assumes that the option with the highest utility gets chosen, this difference in utility represents the preferences of the decision-makers. That is, if one attribute level has a larger impact on utility than another attribute level, then the former attribute level is preferred.

It is, however, not possible to estimate any absolute values of utility. Instead, the relative impact on utility by different attributes can be estimated. This has to do with the scale parameter of the model (*i.e.* the variance of the random and unobservable component of utility), as the preference parameters are confounded with this scale (Train 2009).

When including different price levels in a DCE, the difference in WTP between attributes can be estimated by taking the ratio between a given attribute parameter to the price parameter (Louviere *et al.* 2000; Train 2009). This represents the exchange rate between the price and that given attribute, as the respondents are asked at which price level they are willing to make a purchase. Due to so few data points being collected on an individual level, it is only possible to estimate the WTP on an aggregated level (*i.e.*, the average in the sample, and not for individual decision-makers) (Breibert *et al.* 2006).

3.5 Data analysis

Following the logit model, conditional logistic regressions were conducted using the statistical software Stata. This regression analysis allows for testing whether the difference in preference between attribute levels is statistically significant. In addition, the regression output can be used to estimate the difference in WTP between attribute levels.

To begin with, a main effects model was estimated. As only differences in utility can be estimated, each attribute level tested in this model had to be put in relation to another. In order to answer the first research question, the soy-based mince was used as the reference point for this model, meaning that the other options were all separately tested in relation to the soy-based mince. To answer the second research question, the geographical origin was also tested in this model by including four dummy variables. For each variable, the two levels of origin for each product were compared to each other.

To answer the third research question, a second regression model was conducted based on the main effects model, but also including interaction variables to test the personal characteristics. The characteristics were categorical (*e.g.*, age was divided into 18-38 years, 39-61 years, and 62-76 years) and a dummy variable was created for each category, given the value 1 if the respondent had the given characteristic. These dummy variables were then tested in relation to choosing either of the plant-based minces. As such, it was possible to test whether certain groups of respondents preferred the plant-based minces compared to another group of respondents.

4. Results

This chapter will first summarise the results testing the hypotheses of this thesis, which will provide answers to the research questions. Thereafter follows some additional results which have the purpose to add to the discussion chapter. This includes, in the following order: a comparison of WTP between meat and plant-based options; the reasons for choosing meat or not; perceptions of different product types; and a comparison of food neophobia between diets.

4.1 Results for the research questions

The sample size of 517 respondents resulted in a total of 4 136 observations (*i.e.*, decisions made) in the DCE. In most cases, the respondents chose meat (56.5%), followed by none of the products (19.1%), lentils (9.1%), pea-based (8.6%) and soy-based mince (6.6%).

In the regression using soy-based mince as the reference, the coefficient for the pea-based mince was insignificant (see Table 6 below). This indicates that there was no significant difference in preference between the plant-based minces, all else being equal. Likewise, the WTP estimations found the respondents were only willing to pay 0.91 SEK more for the pea-based mince compared to the soy-based one. In other words, there is no significant evidence supporting H_1 and the results fail to reject the null hypothesis.

Furthermore, the geographical origin was statistically significant for all products besides lentils (either $p < 0.01$ or $p < 0.001$). As shown in Table 6 below, the respondents were willing to pay 14.38 SEK more for a soy-based mince if the soy originated in the EU compared to if it was imported from outside the EU. Similarly, they were willing to pay 26.06 SEK more for a pea-based mince if the protein came from Sweden than if it was imported from the EU. Hence, these findings support H_2 and H_3 , and the null hypotheses are rejected.

Table 6. Results from the conditional logistic regression and the WTP estimations

	Coefficient	Standard error	WTP
Product (reference: soy-based mince)			
Mixed mince	2.046***	0.102	82.44
Pea-based mince	0.024	0.120	0.91
Red lentils	0.035	0.102	1.39
Not choosing any	0.229	0.080	9.23
Geographical origin (ref.: EU)			
Mixed mince: Sweden	0.727***	0.074	29.28
Soy-based mince: Non-EU	-0.357**	0.127	-14.38
Pea-based mince: Sweden	0.647***	0.132	26.06
Red lentils: Sweden	0.215	0.116	8.68
Price	-0.025***	0.002	

Notes: The WTP was estimated using the Krinsky method. The coefficients are annotated with * if $p < 0.05$, ** if $p < 0.01$ and *** if $p < 0.001$

The results from the second regression, including the interaction variables, are summarised in Table 7 below. The results from this regression found that female respondents preferred plant-based mince more than men ($p < 0.010$), and were on average willing to pay 11.48 SEK more for a plant-based mince than men did. Furthermore, a difference was found between respondents of different ages, where those belonging to the youngest group (18-38 years) preferred plant-based mince more than those belonging to the medium group (39-61 years) ($p < 0.001$), willing to pay 34.84 SEK more on average. Likewise, those in the medium group preferred plant-based mince more than the oldest respondents (62-76 years) ($p < 0.010$), willing to pay 13.64 SEK more. In addition, results found that respondents with a high educational level (*i.e.*, finished university) preferred plant-based mince more than those with a lower educational level ($p < 0.001$) and were willing to pay 23.18 SEK more.

The food neophobia scores of the respondents, on a 5-point Likert scale, were divided into tertiles, defined as low (1.000-2.000), medium (2.125-2.750) and high food neophobia (2.875-4.625). For testing the interaction effect of food neophobia, the respondents with a high food neophobia were compared to those with a lower food neophobia, *i.e.* belonging to the two lower tertiles. The results found that respondents with a high food neophobia preferred plant-based mince less than those with a lower food neophobia ($p < 0.010$). The latter group of respondents were willing to pay 11.47 SEK more on average for a plant-based mince. Hence, there is

statistically significant evidence that supports H₄, H₅, H₆ and H₇, meaning that the null hypotheses are rejected.

Table 7. Results from the conditional logistic regression and the WTP estimations, including personal characteristics

	Coefficient	Standard error	WTP
Product attributes			
Product (reference: soy-based mince)			
Mixed mince	2.722***	0.148	108.14
Pea-based mince	0.018	0.141	0.70
Red lentils	0.708***	0.167	28.14
Not choosing any	-0.892***	0.158	35.46
Geographical origin (ref.: EU)			
Mixed-mince: Sweden	0.735***	0.074	29.22
Soy-based mince: Non-EU	-0.364**	0.128	-14.47
Pea-based mince: Sweden	0.668***	0.133	26.56
Red lentils: Sweden	0.213	0.116	8.47
Price	-0.025***	0.002	
Personal characteristics (in relation to choosing plant-based mince)			
Gender (ref.: men)			
Women	0.289**	0.092	11.48
Age (ref.: medium, 39-61)			
Low: 18-38 years	0.877***	0.105	34.84
High: 62-76 years	-0.343**	0.126	-13.64
Educational level (ref.: low-medium, elementary- and high-school)			
High: university	0.583***	0.095	23.18
Food neophobia (ref.: low-medium, 1-2.75)			
High: 2.875-4.625	-0.289**	0.106	-11.47

Notes: The WTP was estimated using the Krinsky method. The coefficients are annotated with * if $p < 0.05$, ** if $p < 0.01$ and *** if $p < 0.001$.

4.2 Comparing meat and plant-based options

The estimates from the main effects model (see Table 6) indicates that meat was the most preferred option in the DCE. Thus, another regression was conducted but using the mixed mince as the reference. This allowed a comparison to be made between the meat and each of the plant-based options. Those results found that mixed mince was indeed more preferred than either of the plant-based options, as the coefficients were all negative and statistically significant ($p < 0.001$) (see Appendix 3). Similarly, the WTP estimations suggest that the respondents were willing to pay significantly more for mixed mince than any other option, as the WTP values were negative and large compared to the price levels of the DCE ($WTP_{soy} = -82.44$ SEK; $WTP_{peas} = -81.53$ SEK; $WTP_{lentils} = -81.04$ SEK; $WTP_{none} = -73.21$ SEK). More than half of the respondents did not choose a plant-based option in any of their choice sets (56.7%), and this unwillingness towards plant-based food is a driver for the large differences in WTP (see Appendix 3).

4.3 Reasons for choosing, or not choosing, meat

In total, 250 respondents (48.4%) chose meat at least once and never any plant-based options. When asked about the main reasons for this decision (see Figure A1 in Appendix 4), the most common answers were meat being tasty ($n = 250$) and a good protein source ($n = 112$), followed by that they have always eaten meat and do not want to change their diets ($n = 85$) and knowing what to expect when purchasing meat ($n = 84$).

Furthermore, 70 respondents (13.5%) chose a plant-based option at least once and never meat and 43 (8.3%) repeatedly opted out from choosing any product. Both groups were asked about the main reasons for not choosing meat.

To begin with, the main reasons for not choosing meat, if also choosing plant-based options, were the high environmental impact of meat ($n = 26$) and the belief that animals should not be eaten ($n = 24$), followed by the respondents eating meat but not pork ($n = 18$) (see Figure A2 in Appendix 4). Thereafter, the most common response option was "Other" ($n = 17$), once again with diverse answers. The most frequent answer was that the respondents either disliked mixed mince or specifically preferred another meat type over pork ($n = 5$).

Secondly, those who never chose any products at all most frequently chose the response option "Other" ($n = 29$), followed by eating meat but not pork ($n = 12$) (see Figure A3 in Appendix 4). As one respondent never added any text when choosing "Other", there were 28 written answers. Out of these, 24 mentioned how they either disliked mixed mince or specifically preferred another meat type.

4.4 Perceptions of product types

As the respondents' perceptions of meat, legumes, and pea- and soy-based meat alternatives were tested by asking the respondents the same questions for each product type, t-tests (assuming equal variances) were conducted to test whether there were any significant differences in perceptions (see Figure 2 below for illustration or Appendix 5 for descriptive statistics and results from t-tests).

To begin with, meat was perceived as both tastier and easier to prepare than all the plant-based options. However, it was also perceived as having the highest environmental impact. Legumes were the option perceived as healthiest, most natural, and having the lowest environmental impact. In addition, it was perceived as tastier and easier to prepare than both pea- and soy-based meat alternatives. Comparing the PBMAs, they scored similarly to each other regarding taste and ease of preparation. However, pea-based meat alternatives were perceived as healthier, more natural, and having a lower environmental impact than soy-based meat alternatives. Lastly, pea-based meat alternatives were perceived as similar to meat in terms of healthiness.

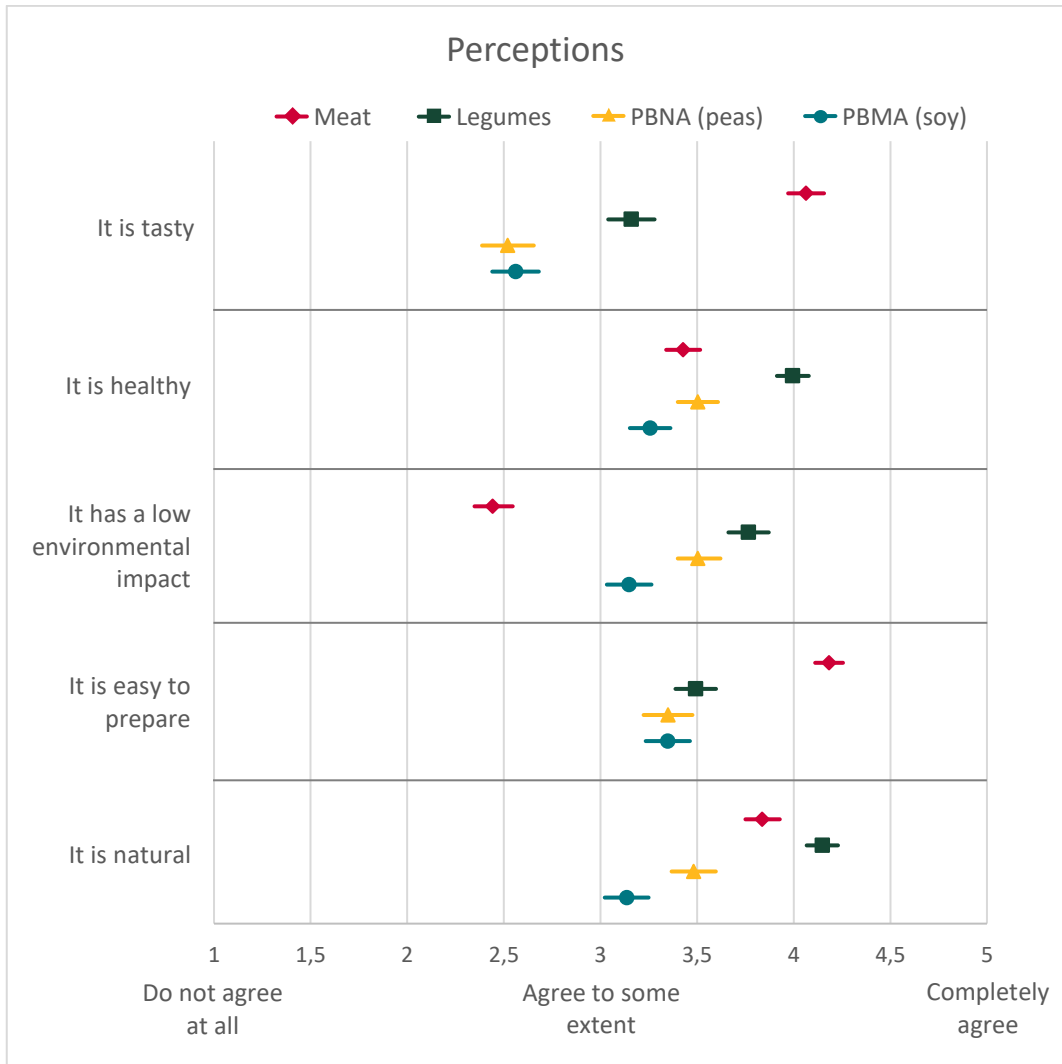


Figure 2. Mean and 95% confidence interval of respondents' perceptions of product types.

4.5 Food neophobia and diets

Figure 3 below illustrates how the proportions of food neophobia levels are quite similar for omnivores and those with mostly/only plant-based diets (*i.e.*, flexitarians, pescetarians, vegetarians and vegans). For meat-eaters, on the other hand, the share of respondents having high food neophobia is much larger and there were very few with low food neophobia.

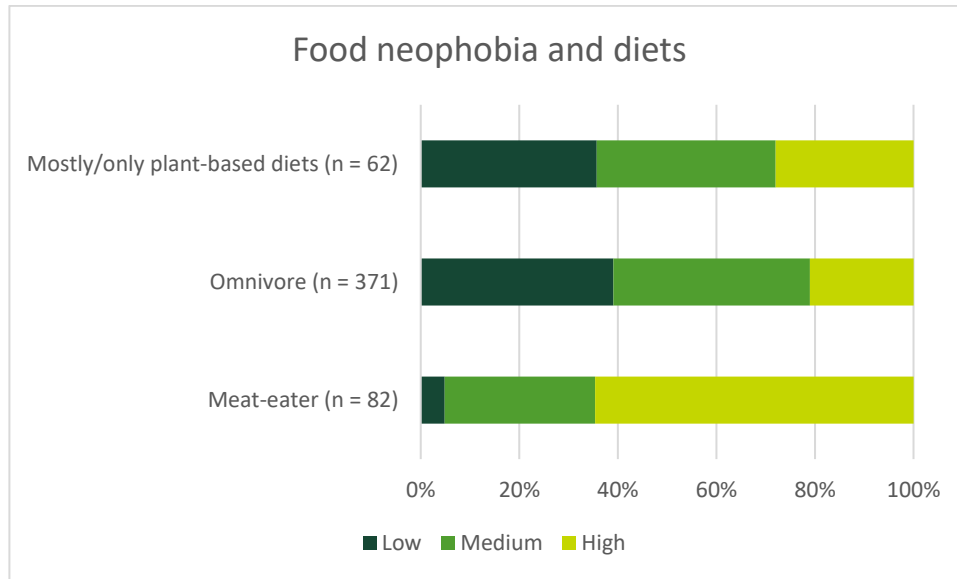


Figure 3. Food neophobia levels compared between diets.

The difference between diets can also be seen if comparing the mean scores of food neophobia between the three categories. On average, meat-eaters scored 3.04 whereas the mean was 2.29 for omnivores and 2.34 for the mostly/only plant-based diets. By doing a t-test (see Table 8 below), it was further found that there is no significant difference in mean between omnivores and those with mostly/only plant-based diets, but between meat-eaters and the other diet types.

Table 8. Results from the t-tests, assuming equal variances, comparing if there is a difference in the mean food neophobia score between respondents with different diets

	t	df	P
Meat-eater vs. omnivore	9.39	451	< 0.001
Meat-eater vs. plant-based diets	5.72	143	< 0.001
Omnivore vs. plant-based diets	-0.59	432	0.556

Note: Plant-based diets include flexitarians, pescetarians, vegetarians, and vegans

5. Discussion

To begin with, the results for each research question will be discussed separately. Thereafter, the respondents' preferences for meat will be discussed in light of further reducing meat consumption. The chapter will then end with an evaluation of this thesis methodology, followed by some reflections for future research.

5.1 Meat alternatives based on different proteins

Although the proteins were perceived differently, there was no significant difference in WTP for pea- and soy-based mince. This does not, however, generalise to all protein types. As demonstrated by previous research, various proteins can be used for meat alternatives (*e.g.*, oat, mycoprotein), and consumers' liking of these protein types differs (Hoek *et al.* 2013; Elzerman *et al.* 2015; Michel *et al.* 2021; Onwezen *et al.* 2021; Niimi *et al.* 2022). For this thesis, both protein types were some type of legume, and it is possible that conducting a similar study with other or additional protein types generates different findings.

Regarding environmental impact, the respondents perceived soy protein to have a higher impact than pea protein. Karlsson Potter *et al.* (2020) demonstrated that soy-based products available on the Swedish market do not necessarily have a higher impact than their pea-based counterparts. In addition, they found that environmental impact differs within the protein categories, such as impact in terms of land use being dependent on the yield. Considering the differences between and within protein types, providing consumers with additional information about the products beyond protein type is necessary to clarify the impact of various products and enable sustainable food choices. Not least as consumers might have misconceptions about various protein types (*e.g.*, see Siegrist & Hartmann, 2019).

5.2 Geographical origin of PBMA proteins

Supporting the hypotheses, this thesis further found that the geographical origin of the plant-based minces protein influenced the WTP. The findings indicate that the WTP is higher for more proximate origins. This aligns with previous research, which suggests that Swedish consumers prefer domestically produced PBMA

(Collier *et al.* 2021; Rööös *et al.* 2022; Spendrup & Hovmalm 2022). Do note, however, that the DCE only included the origin of the protein - not the location of production or packaging. These too might be relevant to consumers when choosing a product. Nonetheless, as mentioned in the introduction, there is a limited supply of Swedish PBMA. Based on this thesis's result, the preference for domestic PBMA bodes positively for the market potential of Swedish PBMA. There are, however, other factors also influencing this potential, such as which protein types can realistically be produced in Sweden and the associated financial costs.

5.3 Personal characteristics

The hypotheses regarding personal characteristics were all supported by the results of this thesis and highly aligned with the results from previous research on which the hypotheses were based (Clicerri *et al.* 2018; Onwezen *et al.* 2021; Carlsson *et al.* 2022; Rööös *et al.* 2022; Spendrup & Hovmalm 2022; Szenderák *et al.* 2022). Relating to the research question, this demonstrates that various personal characteristics interact with consumers' preferences for PBMA: age, gender, educational level, and food neophobia.

Studying these differences further can provide insight into what makes consumers choose a plant-based diet or what barriers exist to reducing meat consumption. For instance, can the low preference for PBMA among older consumers be explained by familiarity and habits, as they have not until recently in their lives had the opportunity to choose these products? Or, how come those with a higher educational level prefer PBMA more than others? These are not questions focused upon in this thesis, but they could be interesting to investigate further.

Parallel to what Spendrup and Hovmalm (2022) found, respondents who solely ate meat and no plant-based foods had higher food neophobia, which for both this thesis and previous research has been identified as a barrier to plant-based food consumption (Onwezen *et al.* 2021; Spendrup & Hovmalm 2022; Szenderák *et al.* 2022). Understanding this relationship could also help to find ways to motivate consumers to reduce their meat consumption. Are those who have lower food neophobia to start with more likely to eat PBMA, or do those who want to eat more plant-based food (*e.g.*, due to animal welfare concerns) get their food neophobia reduced as they have to try new foods to substitute meat? If the latter would be true, finding ways to motivate consumers to choose PBMA could be influential.

5.4 Reducing meat consumption

While meat consumption has decreased recently, the results found, not surprisingly, that Swedish consumers still prefer meat over plant-based food. The large

difference in WTP suggests that better pricing and discounts could encourage consumers to purchase PBMA. However, the results also indicate that while the price is relevant, additional factors are significant for whether consumers choose meat or PBMA. Similar to previous literature, the results found that both product- and consumer-related factors influence or interact with the preferences and WTP.

To begin with, the results found that meat was considered tastier than plant-based food. Similarly, previous research found that the taste of PBMA compared to meat is a barrier to reducing meat consumption (Hoek *et al.* 2011; Weinrich 2018; He *et al.* 2020; Collier *et al.* 2021; Rööös *et al.* 2022; Spendrup & Hovmalm 2022; Szenderák *et al.* 2022). It is easy to assume that improving the intrinsic quality of PBMA and their similarity to meat could reduce this barrier. However, that would not guarantee that a consumer would buy it. Both this thesis and previous research has found that familiarity, habits, and food neophobia are significant for consumers' choice of protein (Hoek *et al.* 2011; He *et al.* 2020; Collier *et al.* 2021; Onwezen *et al.* 2021; Rööös *et al.* 2022; Spendrup & Hovmalm 2022; Szenderák *et al.* 2022). Even if a PBMA perfectly mimics meat, these might hinder some consumers from trying it. Hence, it is crucial to understand how to overcome these barriers. What makes a consumer try something new? What could reduce their food neophobia? These questions are at least as important as improving intrinsic attributes.

In addition, meat was perceived as easier to prepare than PBMA. The perceived difficulty of preparing PBMA could relate to lacking experience and skills for doing so. That is, if consumers rarely or never eat PBMA, they might be unsure how to prepare the products and hence perceive them as difficult. This is similar to the argument by Weinrich (2018), who suggested that the perceived inconvenience of preparing PBMA might rather be due to lacking skills and familiarity. Thus, once again, finding ways to motivate consumers to choose PBMA is essential.

Besides understanding the barriers to consuming PBMA, it is also important to understand what makes a consumer choose plant-based products over meat. The main motives for the respondents to choose PBMA were concerns for animal welfare and the environment. These were likewise found as important by previous research (Hartmann & Siegrist 2017; Weinrich 2018; He *et al.* 2020; Szenderák *et al.* 2022). Interestingly, the respondents of this DCE preferred meat while still perceiving plant-based options as having a lower environmental impact. This suggests that while highlighting the environmental benefits of substituting meat with plant-based food might motivate some to switch diets, it is not enough for most consumers. Moving on, although not as prominent, health also was mentioned as a reason for choosing plant-based. As legumes were perceived as healthier than PBMA, health could be a bigger motive for choosing plant-based food which is unprocessed.

To summarise this discussion point, to increase the consumption of plant-based food, price and improved product attributes are important but it is at least as

important to consider the personal characteristics and how to encourage more people to try and purchase PBMA.

5.5 Evaluation of the methodology

5.5.1 Estimating the WTP

A limitation of using a stated preference method is that the WTP tends to be highly overestimated (Braidert *et al.* 2006; Carlsson *et al.* 2022; Lizin *et al.* 2022). This is due to hypothetical bias, as the respondents, when making a decision in a hypothetical scenario, do not have any consequences for their behaviour and thus tend to overestimate which price they find acceptable for a product (Braidert *et al.* 2006; Carlsson *et al.* 2022; Lizin *et al.* 2022). In an attempt to mitigate this, the respondents were informed that there were no right or wrong answers and that they should choose the option that they as honestly as possible believe they would have chosen in a real scenario (Carlsson *et al.* 2022; Lizin *et al.* 2022). Nonetheless, the aim of this thesis was not to estimate the absolute values of WTP but to understand how the WTP differs between attributes, for which this issue is less problematic.

5.5.2 Choice of hypothetical scenario

The decisions made when constructing the hypothetical scenario for a DCE can influence the results. For this thesis, a rather high share of respondents opted out from choosing any products (19.1%). When going through the motives for not choosing meat, a common theme was dissatisfaction with the mixed mince alternative or directly a preference for beef or another type of meat. Hence, if including another or an additional meat option, the share of respondents opting out might have been smaller.

According to previous studies, consumers' preferences vary between types of dishes and PBMA (Collier *et al.* 2021; Michel *et al.* 2021). For instance, if assuming that highly-processed meat is more suitable to substitute with plant-based options (Michel *et al.* 2021), doing a DCE with plant-based minces compared to plant-based stakes could result in different results. As such, the results are not generalisable to any type of dish or PBMA.

In a real-life scenario, the amount of information available about the products is greater. Especially for the PBMA as mixed mince in Sweden tend to have simple packaging. According to previous literature, too little information about PBMA could barrier consumption (He *et al.* 2020; Collier *et al.* 2021; Onwezen *et al.* 2021; Szenderák *et al.* 2022). Hence, the effect of including this little information about the PBMA is not realistic and might have influenced the results. On the other hand,

providing too much information or options when doing a study like this could also have negative effects as the respondents might be overloaded with information.

5.5.3 Quantitative methodology

A limitation of a quantitative study, using an online survey with close-ended questions, is that it does not allow for elaboration or studying the topic in depth compared to more qualitative methods (*e.g.*, interviews or focus groups). However, the benefit of the selected approach was that the research questions could be tested on a large sample. Still, in order to understand consumers' behaviour towards PBMA, both types of studies are necessary. In addition, a potential risk for the internal validity is that the respondents were not able to ask for clarification about the questions. To reduce this risk, the choice of questions and formulations were based on previous research and they were further tested in a pilot study.

5.6 Future research

As food choice is complex, and there is a continued diversification of PBMA, there are many options that are relevant for future research. Out of these options, this subchapter will present two specific suggestions.

As discussed above, understanding what motivates people to choose PBMA is highly relevant as this can help to find ways to encourage sustainable food choices. Thus, the first suggestion is to further investigate the consumers who have already increased their intake of plant-based food. By understanding what made these consumers change from a meat-based diet, insight can be gained on how the barriers to reduced meat consumption can better be approached.

Secondly, as regards finding ways to encourage the consumption of plant-based food, it would be interesting to conduct experiments in grocery stores to see how different types of strategies influence the purchase behaviour there. To exemplify, in the DCE conducted for this thesis, the respondents could directly compare products as they were presented next to each other. In real stores, the placement of the products is separate. Thus, as suggested by some respondents in the focus group study by Collier *et al.* (2021), it would be interesting to see whether placing PBMA next to meat would increase the sales of the former.

6. Conclusion

By conducting a DCE, this thesis has analysed Swedish consumers' preferences for PBMA. To answer the research questions, there was no significant difference in WTP for meat alternatives based on different types of protein. However, the geographical origin of the protein was crucial as the WTP was higher for a more proximate origin. In addition, various types of personal characteristics interacted with the preferences, demonstrating that both product- and consumer-related factors are influencing preferences. Nonetheless, meat was still the most preferred option and Swedish consumers are willing to pay significantly more for meat than plant-based food. While a lower price for PBMA could increase their competitiveness, this thesis suggests that there are more factors beyond price that are significant for consumers' decision to choose meat or not. Especially the barriers relating to personal characteristics, such as how to encourage sceptical consumers with high food neophobia to increase their intake of plant-based food.

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Popular science summary

Never before have we eaten as many plant-based products mimicking meat as we do today. As plant-based food is considered sustainable for both the environment and health, this diet shift has sparked curiosity amongst researchers. What makes consumers choose a plant-based product over meat?

Imagine you are purchasing food for cooking Bolognese sauce. In this store, you choose between four products: two plant-based minces, lentils, and a meat mince. Which would you choose, and why? That is (more or less) what some Swedish consumers were asked in a choice experiment.

Before going into the results – why is this relevant to understand? The choices made when purchasing food impact sustainability, whether a product has a larger environmental impact or is worse for our health. If we understand what decisions are made and why, we can also understand how the market and policies need to develop to encourage sustainable food choices, for a sustainable food system.

Back to the study: the most popular choice was (not surprisingly) meat. Not only was it picked most frequently, but the participants were also willing to pay significantly more for it than for any plant-based option. This suggests that a lower price on plant-based food could help make the products more attractive. Yet, price is not the only thing influencing which product we choose. The study found that the geographical origin of meat alternatives is crucial. Overall, Swedish consumers are willing to pay more for a more proximate origin. As such, providing more domestic meat alternatives might also increase the intake of plant-based foods.

Price and other product attributes are not enough to consider for increasing plant-based food consumption, as personal characteristics were found to also interact with preferences. One obstacle is the scepticism that remains towards plant-based meat alternatives and the difficulty in changing habits. It is a downward spiral: if people are unfamiliar with and sceptical towards plant-based food, they will avoid them. But if they do not purchase these products, they will not gain familiarity with them and, thus, remain sceptical. What does it take for more consumers to question their own habits, and maybe chose a meat alternative instead?

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Appendix 1: Design of the DCE

Table A1. Overview of choice sets 1 to 10 of the DCE design (price in SEK)

Choice set	Block	Mixed mince		Pea-based mince		Soy-based mince		Red lentils	
		SE (1); EU (0)	Price	SE (1); EU (0)	Price	Non-EU (1); EU (0)	Price	SE (1); EU (0)	Price
1	3	0	48	1	48	1	24	0	42
2	2	0	48	1	40	1	64	1	10
3	1	1	24	1	56	0	56	0	34
4	1	0	48	1	48	1	24	1	50
5	3	1	24	0	64	0	56	0	34
6	2	1	64	0	24	0	40	0	26
7	3	0	40	1	48	1	64	1	10
8	2	0	32	0	56	1	56	1	18
9	1	0	40	0	24	1	56	1	42
10	2	0	32	0	24	1	64	1	50

Table A2. Overview of choice sets 11 to 24 of the DCE design (price in SEK)

Choice set	Block	Mixed mince		Pea-based mince		Soy-based mince		Red lentils	
		SE (1); EU (0)	Price	SE (1); EU (0)	Price	Non-EU (1); EU (0)	Price	SE (1); EU (0)	Price
11	3	1	56	1	32	0	40	0	18
12	3	1	64	0	24	0	32	0	34
13	3	0	40	0	56	1	24	1	50
14	2	1	56	1	32	0	32	0	26
15	3	1	24	0	64	0	48	0	42
16	3	1	64	1	32	0	48	1	10
17	2	0	32	1	48	1	64	1	18
18	1	1	64	1	40	0	40	1	10
19	2	0	40	1	40	1	32	1	50
20	2	0	32	0	56	1	32	1	42
21	1	1	48	0	32	0	48	0	26
22	1	1	56	1	40	0	40	0	18
23	1	0	56	0	64	1	24	0	26
24	1	1	24	0	64	0	48	0	34

Appendix 2: Survey

Informed consent, validation and screening questions

Hej och välkommen!

I denna undersökning vill vi veta mer om dina attityder till, och val av, olika livsmedel. Studien är en del av ett forskningsprojekt vid Sveriges Lantbruksuniversitet. Resultaten av studien kommer att bidra till den offentliga debatten och ligga till grund för beslutsfattandet för offentliga organisationer och aktörer i livsmedelssektorn.

Vi ber dig aldrig uppge några personuppgifter, alla svar är anonyma. Svaren från enkäten kommer att användas för forskningssyften, och analyseras på gruppnivå, där det inte är möjligt att identifiera dig som respondent.

Enkäten förväntas ta ca 12 minuter att slutföra. Du kan när som helst avsluta undersökningen genom att stänga fönstret.

Om du har frågor eller vill ta del av resultat är du välkommen att höra av dig till anna.edenbrandt@slu.se.

Det finns inga rätt eller fel svar, och vi hoppas att du svarar så uppriktigt som möjligt.

Samtycke

Jag bekräftar härmed att jag har läst och förstått informationen ovan. Jag är 18 år eller äldre, och ger mitt samtycke till att delta i denna forskningsstudie.

- Jag har läst och förstått vad som ingår i deltagandet i studien, och jag samtycker till att delta.
- Jag samtycker inte, eller vill inte delta i denna studie.

Screening

Jag är:

- Kvinna
- Man
- Icke binär
- Vill ej ange

Ange din ålder i siffror:

Food Values

Hur viktiga är följande aspekter när du handlar mat?

	(1) Inte alls viktigt	2	3	4	5	6	(7) Väldigt viktigt
Naturlighet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smak	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pris	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Välj "2" för att visa att du är uppmärksam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Livsmedelssäkerhet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lätt att tillaga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hur viktiga är följande aspekter när du handlar mat?

	(1) Inte alls viktigt	2	3	4	5	6	(7) Väldigt viktigt
Näringsinnehåll	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Traditioner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Matens ursprung	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social rättvisa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Utseende	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Miljöpåverkan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Screenout

Hur mycket ansvarar du för matinköp i ditt hushåll?

- Jag har allt ansvar för matinköp
- Jag delar ansvaret för matinköp
- Det är någon annan som ansvarar för matinköpen

Introduction to the DCE

I följande del av enkäten så ska du få välja bland olika alternativ av livsmedel. Tänk dig att du ska handla mat för att laga fyra portioner kött- eller vegofärsås. Du har fyra alternativ av protein att välja bland.

Det finns inga rätta eller felaktiga svar. Det vi ber dig om är att välja vilket av de olika alternativen som du tror att du hade valt om du gjorde valet i verkligheten (t.ex., i en butik eller när du handlar mat online).

Du har även möjligheten att svara "Jag hade inte köpt något av alternativen".

Block 1 of the DCE

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Vegofärs av ärprotein
Ärtprotein från EU, 500 g
56 :- (jfr-pris 112 :- / kg)



Röda linser

Från EU, avrunnen vikt 230 g
2 för 34 :- (jfr-pris 74 :- / kg)



Vegofärs av sojaprotein

Sojaprotein från land utanför EU, 500 g
56 :- (jfr-pris 112 :- / kg)



Blandfärs (50/50)

Kött från Sverige, 500 g
24 :- (jfr-pris 48 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Röda linser

Från Sverige, avrunnen vikt 230 g
2 för 50 :- (jfr-pris 109 :- / kg)



Vegofärs av ärtprotein

Ärtprotein från Sverige, 500 g
24 :- (jfr-pris 48 :- / kg)



Vegofärs av sojaprotein

Sojaprotein från land utanför EU, 500 g
48 :- (jfr-pris 96 :- / kg)



Blandfärs (50/50)

Kött från EU, 500 g
48 :- (jfr-pris 96 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Vegofärs av ärtprotein
Ärtprotein från Sverige, 500 g
56 :- (jfr-pris 112 :- / kg)



Vegofärs av sojaprotein
Sojaprotein från EU, 500 g
24 :- (jfr-pris 48 :- / kg)



Röda linser
Från Sverige, avrunnen vikt 230 g
2 för 42 :- (jfr-pris 91 :- / kg)



Blandfärs (50/50)
Kött från EU, 500 g
40 :- (jfr-pris 80 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Vegofärs av sojaprotein
Sojaprotein från land utanför EU, 500 g
40 :- (jfr-pris 80 :- / kg)



Vegofärs av ärtprotein
Ärtprotein från EU, 500 g
40 :- (jfr-pris 80 :- / kg)



Röda linser
Från Sverige, avrunnen vikt 230 g
2 för 10 :- (jfr-pris 22 :- / kg)



Blandfärs (50/50)
Kött från Sverige, 500 g
64 :- (jfr-pris 128 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Blandfärs (50/50)
Kött från Sverige, 500 g
48 :- (jfr-pris 96 :- / kg)



Röda linser
Från EU, avrunnen vikt 230 g
2 för 26 :- (jfr-pris 57 :- / kg)



Vegofärs av ärtprotein
Ärtprotein från EU, 500 g
48 :- (jfr-pris 96 :- / kg)



Vegofärs av sojaprotein
Sojaprotein från EU, 500 g
32 :- (jfr-pris 64 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Blandfärs (50/50)
Kött från Sverige, 500 g
56 :- (jfr-pris 112 :- / kg)



Vegofärs av sojaprotein
Sojaprotein från land utanför EU, 500 g
40 :- (jfr-pris 80 :- / kg)

**Röda linser**Från EU, avrunnen vikt 230 g
2 för 18 :- (jfr-pris 39 :- / kg)**Vegofärs av ärtprotein**Ärtprotein från EU, 500 g
40 :- (jfr-pris 80 :- / kg) Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.

**Röda linser**Från EU, avrunnen vikt 230 g
2 för 26 :- (jfr-pris 57 :- / kg)**Vegofärs av sojaprotein**Sojaprotein från EU, 500 g
64 :- (jfr-pris 128 :- / kg)**Vegofärs av ärtprotein**Ärtprotein från Sverige, 500 g
24 :- (jfr-pris 48 :- / kg)**Blandfärs (50/50)**Kött från EU, 500 g
56 :- (jfr-pris 112 :- / kg) Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.

**Blandfärs (50/50)**Kött från Sverige, 500 g
24 :- (jfr-pris 48 :- / kg)



Vegofärs av sojaprotein
Sojaprotein från EU, 500 g
64 :- (jfr-pris 128 :- / kg)



Röda linser
Från EU, avrunnen vikt 230 g
2 för 34 :- (jfr-pris 74 :- / kg)



Vegofärs av ärtprotein
Ärtprotein från EU, 500 g
48 :- (jfr-pris 96 :- / kg)

Jag hade inte köpt något av alternativen.

Block 2 of the DCE

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Vegofärs av ärtprotein
Ärtprotein från Sverige, 500 g
64 :- (jfr-pris 128 :- / kg)



Vegofärs av sojaprotein
Sojaprotein från land utanför EU, 500 g
40 :- (jfr-pris 80 :- / kg)



Blandfärs (50/50)
Kött från EU, 500 g
48 :- (jfr-pris 96 :- / kg)



Röda linser
Från Sverige, avrunnen vikt 230 g
2 för 10 :- (jfr-pris 22 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.

**Röda linser**Från EU, avrunnen vikt 230 g
2 för 26 :- (jfr-pris 57 :- / kg)**Blandfärs (50/50)**Kött från Sverige, 500 g
64 :- (jfr-pris 128 :- / kg)**Vegofärs av ärtprotein**Ärtprotein från EU, 500 g
40 :- (jfr-pris 80 :- / kg)**Vegofärs av sojaprotein**Sojaprotein från EU, 500 g
24 :- (jfr-pris 48 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.

**Vegofärs av ärtprotein**Ärtprotein från Sverige, 500 g
56 :- (jfr-pris 112 :- / kg)**Vegofärs av sojaprotein**Sojaprotein från EU, 500 g
56 :- (jfr-pris 112 :- / kg)**Röda linser**Från Sverige, avrunnen vikt 230 g
2 för 18 :- (jfr-pris 39 :- / kg)



Blandfärs (50/50)
Kött från EU, 500 g
32 :- (jfr-pris 64 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Röda linser
Från Sverige, avrunnen vikt 230 g
2 för 50 :- (jfr-pris 109 :- / kg)



Blandfärs (50/50)
Kött från EU, 500 g
32 :- (jfr-pris 64 :- / kg)



Vegofärs av ärtprotein
Ärtprotein från Sverige, 500 g
64 :- (jfr-pris 128 :- / kg)



Vegofärs av sojaprotein
Sojaprotein från EU, 500 g
24 :- (jfr-pris 48 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Röda linser
Från EU, avrunnen vikt 230 g
2 för 26 :- (jfr-pris 57 :- / kg)



Vegofärs av sojaprotein
Sojaprotein från land utanför EU, 500 g
32 :- (jfr-pris 64 :- / kg)

**Vegofärs av ärtprotein**Ärtprotein från EU, 500 g
32 :- (jfr-pris 64 :- / kg)**Blandfärs (50/50)**Kött från Sverige, 500 g
56 :- (jfr-pris 112 :- / kg) Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.

**Röda linser**Från Sverige, avrunnen vikt 230 g
2 för 18 :- (jfr-pris 39 :- / kg)**Vegofärs av sojaprotein**Sojaprotein från land utanför EU, 500 g
48 :- (jfr-pris 96 :- / kg)**Vegofärs av ärtprotein**Ärtprotein från Sverige, 500 g
64 :- (jfr-pris 128 :- / kg)**Blandfärs (50/50)**Kött från EU, 500 g
32 :- (jfr-pris 64 :- / kg) Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.

**Vegofärs av sojaprotein**Sojaprotein från land utanför EU, 500 g
40 :- (jfr-pris 80 :- / kg)



Röda linser

Från Sverige, avrunnen vikt 230 g
2 för 50 :- (jfr-pris 109 :- / kg)



Vegofärs av ärtprotein

Ärtprotein från Sverige, 500 g
32 :- (jfr-pris 64 :- / kg)



Blandfärs (50/50)

Kött från EU, 500 g
40 :- (jfr-pris 80 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Vegofärs av ärtprotein

Ärtprotein från Sverige, 500 g
32 :- (jfr-pris 64 :- / kg)



Röda linser

Från Sverige, avrunnen vikt 230 g
2 för 42 :- (jfr-pris 91 :- / kg)



Blandfärs (50/50)

Kött från EU, 500 g
32 :- (jfr-pris 64 :- / kg)



Vegofärs av sojaprotein

Sojaprotein från EU, 500 g
56 :- (jfr-pris 112 :- / kg)

Jag hade inte köpt något av alternativen.

Block 3 of the DCE

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.

**Vegofärs av sojaprotein**

Sojaprotein från land utanför EU, 500 g

48 :- (jfr-pris 96 :- / kg)**Röda linser**

Från EU, avrunnen vikt 230 g

2 för 42 :- (jfr-pris 91 :- / kg)**Blandfärs (50/50)**

Kött från EU, 500 g

48 :- (jfr-pris 96 :- / kg)**Vegofärs av ärtprotein**

Ärtprotein från Sverige, 500 g

24 :- (jfr-pris 48 :- / kg) Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.

**Vegofärs av sojaprotein**

Sojaprotein från EU, 500 g

64 :- (jfr-pris 128 :- / kg)**Vegofärs av ärtprotein**

Ärtprotein från EU, 500 g

56 :- (jfr-pris 112 :- / kg)**Röda linser**

Från EU, avrunnen vikt 230 g

2 för 34 :- (jfr-pris 74 :- / kg)



Blandfärs (50/50)
Kött från Sverige, 500 g
24 :- (jfr-pris 48 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Vegofärs av sojaprotein
Sojaprotein från land utanför EU, 500 g
48 :- (jfr-pris 96 :- / kg)



Vegofärs av ärtprotein
Ärtprotein från Sverige, 500 g
64 :- (jfr-pris 128 :- / kg)



Blandfärs (50/50)
Kött från EU, 500 g
40 :- (jfr-pris 80 :- / kg)



Röda linser
Från Sverige, avrunnen vikt 230 g
2 för 10 :- (jfr-pris 22 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Vegofärs av sojaprotein
Sojaprotein från land utanför EU, 500 g
32 :- (jfr-pris 64 :- / kg)



Blandfärs (50/50)
Kött från Sverige, 500 g
56 :- (jfr-pris 112 :- / kg)

**Röda linser**Från EU, avrunnen vikt 230 g
2 för 18 :- (jfr-pris 39 :- / kg)**Vegofärs av ärtprotein**Ärtprotein från EU, 500 g
40 :- (jfr-pris 80 :- / kg) Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.

**Vegofärs av ärtprotein**Ärtprotein från EU, 500 g
32 :- (jfr-pris 64 :- / kg)**Röda linser**Från EU, avrunnen vikt 230 g
2 för 34 :- (jfr-pris 74 :- / kg)**Vegofärs av sojaprotein**Sojaprotein från EU, 500 g
24 :- (jfr-pris 48 :- / kg)**Blandfärs (50/50)**Kött från Sverige, 500 g
64 :- (jfr-pris 128 :- / kg) Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.

**Vegofärs av sojaprotein**Sojaprotein från EU, 500 g
56 :- (jfr-pris 112 :- / kg)



Blandfärs (50/50)
Kött från EU, 500 g
40 :- (jfr-pris 80 :- / kg)



Röda linser
Från Sverige, avrunnen vikt 230 g
2 för 50 :- (jfr-pris 109 :- / kg)



Vegofärs av ärtprotein
Ärtprotein från Sverige, 500 g
24 :- (jfr-pris 48 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.



Röda linser
Från EU, avrunnen vikt 230 g
2 för 42 :- (jfr-pris 91 :- / kg)



Vegofärs av ärtprotein
Ärtprotein från EU, 500 g
48 :- (jfr-pris 96 :- / kg)



Vegofärs av sojaprotein
Sojaprotein från EU, 500 g
64 :- (jfr-pris 128 :- / kg)



Blandfärs (50/50)
Kött från Sverige, 500 g
24 :- (jfr-pris 48 :- / kg)

Jag hade inte köpt något av alternativen.

Vilket alternativ hade du köpt om du gjorde valet i verkligheten? Svara så ärligt som du kan.

**Vegofärs av sojaprotein**

Sojaprotein från land utanför EU, 500 g
32 :- (jfr-pris 64 :- / kg)

**Vegofärs av ärtprotein**

Ärtprotein från EU, 500 g
48 :- (jfr-pris 96 :- / kg)

**Blandfärs (50/50)**

Kött från Sverige, 500 g
64 :- (jfr-pris 128 :- / kg)

**Röda linser**

Från Sverige, avrunnen vikt 230 g
2 för 10 :- (jfr-pris 22 :- / kg)

Jag hade inte köpt något av alternativen.

Follow up question: reasons for never choosing meat

Du valde inte blandfärs i någon av de föregående valsituationerna. Vilka är de viktigaste anledningarna till att du inte valde blandfärsen?

Välj de påståenden (**max 3**) som är viktigast för dig.

- Kött har en hög miljöpåverkan
- Jag äter kött men inte fläskkött
- Jag äter kött men inte nötkött
- Kött är inte bra för hälsan
- Jag tycker inte att kött smakar gott
- Köttalternativen var inte ekologiska
- Det är enklare att tillaga vegetariskt än kött
- Risken att bli sjuk är högre för kött än för vegetariskt
- Köttalternativen var inte prisvärda
- Jag tycker inte att man ska äta djur

Annat

Follow up question: reasons for choosing meat

Du valde inte vegetariska produkter i någon av de föregående valsituationerna. Vilka är de viktigaste anledningarna till detta?

Välj de påståenden (max 3) som är viktigast för dig.

- Kött är bra för hälsan
- Det är enkelt att tillaga kött
- Jag vet vad jag kan förvänta mig när jag köper kött
- De växtbaserade alternativen var inte prisvärda
- Det är viktigt för vår miljö att äta kött
- Kött är gott
- Kött är billigt
- Jag har alltid ätit kött och vill inte ändra min diet
- Kött är naturligt för människor att äta
- Kött är en bra proteinkälla
- Kött är mättande
- De växtbaserade alternativen var inte ekologiska
- Annat

Follow up question: perception of product types

Följande frågor handlar om **din** uppfattning av olika produkter. Det finns återigen inga rätta eller felaktiga svar.

För varje produkt så finns fem påståenden. Ange hur väl du instämmer med dem från "Instämmer inte alls" till "Instämmer helt".

Hur uppfattar du sojabaserade alternativ till kött? (T.ex., vegofärs av sojaprotein)

	Instämmer inte alls	Instämmer i låg grad	Instämmer delvis	Instämmer i hög grad	Instämmer helt	Vet ej
De smakar gott	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De är nyttiga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De har en låg miljöpåverkan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De är lätta att tillaga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De är naturliga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hur uppfattar du ärtbaserade alternativ till kött? (T.ex., vegofärs av ärtprotein)

	Instämmer inte alls	Instämmer i låg grad	Instämmer delvis	Instämmer i hög grad	Instämmer helt	Vet ej
De smakar gott	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De är nyttiga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De har en låg miljöpåverkan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De är lätta att tillaga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De är naturliga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hur uppfattar du köttprodukter? (T.ex., blandfärs)

	Instämmer inte alls	Instämmer i låg grad	Instämmer delvis	Instämmer i hög grad	Instämmer helt	Vet ej
De smakar gott	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De är nyttiga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De har en låg miljöpåverkan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De är lätta att tillaga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De är naturliga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hur uppfattar du baljväxter? (T.ex., röda linser)

	Instämmer inte alls	Instämmer i låg grad	Instämmer delvis	Instämmer i hög grad	Instämmer helt	Vet ej
De smakar gott	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De är nyttiga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De har en låg miljöpåverkan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De är lätta att tillaga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De är naturliga	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The next part of the survey included choice tasks and follow-up questions for another student's thesis. These concerned upcycled food and they have been excluded from this appendix.

Food neophobia scale

Nedan följer några påståenden om mat. Ange hur väl du instämmer med dem från "Instämmer inte alls" till "Instämmer helt".

	Instämmer inte alls	Instämmer i låg grad	Instämmer delvis	Instämmer i hög grad	Instämmer helt
Jag provar alltid ny och annorlunda mat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag är skeptisk mot ny mat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag provar inte mat om jag inte känner till vad det är för något	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag gillar mat från olika länder	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag provar ny mat om jag blir bjuden på middag	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag är rädd för att äta något som jag inte har ätit tidigare	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag är väldigt petig med vilken mat jag äter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag äter nästan vad som helst	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Background questions

Frågorna nedan handlar om din kost. Tänk tillbaka på de senaste 12 månaderna när du svarar på frågorna.

Vilket av följande påståenden beskriver bäst din kost?

- Köttätare: jag undviker vegetarisk mat
- Allätare: jag äter både kött, fisk och vegetarisk mat
- Flexitarian: jag äter främst vegetarisk mat, och kött och fisk ibland
- Pescetarian: jag äter främst vegetarisk mat, och fisk ibland
- Vegetarian: jag äter bara vegetarisk mat, och undviker kött och fisk
- Vegan: jag äter bara vegansk mat, och undviker alla animaliska produkter

Ungefär hur ofta äter du växtbaserade alternativ till kött? T.ex. vegoburgare, vegofärs, och tofu.

*Oförädlade proteinkällor såsom linser, bönor eller kikärter räknas **inte**.*

- Dagligen
- 4-6 gånger i veckan
- 1-3 gånger i veckan
- 1-3 gånger i månaden
- Sällan eller aldrig

Högsta avslutade utbildning

- Ingen avslutad utbildning
- Grundskola
- Gymnasieutbildning
- Eftergymnasial utbildning max. 3 år
- Eftergymnasial utbildning mer än 3 år
- Vill ej ange

Appendix 3: Regression tables with mixed mince as the reference

Table A3 below summarises the findings from doing a regression analysis with mixed mince as the reference.

Table A3. Results from the conditional logistic regression and the WTP estimations, using mixed mince as a reference and including the entire sample (n = 517)

	Coefficient	Standard error	WTP
Product (reference: mixed mince)			
Soy-based mince	-2.046***	0.102	-82.44
Pea-based mince	-2.024***	0.120	-81.53
Red lentils	-2.012***	0.102	-81.04
Not choosing any	-1.817***	0.080	-73.21
Geographical origin (ref.: EU)			
Mixed mince: Sweden	0.727***	0.074	29.28
Soy-based mince: Non-EU	-0.357**	0.127	-14.38
Pea-based mince: Sweden	0.647***	0.132	26.06
Red lentils: Sweden	0.215	0.116	8.68
Price	-0.025***	0.002	

*Notes: The WTP was estimated using the Krinsky method. The coefficients are annotated with * if $p < 0.05$, ** if $p < 0.01$ and *** if $p < 0.001$*

As mentioned in the results chapter, the unwillingness to choosing plant-based options was a driving factor for the large values of the WTP. To demonstrate this effect, two additional regressions were conducted. The first one only included respondents who answered that they eat PBMA more frequently than “Rarely or never” (n = 237) (see Table A4) and the second one only included respondents who chose a plant-based option at least once in the DCE (n = 224) (see Table A5). In both cases, the WTP were lower than for the regression including the entire sample.

Table A4. Results from the conditional logistic regression and the WTP estimations, using mixed mince as a reference and only including those who eat PBMA's more frequently than "Rarely or never" (n = 237)

	Coefficient	Standard error	WTP
Product (reference: mixed mince)			
Soy-based mince	-1.2004***	0.120	-45.21
Pea-based mince	-1.4138***	0.149	-53.25
Red lentils	-1.5843***	0.136	-59.68
Not choosing any	-2.106***	0.115	-79.31
Geographical origin (ref.: EU)			
Mixed mince: Sweden	0.5270***	0.111	19.85
Soy-based mince: Non-EU	-0.2966*	0.140	-11.17
Pea-based mince: Sweden	0.8977***	0.156	33.81
Red lentils: Sweden	0.3329**	0.149	12.54
Price	-0.0265***	0.002	

Notes: The WTP was estimated using the Krinsky method. The coefficients are annotated with * if $p < 0.05$, ** if $p < 0.01$ and *** if $p < 0.001$

Table A5. Results from the conditional logistic regression and the WTP estimations, using mixed mince as a reference and only including respondents who chose plant-based options at least once (n = 224)

	Coefficient	Standard error	WTP
Product (reference: mixed mince)			
Soy-based mince	-0.7493***	0.123	-24.53
Pea-based mince	-0.8558***	0.146	-28.01
Red lentils	-0.9107***	0.130	-29.81
Not choosing any	-2.711***	0.137	-88.72
Geographical origin (ref.: EU)			
Mixed mince: Sweden	0.661***	0.122	21.63
Soy-based mince: Non-EU	-0.286*	0.136	-9.36
Pea-based mince: Sweden	0.850***	0.148	27.83
Red lentils: Sweden	0.374**	0.133	12.24
Price	-0.031***	0.002	

Notes: The WTP was estimated using the Krinsky method. The coefficients are annotated with * if $p < 0.05$, ** if $p < 0.01$ and *** if $p < 0.001$

Appendix 4: Reasons for choosing or not choosing meat

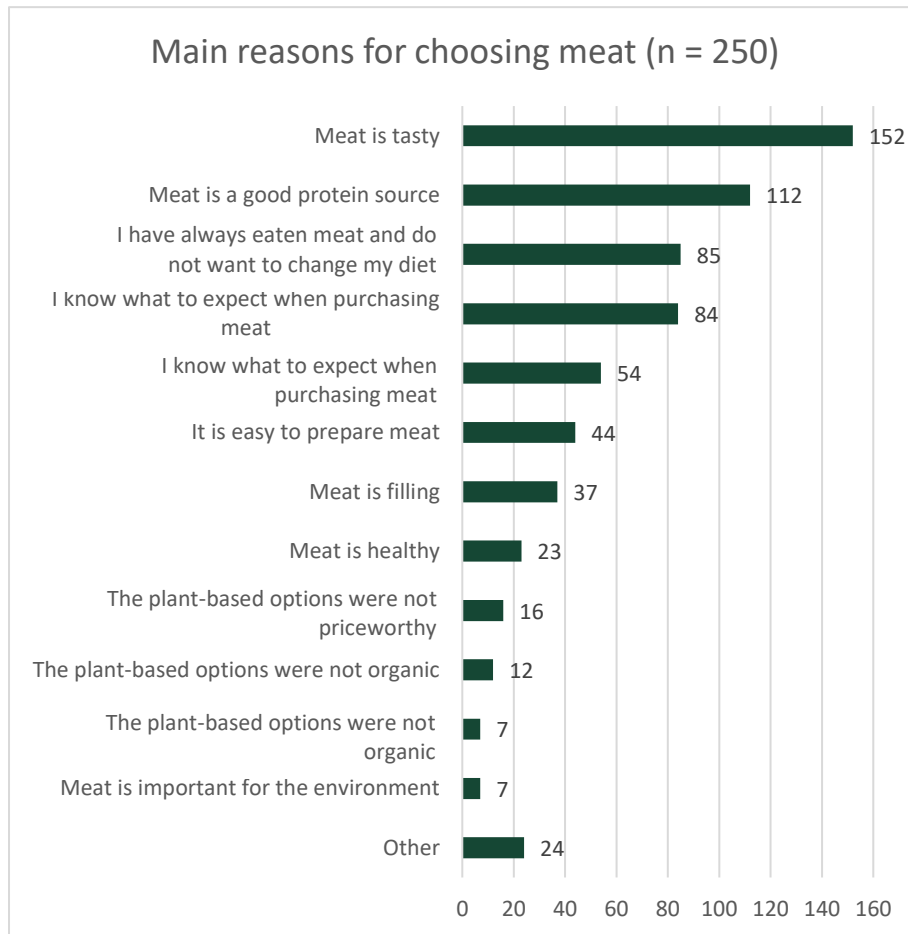


Figure A1. Main reasons for choosing meat, if choosing meat at least once in the DCE and never choosing a plant-based option (n = 250).

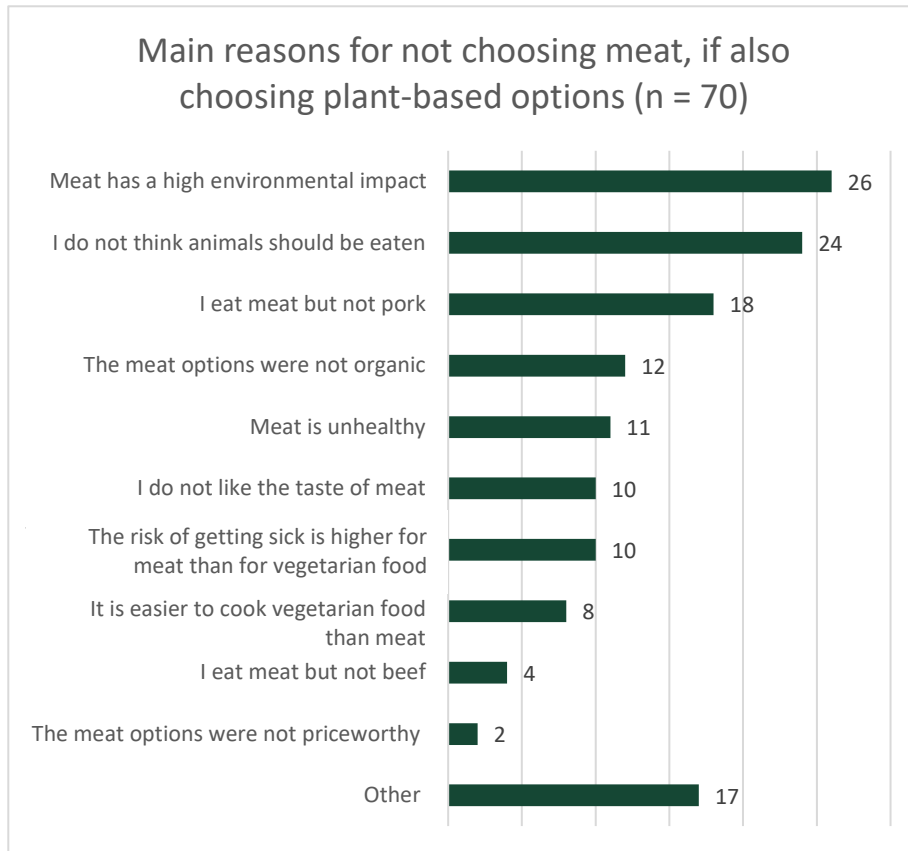


Figure A2. Main reasons for not choosing meat, if never choosing meat but choosing a plant-based option at least once (n = 70).

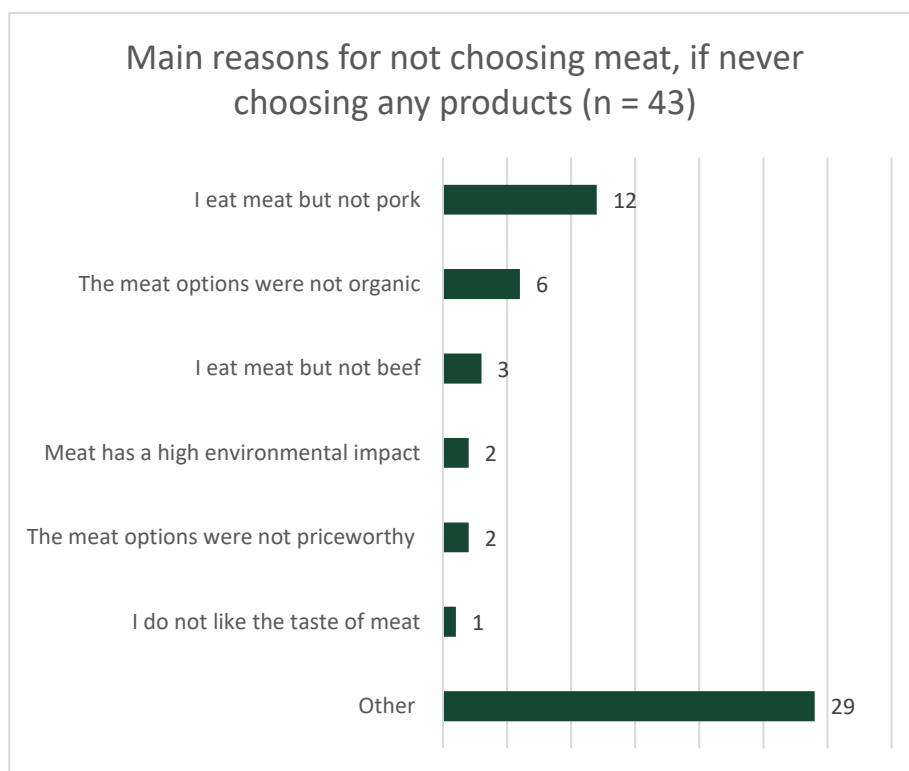


Figure A3. Main reasons for not choosing meat, if never choosing any products (n = 43).

Appendix 5: Perceptions

Table A6. Mean scores and standard deviations of how respondents perceived different product types, including the number of respondents who answered each separate question

	Mean	SD	n
Tastiness			
Meat	4.06	1.06	502
Legumes	3.16	1.24	413
PBMA (peas)	2.52	1.19	305
PBMA (soy)	2.56	1.18	371
Healthiness			
Meat	3.43	1.00	493
Legumes	4.00	0.88	442
PBMA (peas)	3.50	1.02	371
PBMA (soy)	3.26	1.04	377
Low environmental impact			
Meat	2.44	1.02	455
Legumes	3.77	0.97	334
PBMA (peas)	3.50	1.07	327
PBMA (soy)	3.15	1.09	344
Ease to prepare			
Meat	4.18	0.82	502
Legumes	3.49	1.05	374
PBMA (peas)	3.36	1.08	286
PBMA (soy)	3.35	1.06	330
Naturalness			
Meat	3.84	1.01	495
Legumes	4.15	0.87	439
PBMA (peas)	3.48	1.13	375
PBMA (soy)	3.14	1.14	391

Table A7. Results from the t-tests, assuming equal variances, comparing if product types are perceived differently in terms of tastiness, healthiness and environmental impact

	t	df	P
Tastiness			
Meat and soy	19.72	871	< 0.0001
Meat and peas	19.10	805	< 0.0001
Meat and legumes	11.87	913	< 0.0001
Peas and soy	-0.43	674	0.6672
Peas and legumes	-6.94	716	< 0.0001
Soy and legumes	-6.92	782	< 0.0001
Healthiness			
Meat and soy	2.46	868	0.0142
Meat and peas	-1.10	862	0.2725
Meat and legumes	-9.16	933	< 0.0001
Peas and soy	3.28	746	0.0011
Peas and legumes	-7.36	811	< 0.0001
Soy and legumes	-11.00	817	< 0.0001
Low environmental impact			
Meat and soy	-9.43	797	< 0.0001
Meat and peas	-14.08	780	< 0.0001
Meat and legumes	-18.44	787	< 0.0001
Peas and soy	4.27	669	< 0.0001
Peas and legumes	-3.30	659	0.0010
Soy and legumes	-7.81	676	< 0.0001

Table A8. Results from the t-tests, assuming equal variances, comparing if product types are perceived differently in terms of ease to prepare and naturalness

	t	df	P
Ease to prepare			
Meat and soy	12.77	830	< 0.0001
Meat and peas	12.15	7863	< 0.0001
Meat and legumes	10.95	874	< 0.0001
Peas and soy	0.01	614	0.9892
Peas and legumes	-1.71	658	0.0885
Soy and legumes	-1.81	702	0.0709
Naturalness			
Meat and soy	9.71	884	< 0.0001
Meat and peas	4.89	868	< 0.0001
Meat and legumes	-4.99	932	< 0.0001
Peas and soy	4.24	764	< 0.0001
Peas and legumes	-9.52	812	< 0.0001
Soy and legumes	-14.50	828	< 0.0001

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