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Encouraging sustainable behaviour in the wine market

The effect of carbon labeling on the choice of wine contained in climate-smart packaging

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Executive summary

The purpose of this study is to investigate if carbon labels can be used to encourage consumers to act more sustainably in the wine market. As most of the CO^2-emissions of a bottle of wine are linked to the packaging, encouraging consumers to choose products contained in climate-smart packaging can have a big impact on the total CO^2 emissions related to the wine market.

The study was conducted through an experiment where the behaviour of one control group and two treatment groups were compared. The sample was asked to choose from a selection of 12 wines in a web shop, where half of the wines were contained in climate-smart packaging. The two treatment groups were exposed to a web shop that either used binary carbon labeling or graded carbon labeling. Our aim was to map the effect carbon labeling has on consumer behaviour, being whether the consumer would choose wine contained in climate-smart packaging or not. We also tested which carbon labeling had the greater effect, by comparing binary carbon labeling to graded carbon labeling.

The results of the study show that carbon labeling overall has a positive effect on the respondents' intention of purchasing products contained in climate-smart packaging. We found that compared to the control group, graded carbon labeling had a statistically significant positive effect on the respondents' intention of purchasing products contained in climate-smart packaging. This was not the case for binary carbon labeling. Additionally, we did not find a statistically significant difference between the effect of the graded and the binary carbon labeling. When testing for the moderating effects of habit, environmental concern, and socio-demographics, we only found age to have a significant moderating effect when looking at the overall effect of the carbon labels. Lastly, when looking into the carbon labels' moderating effect on subjective norms' effect on intention of choosing climate-smart packaging, we did not find any statistically significant relationships between the variables.

The study has implications for actors in the wine market that wish to communicate the carbon footprint of their products to their consumers. The type of carbon labeling that should be employed depends on which kind of carbon labeling the actor currently has in place. Graded carbon labeling will have the most effect for an actor that does not already have carbon labeling in place. If an actor has binary carbon labeling in place, we do not have the basis to claim that they should make the switch to graded carbon labeling.

Preface

This thesis is a part of the finalisation of our master's degree at the Norwegian School of Economics. The thesis is a collaboration between students from the Energy, Natural Resources, and the Environment profile and the Business Analysis and Performance Management profile.

The subject of the study is rooted in our interest for sustainable business and has proven itself to be an interesting and rewarding study. The opportunity to work on a project that is relevant for a big Norwegian company such as Vinmonopolet has been a great opportunity that we have valued deeply.

We would like to thank our dedicated supervisor, Lars Jacob Tynes Pedersen for all the valuable feedback and conversations over the course of the project, which have given the study direction. We would also like to thank Rolf Erling Eriksen at Vinmonopolet for facilitating the process for us by giving us access to both Figma and datasets, as well as helpful information. Finally, we would like to thank William Sherman and Giulia Spinelli for being important conversation partners during the process. A special thanks to William who helped us tremendously in the designing process of the experiment in Figma.

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1. Introduction

1.1. Background

If everyone on this planet ought to have the same consumption pattern as a Norwegian, we would be in need of 3.4 planets (FN-Sambandet, 2021). This is not in line with the definition of sustainable development, which was defined by the Brundtland Commission in 1994: Sustainable development ensures that the needs of the present are met without compromising the needs of future generations (UNESCO, 2021). To reverse this trend, governments, businesses, and consumers have to acknowledge their role in the unsustainable manner in which many are living today. To guide the reversion, the Sustainable Development Goals were developed. These goals address global challenges like poverty, inequality, climate change, environmental degradation, peace and justice, and are set to be reached by 2030 (United Nations, 2021).

Today, many businesses have a strong focus on sustainability and use this as a marketing tool, also in the beverage industry. For example, Coca-Cola currently has a strong focus on their "Recycle me again" campaign in Norway and advertise that all of their bottles are now made of 100 per cent recycled plastic. This has led Coca-Cola to reduce their bottle production's greenhouse gas emissions by 28 per cent compared to 2020 (Coca-Cola, 2021). Carlsberg has launched their "Together towards ZERO" campaign, focusing on zero carbon emissions at their breweries. Furthermore, Carlsberg has reduced their plastic waste by holding their six-packs together with glue, instead of plastic wrapping (Carlsberg Group, 2021). Also in the wine market, suppliers have begun to reinvent their products to become more sustainable. An example is GarçonWines, who has designed a flat plastic bottle that enables manufacturers to stack up to 91 per cent more wine on a pallet in transport and warehousing (Garçon Wines, 2021). Thus, innovation and willingness to implement necessary changes is present on the business side. But for the changes to have an effect, the consumers must be willing to choose the packaging alternatives that are less harmful for the environment.

When drinking beer and soda, consumers are accustomed with packaging types with low carbon footprint e.g., PET bottles and aluminium cans (Vinmonopolet, 2021). In the wine industry, there is a strong tradition for choosing the glass bottle, and to try an alternative packaging such as PET, is distant for many (Ferrara, Zigarelli, & De Feo, 2020). Furthermore, consumers are not aware of the environmental benefits of choosing PET (Boesen, Bey, &

Niero, 2019). The consumers' evaluation of the sustainability of packaging is based on the material type and end of life, while the emissions related to production and transport is seldom part of the evaluation (Boesen et al., 2019). As a result, with a large focus on ocean plastic in the media, and the related concern (Schwarz, Lighthart, Boukris, & Van Harmelen, 2019), the demand for glass packaging has increased significantly in recent years, as many consider glass packaging more sustainable than PET (Ferrara & De Feo, 2020). The reality is that the production of glass bottles is more energy intensive than PET bottles, and as the weight of a glass bottle is substantially higher than a PET bottle, emissions related to transport is also higher – seen as a whole, emissions related to a heavy glass bottle is about 13 times higher than of a PET bottle (Opinion, 2020). See appendix A for reference.

Vinmonopolet is the retail monopolist of the Norwegian wine, hard liquor, and strong beer market, and the subject of this study. The business is owned by the Norwegian government, and their social goal is to ensure responsible distribution of alcohol to Norwegian consumers (Vinmonopolet, n.d.(a)). Being the single retail supplier of wine in Norway, Vinmonopolet sold 115.5 million litres in 2020, and 82.6 million litres in 2019, making them one of the largest distributors of wine in Europe (Vinmonopolet, 2020, 2021). With sales of such numbers comes a responsibility towards the environment, and Vinmonopolet's sustainability strategy is aligned with the Sustainable Development Goals (SDGs). Two of the SDGs that Vinmonopolet has a particular focus on are number 12 "Ensure responsible consumption and production" and number 13 "Take urgent action to combat climate change and its impacts". As a result, one of Vinmonopolet's goals is to reduce their greenhouse gas (GHG) emissions by 40 per cent within 2030. An important part of reaching this goal is to encourage consumers to choose more sustainable alternatives.

According to Vinmonopolet, on average, 40 per cent of the GHG emissions throughout a wine product's life cycle is due to its heavy glass packaging (Vinmonopolet, n.d.(b)). Thus, by motivating their consumers to choose wine contained in climate-smart packaging (from now on referred to as CSP), such as light glass bottles and PET bottles, Vinmonopolet can substantially reduce their consumers', producers', and their own carbon footprint related to wine.

From a study conducted by the market research company Opinion on request by Vinmonopolet, we know that 52 per cent of respondents stated they would choose the CSP

alternative, if the product they were looking for was available in both CSP and non-CSP (Opinion, 2020). This shows a willingness from the consumers to adapt their behaviour in order to reduce the environmental footprint of their purchasing decisions. But as the same study showed: the majority of Vinmonopolet's consumers do not know what CSP is, nor that it exists. They are not aware of the carbon footprint of the heavy glass bottles, and the general perception is that plastic is less sustainable than glass, even though this is not the case (Opinion, 2020).

These findings reveal a need for Vinmonopolet to communicate what products are relatively better for the environment in a more visible and intuitive way, compared to what they are doing today through their binary labels in-store. We believe clear and visible carbon labeling of the packaging will be a good starting point to help consumers to identify what products are contained in CSP and not. For this research study, we will look into the effect of implementing binary and graded carbon labeling in Vinmonopolet's web shop, as they currently do not have any kind of labeling present on this platform. The aim of the study is to uncover whether carbon labeling can shift consumer behaviour towards sustainable consumer behaviour in the wine market.

1.2 The Research Questions and the Reasoning Behind Them

One of the greater challenges for stakeholders trying to promote sustainable consumption is the "value-action-gap" (Johnstone & Tan, 2015; Prothero et al., 2011). Even though consumers report favourable attitudes towards pro-environmental behaviours, they rarely exert sustainable consumer behaviour (Gatersleben, Steg, & Vlek, 2002; Kollmuss & Agyeman, 2002; Young, Hwang, McDonald, & Oates, 2010). As previously mentioned, this has also proven itself to be the case for Vinmonopolet's consumers.

When making decisions, one can either take an intuitive, affective route or a more deliberative, cognitive route, popularly called *system 1*- and *system 2 thinking* (Kahneman, 2003, 2011). When buying a bottle of wine, which is a fast-moving consumer good, consumers exert a low-involvement behaviour when making a purchasing decision (Thøgersen, Jørgensen & Sandager, 2012). The use of labels with information about the product's environmental footprint has been used to overcome the intuitive, affective route to purchase, and to create relevant cognition. For the label to be effective, it must be intuitively understandable and show

information about the product's performance relative to the other products in the same category (Grankvist, Dahlstrand, & Biel, 2004; Van Dam, & De Jonge, 2015). This has also been found the be true for carbon labeling specifically (Thøgersen & Nielsen, 2016), which we will be using as part of this research study.

As of today, there is no visible carbon labeling in Vinmonopolet's web shop. Furthermore, according to the Consumer Relations Manager at Vinmonopolet, their consumers rarely use any of the filtering options in the web shop, which could enable the consumer to only be shown products with CSP. By implementing a carbon label to identify the products contained in CSP, Vinmonopolet would make it easy for the consumers to find, and possibly buy these products.

Based on this, we want to investigate what effect carbon labels have on the consumers' intention of purchasing wine contained in CSP. We shall further analyse whether a binary and a graded carbon label leads to a different effect or not, and if so, which label will have the largest effect. As such, we aim to answer the research question:

Does carbon labeling have a positive effect on consumers' intention of purchase of wine contained in CSP, and, if so, is a binary or graded carbon label more effective?

To answer the research question, we conducted an experiment where the behaviour of one control group and two treatment groups was compared. In the experiment, the three groups had to choose from a selection of 12 red wines in a web shop, where half of the wines were contained in climate-smart packaging. While there was no carbon labeling present in the web shop the control group had access to, the two treatments groups were exposed to a web shop that used either binary or graded carbon labeling. The aim of the experiment was to map the effect of the carbon labeling on consumer's intention of purchase of wine contained in CSP. By having two treatment groups, we could also isolate the effects of both binary and graded carbon labeling. To get more insight, the respondents also answered a questionnaire after choosing a product.

1.3 The Structure of the Thesis

The study consists of seven chapters, excluding the executive summary and preface. In chapter 1 we introduced the subject of the thesis and presented our overarching research question. The literature review will be presented in chapter 2, and will work as the foundation of our hypotheses, which can be found in chapter 3 together with our complete research model. The methodology is presented in chapter 4. Here you will find information about our experiment - a simulated shopping experience, and its associated questionnaire which was used to collect our primary data. Our findings are then analysed in chapter 5, before we discuss our results in chapter 6. As part of our discussion chapter, we assess the theoretical and practical implications of the study and its limitations, before presenting suggestions for further research. Lastly, we will present our conclusion in chapter 7.

2. Literature Review

In this chapter we review the theories which make up our theoretical model. Firstly, we define consumer behaviour as it is part of the study's two main theories: Theory of reasoned action, and the SHIFT-framework. Secondly, the theory of reasoned action, which seeks to explain consumer behaviour, is presented and further visualized. Thirdly, as an addition to the theory of reasoned action, we include the SHIFT-framework, as it explains how one can shift the consumer towards more sustainable consumer behaviour. Fourthly, we elaborate on what carbon labels are, as it is the tool we have chosen from the SHIFT-framework to promote sustainable consumer behaviour. Lastly, we present the mentioned theories through a visualization of our theoretical model.

2.1 Consumer Behaviour

Solomon, Bamossy, Askegaard, & Hogg (2006, p.6) describe consumer behaviour as "the study of the processes involved when individuals or groups select, purchase, use or dispose of products, services, ideas or experiences to satisfy needs and desires", where the mentioned processes include the decision-making-process prior and post the action of purchase (Blackwell, Miniard, & Engels, 2001; Khan, 2007; Solomon, Russel-Bennett, & Previte, 2012).

When analysing consumer behaviour, one seeks to understand what elements are affecting the consumer's purchasing decision, and how those decisions can be influenced or changed. In this study, the Theory of Reasoned Action will be used to examine consumer behaviour and in turn contribute to prove/disprove the hypotheses presented in chapter 3 of this study.

2.2 Theory of Reasoned Action

The *Theory of Reasoned Action* (TRA) seeks to explain how *attitudes* and *subjective norms* affect *behavioural intention*, which in turn can predict, explain, or influence the *actual behaviour* (Hoyer, MacInnis & Pieters, 2018). As follows, TRA suggests that by influencing the consumer's attitudes and subjective norms by adding new beliefs and targeting normative beliefs, one can alter the consumer's behavioural intention, and in turn the consumer's actual behaviour.

An attitude towards a certain behaviour is a function of the consumer's perception of the consequences of engaging in that behaviour and the consumer's evaluation of the implication of those consequences (Hoyer et al., 2018). If the consequence of the behaviour is to be regarded as mainly positive by the consumer, then the consumer will obtain a positive attitude towards the behaviour in question. This positive attitude will increase the behavioural intention of performing the behaviour, and thus increase the probability of the behaviour being executed (Thilina, 2021). One strategy for promoting sustainable consumer behaviour would then be to change the consumer's perception of the consequences from a specific behaviour by enhancing the belief that the behaviour leads to positive consequences for the environment, or by reducing the belief that the behaviour will have negative consequences. One could also focus on changing the consumer's evaluation of the implications of the consequences by creating an attitude campaign toward sustainable consumption, so that the consumer will value green attributes of products to a larger degree than brown attributes.

Subjective norm is a function of the consumer's *normative beliefs* and the consumers *need to comply with others*. Normative beliefs are the consumer's perception of what others think of the behaviour in question (Hoyer et.al., 2018). Whether these normative beliefs will affect the consumer's intended behaviour depends on the consumer's desire to behave in line with others' expectations, the need to comply with others. The "others" here refers to those who are near to us, such as friends, family, and colleagues.

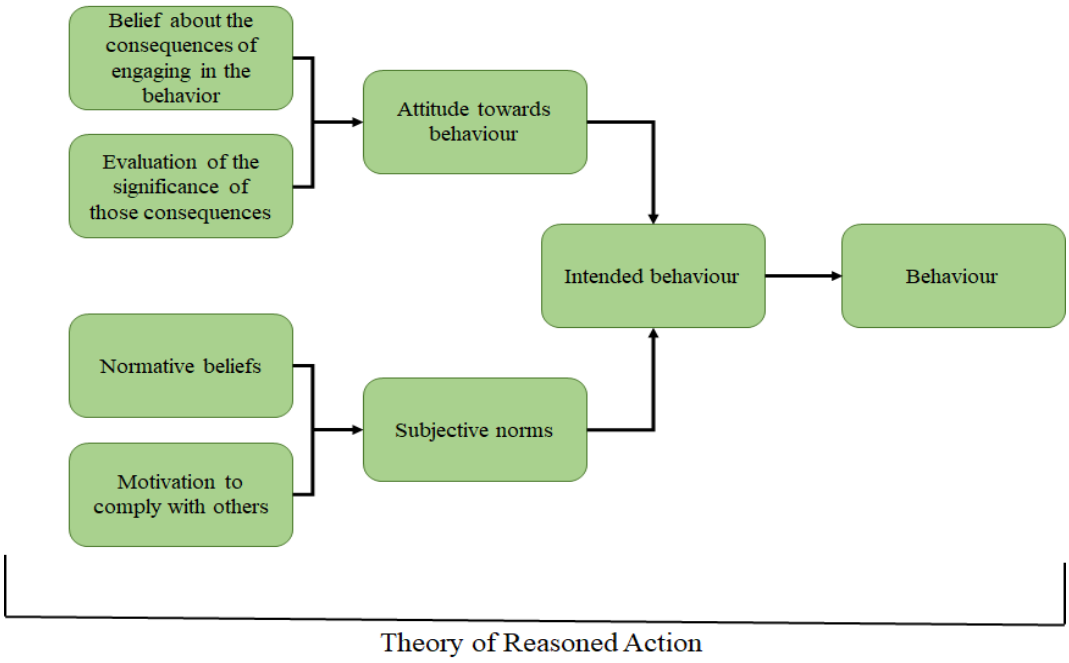


Figure 1: Theory of Reasoned Action

2.3 The SHIFT-Framework

The SHIFT Framework can be used as a tool to influence behaviour and encourage sustainable consumer behaviour change. Sustainable consumer behaviour is here defined as the actions that lead to decreases in adverse environmental impacts and decreases in the utilization of natural resources across the lifecycle of the product, behaviour, or service (White, Habib, & Hardisty, 2019). Five psychological factors make up the acronym SHIFT and are the basis of the framework: *Social influence, Habit formation, Individual self, Feelings and cognition*, and *Tangibility*. In this study, the focus will be on habit formation, individual self, and feelings and cognition, which we account for in the following subchapters.

2.3.1 Habit formation

Because many habits are not sustainable, it is important to create new habits in order to achieve sustainable behaviour change (Verplanken, 2011). The SHIFT-framework presents two ways to affect habits: By i) interventions that break repetition, and by ii) actions that encourage repetition (White et al., 2019). This study will focus on the latter by creating and strengthening positive, sustainable habits through *making sustainable actions easy*, and by utilizing *prompts*.

Making sustainable actions easy. Often, sustainable behaviour is thought of as demanding, time-consuming, and difficult to carry out, which works as a hindrance to sustainable behaviour (McKenzie-Mohr, 2000). To counteract this hindrance, one should make the sustainable action easier to do (Van Houten, Nau, & Merrigan, 1981). This is especially relevant since consumers often make purchasing decisions very fast, and low on cognitive resources, making the decision-making process easier. This will allow the consumer to form sustainable habits more naturally (Steg & Vlek, 2009).

Prompts are messages used to remind the consumer of what the desired sustainable behaviour is. They are most effective when they are large, clear, easy to follow, and placed close to where the behaviour will take place (Austin, Hatfield, Grindle, & Bailey, 1993; Werner, Rhodes, & Partain, 1998; Lehman & Geller, 2004). In this study, the applied prompt is carbon labeling.

2.3.2 Individual self

The third dimension is *the individual self* and is represented by the five elements: Positivity of the self-concept, self-interest, self-consistency, self-efficacy, and individual differences. While this study will look into the effect of *individual differences*, all of the five elements can have a powerful influence on consumption behaviours (White et al., 2019).

An essential individual difference is personal norms, which is defined as “beliefs regarding a sense of personal obligation that are linked to one’s self-standards" (White et al., 2019, p. 28, collected from (Bamberg, Hunecke, & Blöbaum, 2007; Jansson, Marell, & Nordlund, 2010; Schwartz, 1977; Stern & Dietz, 1994)). Environmental concern and personal norms in regard to sustainability have been recorded to predict sustainable behaviour (Alwitt & Pitts, 1996; Paul, Modi, & Patel, 2016; Schwepker Jr., Charles, & Cornwell, 1991), such as sustainable food choices (Wiidegren, 1998), and recycling (Guagnano, Stern, & Dietz, 1995).

Furthermore, there has been demonstrated a correlation between certain demographics and sustainable consumption behaviours (Diamantopoulos, Schlegelmilch, Sinkovics, & Bohlen, 2003; Gifford & Nilsson, 2014). In general, women display more sustainable consumer behaviours than men (Dietz, Kalof, & Stern, 2002; Eagly, 2009; Luchs & Mooradian, 2012), and highly educated, younger consumers are prone to participate in pro-environmental behaviours (Gilg, Barr, & Ford, 2005; Granzin & Olsen, 1991; Roberts, 1993; Semenza et al., 2008). Studies have also found that consumers living in urban areas are more prone to displaying sustainable behaviour (Mann, Ferjani & Reissig, 2012; Sellers Rubio, 2016).

2.3.3 Feelings and Cognition

According to Shiv & Fedorikhin (1999) and Kahneman (2003, 2011), when making a decision, consumers are either driven by affect or by cognition. This study will look into how information, learning and knowledge, together with positive and negative emotions, affect the consumers feelings and cognition.

Information, learning and knowledge. To convince consumers to engage in pro-environmental behaviour it is necessary to convey information regarding both desired and undesired behaviours and their consequences (McKenzie-Mohr, 2000). One way of enabling this is through *eco-labels*, which provide information about the sustainable attributes of a product

(Parguel, Benoît-Moreau, & Larceneux, 2011). To best convey this information, it is important that the labels are "attention-grabbing, easily understandable, and consistent across categories" (White et al., 2019, p.30, collected from (Borin, Cerf, & Krishnan, 2011; Thøgersen, 2000)).

Positive and negative emotions. According to Corral-Verdugo et al. (2009), consumers will be more willing to engage in pro-environmental behaviour when they obtain some positive effect from the behaviour. Other research suggests that eco-labels are more effective when compared to negative labels, as consumers will want to avoid the products with the negative rating (Borin et al., 2011).

2.4 Carbon Labels

A carbon label is a type of environmental label which gives the consumer the opportunity to make an informed product choice in relation to the relative carbon footprint accumulated through production, consumption, and waste phases of the product, also referred to as life-cycle assessment. By awarding products a positive carbon label, one encourages the consumer to choose products which are relatively more resource and energy efficient (Thøgersen, Haugaard & Olesen, 2010; Ölander & Thøgersen, 2014). Furthermore, carbon labels also encourage producers to improve the environmental standards of their products and services (Galarraga Gallastegui, 2002).

Carbon labeling comes in two forms: Private voluntary standards with private companies owning the scheme, and public standards with a government agency as the scheme owner (Schaefer, & Blanke, 2014). In this study, we will use a fictional, private voluntary standard. There are two ways to visualize the label, by the use of binary labels or graded labels.

2.4.1 Binary Carbon Labeling

With a binary carbon label, a product is either awarded the label or not. If awarded the label, the carbon emissions related to the product is equal or less than a certain threshold (Uchida, 2007), giving the label a positive association. Consumers have been found to be more susceptible to positive attribute messages compared to negative attribute messages (Beach,

Puto, Heckler, Naylor, & Marble, 1996; Buda & Zhang, 2000; Levin & Gaeth, 1988). This indicates that consumers would react well to a positive binary carbon labeling. On the other hand, a binary carbon label makes it hard for the consumer to evaluate how non-labeled products perform on the relevant criteria, and whether some of the products are performing especially badly (Grankvist et al., 2004; Kimura et al., 2010).

2.4.2 Graded Carbon Labeling

When using a graded carbon labeling strategy, products will be placed in a tier in accordance with the product's relative performance on the criteria set for the carbon label. A product can either perform relatively well, average, or poor on the criteria. It is also possible to use larger tiers, such as five- or seven-tiers. But for *Fast Moving Consumer Goods*, a simpler labeling system is deemed beneficial due to the fast, low-involvement behaviour of the consumers when making such purchasing decisions (Thøgersen et al., 2012). Wine can be considered a fast-moving consumer good, and a graded carbon labeling is therefore used in this study.

Using colours to signal whether a product performs relatively well (green), average (yellow), or poor (red) compared to its product category, significantly increases the effectiveness of a carbon label (Thøgersen et al., 2016). This is part because the coloured labels make it intuitively easier for the consumer to understand the label (Thøgersen et al., 2016; Bargh, 1992), but studies also suggest it is due to the effect of some products receiving a poor rating, leading consumers to avoid the products marked red (Borin, et al., 2011; Van Dam & De Jonge, 2015).

The theories of *negativity bias* (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Mittal, Ross, & Baldasare, 1998; Rozin and Royzman 2001) and of *loss aversion* within prospect theory (Kahneman and Tversky, 1979) can explain the avoidance-effect due to a red carbon label rating. According to the mentioned theories, being able to avoid a loss weighs more than being able to acquire the same objective value through a gain. This implies that a red, negative label will affect the consumers' purchasing decision to a larger degree than what a green, positive label would.

2.4.3 Labeling strategies in the Wine Market

Delmas and Grant (2014) found that wines which were eco-labeled experienced an eco-penalty, meaning the wines were thought less of when carrying the label compared to those without a label. This corresponds to Luchs, Naylor, Irwin, & Raghunathan's (2010) research, which found consumers to believe an eco-label entailed a quality trade-off for the products which were awarded the label. Delmas and Lessem (2017) further found that when consumers have the choice between binary eco-labeled and unlabeled wines, they will prefer the labeled wine when the price range and general quality is perceived as relatively low. However, when the wine was from a high-quality region and set at a higher price point, the consumers would prefer the wine without the eco-label.

As such, we know that binary eco labels related to the content of the wine, give incentives to choose wine products which are relatively better than others on environmental attributes, when the price point and general quality is perceived as relatively low. To our knowledge, there is no research conducted on the effect of carbon labels in relation to the wine packaging, nor that there are any studies comparing the effect of a binary label against a graded label within the wine industry. In this study, we therefore want to test the effect of carbon labeling related to the wine packaging, in the form of binary and graded carbon labeling.

2.5 Theoretical Model and a Summary of the Literature Review

In this chapter, three different theories have been presented: Theory of Reasoned Action, the SHIFT-framework, and carbon labeling. Based on these theories, a theoretical model has been developed, as shown in figure 2. From TRA, all components are included. The theoretical model says that attitude towards a certain behaviour is a function of the person's belief and evaluation of the consequences of that behaviour. Furthermore, attitude affects intention, which in turn affects actual behaviour. To the left of TRA, information in the form of carbon labeling has been implemented. This implementation and its expected effect on consumer behaviour are based on the SHIFT-framework and theory about carbon labeling. Furthermore, intention is also affected by subjective norms, which in turn is a function of normative beliefs and the consumers motivation to comply with others. This aspect of the theoretical model will not be manipulated in this study but will serve as a base for some of the hypotheses presented

in chapter 3. The theoretical model shown in figure 2 will serve as the basis for the research model.

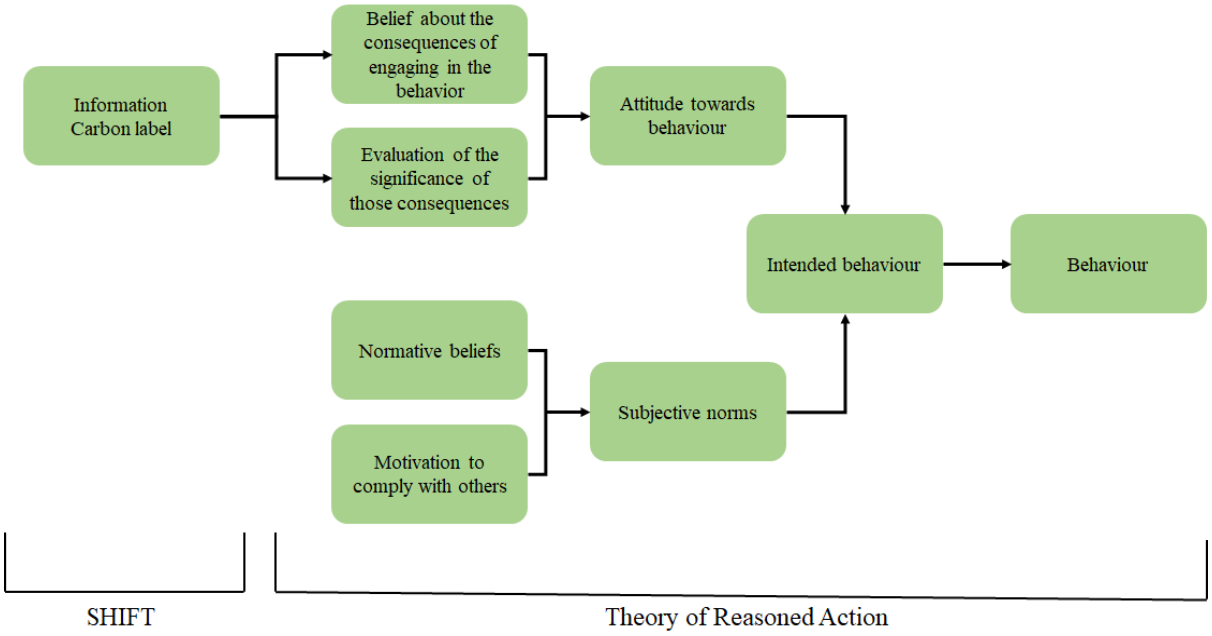


Figure 2: The theoretical model

3. Hypotheses and Research Model

In this chapter, we present the hypotheses we have developed based on the literature review in chapter 2. We start by identifying the main boundaries to why products contained in CSP are not chosen, before we present relevant hypotheses to the remedies suggested to overcome the mentioned boundaries. Then, we will present hypotheses in relation to habit, environmental concern and socio-demographics. Lastly, we will elaborate a hypothesis concerning subjective norms.

3.1 Hypotheses

In conjunction with the SHIFT framework, the primary and secondary boundary to why the Norwegian consumers do not buy wine contained in climate-smart packaging was identified.

Primary boundary: *Cognition of what products have climate-smart packaging.*
Secondary boundary: *Habit of choosing similar wine products each time*.

The primary boundary serves as the basis for hypothesis 1-4, while the secondary boundary serves as the basis for hypothesis 5 and is further presented below.

The primary boundary was identified through analysing the survey named "*Drivers and barriers towards climate-smart packaging*", which was conducted by the market research company Opinion. The survey was requested by Vinmonopolet and investigates the drivers and barriers from the consumers' perspective. When asked if the respondent had ever purchased an alcoholic product contained in CSP from Vinmonopolet, 44 per cent answered that they *do not remember*. Similarly, when asked if their favourite product exists in CSP, 44 per cent answered that they *do not know*. Furthermore, 84 per cent of respondents said they *seldom remember/ realize that Vinmonopolet has products available in CSP*.

By giving the consumers information about the carbon-footprint through carbon labeling, the consumer will become aware of the environmental benefit of choosing light glass bottles and plastic bottles with a take back system[1] (PET), instead of heavy glass bottles. This will create

[1] The Norwegian "pantesystem" or take back system is a system where Norwegian consumers pay a deposit of NOK 2-3 per bottle, that is returned to them when recycling a bottle. Approximatly 92 per cent of all bottles are recycled in Norway each year (Infinitum, 2021).

a positive attitude towards CSP, and in turn have a positive effect towards the consumer's intended behaviour - the *intention of purchasing* (from now on called *purchase/purchasing)* wine contained in CSP (Onwezen, Antonides, & Bartels, 2013; Rezvani, Jansson & Bengtsson, 2017; Sun & Trudel, 2017). Furthermore, from Opinion's survey, one could also identify the largest drivers to why the respondent chose certain products, which was *quality* (81 per cent) and *recommendations from employees at the wine monopoly* (66 per cent). A carbon label enforced by Vinmonopolet will work as a recommendation towards the consumers to choose products contained in CSP. From this the first hypothesis is derived:

H1: *Carbon labeling is associated with more purchases of wine contained in climate-smart packaging.*

Hypothesis 2 and 3, derived from hypothesis 1:

H2: *Binary carbon labeling is associated with more purchases of wine contained in climate-smart packaging.*

H3: *Graded carbon labeling is associated with more purchases of wine contained in climate-smart packaging.*

Studies suggest that a traffic-light label is more effective in changing consumer behaviour toward purchasing more sustainable product alternatives, compared to binary carbon labeling, due to both the enhanced effectiveness of the carbon label (Thøgersen et al., 2016), and the effect a poor rating has on the consumer's perception of a product (Grankvist & Biel, 2007; Grankvist et al., 2004; Van Dam et al., 2015). These studies suggest that traffic-light carbon labeling influences consumers' intended behaviour to a larger degree than binary carbon labeling. From this, the fourth hypothesis is derived:

H4: *Graded carbon labeling will have a stronger effect on purchases of wine contained in climate-smart packaging compared to binary carbon labeling.*

The second boundary to buying wine contained in CSP was identified as "*Habit of choosing similar wine products each time*". In the survey conducted by Opinion, 58 per cent of respondents answered that they normally buy the same product every time. Since 64,5 per cent

of Vinmonopolet's products are non-CSP (Miljøfyrtårn, 2020), many consumers might end up choosing non-CSP wines every time due to habit. In addition, consumers with strong habits has been shown to "attend less to contextual information, to display less appreciation of choice options and attributes, and to show less integration of information into judgments" (Grankvist et al., 2004, p.226, collected from (Verplanken, Aarts, & van Knippenberg, 1997)), meaning that the carbon labels will be of lesser value in a decision process for a consumer with strong habits. This leads to hypothesis number 5 being:

H5: *Habit will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where those who are strongly habitual will avoid choosing products contained in climate-smart packaging.*

Thøgersen and Nielsen (2016) have found that the importance of the carbon footprint of a product is the largest for consumers with the highest degree of environmental concern. This means that the effect of a carbon label on intended behaviour will be larger the more environmentally concerned the consumer is. This is also in line with other studies, where environmental values have been found to play an important role in pro-environmental behaviour (Reser & Bentrupperbäumer, 2005; Stern, 2000).

H6: *Environmental concern will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for those who have a high degree of environmental concern.*

As mentioned in the literature review, women display more sustainable consumer behaviours than men (Dietz et al., 2002; Eagly, 2009; Luchs et al., 2012). Highly educated, younger consumers are prone to participate in pro-environmental behaviours (Gilg et al., 2005; Granzin & Olsen, 1991; Roberts, 1993; Semenza et al., 2008), as well as consumers living in urban areas (Mann, Ferjani & Reissig, 2012; Sellers Rubio, 2016). Since behaviour is affected by belief and values, these four hypotheses regarding environmental concern and relevant demographics are derived:

H7a: *Age will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for younger respondents.*

H7b: *Gender will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for women.*

H7c: *Education will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for respondents with higher education.*

H7d: *Domicile will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for respondents living in urban areas.*

Intended behaviour is affected by subjective norms, which is a function of normative beliefs and social compliance (Hoyer et.al., 2018). As the respondents will choose a wine product **prior** to the questionnaire, they will already have made a decision based on these two components - according to theory about reasoned action (intended behaviour). This will be true for the control group and for both treatment groups. Thus, we would like to look at what moderating effect the different carbon labels have on subjective norms. Will respondents who chose wine contained in CSP to a larger degree believe that their friends would have bought the same or a similar product as themselves when there has been a carbon label present in the web shop? This would make sense, as there is a rising interest in purchasing wine contained in CSP (Opinion, 2020), and by having a label present one would draw attention to this attribute. This leads us to hypothesis number eight:

H8: *Carbon labels will have a positive moderating effect on subjective norms, where the respondents who choose wine contained in climate-smart packaging to a higher degree will believe their friends would choose the same or a similar product when a carbon label has been present.*

3.2 Research Model

Based on these hypotheses, the research model in figure 3 was developed:

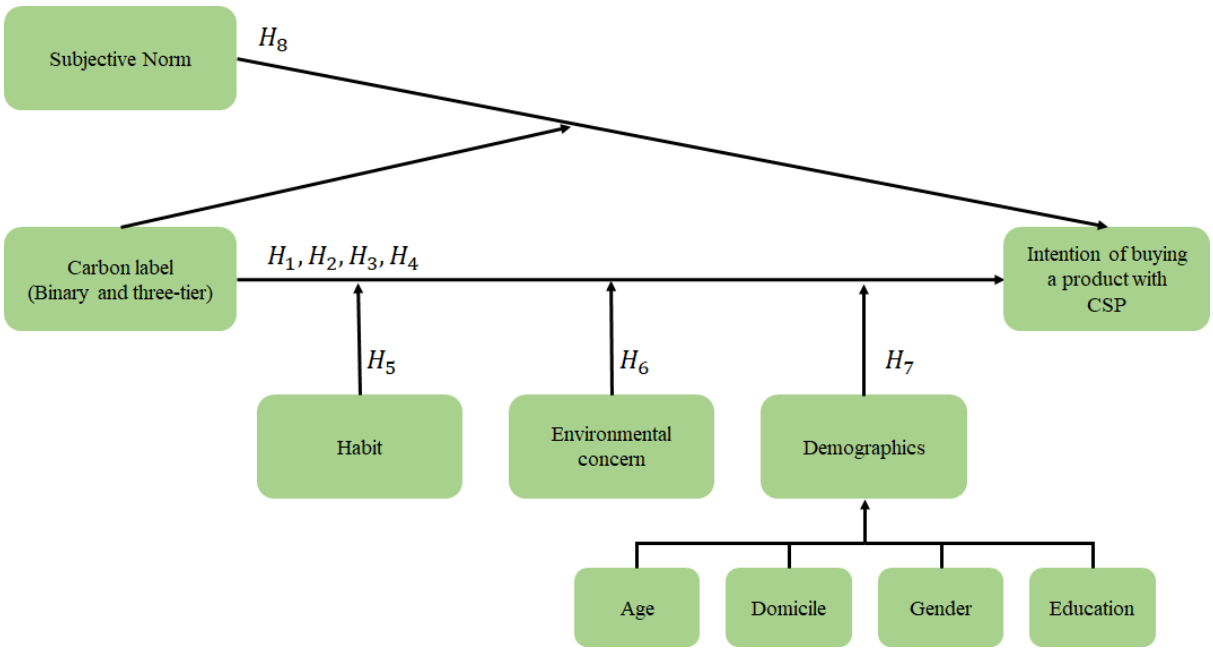


Figure 3: Complete research model

4. Methodology

In the following chapter, we will present the methodology that has been applied in the study. We will first explain the research design, before going into detail of the research population and sample, as well as the experimental design. The methodology behind the data collection and data analysis is also explained in this chapter. Finally, the validity, reliability and ethics of the study are reviewed.

4.1 Research Design

The research design refers to the overall strategy chosen to integrate the different components of a study in a coherent and logical way, to ensure that the research questions are addressed effectively (De Vaus, 2006). The purpose of this study is to establish a relationship between the independent variable and the dependent variable. The independent variable is carbon labeling, while the dependent variable is the consumer's intended behaviour, being the intended choice of products contained in CSP or non-CSP. The exception is when testing hypothesis 8, where carbon labeling is being used as a moderator, while subjective norm is the independent variable. The dependent variable remains the same, the consumer's intended behaviour. The study is by such an explanatory study (Saunders, Lewis, & Thornhill, 2016). Previous literature and research, including studies conducted by Opinion on behalf of Vinmonopolet, have been examined to develop hypotheses concerning the role of carbon labeling in encouraging consumer choice behaviour towards sustainable consumer choice behaviour. To test the hypotheses presented in chapter 3, primary data was collected through a quantitative experiment and an associated questionnaire. This way of testing existing theory using primary data is referred to as a deductive research approach (Saunders et al., 2016). The experiment is only completed one time per respondent, at one time, making it a cross-sectional study (Saunders et al., 2016).

The purpose of an experiment is to study the probability that a change in one or several independent variables will lead to a change in a dependent variable (Saunders et al., 2016). Because one anticipates whether a relationship exists between the variables, experiments use predictions in the form of hypotheses, rather than research questions. The simplest experiments only investigate the link between two variables. More complex experiments also take into consideration the size of the change, as well as the relative importance of two or more independent variables. In a classical experiment, a sample of participants is selected and are

assigned to either the control group or a treatment group at random. In the treatment group, a planned intervention or manipulation is tested, while in the control group, no intervention or manipulation is made. The participants are assigned at random to mitigate the threats to the internal validity of the experiment, and to control the possible effects of alternative explanations to the planned intervention (Saunders et al., 2016). The set-up for the experiment of this study will be presented in chapter 4.3.

The questionnaire following the experiment in this study does not include any open questions but is instead based on numeric data. The study consequently qualifies as a quantitative study (Saunders et al., 2016). Quantitative research is characterized by examining relationships between variables which are measured numerically and analysed by using a range of statistical and graphical techniques. This study only uses one data collection technique, which is an experiment conducted as an online questionnaire, and is thus a mono method quantitative study.

4.2 Population and Sample

The population of this study includes those who are over the legal drinking age in Norway, which is 18 years, who have purchased wine at Vinmonopolet during the past 12 months. Respondents who did not fulfil these criteria would not be of value for the study, since they would not be considered current consumers of Vinmonopolet.

4.3 Experimental Design

The experimental design of the study was based on one primary independent variable: Carbon labeling, which was used to affect the dependent variable: Intention of purchasing wine contained in CSP. The independent variable had three levels: Binary carbon label, graded carbon label, and carbon label, which includes both treatment groups (binary and graded). The experimental design was a between-subject design, as each participant in the treatment groups was exposed to only one kind of carbon labeling (Saunders et al., 2016). The study also included a control group where participants were not exposed to any carbon labeling. This was done to measure whether participants chose wine contained in CSP or not when carbon labels were not present. By doing so, one can measure the effect of the different carbon labels on consumer behaviour. When testing hypothesis 8, carbon labeling is used as a moderator instead

of an independent variable, while subjective norms is used as the independent variable. The dependent variable stays the same.

The experiment is set up as a discrete choice experiment as it simulates a buying situation where the respondents are asked to choose between product alternatives from a restricted product set (Sammer and Wüstenhagen, 2006). The experiment is conducted through a lab-in-the-field experiment (Gneezy and Imas, 2017), which combines elements of both the lab approach and the field approach. As such, it has the benefits of both approaches, while minimizing the costs (Gneezy et al., 2017). A lab-in-the-field experiment is similar to what is described by Harrison and List (2004) as an artefactual field experiment, which is defined as a standard lab experiment with a nonstandard subject pool, rather than a student population. This study has characteristics from a lab experiment because we had the possibility to have control over the experiment by removing factors that could confound the respondents, such as alcohol percentage and other products, and by manipulating the prices of the wines. The downside of lab experiments is that the results are not always good representations of the types of decisions that would be made in real life (Gneezy et al., 2017). Field experiments are conducted in naturalistic settings and usually use a nonstudent population that is not aware that their decisions are the subject of a study (Gneezy et al., 2017). By targeting a population in their natural environment, it is more likely that the results are applicable to the relevant context, but there are also more sources to statistical noise in the data (Gneezy et al., 2017). Results from a field experiment are also often harder to replicate. As our study is conducted as a lab-in-the-field experiment, we had the opportunity to use a nonstudent population, which makes it more likely that our results are also applicable to the relevant context, which is adults purchasing wine. We also made use of a web shop that was almost identical to Vinmonopolets real web shop, which made the shopping experience more realistic for our respondents. At the same time, by drawing in elements from the lab study, we had the ability to control the experiment, and reduce the sources of noise.

4.3.1 The Setting of the Experiment

Before gaining access to the fictional web shop, the respondents were asked to read an informative text. In the text, they were asked to imagine they were going on a cabin trip with their friends, and that everyone had agreed to buy their own alcohol for the trip, being wine.

We wanted to give all the respondents the same scenario, so that their mindset going into the shopping experience would be somewhat the same.

4.3.2 The Carbon Labeling

The binary carbon label was awarded to both the light glass bottles and the PET bottles. Heavy glass bottles did not receive any kind of label. The label was bright green and large to ensure that the respondents would take notice. For the same reason, the label was visible both in the product catalogue and on the individual product page, see figure 4 and figure 5 respectively.

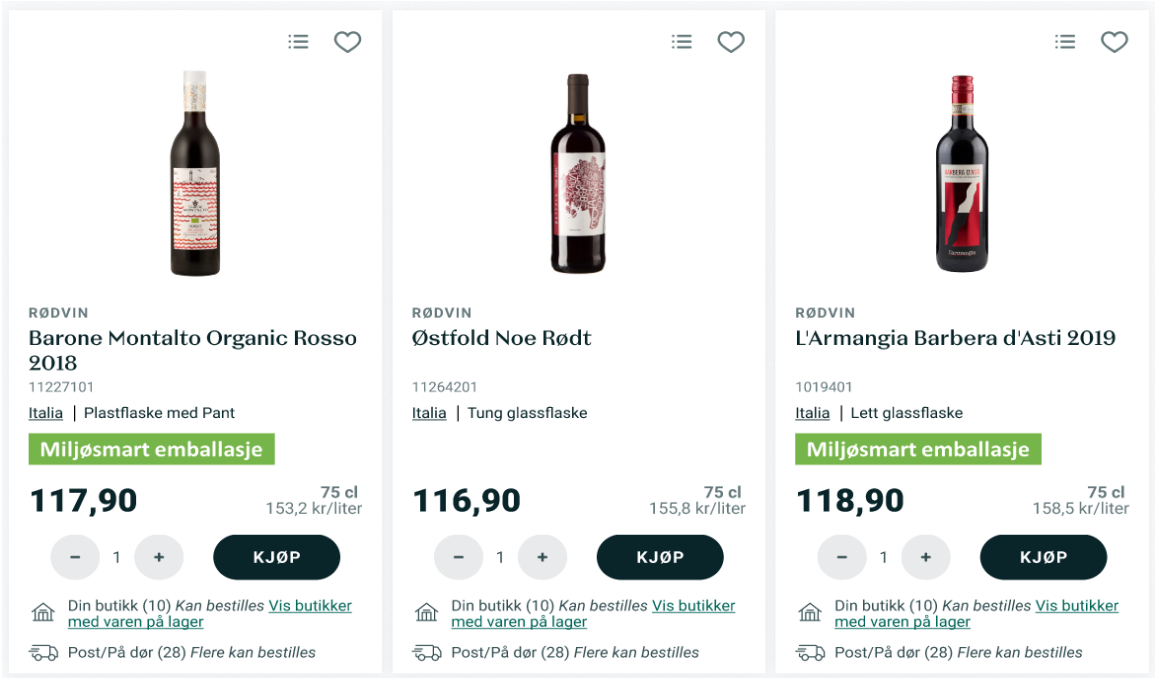


Figure 4: Binary carbon label shown in the product catalogue.

Figure 5: Binary carbon label shown on the individual product page.

The graded carbon labeling was visualized as a colour-scale, where a black foot indicated what tier the specific packaging belonged to. Heavy glass bottles were given a red rating, the bottles made of light glass were rated orange, and the bottles made of PET were rated green. The graded carbon labeling was initially designed by Opinion and used in their mentioned survey. From the survey we learned that only 29 per cent of respondents associated the labeling with CSP. Based on this we choose to have a small description next to the label saying "Evaluation of the CO^2 related to the packaging", to make it clearer what the colour-scale was meant to indicate. The label was colourful and large, and visible both in the product catalogue and on the individual product page, see figure 6 and figure 7 respectively.

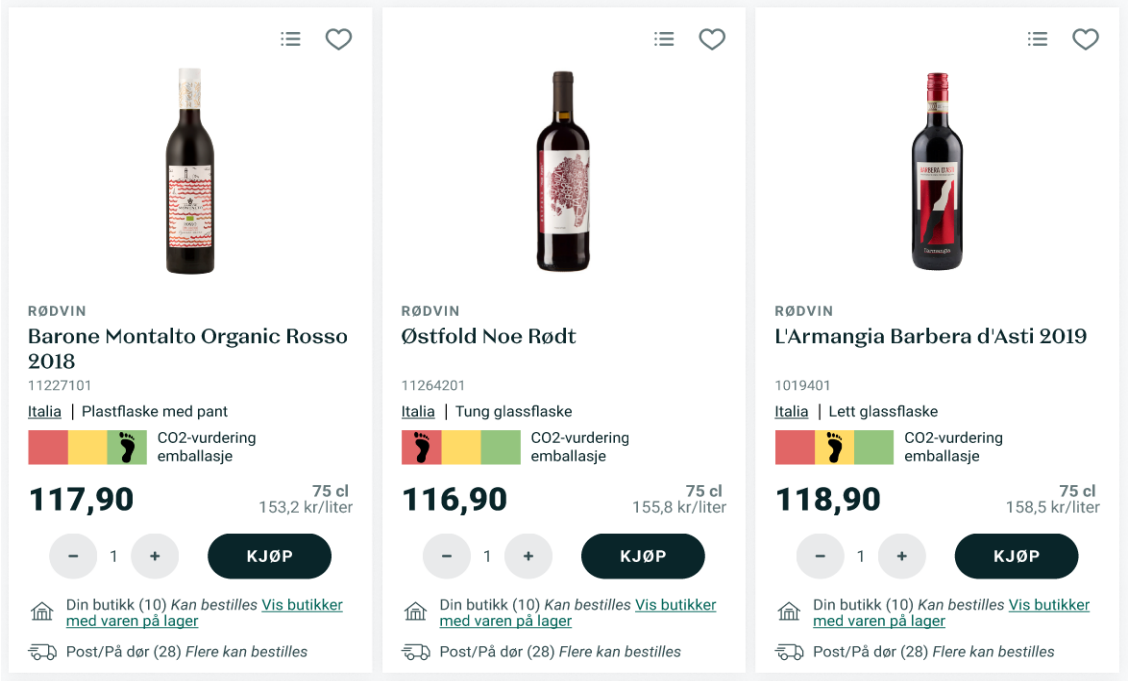


Figure 6: Graded carbon label shown in the product catalogue.

Figure 7: Graded carbon label shown on the individual product page.

4.3.3 The Products

To make the shopping experience as authentic as possible we concluded, in conversation with Vinmonopolet, to use existing products. When choosing the 12 wines, we wanted to keep all attributes as similar as possible to isolate the effect of the carbon labeling. Thus, all the wines chosen had the attributes: Good body, red, not suitable for storage, from Italy, and in the NOK 100-150 price range. When choosing which wines to include in our experiment, we also made sure that none of them were at the top 20 most sold red wines. This was done to prevent consumers choosing wines they knew from before in the experiment.

In the web shop of the experiment, wines are shown in a 3x4 matrix, with three wines in each row. Since one row typically is in focus at a time, we wanted each set of three wines to have a similar bottle and label design (see Appendix B for the complete product selection). Furthermore, the price of the different bottles within each set of three were also manipulated so that the price would be close to identical. The difference of price within each set of three is NOK 2, which is the equivalent of 0.25 American dollars. As before, this was done to have all other attributes than the carbon label as similar as possible.

Each row had at least one CSP product, some rows had two. When creating the web shop, we wanted 12 wines, where three wines would be contained in PET bottles, another three in light glass bottles, and the last six would be contained in heavy glass bottles. This means that 50 per cent of the bottles were in CSP. When applying the filters we used in the test shop, 13 of 41 wine bottles are in CSP, accounting for 31.7 per cent of the relevant products. Hence, we increased the share of bottles in CSP in the test shop. This increase is in line with Vinmonopolets vision to increase the share of products with CSP. From January 2019, Vinmonopolet has demanded that all new products that cost under NOK 150 must be in CSP (Miljøfyrtårn, 2020). Hence, although the test shop does not reflect the current status of Vinmonopolets assortment, it reflects their future vision.

To have three bottles marked as light glass and another three as PET, we had to mark the wine Il Portone Montepulciano d'Abruzzo as a PET bottle. The bottle is made of light glass. This was done because with the filtering we used to select the products, there were only two bottles made of PET. To make it as close in carbon footprint as possible, we chose a product contained in a light glass bottle, but changed the packaging information to PET.

4.3.4 The Test Shop

The test shop was developed using figma.com, which Vinmonopolet already uses to test new functions in their web shop. To make the experience as similar as possible to the real shopping experience, we made the test shops design as identical to the real web shop as we could, but with some simplifications. Firstly, respondents could only see the 12 red wines that we had chosen. The information about each wine was limited, and did not include information such as alcohol percentage, supplier, and other specific qualifications about the wine. It was not possible for users to search for other products such as white wine or spirits.

In addition to removing some information, we also added some information which is not visible at Vinmonopolet.no. Information about the packaging of each product was included both in both the product catalogue and on each product page. This was to make sure that the packaging information was registered by the respondents. Furthermore, two carbon labels were introduced, but only one carbon label was shown to each of the two treatment groups.

4.3.5 The Questionnaire

A questionnaire is an efficient tool for collecting primary data from a large sample for quantitative analysis (Saunders et al., 2016). When designing the questionnaire, we wanted to have as few questions as possible, while still being able to measure the effects necessary to test our hypotheses. For some parts of the questionnaire, such as when wanting to assess the respondent's environmental concern, we asked several questions that measured the same phenomenon. This was done to increase the internal validity of the questionnaire (Saunders et al., 2016).

The questionnaire was split into five parts, with questions regarding why the respondents chose the specific product, normative beliefs and social compliance, their wine habits in general, their environmental concern, and their demographics. The questionnaire had a total of 14 questions for the respondents in the control group, while the respondents in the treatment groups had 16 questions. The additional two questions for the treatment group were asking whether the respondents saw the carbon labeling or not, and to what degree the labeling affected their choice of product. For most questions, a Likert-style rating scale with five-points was used. By doing so, there was a neutral point which allowed a less adamant answer to respondents who were uncertain about their opinion (Saunders et al., 2016).

Why they chose the specific product: In this section, respondents were asked questions about how important different elements were when choosing the specific product. This included questions asking about the relevance of quality, CSP, price, design, producer and such. Additionally, to verify whether the respondents had been conscious of their choice or not, they were asked what kind of packaging their product had. Respondents were also asked questions regarding their level of content, if they would buy a similar product in a higher price range, and whether they thought they would regret their choice of wine.

Normative beliefs and social compliance. To test what normative beliefs the respondents had about their choice of wine, they were asked if they thought their friends "could have bought the same product" and "could have bought a similar product". To test for social compliance the questions were "could have served this wine to friends during a dinner I hosted", and "it is important to me **not** to stand out from my circle of friends".

General wine habits. Firstly, a screening question of whether the respondent had bought a product at Vinmonopolet within the last year was asked. The respondents were then asked to rank to which degree different elements were important to them when they chose wine normally, similar to the questions in part 1. Thirdly, seven statements regarding the respondents' attitude around and knowledge about wine were stated. These statements were based on previous research by Opinion for Vinmonopolet and were asked to get a deeper insight into the sample.

Environmental concern. To measure environmental concern, five questions with a 5-point Likert scale were taken from Thøgersen et al. (2010). The end-point labels were "strongly disagree" and "strongly agree". Respondents were also asked whether they had seen the carbon labeling or not, in this segment, and if yes, to which degree it had influenced their choice of product. These two questions were placed towards the end, in order to not influence the answers given to previous questions.

Demographics. Respondents also had to answer questions about age, gender, education, and the size of their municipality, to segment respondents according to demographics.

To see the complete questionnaire, see appendix C.

4.3.6 The Pre-test

Before the launch of the experiment and the associated questionnaire, we conducted a pre-test of both. The experiment was sent out to a small sample consisting of friends and family of different demographics. This was to make sure that both the shopping experience in Figma and the associated questionnaire were intuitive and easy to complete, and that the combination of the two worked as intended. Based on the feedback we got from the respondents in the pre-test, we changed some formulations to make them clearer to the reader. We also included headers to each question to reduce confusion on whether the questions were about the specific product the respondents had chosen, wine habits in general, or about the respondent in general. We also received feedback about including a progression bar, but because of the setup of the survey in Qualtrics, the progression bar would be at 50 per cent after the first question, and then move very slowly after this. Because of the risk of this being a source of frustration and confusion for respondents, we decided to not include a progression bar. Respondents were informed by Norstat that the experiment in total would take a maximum of ten minutes, and a progression bar was therefore not deemed a critical element.

4.4 Data Collection

For this study, Norstat, a data collection company, was requested to gather 150 responses for the control group and the two treatment groups, giving us a total sample of at least 450 respondents. Norstat was used to avoid convenience sampling where respondents are sampled simply because they are easy to obtain (Saunders et al., 2016) i.e., through personal social media of the authors of this study. This service was funded by *The Centre for Sustainable Business* at NHH.

4.5 Operationalisation

Deductive research requires that concepts need to be operationalised in a manner that enables fact to be measured (Saunders et al., 2016). Operationalisation is defined as “the translation of concepts into tangible indications of their existence” (Saunders et al., 2016, p.722). In this study, concepts that had to be operationalised were intent of purchase, habit, subjective norms, environmental concern, and the socio-demographic variables.

4.5.1 Operationalisation of intention of purchase

Intention of purchase was operationalised through the respondents choosing the product they wanted in the simulated shopping experience. Since the experiment had a relatively large product selection and the web shop was almost identical to Vinmonopolet.no in appearance, we considered the respondents' choice of wine as a suitable measure of purchase. We wanted to measure whether the carbon labeling led to an increase of the sale of products in CSP or not, while other product attributes were not of interest to our study. We thus created a new variable: "dummycsp", which is used as the dependent variable throughout the study. The dummy indicates whether the chosen wine is contained in CSP (1), or not (0). This was used as the dependent variable when testing hypothesis 1-7, and as a moderator when testing hypothesis 8.

4.5.2 Operationalisation of habit

Habit was operationalised through the respondents answering several questions about their wine habits on a five-point Likert scale. The questions were asked in relation to both when the respondent chose a wine in the experiment, and when they normally go to purchase wine: "I bought the product because it is similar to what I normally buy", "When I buy wine, I buy products which are similar to what I normally buy", and "When I purchase wine, I normally choose between a set which I am previously familiar with". The independent variable for "Habit" was developed through creating a new variable which summed up and found the average of each respondent's answers to these questions. A high value meant that the respondent showed a high degree of acting upon habit. This variable was used to test hypothesis 5.

4.5.3 Operationalisation of environmental concern

Environmental concern was operationalized through five questions with a five-point Likert scale, taken from Thøgersen et al. (2010). The end-point labels were "strongly disagree" and "strongly agree", whilst the questions were: (1) I am concerned about the development of the global environment, (2) I feel it is a moral obligation to use environment-friendly products, (3) It concerns me that people do not care enough for the environment, (4) I have changed from one brand to another for the sake of the environment, (5) I often buy carbon labeled

products for the sake of the environment. The environmental concern index produced by averaging the responses to these five items has excellent construct reliability (Cronbach's Alpha 0.85) according to Thøgersen et al. (2010). The variable for environmental concern was operationalised as a dummy variable, separating between green (1) and brown (0) respondents. Green respondents were those who had an average of 4 points or higher, while the other respondents were labeled brown. This variable was used to test hypothesis 6.

4.5.4 Operationalisation of socio-demographics

For most of the socio-demographic questions, we had four to six categories. This led some of the categories to have very few respondents. Thus, to ensure each category had enough respondents for our analyses, we grouped the respondents according to their socio-demographic characteristics with the help of dummy variables. This also made sense for the testing of our hypotheses related to socio-demographics.

For the **age** variable, we created a dummy variable that was equal to 1 if the respondent was over the age of 50, and 0 if not. Ideally, we would have preferred to set this limit lower, but because of the high average age of our respondents, we found it most purposeful to put 50 years as the limit. Also, we created the variable with the intention of separating “old” respondents from “young” respondents, while what age is young and old can be quite subjective. Thus, having the line at halfway to one hundred can be deemed suitable. The dummy variable for age was used when we tested hypothesis 7a.

For the **education** variable, we created a dummy variable that was equal to 1 if the respondent had completed a level of higher education (vocational school, bachelor's degree, master’s degree, or doctorate degree), and equal to 0 if not. This dummy variable was used to test hypothesis 7c.

For the **domicile** variable, we decided to differentiate between respondents that lived in municipalities with over and under 50,000 inhabitants. This limit was based on the fact that Norway is a sparsely populated country, with only a few municipalities with more than 100,000 inhabitants. Thus, we chose to include the alternative 50,0000+ inhabitants into the category, as those are to be considered large, urban municipalities in Norwegian terms. We

therefore added a dummy variable that was equal to 1 for respondents that lived in municipalities with over 50 000 inhabitants. This dummy variable was used to test hypothesis 7d.

4.5.5 Operationalisation of subjective norm

Initially, we had four questions which we wanted to use to measure subjective norms, which is a function of normative beliefs and social compliance. The two questions which were aimed at identifying social compliance were: "I would serve this product to my friends during a dinner party I hosted myself" and "It is important to me, not to stand out from my circle of friends". For the latter, we deemed the question as being too obvious, after the majority of respondents strongly disagreed, and we thus chose to remove the question from the data set to avoid participant bias. As for the question related to serving wine, we thought that if the respondent did not believe their friends would buy the same product, then the respondent would not like to serve it either - if the respondent's social compliance was high. We found this reasoning to be problematic, as we could not control for social compliance if the respondent did believe their friends would like the product, and additionally stated they would want to serve the wine to them. As such, we decided to also remove this question, with the belonging data from the data set.

The last two questions were aimed at identifying normative beliefs. Respondents were asked both how probable it was that their friend would choose the same product as them and how probable it was that their friends would buy a similar product. The subjective norms variable created holds the value of the average point which the respondent gave to the questions concerning whether friends would have bought the same or a similar product, or not. A high value indicates that what the respondents purchased was in line with their subjective norms. Initially, we believed these two questions would measure normative beliefs in a good manner. In hindsight, we evaluate these questions as being simplistic, and possibly not adequate in measuring subjective norms. Still, we decided to keep the variable for subjective norms and use it to test hypothesis 8, as we did not have any other way of measuring the phenomenon. The implications of this are discussed in chapter 6.4, limitations of the study.

4.5.6 Operationalisation Overview

The questions which make up the variables presented in chapter 4.5.

Concept	Indicator(s)
Intention of purchase	Respondents were asked to choose a wine in the simulated shopping experience
Habit	Variable based on three claims. 1. When asked why they chose the product: "The product reminded me of what I usually buy" 2. When asked about general wine habits: "I chose wine based on how similar they are to what I usually buy" 3. When asked about general wine habits: "When I purchase wine, I normally choose from a small selection which I am already familiar with and know I like"
Environmental concern	1. I am concerned about the development of the global environment. 2. I feel it is a moral obligation to use environment-friendly products. 3. It concerns me that people do not care enough for the environment. 4. I have changed from one brand to another for the sake of the environment. 5. I often buy carbon labeled products for the sake of the environment.
Age	18-29, 30-39, 40-49, 50-70, 70+, do not wish to answer.
Education	Primary school, high school, bachelor's, master's, PhD, vocational school.
Domicile	0-9,999, 10,000-49,000, 50,000-100,000, more than 100,000.
Subjective Norms	1. I think my friends/ family could have chosen the same product as me. 2. I think my friends/ family could have chosen a similar product to the one I chose.

Table 1 – Operationalisation Overview

4.6 Data Analysis

In this chapter we will go through the different tests and analyses that are necessary to test our previously mentioned hypotheses. We will first go through the use of descriptive statistics, before explaining the value of correlation analyses. Then we will elaborate on when to use a chi-square test and what its results can tell us. Lastly, we will explain the concept of binary regressions and moderation analyses.

To analyse the data, we used the statistical software STATA for chi-square testing and correlation analysis, while SPSS with the add-in Hayes' PROCESS-macro was used for moderating analyses. The results of the analyses will be presented in chapter 5.

4.6.1 Descriptive Statistics

Descriptive statistics are used to identify characteristics, and understand the composition of a sample (Nick, 2007). We first made frequency tables based on the socio-demographic characteristics. Then, we made descriptive statistics going more into depth in the data, as presented in chapter 5.2.

Skewness refers to one tail of the curve being heavier or lighter than the other (Nick, 2007). 0 means no skewness, meaning that the curve has normal distribution and is symmetrical. A skewness value over +/- 2 will be problematic as it can affect the performance of further tests such as regressions (Tjønndal, 2018). If the skewness value is positive, the data is left-skewed, while if the skewness data is negative, the data is right-skewed.

Kurtosis is a measure of heavy tails (Nick, 2007). The kurtosis is positive when the tails are heavier than the normal distribution, and negative when the tails are lighter than the normal distribution (Nick, 2007). In Stata, the kurtosis is centred at 3, meaning that if a variable has a kurtosis of 3, then the variable is perfectly normal distributed (Tjønndal, 2018). A kurtosis with a value above 10 gives reason to worry (Acock, 2014).

4.6.2 Correlation Analysis

Correlation is a statistical measure showing to what degree two variables are associated and is measured through a correlation coefficient (Ubøe, 2012). If the correlation coefficient has a value of 0, it means that there is no correlation between the variables. It is important to conduct

a correlation analysis to avoid multicollinearity in a regression analysis. When looking at the correlation between dichotomous variables, also known as binary variables, one should use a tetrachoric correlation value (Bonett, 2007). A correlation coefficient over 0,7 is considered a strong correlation (Glen, 2016).

To test whether some independent variables were correlated, we computed the tetrachoric correlation between the *naturally dichotomous* variable gender, and the *artificially dichotomous* (Bonett, 2007) variables of age, level of education, domicile, and environmental concern. To obtain the exact tetrachoric correlation value we used the statistical program STATA.

4.6.3 Chi Square Test

To test the main effect of the carbon labels; hypotheses 1, 2, 3 and 4, we used a chi-square test. Prerequisites to run a chi-square test is for the observations to be independent from each other, and that the categories are mutually excluded (Keller, 2009).

The chi-square test is a measure of how far the observed counts in a two-way table are from the expected counts if the null hypothesis were true (Moore, Notz, & Fligner, 2015). The null hypothesis will state that the two variables are independent from each other, while the alternative hypothesis will be that one of the variables is dependent on the other.

The formula for the chi-square test is:

$$X^2 = \Sigma \frac{(Observed\ count - Expected\ count)^2}{(Expected\ count)}$$

Large values of X^2 are evidence against the null hypothesis because it indicates that the observed counts are far from what we would expect if the null hypothesis were true (Moore et al., 2015). If the p-value is below the significance level, the null hypothesis will be rejected.

4.6.4 Binary regression

Regressions are the foundation of moderator analyses (Hayes, 2018). Since our dependent variable, purchase of wine contained in CSP or non-CSP, was binary, binary regression was used and will be explained in this subchapter, followed by an explanation of moderation analysis in subchapter 4.6.5.

In the binary regression, the dependent variable Y holds the value of either 0 or 1 (Cox, 1958), and it is the likelihood that Y holds the value of 1 which is predicted. The regression includes one or more independent variables whose value affects the dependent variable. The coefficient in logistic regression measures the change in odds ratio when there is a one-unit change in the independent variable and is expressed as natural logarithms. To make the interpretation of the coefficient easier, it is common to transform it back to odds ratio by exponential of the coefficient (Ghauri & Grønhaug, 2005).

Prerequisites for the binary regression are independence, little to no multicollinearity, a large sample, and linearity of independent variables (Schreiber-Gregory, 2018). Independence means that the observations are independent of each other. Because the study is conducted by 453 respondents that each conducted the experiment once, this prerequisite is fulfilled, as well as the prerequisite of a large sample. Furthermore, the tetrachoric correlation analysis conducted in chapter 5.3.1 shows no correlation between variables.

4.6.5 Moderation Analysis

"An association between two variables X and Y is said to be moderated when its size or sign depends on a third variable W" (Hayes, 2018, p.8). Many of our hypotheses speculate in a variable's (W) moderating effect on the carbon label (X), in a model of intention of purchasing wine contained in CSP (Y). After establishing an interaction between X and W, we will test X's effect on Y at different values of W, also known as probing an interaction (Hayes, 2018).

To test for the moderating effects in hypothesis 5, 6, 7a, 7b, 7c, and 7d, and to probe the statistically significant interactions, we used the statistical software SPSS and Hayes' PROCESS-macro. As the PROCESS tool does not treat more than one moderator effect at the time, we tested the moderating effect of the relevant variables separately.

4.7 Reliability and Validity

4.7.1 Reliability

Reliability relates to the replication and consistency of a study (Saunders et al., 2016, p.202). A study is reliable when it can be conducted multiple times with corresponding results (Saunders et al., 2016).

Internal reliability is the degree to which consistency is ensured over the course of the research project (Saunders et al., 2016). The internal reliability of our study was increased by the fact that we were two people conducting the study and performing the analysis. The reliability of the measures and analyses was thoroughly considered by both authors, and the majority of the variables are considered reliable. However, one variable, subjective norm, as presented in chapter 4.5.5 operationalisation of subjective norm, is considered to have a low reliability. The reason for this is that the questions that were used to operationalise this variable did not capture subjective norm towards climate-smart packaging in an adequate manner. This variable is only used to test hypothesis 8.

External reliability is linked to whether the applied data collection techniques and analytical procedures would generate consistent results if repeated or conducted by another researcher (Saunders et al., 2016). In this study, we have aimed to be as transparent as possible in the depiction of our data collection and analysis processes.

Participant bias can be a threat to the study's reliability. Participant bias includes any factors that could induce a false response (Saunders et al., 2016). Participant bias can happen for example if the respondents feel observed and pressured to answer in a certain manner (Saunders et al., 2016). Because respondents in this case responded to the questionnaire in the privacy of their home, as well as being informed that the experiment was conducted anonymously, we do not consider this to have been an element. However, participant bias can also occur if the questions are not neutral enough, and the respondents feel like there is a "wrong" and "right" answer. To prevent this from happening, and ensuring the reliability of the data, we tried to word the questions as neutrally as possible. Even so, we failed to avoid participant bias in the question: "It is important to me, **not** to stand out from my circle of friends", as we read from the data set that the respondents thought the right answer was "I strongly disagree". Thus, we removed this question and its data from the data set. We also

placed the questions measuring the environmental concern, and the effect of the carbon labeling toward the end of the questionnaire. This was done so that the respondents would not believe that the “right answers” was anything related to green behaviour, as this would give us biased data.

Participant error is another threat to the study's reliability. Participant error includes any factor which unfavourably impacts the way in which a participant performs (Saunders et al., 2016). Because the experiment was conducted online, we had no control over the environment in which the respondents conducted the experiment. Sources of participant error in this case could for example be that participants engaged in other activities while participating in the experiment and the following questionnaire, so that their attention span was limited. Another source of participant error can be that respondents had trouble when opening the test shop in Figma, causing them to be impatient when conducting the experiment, or even making them choose to exit the page. However, because the respondents could choose themselves when they wanted to conduct the experiment, within a set time of 5 days, participant error was mitigated.

4.7.2 Validity

Validity relates to the appropriateness of the applied measures, the generality of the discoveries, and the accuracy of the analysis (Saunders et al., 2016, p.202).

Internal validity is established when the research precisely demonstrates a relationship between two variables (Saunders et al., 2016, p.203). The study was conducted as an experiment, which increased the internal validity, as we had control over most aspects of the research process (Saunders et al., 2016). In an experiment, internal validity is established when an intervention is shown to lead to an outcome (Saunders et al., 2016). To ensure that this would be the case, the treatments were based on previous theory and carefully designed in order to make them as impactful as possible. Internal validity for a questionnaire is established when a set of questions can be statistically shown to be associated with an analytical factor or outcome (Saunders et al., 2016, p.203). To ensure the internal validity of the questionnaire we audited the questionnaire multiple times in order to verify that all the questions we asked would provide relevant information for the analysis. We also conducted pre-tests to make sure that the questions did not appear ambiguous or unclear to the respondents.

External validity refers to whether the study's findings can be generalised to other relevant groups or settings (Saunders et al., 2016, p.204). As previously mentioned, conducting the study as an experiment can increase internal validity. However, this makes external validity harder to establish. To increase the external validity, we decided to include 12 different products in the experiment, instead of having identical products where the only difference was the packaging. Although having everything the same, except for the packaging would have led to fewer sources of statistical noise in the analysis, we thought making the experiment more similar to a real-life experience weighted heavier. In this way we increased the external validity of the experiment, which we deem as having greater value for both Vinmonopolet and other readers of the study. Having a sample of 453 respondents further increased the external validity of the study. The respondents were also allocated randomly to the different groups by Norstat.

Measurement validity refers to whether operationalisation, and the scoring of cases adequately reflects the concepts the researcher seeks to measure (Adcock and Collier, 2001). Valid measurement is attained when "a variable measures what it is supposed to measure" (Bollen, 1989, p.184). Three kinds of validity can be recognized: content validity, criterion validity and construct validity (Adcock et al., 2001).

Content validity relates to the degree to which the questionnaire contains questions that make it possible to answer the research question (Adcock et al., 2001). To guarantee that this would be the case, we reviewed the questionnaire multiple times to make sure that each question had a purpose in the questionnaire. Those that did not were removed from the questionnaire.

Criterion validity relates to the degree to which the questions in the questionnaire give valid predictions (Saunders et al. 2016). This can be verified by checking whether there is an empirical association between the scores produced by an indicator and scores for other variables (Adcock et al., 2001). In this study, the biggest source of uncertainty was related to the questions that measured the subjective norm.

Construct validity relates to the degree to which the questions measure the constructs that they are meant to measure (Adcock et al., 2001). Questions that measured subjective norm and

environmental concern were asked multiple times, to increase the validity of the construct validity of the questionnaire.

4.8 The Ethical Aspect

Research ethics are standards that guide the researchers' behaviour and attitudes to the rights of those that are subject to the study, or affected by it (Saunders et al., 2016). The research design shall not expose others to risk of embarrassment, hurt or other disadvantages (Saunders et al., 2016). The researchers must uphold their integrity and objectivity through the entire research process. The research questions must be formulated in a manner that they are objective and do not contain any prejudice (Saunders et al., 2016).

To ensure that the ethical aspect of the study was withheld, participation in the survey was voluntary and anonymous. This was communicated to the respondents through Norstat. We also wanted to include this in the end window of the survey, but because of technical issues this was not possible. However, because Norstat is known for conducting anonymous surveys in Norway and send surveys to a population of respondents that have given informed consent prior to answering the questionnaire, we considered that this information was known to the respondents and clearly communicated. The reliability of the data is also likely to increase because confidentiality and anonymity is ensured (Saunders et al., 2016). We also informed respondents of who they could address any possible questions to if these should arise.

In Norway, the legal drinking age is 18 years. As the topic of our research study was wine, it was important that only people over the age of 18 answered the survey. This was communicated to Norstat as well when they sent out the survey. We had no way to ensure that all respondents were over the age of 18 after the survey was sent out, but because this had been put an emphasis on during the initial process with Norstat, we consider that the ethical aspect was withheld. Another ethical aspect related to the choice of produce, is the fact that there is a strong alcohol law in Norway, prohibiting the advertising of alcoholic drinks. Other than the carbon labeling, the test shop did not contain any information that is not already present on Vinmonopolets website. We also talked with Vinmonopolet before sending out the survey to make sure that the test shop was approved by them. The use of carbon labeling was thoroughly discussed with Vinmonopolets representatives, as Vinmonopolet are legally

obliged to treat all suppliers the same. The question on whether Vinmonopolet could use labeling only on products with CSP was therefore raised, but in dialogue with Vinmonopolet we decided to go through with the experiment. However, on request from Vinmonopolet, we made sure to specify that the experiment was directed by the Norwegian School of Economics and included the NHH logo on the landing page after request by Vinmonopolet.

5. Data Analysis

In this chapter, we go into detail about the data analysis process. We will first explain how we prepared the data set for analysis. To make it easier to grasp the sample, we also present descriptive statistics. Thereafter, we conduct statistical analysis to test the various hypotheses and present the results.

5.1 Preparing the Data Set

Before performing analyses on the collected data, we had to prepare the dataset. In total, there were 505 respondents, distributed on three different questionnaires. In the control group (Group 1), we received a total of 176 respondents, the binary manipulation (Group 2) received a total of 158 respondents, and the graded manipulation (Group 3) received a total of 171 respondents. We started by removing the observations where the respondents had not completed the survey, as well as observations where respondents answered that they had not shopped at Vinmonopolet within the last year. In total, we then had 453 respondents that were part of the population we wished to conduct the experiment on. Out of these 453 respondents, 159 were part of Group 1, 137 were part of Group 2, and 157 were part of Group 3.

We also considered if there were any outliers in the dataset. Because all the questions were closed, there were not many possibilities for outliers, and we recognized time spent on the questionnaire as the only outlier. In general, most respondents spent a maximum of ten minutes conducting the experiment, but some users spent more time and sometimes up to thirty minutes. However, we knew that some users had had issues when opening Figma, which could cause this effect. We therefore chose not to use time spent as an eliminating factor.

From the descriptive statistics, we saw that many respondents answered that they did not notice the carbon labeling. Although we considered removing these observations, we decided to keep them. This is because we believe that although the respondents might not have consciously registered the carbon labeling, they could have noticed them subconsciously, which could also have affected their choice. Additionally, this also makes the results more applicable to real life, as it is not always possible to ensure that every consumer notices the carbon labeling. However, when testing the main effects of the carbon labeling, we also conduct tests that are adjusted for the respondents who indicated that they did not notice the carbon labeling. This is presented in chapter 5 Analyses.

5.2 Descriptive statistics

In this paragraph, we will present descriptive statistics of the dataset. We will first present the sample according to their socio-demographic characteristics. We then made frequency tables to depict how these respondents answered questions related to what they deem important when purchasing wine, their product choice, and their environmental concern. To get a deeper understanding of the data, we included mean, standard deviation, skewness, and kurtosis in the latter tables. We will also present descriptive data related to whether respondents purchased products with CSP, if they noticed the carbon labeling or not, and if so, to which degree the carbon labeling affected their choice.

Age	Female	Male	Total
<=49	52	21	73
>=50	103	275	378
Does not wish to answer	0	2	2
Total	155	298	453

Table 2 - Descriptive data for the whole sample, age and gender

Age	Control	Binary	Graded	Total
<=49	26	24	23	73
>=50	132	112	134	378
Does not wish to answer	1	1	0	2
Total	159	137	157	453

Table 3 - Descriptive data for the different groups, age

Table 2 depicts the spread of the sample based on age and gender. 65.7 per cent of the respondents were male. Two respondents did not wish to indicate their age. 83.4 of the respondents were 50 years or older, meaning that only 16.6 per cent of the respondents were under 50. The male respondents have a high average age, with only 7 per cent of the male respondents indicating that they are under 50 years old. Table 3 depicts the age spread across the different groups. As we can see, the spread is quite similar in each group, with most respondents in each group being above 50 years old.

Age	<=49	>=50	Does not wish to answer	Total
No higher education	21	103	0	124
Higher education	52	275	2	329
Total	73	378	2	452

Table 4 - Descriptive data all sample, age and education

Education	Control	Binary	Graded	Total
No higher education	45	42	37	124
Higher education	114	95	120	329
Total	159	137	157	453

Table 5 - Descriptive data for the different groups, education

Table 4 shows that 72.6 per cent of respondents had taken higher education (bachelor's degree, master's degree, doctorate degree, vocational school). Almost 40 per cent of respondents had at least a bachelor's degree. From table 5 we see that the spread is quite similar in each group.

Inhabitants in municipality	Control	Binary	Graded	Total
Less than 50.000	82	69	64	215
Higher than 50.000	77	68	93	238
Total	159	137	157	453

Table 6 - Descriptive data for the different groups, domicile

As one can see from table 6, 52.56 per cent of the respondents lived in municipalities with a population of 50,000 or above.

Noticed the carbon labeling	Binary	Graded	Total
No	52	72	124
Yes	85	85	170
Total	137	157	294

Table 7 - Descriptive data for the different groups, who noticed the carbon labeling

Because we wanted to test the effect carbon labeling had on the purchase of products with CSP, it was also interesting to look at how many respondents in each treatment group saw the carbon labeling. In total, 294 respondents were exposed to a test shop with carbon labeling. Out of these respondents, 57.8 per cent answered that they noticed the carbon labeling. 62 per cent of the respondents exposed to the binary carbon labeling answered that they noticed the carbon labeling, while only 54.1 per cent of the respondents exposed to the graded carbon label answered the same.

Chose CSP/non-CSP	Control	Binary	Graded	Total
non-CSP	63	44	44	151
CSP	96	93	113	302
Total	159	137	157	453

Table 8 - Descriptive data for the different groups, choice of CSP/ non-CSP

Packaging type	Control	Binary	Graded	Total
Heavy glass	63	44	44	151
Light glass	47	52	48	147
PET	49	41	65	155
Total	159	137	157	453

Table 9 - Descriptive data for the different groups, choice of packaging

We also wanted to see how the distribution of products with/without CSP was depending on which group the respondents belonged to. In the control group, 58.5 per cent of respondents chose products with CSP. In group 2, the group exposed to binary carbon labeling, 67.9 per cent of respondents chose products with CSP. In group 3, the group exposed to graded carbon labeling, 71.9 per cent of respondents chose products with CSP. In table 9, a more precise break-down is seen.

	Did you notice the carbon labeling?			
	Binary		Graded	
Chose CSP/non-CSP	Yes	No	Yes	No
non-CSP	26	18	18	26
CSP	59	34	67	46

Table 10 - Descriptive data for the treatment groups, noticing the label, choosing CSP/ non-CSP

To what degree did the carbon labeling affect your choice?	1	2	3	4	5	Total	Mean(SD)
Binary	20	14	0	28	23	85	3.24(1,58)
Graded	17	12	24	17	15	85	3.01(1,37)
Total	37	26	24	45	38	170	3.12(1,48)

Table 11 - Descriptive data for the treatment groups, when noticing the label, how did it affect choice

Table 10 shows the number of respondents in each group that chose a product contained in CSP, and whether they noticed the carbon labeling or not. We see that for both groups, the share of respondents that chose a product contained in CSP is larger for the respondents that noticed the carbon labeling. Table 11 shows to which degree the respondents that noticed the carbon labeling, indicated that the carbon labeling affected their choice of product. We see that on average, the binary carbon labeling seems to have had the biggest effect on the respondents' choice. However, the binary carbon labeling also has the highest standard deviation, which means that respondents disagree the most on the influence of the binary carbon labeling on their choice.

Variables	Mean	SD	Skewness	Kurtosis	N
High quality	3.786	0.893	-0.782	4.042	453
Try something new	3.424	1.090	-0.601	2.844	453
Product price	3.199	1.077	-0.358	2.575	453
Similar to what I normally buy	3.029	1.149	-0.336	2.286	453
Design of bottle	2.523	1.136	0.120	2.007	453
CSP	2.804	1.330	0.098	1.857	453
Producer /brand	3.022	1.131	-0.218	2.313	453

Table 12 - Descriptive data for all groups, importance of attribute in experiment

Table 12 shows the respondents' answers on the question regarding important elements for their choice of wine in the experiment. High quality has the highest mean meaning that on average this is the most important element for the respondents. High quality also has the lowest standard deviation, meaning that this is the element that respondents agree the most on. Bottle design has the lowest mean meaning that this is the least important element for respondents. Products with CSP have the highest standard deviation, meaning that this is where respondents differ the most. For all the variables, skewness and kurtosis are within the reasonable limit.

Variables	Min	Max	Mean	SD	Skewness	Kurtosis	N
Will be satisfied	1	5	4.307	0.729	-0.716	2.988	453
Will regret	1	4	1.799	0.816	0.604	2.366	453
Friends could buy same product	1	5	3.611	0.841	-0.152	3.302	453
Friends could buy similar product	1	5	3.777	0.810	-0.199	3.128	453
Would serve the wine to friends	1	5	4.108	0.912	-0.986	3.763	453

Table 13 - Descriptive data for all groups, thoughts around chosen product

The table above summarizes the respondents' answers regarding their product choice. A notable observation is that the maximum value for the question "I think I'm going to regret my choice of wine" is 4. This means that zero respondents answered that they completely agree that they think they will regret their choice of wine. This also includes the respondents indicating that they do not like red wine. Furthermore, this question also has the lowest mean, indicating that respondents overall seem content with their choice. This is also confirmed by the fact that question 1, "I think I'll be satisfied with the wine I chose" has the highest mean. Both these questions also have a relatively low standard deviation. Most users also indicate

that they agree that they would serve the chosen wine at a dinner party with their friends, but this question also has the highest standard deviation. Both skewness and kurtosis are within the reasonable limits for all variables.

Variables	Mean	SD	Skewness	Kurtosis	N
High quality	3.940	0.760	-0.474	3.229	453
Try something new	3.419	0.915	-0.507	3.048	453
Product price	3.563	0.887	-0.324	2.867	453
Similar to what I normally buy	3.190	0.991	-0.537	2.878	453
Design of bottle	2.386	1.047	0.140	2.054	453
CSP	2.570	1.170	0.247	2.192	453
Producer /brand	3.190	1.051	-0.396	2.615	453

Table 14 - Descriptive data for all groups, importance of attribute in real life

Table 14 shows descriptive statistics regarding what is important for respondents when buying wine. In line with the findings we found in table 12, high quality has the highest mean, meaning that on average, it is important for respondents. This question also has the lowest standard deviation. Also here, we find that the design of the bottle is the least important to respondents, while CSP has the second lowest mean, but the highest standard deviation, meaning that respondents differ the most in regards to the importance of climate-smart packaging. Both skewness and kurtosis are within the reasonable limits for all variables.

Variables	Mean	SD	Skewness	Kurtosis	N
Regard myself as a wine expert	2.040	1.008	0.491	2.138	453
Broad knowledge of wine	2.075	1.008	0.589	2.456	453
Often buy the same wines	3.592	0.959	-0.692	3.237	453
Open to try new products	3.854	0.855	-0.568	3.139	453
Want to try new products	3.194	0.983	-0.172	2.572	453
I value quality over price	3.413	0.964	-0.309	2.829	453
I value price over quality	2.781	1.015	0.027	2.393	453

Table 15 - Descriptive data for all groups, wine habits

Table 15 shows descriptive statistics regarding what wine habits the respondents have. From the data we see that the highest average mean is 3.85 on the question “When I buy wine, I am normally open to try new products”. Second comes the question “When I buy wine, I choose

from a small selection which I am familiar with from before, and that I know that I like" with a mean of 3.59. Although not mutually exclusive, these questions are indicators of different behaviours, and it is therefore interesting that both have a high mean. The two questions with the lowest rated means are "I regard myself as a wine expert" and "I have a broad knowledge of wine", but these are also some of the questions with the highest standard deviation, meaning that most respondents do not regard themselves as experts nor knowledgeable, whilst there are a few who indeed do regard themselves as inhibiting these qualities. Both skewness and kurtosis are within the reasonable limits for all variables.

Variables	Min	Max	Mean	SD	Skewness	Kurtosis	N
Concerned development global environment	1	5	3.709	1.210	-0.786	2.732	453
Moral obligation to use eco-products	1	5	3.285	1.177	-0.500	2.447	453
Concerns me that people don't care enough	1	5	3.355	1.199	-0.509	2.475	453
Switched brands	1	5	2.307	1.190	0.518	2.321	453
Buy carbon labeled for the sake of environment	1	5	2.702	1.245	0.110	2.013	453

Table 16 - Descriptive data for all groups, environmental concern

We also asked respondents questions mapping their environmental concerns. As mentioned in the chapter 4.5.3 operationalisation of environmental concern, respondents with an average of 4 are labeled as environmentally concerned. We can see that on average, respondents are not environmentally concerned. The standard deviation is the largest for question 1 "I am concerned about the development of the global environment" and 5 "I often buy carbon labeled products for the sake of the environment". Both skewness and kurtosis are within the reasonable limits for all variables.

Brown/Green	Control	Binary	Graded	Total
Brown	126	107	114	347
Green	33	30	43	106
Total	159	137	157	453

Table 17 - Descriptive data all groups, environmental concern dummy

To have an overview of the number of respondents that have an average above 4, and thus are environmentally concerned, we created a dummy variable. 106 respondents are labeled green, while the other 347 respondents are labeled brown.

5.3 Analyses

In this chapter, we will present all the analyses we conducted with their results. Prior to conducting the tests to answer our hypotheses, we conducted a correlation analysis on the demographic variables and environmental concern. We then conducted chi-square tests to answer hypothesis 1-4, and binary regression and moderator analysis to answer hypothesis 5-8.

5.3.1 Correlation analyses

We computed a tetrachoric correlation matrix in Stata to see if any of our demographic variables, or our variable for environmental concern were measuring the same effect. The correlation between these variables was tested because we thought one's demographic characteristics could correlate with one's environmental concern.

	Age50	Gender	HigherEd	Population50	DummyEC
Age50	1				
Gender	0.3297	1			
HigherEd	0.0063	0.0164	1		
Population50	-0.0547	-0.0332	0.0114	1	
DummyEC	-0.1326	-0.1619	0.1054	0.045	1

Table 18 - Tetrachoric correlation matrix

We see from table 18 that none of the variables are correlated to an extent where they are measuring the same effect. The highest correlation value is between gender and age = 0.5631, which is natural since a bit more than half of the sample is male.

5.3.2 Testing Hypothesis 1

To test for hypothesis 1, "*Carbon labeling is associated with more purchases of wine contained in climate-smart packaging*", we conducted a chi-square test, comparing the control group to the treatment groups.

Group	Non-CSP	CSP	Total
Control			
Frequency	63	96	159
Expected frequency	53	106	159
Row percentage	39.62	60.38	100
Carbon labeling (binary+graded)			
Frequency	88	206	294
Expected frequency	98	196	294
Row percentage	29.93	70.07	100
Total			
Frequency	151	302	453
Expected frequency	151	302	453
Row percentage	33.33	66.67	100
Pearson chi2(1)=4.3608		**Pr=0.037**	

Table 19 - Chi-square test, hypothesis 1

From the chi-square test, we see that the share of respondents who chose products in CSP is larger for the treatment groups than for the control group. The results are statistically significant ($p<0.05$). This means that there is statistical evidence that carbon labeling is associated with an increase in sales of wine contained in CSP.

Testing hypothesis 1, adjusted for respondents that did not notice the carbon labeling:

Group	Non-CSP	CSP	Total
Control			
Frequency	63	96	159
Expected frequency	51.7	107.3	159
Row percentage	39.62	60.38	100
Carbon labeling (binary+graded)			
Frequency	44	126	170
Expected frequency	55.3	114.7	170
Row percentage	25.88	74.12	100
Total			
Frequency	107	222	329
Expected frequency	107	222	329
Row percentage	32.52	67.48	100
Pearson chi2(1)=7.0680		**Pr=0.008**	

Table 20 - Chi-square test, hypothesis 1, adjusted for those that did not see the carbon labeling

We also wanted to test the effect of the carbon labeling solely on the respondents that indicated that they had noticed the carbon labeling. To do so, we deleted the answers of respondents that said that they did not notice the carbon labeling, which eliminated 124 answers. We then ran the same chi-square test as above. From the test, we see that the share of respondents that chose a product contained in CSP was almost 14 per cent larger for the respondents that had been exposed to a test shop with carbon labeling, than in the control group. The test is statistically significant on a p<.01 level.

5.3.3 Testing Hypothesis 2

To test for hypothesis 2, "*Binary carbon labeling is associated with more purchases of wine contained in climate-smart packaging",* we conducted a chi-square test, comparing the control group to Group 2, the group exposed to binary carbon labeling.

Group		Non-CSP	CSP	Total
Control				
	Frequency	63	96	159
	Expected frequency	57.5	101.5	159
	Row percentage	39.62	60.38	100
Binary				
	Frequency	44	93	137
	Expected frequency	49.5	87.5	137
	Row percentage	32.12	67.88	100
Total				
	Frequency	107	189	296
	Expected frequency	107	189	196
	Row percentage	36.15	63.85	100
Pearson chi2(1)=1.7962			**Pr=0.180**	

Table 21 - Chi-square test, hypothesis 2, on the effect of binary carbon labeling on the choice of packaging

From the chi-square test, we see that the share of respondents that chose products in CSP is larger for the treatment group than the control group. However, the results are not statistically significant (p>0.05). This means that our data does not support the hypothesis that binary carbon labeling is associated with an increase in the sales of wine contained in CSP.

Testing hypothesis 2, adjusted for respondents that did not notice the carbon labeling:

Group		Non-CSP	CSP	Total
Control				
	Frequency	63	96	159
	Expected frequency	58	101	159
	Row percentage	39.62	60.38	100
Binary				
	Frequency	26	59	85
	Expected frequency	31	54	85
	Row percentage	30.59	69.41	100
Total				
	Frequency	89	155	244
	Expected frequency	89	155	244
	Row percentage	36.48	63.52	100
Pearson chi2(1)=1.9511			**Pr=0.162**	

Table 22 - Chi-square test, hypothesis 2, on the effect of binary carbon labeling on the choice of packaging, adjusted for respondents who did not see the carbon labeling

From the chi-square test, we see that the share of respondents who chose a product contained in CSP is 9 per cent larger in the group of respondents who were exposed to binary carbon labeling than in the control group. However, excluding the respondents that did not notice the carbon labeling did not lead to the effect of binary carbon labeling on the choice of product to be statistically significant, although the p-value decreased from 0.180 to 0.162.

5.3.4 Testing Hypothesis 3

To test for hypothesis 3, "*Graded carbon labeling is associated with more purchases of wine contained in climate-smart packaging*", we conducted a chi-square test, comparing the control group to Group 3, the group exposed to graded carbon labeling.

Group		Non-CSP	CSP	Total
Control				
	Frequency	63	96	159
	Expected frequency	53.8	105.2	159
	Row percentage	39.62	60.38	100
Graded				
	Frequency	44	113	157
	Expected frequency	53.2	103.8	157
	Row percentage	28.03	71.97	100
Total				
	Frequency	107	209	316
	Expected frequency	107	209	316
	Row percentage	33.86	66.14	100
Pearson chi2(1)=4.7441			**Pr=0.029**	

Table 23 - Chi-square test, hypothesis 3, on the effect of graded carbon labeling on the choice of packaging

From the chi-square test, we see that the share of respondents choosing wine in CSP is larger for the treatment group than the control group. The results are also statistically significant ($p<0.05$). This means that our data supports the hypothesis that graded carbon labeling is associated with an increase in sales of wine contained in CSP.

Testing hypothesis 3, adjusted for respondents that did not notice the carbon labeling:

Group		Non-CSP	CSP	Total
Control				
	Frequency	63	96	159
	Expected frequency	52.8	106.2	159
	Row percentage	39.62	60.38	100
Graded				
	Frequency	18	67	85
	Expected frequency	28.2	56.8	85
	Row percentage	21.18	78.82	100
Total				
	Frequency	81	163	244
	Expected frequency	81	163	244
	Row percentage	33.2	66.8	100
Pearson chi2(1)=8.4986			**Pr=0.004**	

Table 24 - Chi-square test, hypothesis 3, on the effect of graded carbon labeling on the choice of packaging, adjusted for respondents who did not see the carbon labeling

From the chi-square test, we see that the number of respondents who chose a product contained in CSP is over 18 per cent larger for the respondents in the treatment group. This result is also statistically significant ($p<.01$).

5.3.5 Testing Hypothesis 4

To test for hypothesis 4, "*Graded carbon labeling will have a stronger effect on purchases of wine contained in climate-smart packaging compared to binary carbon labeling*", we conducted a chi-square test, comparing Group 2 to Group 3.

Group	Non-CSP	CSP	Total
Binary			
Frequency	44	93	137
Expected frequency	41	96	137
Row percentage	32.12	67.88	100
Graded			
Frequency	44	113	157
Expected frequency	47	110	157
Row percentage	28.03	71.97	100
Total			
Frequency	88	206	294
Expected frequency	88	206	294
Row percentage	29.93	70.07	100
Pearson chi2(1)=0.5839		**Pr=0.445**	

Table 25 - Chi-square test, hypothesis 4, on the effect of graded carbon labeling vs. the effect of binary carbon labeling

From the chi-square test, we see that the percentage of respondents who chose a product contained in CSP is around 3 per cent larger for the respondents who were exposed to graded carbon labeling than the respondents who were exposed to binary carbon labeling. However, this result is not statistically significant ($p>0.05$). This means that our data does not support the hypothesis that graded carbon labeling has a stronger effect on purchases of wine contained in CSP than binary carbon labeling.

Testing hypothesis 4, adjusted for respondents that did not see the carbon labeling:

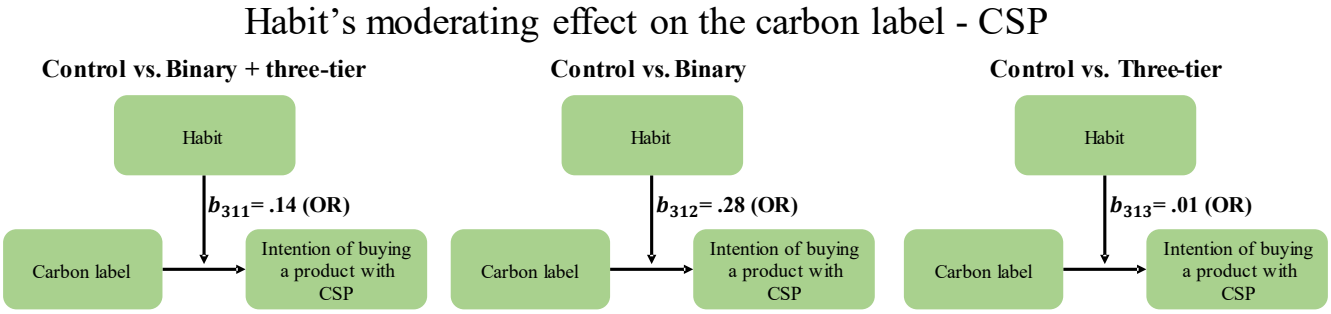
Group	Non-CSP	CSP	Total
Binary			
Frequency	26	59	85
Expected frequency	22	63	85
Row percentage	30.59	69.41	100
Graded			
Frequency	18	67	85
Expected frequency	22	63	85
Row percentage	21.18	78.82	100
Total			
Frequency	44	126	170
Expected frequency	44	126	170
Row percentage	25.88	74.12	100
Pearson chi2(1)=1.9625		**Pr=0.161**	

Table 26 - Chi-square test, hypothesis 4, on the effect of graded carbon labeling vs. the effect of binary carbon labeling, adjusted for respondents who did not see the carbon labeling

From the chi-square test, we see that the share of respondents that chose a product contained in CSP in group 3 is 9 per cent larger than in group 2. However, just as the abovementioned test, the results are not statistically significant. Nevertheless, the p-value decreased dramatically when we adjusted for respondents that did not see the carbon labeling (from 0.445 to 0.161).

5.3.6 Testing for H5 - Habit

To test for hypothesis 5, "*Habit will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where those who are strongly habitual will avoid choosing products contained in climate-smart packaging*", we conducted a moderator analysis, using habit as a moderator.



(OR) signifies the coefficients are expressed in a log-odds metric: Odds ratio
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 8 - Moderation analysis, hypothesis 5, habit's moderating effect on the carbon label, looking at intention of purchasing a product contained in CSP

We found habit to have a non-significant moderating effect on the carbon label (b_{311}=0.14, p=.60; b_{312}=0.28, p=.37; b_{313} =0.01, p=.98), meaning there is no statistical basis to claim that the carbon labels efficiency is moderated by the respondents being habitual when choosing wine. This test looked at the carbon label's effect on the respondents' intention of buying a product with CSP, thus also including light glass bottles. Based on Opinion's qualitative study, we know some respondents have a psychological barrier towards choosing PET bottles. Thus, we wanted to conduct the same test, but this time with the dependent variable being the intention of buying a product contained in a PET bottle, as shown below:

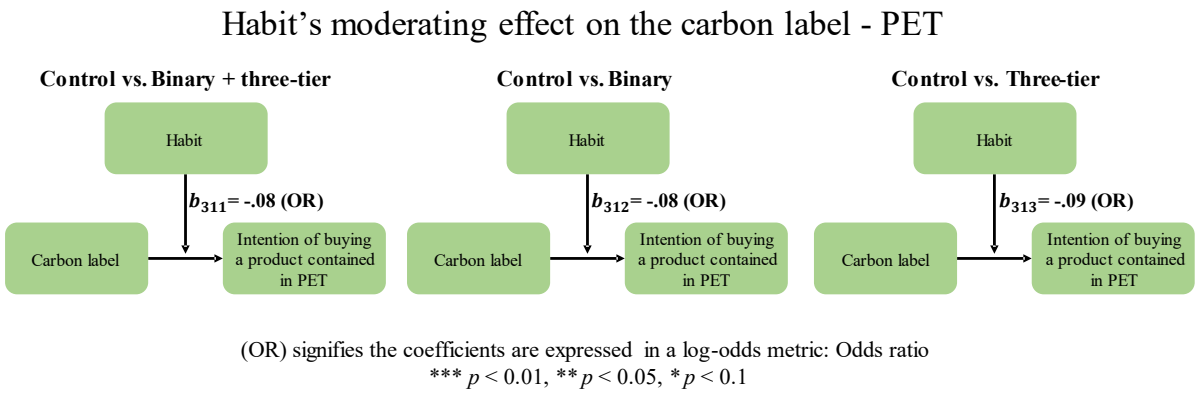


Figure 9 - Moderation analysis, hypothesis 5, habit's moderating effect on the carbon label, looking at intention of purchasing a product contained in PET

When analysing the label's effect on the intention of buying a PET bottle with habit as a moderator, we see that the regression coefficient changes from + to -. Even so, the moderating effect is still not statistically significant, and we cannot state that habit has a moderating effect on the carbon labels effect on purchase intention of PET bottles.

5.3.7 Testing for H6 - Environmental Concern

To test for hypothesis 6, "*Environmental concern will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for those who have a high degree of environmental concern*", we conducted a moderator analysis, using environmental concern as a moderator. In this case, the moderating variable is a dummy variable, where 1 indicates green respondents, and 0 indicates brown respondents.

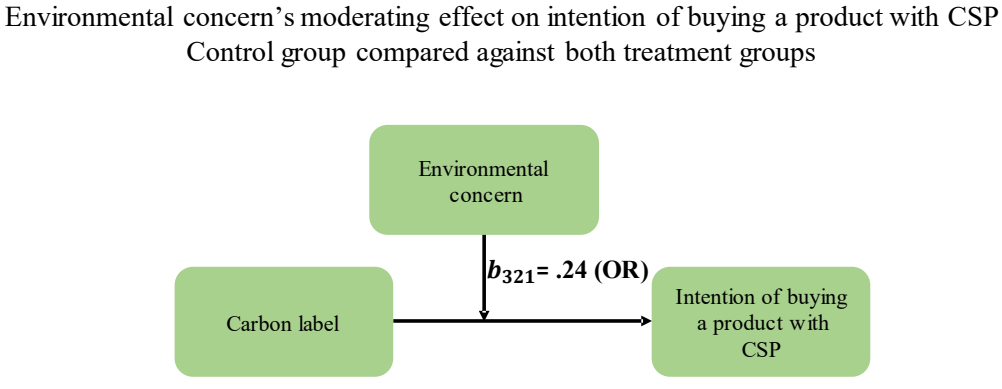
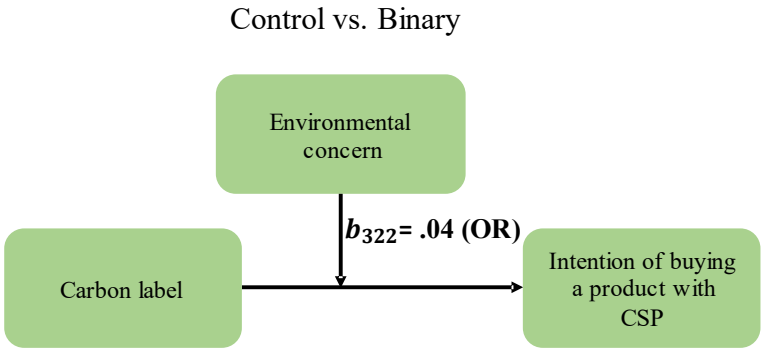
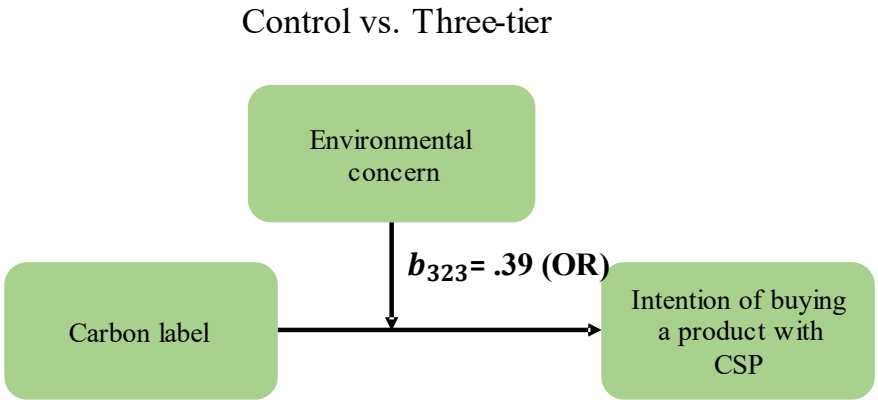


Figure 10 - Moderation analysis, hypothesis 6, control group against both treatment groups



(OR) signifies the coefficients are expressed in a log-odds metric: Odds ratio
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 11 - Moderation analysis, hypothesis 6, control group against binary



(OR) signifies the coefficients are expressed in a log-odds metric: Odds ratio
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 12- Moderation analysis, hypothesis 6, control group compared against graded

When analysing the carbon labels effect on the intention of buying a product with CSP, with environmental concern as a moderator, we find no statistically significant results in any of the analyses (Both b_{321}=.24, p=.65; binary b_{322}=.04, p=.95; graded b_{323}=.39, p=.53). This means that we have no statistical basis to claim that environmental concern will have a moderating effect on the carbon label, or that green respondents will react better to the carbon labeling.

5.3.8 Testing for H7a, b, c, d - Age, Gender, Education and Domicile

To test for hypothesis 7, we conducted four different moderator analyses, using the socio-demographic variables (age, domicile, gender, and education) as moderators. Although presented in the same figure, the demographic variables were analysed one at the time.

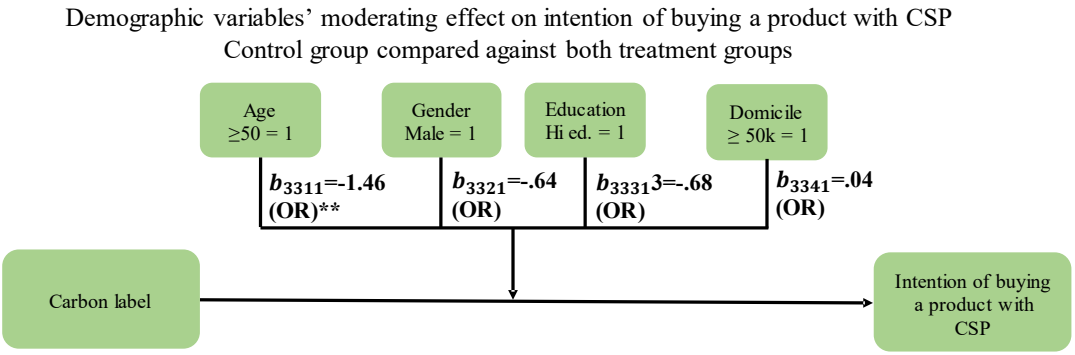
Hypothesis 7 consisted of four parts:

H7a: *Age will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for younger respondents.*

H7b: *Gender will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for women.*

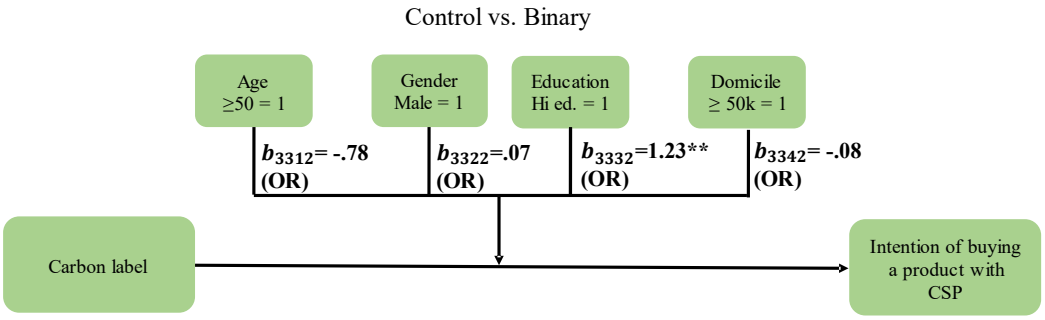
H7c: *Education will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for respondents with higher education.*

H7d: *Domicile will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for respondents living in urban areas.*



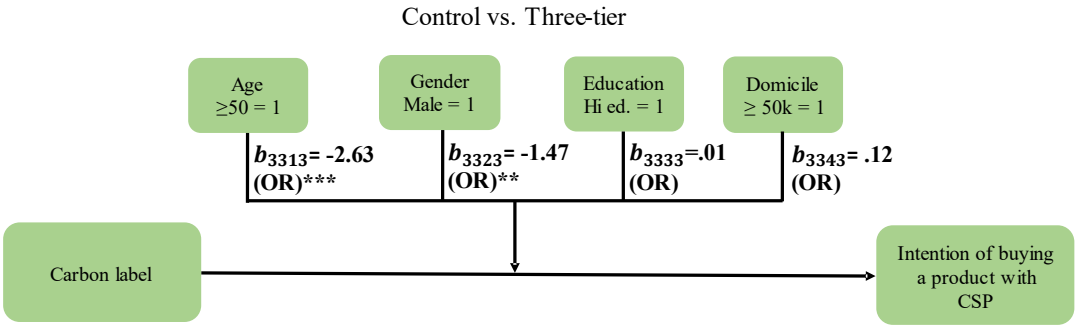
(OR) signifies the coefficients are expressed in a log-odds metric: Odds ratio
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 13- Moderation analysis, hypothesis 7a, b, c, d, control against both treatment groups



(OR) signifies the coefficients are expressed in a log-odds metric: Odds ratio
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 14 - Moderation analysis, hypothesis 7a, b, c, d, control against binary



(OR) signifies the coefficients are expressed in a log-odds metric: Odds ratio
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 15 - Moderation analysis, hypothesis 7a, b, c, d, control against graded

Age as a moderating variable, 1=50 years or older. We see that the variable age has a significant, negative moderating effect (b_{3313}=-2.63, p=.003) on the graded carbon label. When probing the interaction, we see that younger age results in a larger chance of the respondent choosing CSP. When looking at the binary treatment group vs the control group, the moderating effect of age is not significant (b_{3312}=-.78, p=.22). Thus, when looking at both treatment groups as one, compared to the control group, the moderating effect is weaker, with a $p < 0.05$ (b_{3311}=-1.46, p=.0113), but still statistically significant. Also, here, younger age results in a larger share of the respondents choosing CSP.

Gender as a moderating variable, 1=male. When looking at gender as a moderating variable, we find that the moderating effect is only significant when we compare the graded treatment group to the control group (b_{3323}=-.1.47, p=.018). The effect in question is negative, meaning that if the respondent is a man, he is less likely to choose a product contained in CSP, compared

to what a woman would be. The moderating effect of gender is non-significant for binary carbon labeling (b_{3322}=.07, *p*=.90). When looking at gender as a moderating variable overall, the effect is not significant (b_{3321}=-.64, *p*=.17).

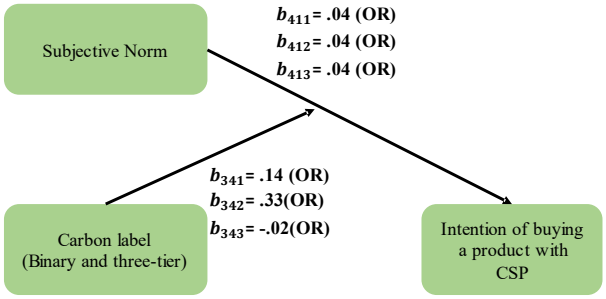
Education as a moderating variable, 1= Higher education. The moderating effect of higher education is only significant when the carbon label is binary (b_{3332}=1.23, *p*=.02). The effect is positive, meaning that a person with higher education will be more affected by the binary carbon labeling than what a person without higher education would be. When using a graded carbon labeling, education does not have a significant moderating effect (b_{3333}=.01, *p*=.99). Which in turn leads to the overall effect of carbon labels to be non-significant (b_{3331}=.68, *p*=.14).

Domicile as a moderating variable, 1=population of municipality is 50k or more. Domicile is not a moderating variable for either of the treatment groups. This means that we have no statistical basis to claim that those who live in densely or sparsely populated municipalities will be affected differently by the carbon labeling.

Testing for H8 - Carbon Labels and Subjective Norms

To test for hypothesis 8 "*Carbon labels will have a positive moderating effect on subjective norms, where the respondents who choose wine contained in climate-smart packaging to a higher degree will believe their friends would choose the same or a similar product when a carbon label has been present"*, we conducted a moderation analysis using PROCESS-macro in SPSS. Intention of buying a product with CSP was set as the dependent variable, and carbon label was set as the moderating variable to test its effect on the independent variable, subjective norm.

The carbon label's moderating effect on subjective norm



(OR) signifies the coefficients are expressed in a log-odds metric: Odds ratio
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 16 - Moderating analysis, hypothesis 8, 1) control vs both treatment groups,2) control vs binary, 3) control vs graded

When testing for the carbon labels' moderating effect on subjective norms, we want to see if respondents who chose a wine product contained in CSP believed their friends would want to buy the same or a similar product to a higher degree when exposed to a carbon label, than when there is no carbon label present in the web shop. None of the tests were statistically significant (b_{341}=.14, p=.59; b_{342}=.33, p=.31; b_{343}= -.02, p=.95), thus hypothesis 8 is rejected since there is no significant relationship between any of the variables.

5.4 Analysis Summary

HYPOTHESIS	RESULTS
Hypothesis 1: Carbon labeling is associated with more purchases of wine contained in climate-smart packaging	**Supported**
Hypothesis 2: Binary carbon labeling is associated with more purchases of wine contained in climate-smart packaging	Not supported
Hypothesis 3: Graded carbon labeling is associated with more purchases of wine contained in climate-smart packaging	**Supported**
Hypothesis 4: Graded carbon labeling will have a stronger effect on purchases of wine contained in climate-smart packaging compared to binary carbon labeling	Not supported
Hypothesis 5: Habit will moderate the carbon label's effect on the share of purchased products in climate-smart packaging, where those who are strongly habitual will avoid choosing products contained in climate-smart packaging	Not supported
Hypothesis 6: Environmental concern will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for those who have a high degree of environmental concern	Not supported
Hypothesis 7:	
7a: Age will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive efect of the label will be stronger for younger respondents	
Binary+Graded	**Supported**
Binary	Not supported
Graded	**Supported**
7b: Gender will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for women	
Binary+Graded	Not supported
Binary	Not supported
Graded	**Supported**
7c: Education will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for respondents with higher education	
Binary+Graded	Not supported
Binary	**Supported**
Graded	Not supported
7d: Domicile will moderate the carbon label's effect on the share of purchased products contained in climate-smart packaging, where the positive effect of the label will be stronger for respondents living in urban areas	
Binary+Graded	Not supported
Binary	Not supported
Graded	Not supported
Hypothesis 8: Carbon labels will have a positive moderating effect on subjective norms, where the respondents who choose wine contained in climate-smart packaging to a higher degree will believe their friends would choose the same or a similar product when a carbon label has been present	
Binary+Graded	Not supported
Binary	Not supported
Graded	Not supported

Table 27 - Analysis summary

6. Discussion

6.1 Interpretation of Results

The primary hypothesis of this research was "Carbon labeling is associated with more purchases of wine contained in climate-smart packaging". Based on our analysis, the data supports this hypothesis. Carbon labeling is associated with a higher share of consumers purchasing wine contained in CSP. This is also in line with previous studies (Onwezen, Antonides, & Bartels, 2013; Rezvani, Jansson & Bengtsson, 2017; Sun & Trudel, 2017)

We know from Opinion's and Vinmonopolet's qualitative and quantitative studies that quality and recommendations from employees are big drivers for purchase for the consumers of Vinmonopolet. The carbon label in the web shop can be seen as a recommendation from Vinmonopolet, indicating quality and sustainability, which can be part of the explanation as to why the carbon label is effective. This would indicate that companies who wish to encourage their consumers to behave in a more sustainable manner, can use carbon labels to do so.

6.1.1 Binary

We also wanted to isolate the effect of the independent variable binary carbon label on the dependent variable purchase of CSP. Previous studies have shown that consumers are more susceptible to positive attribute messages than negative (Beach, Puto, Heckler, Naylor, & Marble, 1996; Buda & Zhang, 2000; Levin & Gaeth, 1988), and we therefore wanted to test the effect of the carbon label when we only labeled the products contained in CSP. However, our results were not statistically significant, and we could not prove that binary carbon labeling was associated with increased sales of wine contained in CSP. This could be due to the lack of information a binary label entails - since only some products are marked, the respondents are not able to know how much better the labeled products are compared to those which are not labeled. Perhaps they believe the difference is not significant enough for them to re-evaluate their purchasing decision. This is also consistent with theory that says that a binary carbon label makes it hard for consumers to evaluate how other products perform on the chosen criteria (Grankvist et al., 2004; Kimura et al., 2010).

6.1.2 Graded

When isolating the effect of the independent variable: Graded carbon labeling on the dependent variable: Purchase of CSP, we found a strong statistical significant relationship, and hypothesis 3 was supported by the data. This corresponds with previous studies that have found that using colours to signal whether a product performs well, average or poor, significantly increases the effectiveness of the carbon label (Thøgersen et al., 2016). This is partly because the colours make the label easy to understand for the consumers (Thøgersen et al., 2016; Bargh, 1992), but also because consumers have a need to avoid the products which are labeled as red (Borin, et al., 2011; Van Dam & De Jonge, 2015).

6.1.3 Binary vs. Graded

Our analysis said that graded carbon labeling was significantly better than no labeling, while the binary label was not significantly better than no label. Thus, we also wanted to check whether a graded label was significantly better than a binary label in encouraging the consumers to choose wine contained in CSP. Based on theory, we developed hypothesis 4, saying that graded carbon labeling would lead to a higher increase in the share of respondents who purchased wine contained in CSP than binary carbon labeling. Thøgersen et al., (2016) found that traffic-light carbon labeling is more effective in changing consumer behaviour towards sustainable alternatives than binary, due to the increased effectiveness of the graded carbon label. Furthermore, studies have found that poor ratings (red carbon labels) would have a negative effect on the consumers perception of the product (Grankvist & Biel, 2007; Grankvist et al., 2004; Van Dam et al., 2015).

When comparing the effect of graded and binary carbon labeling, the results were not statistically significant, and hypothesis 4 was not supported. This was surprising, as we got strong statistical results when comparing graded carbon labeling to the control group, while we did not get statistically significant results when comparing the binary carbon labeling to the control group. We see that when adjusting for respondents that did not see the carbon labeling, the p-value decreased significantly (from 0.445 to 0.161) This indicates that the graded carbon labeling is more effective than the binary carbon labeling when noticed. However, these results are not statistically significant. Another possible reason that the hypothesis was not supported, is that while the difference between no carbon labeling and graded carbon labeling is very noticeable, the difference between binary and graded carbon

labeling is less noticeable, which would explain our results. It is also possible that the results would have been more significant if the sample was bigger.

6.2 Moderator analyses

When conducting the moderator analyses, we looked at the moderating effects on 1) carbon labels overall, treating both treatment groups as one, 2) binary carbon label, 3) graded carbon label. Here we discuss the findings in relation to theory.

6.2.1 Habit as a Moderator

Treating the habit of purchasing wine contained in glass bottles as a boundary, we developed hypothesis 5 which said that habit would have a negative moderating effect on the carbon label. This hypothesis was rejected for all three scenarios, which means that even though a person tends to buy the same, or similar wine products every time they shop at Vinmonopolet, they will still be open to buy wine contained in CSP. This is positive, as it implies that consumers are open to trying new packaging types. From the descriptive data, we saw that consumers on average answered that they were often open to trying new things, although they simultaneously indicated that they choose their wine from a set of products that they already know from before. We also know from previous research that Vinmonopolet's consumers would choose products contained in CSP if the product they wanted existed in CSP. This could indicate that consumers are open to trying products contained in CSP when they are made aware of them, through a carbon label for example.

6.2.2 Environmental Concern as a Moderator

Hypothesis 6 predicted environmental concern to have a positive moderating effect on the carbon label, as this has been proven in previous research (Thøgersen & Nielsen, 2016). For our instance, this was not the case as the hypothesis was rejected for all three scenarios. This means that the carbon label is just as efficient in motivating consumers to choose wine contained in CSP for those who are concerned with the environment as those who are not concerned. This result was quite surprising, but also promising, as it means that the carbon label has the same effect on consumers that are considered green, as consumers that are considered brown. Reasons for this could be the intuitive design of the label, which does not require the respondent to be knowledgeable on subjects such as carbon emissions in the

product's life cycle, or carbon footprints to understand that the label indicates that the product has a positive attribute. Another possible reason that our results differed from previous studies, could be that the share of respondents that were labeled as green in each group was quite low, at approximately 25 per cent of the sample in each group, which could have led to the hypothesis not being supported. We also tested if the results would be different when only labeling respondents that had an average of 4.5 or above on the questions measuring environmental concern, to test if a higher degree of environmental concern would have an effect, but the results remained the same.

6.2.3 Socio-demographic Variables as Moderators

When testing the effect of the moderating socio-demographic variables, the results varied across the different scenarios. What we saw with carbon labels as a whole was that **age** was significant, where an older person would be less inclined to choose CSP. As mentioned earlier, this fits well with previous research, but none of the other moderating variables had a significant moderating effect when looking at the two carbon labels as one. This is not in line with previous research, but it is positive for Vinmonopolet. Since Vinmonopolet cannot market themselves or their products, they cannot create market campaigns to reach certain segments. Thus, if socio-demographics does not have a significant moderating effect on the carbon label it means that the carbon label will be equally efficient on all the socio-demographics tested - with the exemption of those who are older than 50 years old.

Why the other moderating variables did not have a significant moderating effect on carbon labels as a whole could for the case of **education** be due to the increased awareness of climate change and the importance of sustainable consumption in the Norwegian society, it is no longer needed to undertake a higher degree to be aware of the importance of sustainable consumer behaviour. The same reasoning could be true for **domicile** and **gender**, the difference in awareness between those who live in more urban areas compared with those who live in more sparsely populated areas, and between men and women, is less than what previously found in research.

6.2.4 Carbon Label as a moderator on Subjective Norm

Subjective norm is a function of normative beliefs and social compliance. We wanted to see whether the carbon labels could increase the effect of subjective norms positively towards

choosing products contained in CSP. We did not find any statistically significant relationship here, meaning that we could not say that the respondents thought their friends would choose the same or a similar product to them to a higher degree when choosing a product contained in CSP, compared to non-CSP.

Even though we did not find a significant relationship between subjective norms and purchase of products contained in CSP or non-CSP, nor for carbon labels as a moderator on subjective norms, this does not necessarily mean that these relationships are non-significant in real life. This will be elaborated on in chapter 6.4 about limitations of our study.

6.3 Implications of findings

In this study we aimed to look at the effect of carbon labeling on encouraging sustainable behaviour. Although we looked specifically at the case of Vinmonopolet, our aim is that the results can be applicable for other beverage suppliers and consumer goods suppliers as well.

6.3.1 Theoretical Implications of Findings

From the theory of reasoned action, we know that a person's belief about the consequences of engaging in a certain behaviour, and the person's evaluation of the significance of those consequences, affect the person's intention of purchasing wine contained in CSP. Thus, we wanted to change the respondents' belief and evaluation of the consequences by the use of relevant tools from the SHIFT-framework. These tools were information and prompts, in the form of a carbon label, which were used to shift consumer behaviour towards sustainable consumer behaviour.

Like previous studies, we found that carbon labeling has a positive effect on the purchase of products which are awarded the label, and that graded carbon labeling was especially efficient. However, we did not find that binary carbon labeling led to a significant increase in the share of products with CSP purchased, nor did we find that graded labeling was significantly better than binary labeling, both of which is not in line with previous studies.

Our study is conducted as a lab-in-the-field experiment, which makes it more likely that our results are also applicable to the relevant context (Gneezy et al., 2017), which is adults purchasing wine online. We find statistically significant results when testing the effect of

carbon labeling and graded carbon labeling on the purchase of wine contained in CSP. These results are significant both when we adjust for respondents who indicate that they did not see the carbon labeling, and when we do not. Our study therefore demonstrates that even when consumers are not conscious of the carbon labeling, it has an effect on consumer behaviour. When we adjust for respondent who did not see the carbon labeling, the results when testing both carbon label overall and graded carbon labeling are significant ($p<0.01$). Our findings are relevant for Vimonopolet and other actors in the market that sell wine in web shops.

This study fills a void in existing theory by looking at the effect of carbon labeling of the wine packaging in encouraging sustainable consumer behaviour when shopping online. Additionally, we have compared the effect of binary labeling to graded labeling and found that graded labeling is significantly better than no labeling, whilst we cannot say that graded labeling is significantly better than binary labeling.

6.3.2 Practical Implications of Findings

The aim of the study is to investigate how retailers can encourage sustainable behaviour in the wine market, as this is currently not the case. For wine bottles, the packaging stands for 40 per cent of the environmental footprint of the product (Vinmonopolet, 2021) and getting consumers to switch to more sustainable options would therefore be a big step in the right direction. However, lack of information is a barrier for consumers' sustainable actions. In this study, we have found that the use of carbon labeling is a great tool to encourage consumers to act more sustainably. We have found that if a retailer currently does not use carbon labeling on their products, implementing graded carbon labeling will have a positive effect on the purchase of climate-smart products. However, if a retailer currently uses binary carbon labeling, we do not have data to support that a switch to graded carbon labeling should be implemented. When conducting the moderator analyses, we found that age, gender and education can have a moderating effect on the effect of carbon labeling. However, this moderating effect varied across the different kinds of carbon labeling. It is worth to note that for a supplier that has no way of differentiating between their consumers, it is positive that demographic variables do not have much of an effect. For suppliers that have this opportunity, it can be valuable to look further into the moderating effects in order to customize the carbon

labels accordingly. Our recommendations for Vinmonopolet would therefore be to implement graded carbon labeling in their web shop.

In our study, we have only looked at carbon labeling of wine bottles. However, Vinmonopolet uses many other packaging types for their wines, such as bag-in-box, pouches, and smaller cartons. As we have not tested the use of carbon labels on these products, we cannot conclude on whether carbon labeling would be effective on these kinds of packaging. While a PET bottle, light glass bottle and heavy glass bottle look almost the same to the consumer in a web shop, this is not the case for other packaging types. It is therefore a possibility that the effect of carbon labeling on these products will be lower, or non-existing. However, we know that bag-in-box is already a popular product among Vinmonopolets consumers, while pouches and smaller cartons are not (Opinion, 2020). Subsequently, it would be interesting to look at what effect carbon labeling would have on these products.

When analysing the data, we noticed that a large share of the respondents in the treatment groups (42 per cent) indicated that they had not noticed the carbon labeling. Although results indicate that the carbon labeling had an effect even though respondents indicated that they had not noticed it, this implicates that the carbon label must be very clear for the respondents to register it consciously. This way, the carbon label can create relevant cognition and activate system 2 thinking within the consumer (Kahneman, 2003, 2011).

The focus in this study was the Norwegian market, which has a very distinct wine market with one monopolist. Although this is not the case in most countries, the findings can be relevant to other Nordic countries that have the same system, such as Sweden, Finland, and Iceland. The advantage of being a monopoly is that the supplier then can ensure that the carbon labeling is the same for all products across the country. This will also make it easier for consumers to grasp the concept. Because consumers in these countries only have one designated seller of wine, it is easy to ensure that all the consumers are exposed to the information, and that the information comes from a reliable source. It is also worth noting that consumers tend to think that plastic bottles with take-back are more environmentally friendly than plastic bottles without (Opinion, 2020). This is also a system that is well enrooted and supported by Norwegian consumers. It is therefore not certain that the results are transferable to markets that do not have take-back systems. However, if suppliers communicate efficiently to

consumers that PET bottles are more sustainable than glass bottles, even without the take-back system, they might have the same results with carbon labeling as found in this study.

The study was conducted in the setting of a web shop, and the results are relevant for other suppliers that sell wine online, such as online wine stores and online retail stores. However, studies have found that eco labels are most effective when they are presented by a third-party, as this gives assurance to the consumers and reduces potential greenwashing from producers (Delmas & Gergaud, 2021). While monopolists can be seen as third parties as they do not produce their own products or have any competitors in the market, it is possible that eco-labeling would not be as efficient in markets with competition. This does not mean however that the results are not relevant for online wine sellers in other markets, but it means that these actors have to be aware of how the labeling is presented so that it appears credible to the consumers. If not, there is a risk that the labeling will not have an impactful effect on consumer behaviour.

6.4 Limitations of the Study

The study has some limitations that we will address in this chapter.

The experiment only tested intended behaviour and not actual behaviour

Being an experiment conducted in a fictional web shop, we have only been able to measure intended purchasing behaviour. Thus, we cannot with certainty say that the respondents would have made the same choices in real life. However, as mentioned in chapter 4.3, the study was conducted as a lab-in-the-field study. The chances of the results being applicable to real life are therefore higher than they would be if the experiment was to be conducted as a lab experiment. It is therefore more likely than not that the results are a realistic picture of actual behaviour, and that we would see similar results if carbon labeling was to be implemented in Vinmonopolet's web shop.

Respondents did not get the opportunity to touch the physical product

The study investigates the effect of carbon labeling in a web shop, which implies that respondents do not have the opportunity to touch the product before making the purchasing decision. Because the qualities of a plastic bottle and a glass bottle are quite different, it is possible that touching the products would have led to some respondents choosing differently

than they did in the experiment. When analysing the data, we found that respondents had not always been aware of what packaging their chosen product was contained in. This was especially the case with heavy and light glass bottles. Because we just wanted to test whether the respondents chose products contained in CSP or not, we did not adjust for this. The mentioned factors could have led the results to be different if the experiment were to be conducted in a physical store.

Different design on the bottles might have led to statistical noise in the results

To make the experiment as similar to a real-life shopping experience as possible, we decided to use products that currently exist in Vinmonopolet's product selection. Because of this, the 12 products in the test shop differ in design. For some respondents, the bottle design can be an important factor when choosing a product, and maybe even more important than carbon labeling or other relevant attributes. The difference in design might therefore have led to statistical noise because there are more elements than the carbon labeling that can have affected the respondent's choice of product.

Only one price point was subject of this experiment

In our study, we only included wines in the price point of NOK 100-150, which is not considered to be very expensive for a wine in Norway. It is possible that the results would have been different if the tests were to be conducted at a higher price point. This was the case for Delmas and Lessem's (2017) study, where they found eco labels to have positive effects for wines which were priced relatively low, whilst the label had a negative effect on the wines which were priced relatively high. However, Vinmonopolets mission is that all new wines in the price point of NOK 100-150 will be contained in CSP (Miljøfyrtårn, 2020), while the same goal has not been set for more expensive wines. Therefore, the lower price point was used in this experiment.

Skewed sample

The sample had an overrepresentation of men, and respondents above the age of 50. Because of this, we cannot conclude that the results are generalisable and applicable to the entire population, which is everyone in Norway above 18 years, and that has shopped at Vinmonopolet within the last year. However, it is worth noting that theory suggested that female respondents and younger respondents would act more sustainably, so it is promising

that we obtained statistically significant results when the sample consisted mostly of men over 50 years.

Subjective norms not adequately measured

Because the respondent will evaluate the questions of whether their friends would buy the same or a similar product based on more elements than solely the packaging, the responses might be based on other attributes of the wine. Thus, we might not have been able to capture subjective norms in relation to the choice between CSP and non-CSP to a sufficient degree. This a source of statistical noise when looking at subjective norms' effect on the dependent variable: Intended purchase of wine contained in CSP. Furthermore, the concept of subjective norms is complex, and might require a higher number of questions to be properly measured.

Still, we decided to create a variable for subjective norms based on our questions, as we did not have any other way of measuring the phenomenon.

6.5 Future Research

The study discovered several elements that would be interesting to look at in more depth. In this chapter, we will go through some of them.

Effect Over Time

Being a cross-sectional study, we were not able to look at the effect of the carbon labels at different points in time. It would be interesting to see if the effect of the label changed for the individual respondents. As earlier stated, the respondents were not able to touch and feel the bottles, and some believed they had chosen another type of packaging than what they actually had. It is easy to imagine that a person who normally buys wine contained in heavy glass bottles might have chosen a PET bottle in the experiment without realising. As a result, they could be disappointed when receiving the product, and possibly decide not to buy PET again. It would also be interesting to investigate if those who did not choose a CSP product the first time, perhaps would choose to do so the second time after being more familiar with the carbon label.

Effect in the stores

Due to practical issues and the unprecedented times we live in, we did not have the opportunity to test the carbon labeling in a physical Vinmonopolet store. However, as the majority of Vinmonopolet's consumers shop their products in the store and not on the website, it would be valuable to look into how the carbon labeling would affect consumers if it were to be displayed at Vinmonopolets stores. This would also give the opportunity to add more elements such as information about the meaning of the labeling, personal information from the employees, the implications of the packaging and such, which could lead to interesting results.

Test carbon labeling in combination with other nudges

Previous studies have shown that prompts such as carbon labeling can be a good initial behaviour change strategy, as they are easy to employ and cost-effective (Schultz, Oskamp and Mainieri, 1995). However, they are best utilized in combination with other strategies (Delmas, Fischlein, and Asensio (2013). It would therefore be interesting to combine the carbon labeling with other strategies, such as information about quality or further information as to why plastic bottles are the most sustainable option. It would be especially interesting to investigate whether this would increase the effect of the binary carbon labeling on purchase of CSP, as we did not find binary carbon labeling to influence consumer behaviour on its own in this study.

7. Conclusion

To live sustainably is to adjust one's consumption so that the needs of the present are not compromising the needs of future generations. Today, most of us are not living in a sustainable manner. However, many businesses have a stronger focus on sustainability than ever, also in the beverage industry, and it is crucial that consumers support and adapt to this trend. In the Norwegian wine market, barriers to sustainable behaviour have been recognized as cognition of what products are contained in climate-smart packaging and habit. The purpose of this study has been to investigate how carbon labeling can be used to encourage sustainable behaviour in the wine market through answering the following research question:

Does carbon labeling have a positive effect on consumers' intention of purchase of wine contained in CSP, and, if so, is a binary or graded carbon label more effective?

To answer the research question, we conducted an experiment where three groups were exposed to three different versions of Vinmonopolets web shop. One group was the control group, another group was exposed to binary carbon labeling, while the last group was exposed to graded carbon labeling. The respondents were asked to choose a wine in the web shop, before being sent to the questionnaire. The relevant population of the experiment was Norwegians over 18 years old, who had shopped at Vinmonopolet within the last year. The experiment was sent out through Norstat, and the final sample consisted of 453 respondents. The respondents' choices of wine, and their answers to the questionnaire made up the primary data that was used to test our hypotheses.

We found that carbon labeling has a positive effect on consumers' intention of purchasing wine contained in CSP. When differentiating between the two forms of carbon labeling, we found that graded carbon labeling had a statistically significant positive effect on consumers' intention of purchase, while binary carbon labeling had a positive, but non-significant effect, when comparing the treatment groups to the control group. When comparing the two treatment groups to each other, we did not find a statistically significant difference between the two types of carbon labeling. This means that while carbon labeling has a positive effect on consumers' intention of purchasing wine contained in CSP, we cannot conclude on which type of carbon labeling leads to the largest effect.

When testing for moderating effects we found that habit did not prevent respondents from choosing wine contained in CSP. Furthermore, we found that age had a negative moderating effect on carbon labels overall, meaning that the carbon labels had a lesser effect on those over the age of 50. None of the other socio-demographics had significant moderating effects on carbon labels overall, which is positive for Vinmonopolet as they are not able to market themselves to affect certain segments. It was especially surprising that environmental concern did not have a significant moderating effect on carbon label, as this has been proved in previous studies.

We also tested if carbon labeling moderates the effect of subjective norms on consumers' intention of purchase of wine contained in climate-smart packaging. This relationship was non-significant for both carbon labels, and we could therefore not say that a carbon label will change the effect of respondents' subjective norm on the choice between CSP and non-CSP.

Based on these findings, actors in the wine market that wish to encourage their consumers to behave more sustainably and that currently do not make use of carbon labeling, should introduce graded carbon labeling of their products. However, we do not have the basis to claim that actors that currently use binary carbon labeling should make the transition to graded carbon labeling, as it has not been found to be significantly better than binary labeling. We did not find very strong moderating effects, which for companies that do not have the possibility to differentiate between their consumers is positive.

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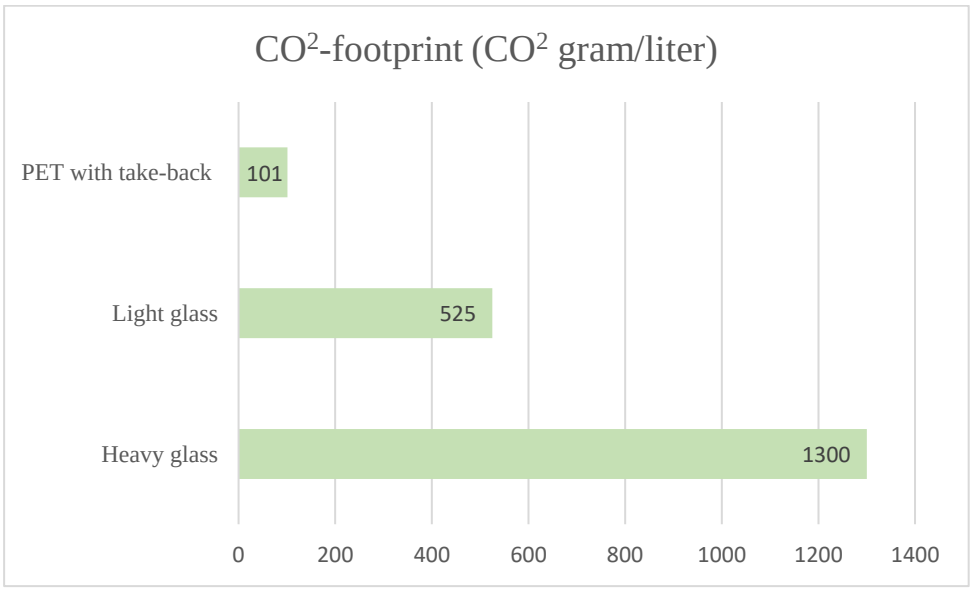
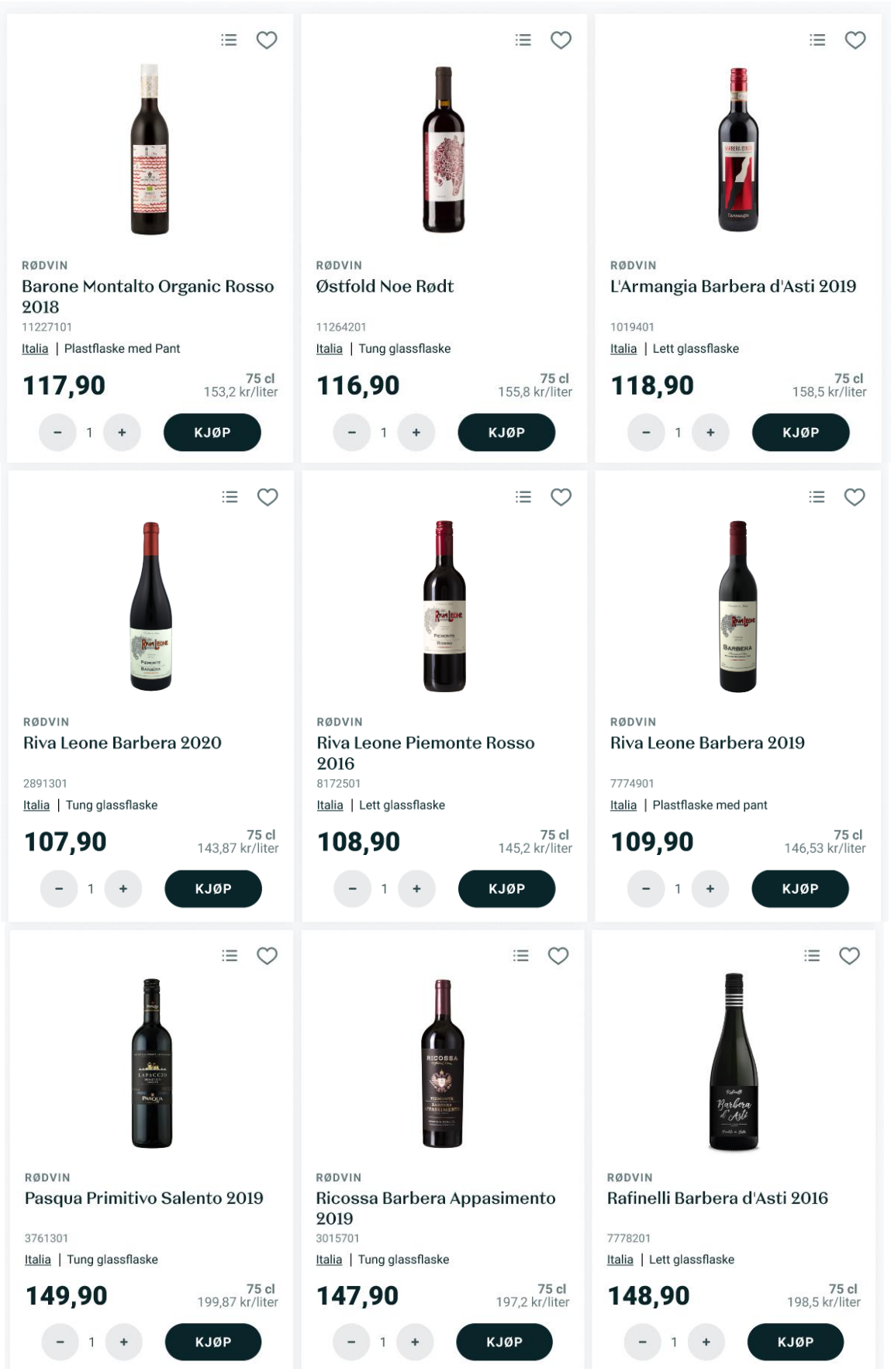
8. APPENDIX

Appendix A: Carbon footprint according to packaging type



Appendix B: Complete Wine Selection



RØDVIN
Barone Montalto Organic Rosso 2018
11227101
Italia | Plastflaske med Pant
117,90
75 cl
153,2 kr/liter
− 1 + KJØP

RØDVIN
Østfold Noe Rødt
11264201
Italia | Tung glassflaske
116,90
75 cl
155,8 kr/liter
− 1 + KJØP

RØDVIN
L'Armangia Barbera d'Asti 2019
1019401
Italia | Lett glassflaske
118,90
75 cl
158,5 kr/liter
− 1 + KJØP

RØDVIN
Riva Leone Barbera 2020
2891301
Italia | Tung glassflaske
107,90
75 cl
143,87 kr/liter
− 1 + KJØP

RØDVIN
Riva Leone Piemonte Rosso 2016
8172501
Italia | Lett glassflaske
108,90
75 cl
145,2 kr/liter
− 1 + KJØP

RØDVIN
Riva Leone Barbera 2019
7774901
Italia | Plastflaske med pant
109,90
75 cl
146,53 kr/liter
− 1 + KJØP

RØDVIN
Pasqua Primitivo Salento 2019
3761301
Italia | Tung glassflaske
149,90
75 cl
199,87 kr/liter
− 1 + KJØP

RØDVIN
Ricossa Barbera Appasimento 2019
3015701
Italia | Tung glassflaske
147,90
75 cl
197,2 kr/liter
− 1 + KJØP

RØDVIN
Rafinelli Barbera d'Asti 2016
7778201
Italia | Lett glassflaske
148,90
75 cl
198,5 kr/liter
− 1 + KJØP

Appendix C: Questionnaire in English (Translated)

Vinmonopolet - Labeling

Start of Block: Wine Selection

WineChoice Thank you for purchasing..
(the wine you chose has already been filled in below)

▼ Barone Montalto Organic Rosso 2018 (1) ... Il Portone Montepulciano d'Abruzzo (12)

PleaseContinue Please press the arrow in the corner to continue the survey

Page Break

Display This Question:

If Thank you for purchasing..(the wine you chose has already been filled in below) = Barone Montalto Organic Rosso 2018

p01

Display This Question:

If Thank you for purchasing..(the wine you chose has already been filled in below) = Østfold Noe Rødt

p12

Q2ViktigeElementer About your product choice

How important were these elements for the product you chose?

Please rate these elements on a scale from 1-5, where 1 is "Not important" and 5 is "Very important".

	1 (1)	2 (13)	3 (12)	4 (7)	5 (15)
High quality (1)	○	○	○	○	○
I wanted to try something new (2)	○	○	○	○	○
Price (3)	○	○	○	○	○
The product looks like what I normally buy (4)	○	○	○	○	○
The design of the bottle (5)	○	○	○	○	○
Product with climate-smart packaging (6)	○	○	○	○	○
Manufacturer/brand (7)	○	○	○	○	○

Page Break

Q3Emballasjetype About your product choice

What packaging type did the product you chose have?

- ○ Glass bottle (1)
- ○ Light glass bottle (2)
- ○ Plastic bottle with pant (3)
- ○ I don't know (4)

Display This Question:

If About your product choice What packaging type did the product you chose have? = Glass bottle

Or About your product choice What packaging type did the product you chose have? = Light glass bottle

Or About your product choice What packaging type did the product you chose have? = Plastic bottle with pant

Q4DyrerePrisklasse About your product choice

Would you choose a product with the same packaging type in a more expensive price class (over 250 kroner)?

- Yes (1)
- No (2)

Page Break

Q5likert About your product choice

Please indicate to which degree you agree/disagree with the following claims:

	Strongly disagree (1)	Disagree (2)	Neither (3)	Agree (4)	Strongly agree (5)
I think I'll be happy with the wine I chose (1)					
I think I'll regret my choice of wine (2)					
My friends could buy the same product as me (3)					
My friends could buy a similar product (4)					
I would serve the wine I chose at a dinner party I hosted for my friends (5)					

Page Break

Q6Polkunde Your wine habits in general

Have you purchased wine at Vinmonopolet the last year?

- Yes (1)
- No (2)

Q7LikerRodvin Do you like red wine?

- ○ Yes (1)
- ○ No (2)

Page Break

Q8ViktigVinkjop Your wine habits in general

To which degree are these elements important to you when you normally purchase wine?

Please rate these elements on a scale from 1-5, where 1 is "Not important" and 5 is "Very important".

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)
High quality (1)	○	○	○	○	○
To try something new (2)	○	○	○	○	○
Price (3)	○	○	○	○	○
The product looks like what I normally buy (4)	○	○	○	○	○
The design of the bottle (5)	○	○	○	○	○
Product with climate-smart packaging (6)	○	○	○	○	○
Manufacturer/brand (7)	○	○	○	○	○

Page Break

Q9Vinvaner Your wine habits in general

Please indicate to which degree you disagree/agree with the following claims:

	Strongly disagree (1)	Disagree (2)	Neither (3)	Agree (4)	Strongly agree (5)
I consider myself a wine expert. (1)	○	○	○	○	○
I have broad knowledge about wine (2)	○	○	○	○	○
When purchasing wine, I choose from a selection of wines I know and that I know I like (4)	○	○	○	○	○
When I purchase wine I am normally open to trying new products (5)	○	○	○	○	○
When purchasing wine I want to try new products (6)	○	○	○	○	○
When purchasing wine I weigh quality stronger than price (7)	○	○	○	○	○
When purchasing wine I weigh price stronger than quality (8)	○	○	○	○	○

Page Break

Q10Omgangskrets General about you

Please indicate to which degree you agree with the following claim

	Strongly disagree (1)	Disagree (2)	Neither (3)	Agree (4)	Strongly agree (5)
To me, its important not to stand out from my circle (1)	○	○	○	○	○

Page Break

Q11Miljoprofil General about you

Please indicate to which degree you agree with the following claims

	Strongly disagree (1)	Disagree (2)	Neither (3)	Agree (4)	Strongly agree (5)
I am worried about the development of the global climate changes (1)	○	○	○	○	○
I feel like I have a moral obligation to choose environmentally friendly products (2)	○	○	○	○	○
I am worried that people don't care enough about climate changes (3)	○	○	○	○	○
have swapped from one brand to another for the sake of the environment (4)	○	○	○	○	○
I often buy eco-labeled products for the sake of the climate (5)	○	○	○	○	○

Page Break

SeMiljomerking Did you notice the carbon labeling in the web shop?

○ Yes (1)

○ Noi (2)

Display This Question:

If Did you notice the carbon labeling in the web shop? = Yes

MiljomerkingPavirket To which degree did the carbon label affect your choice of wine?
Please rate the influence on a scale from 1-5m where 1 is "Very little" and 5 is "Very much".

	1 (1)	2 (2)	3 (4)	4 (5)	5 (6)
To which degree did the carbon labeling affect your choice of wine (1)	○	○	○	○	○

Page Break

Q12Alder General about you

How old are you?

- 18-29 (1)
- 30-39 (3)
- 40-49 (4)
- 50-70 (5)
- 70+ (7)
- Do not wish to answer (8)

Q13Kjonn What is your gender?

- Male (1)
- Female (2)
- Non-binary (3)
- Do not wish to answer (4)

Q14Utdanning What is the highest level of education you have completed?

- Primary school (1)
- High school (2)
- Bachelor's degree (3)
- Master's degree (4)
- Phd (5)
- Vocational school (6)

Q15Innbyggere How big is the municipality you live in?

- Over 100.000 inhabitants (1)
- 50.000-100-000 inhabitants (2)
- 10.000-49.000 inhabitants (3)
- 0-9.999 inhabitants (4)

Page Break

Appendix D: Detailed wine choice of respondents

Wine chosen by the respondent	Packaging type	Control	Binary	Three-tier	Total
Barone Montalto Organic Rosso 2018	PET	17	8	25	50
Østfold Noe Rødt	Heavy glass	6	6	3	15
L'Armangia Barbera d'Asti 2019	Light glass	19	23	15	57
Riva Leone Barbera 2020	Heavy glass	4	2	4	10
Riva Leone Piemonte Rosso 2016	Light glass	9	8	6	23
Riva Leone Barbera 2019	PET	3	10	14	27
Pasqua Primitivo Salento 2019	Heavy glass	15	6	9	30
Ricossa Barbera Appasimento 2019	Heavy glass	10	10	6	26
Rafinelli Barbera d'Asti 2016	Light glass	19	21	27	67
Piemonte Barbera	Heavy glass	21	11	16	48
Conte Ricci Barbera Piemonte 2019	Heavy glass	7	9	6	22
Il Portone Montepulciano d'Abruzzo	PET	29	23	26	78
Total		159	137	157	453

Appendix E: Chi-square test on the effect of graded carbon labeling on the purchase of the different packaging types (heavy glass, light glass, PET)

Group	Heavy glass	Light glass	PET	Total
Control				
Frequency	63	47	49	159
Expected frequency	53.8	47.8	57.4	159
Carbon labeling (graded)				
Frequency	44	48	65	157
Expected frequency	53.2	47.2	56.6	157
Total				
Frequency	107	95	114	316
Expected frequency	107	95	114	316
Pearson chi2(2)=5.6175		**Pr=0.060**		

Here we tested for the effect of the graded carbon label by also differentiating between the two CSPs: Light glass and PET bottles. We see that there is no statistical basis to claim that carbon labeling leads to an increase in the share of respondents choosing a certain packaging type. However, it is worth noting that while in the control group the majority of respondents chose heavy glass bottles, the majority chose PET bottles in the treatment group.

Appendix F: Chi-square test on the effect of graded carbon labeling on the purchase of the different packaging types – Adjusted for respondents who did not see the carbon labeling

Group	Heavy glass	Light glass	PET	Total
Control				
Frequency	63	47	49	159
Expected frequency	52,8	48,9	57,3	159
Row percentage	39.62	29.56	30.82	100
Carbon labeling (graded)				
Frequency	18	28	39	85
Expected frequency	28,2	26,1	30,7	85
Row percentage	21.18	32.94	45.88	100
Total				
Frequency	89	79	76	244
Expected frequency	89	79	76	244
Row percentage	33.2	30.74	36.07	100
Pearson chi2(2)=9.3688		**Pr=0.009**		

When testing the effect of the graded carbon labeling solely on the respondents that indicated that they saw the carbon labeling, we see that 15% more respondents choose a product contained in a PET bottle, while 18% fewer respondents choose a product contained in heavy glass. These results are statistically significant at a 1% level.

Appendix G: Chi-square test on the effect of binary carbon labeling on the purchase of the different packaging types (heavy glass, light glass, PET)

Group	Heavy glass	Light glass	PET	Total
Control				
Frequency	63	47	49	159
Expected frequency	57.5	53.2	48.3	159
Carbon labeling (binary)				
Frequency	44	52	41	137
Expected frequency	49.5	45.8	41.7	137
Total				
Frequency	107	99	90	296
Expected frequency	107	99	90	296
Pearson chi2(2)=2.7173		**Pr=0.257**		

Here we tested for the effect of the binary carbon label by also differentiating between the two CSPs: Light glass and PET bottles. We see that there is no statistical evidence to claim that binary carbon labeling leads to an increase in the share of respondents choosing a certain packaging type. However, it is worth noting that the shares are more equal in the treatment group, while as in the control group, the majority of respondents chose bottles contained in heavy glass. Most respondents that chose a product in CSP chose a light glass bottle. This makes sense, as the difference between light glass bottles and PET bottles is not highlighted.

Appendix H: Chi-square test on the effect of binary carbon labeling on the purchase of the different packaging types – Adjusted for respondents who did not see the carbon labeling

Group	Heavy glass	Light glass	PET	Total
Control				
Frequency	63	47	49	159
Expected frequency	58	51.5	49.5	159
Carbon labeling (binary)				
Frequency	26	32	27	85
Expected frequency	31	27.5	26.5	85
Total				
Frequency	89	79	76	244
Expected frequency	89	79	76	244
Pearson chi2(2)=2.3743		**Pr=0.305**		

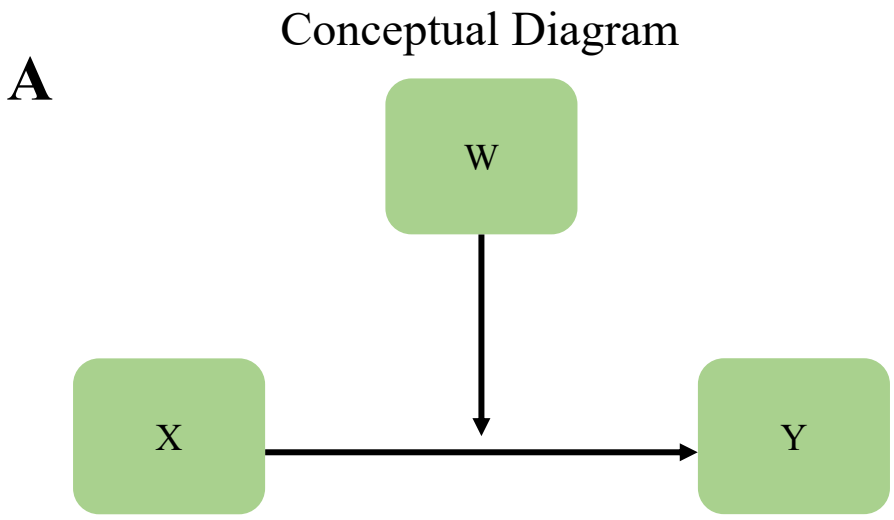
We see that there is no statistical evidence to claim that binary carbon labeling leads to an increase in the share of respondents choosing a certain packaging type, even when only looking at the respondents that indicated that they saw the carbon labeling.

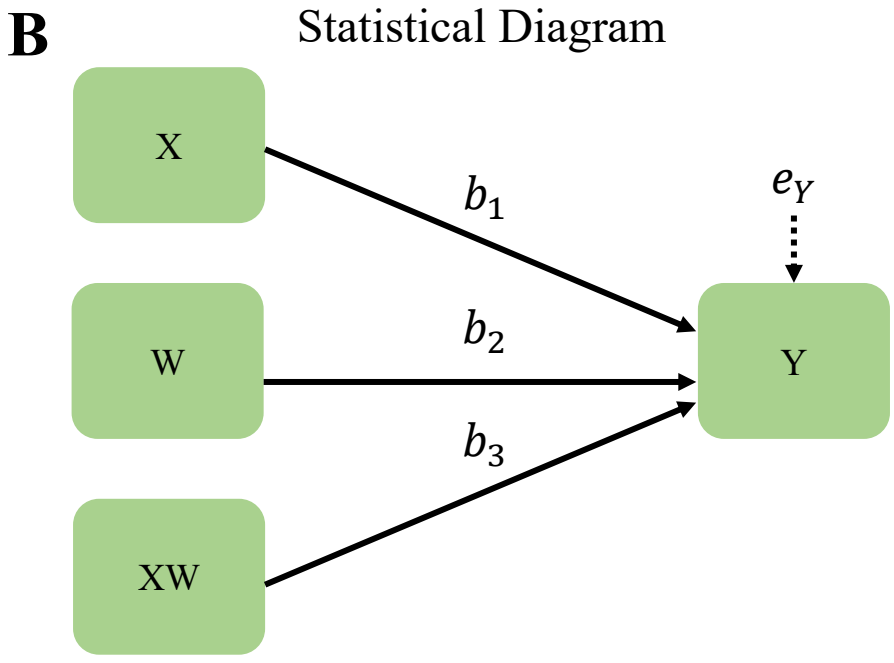
Appendix I: Fundamentals of Moderator Analysis

When conducting the moderator analyses, we used the statistical tool SPSS, with the add-in Hayes' PROCESS-macro. The program can only conduct one moderator analysis at a time. Thus, we used simple moderator analysis, here shown as a regression equation:

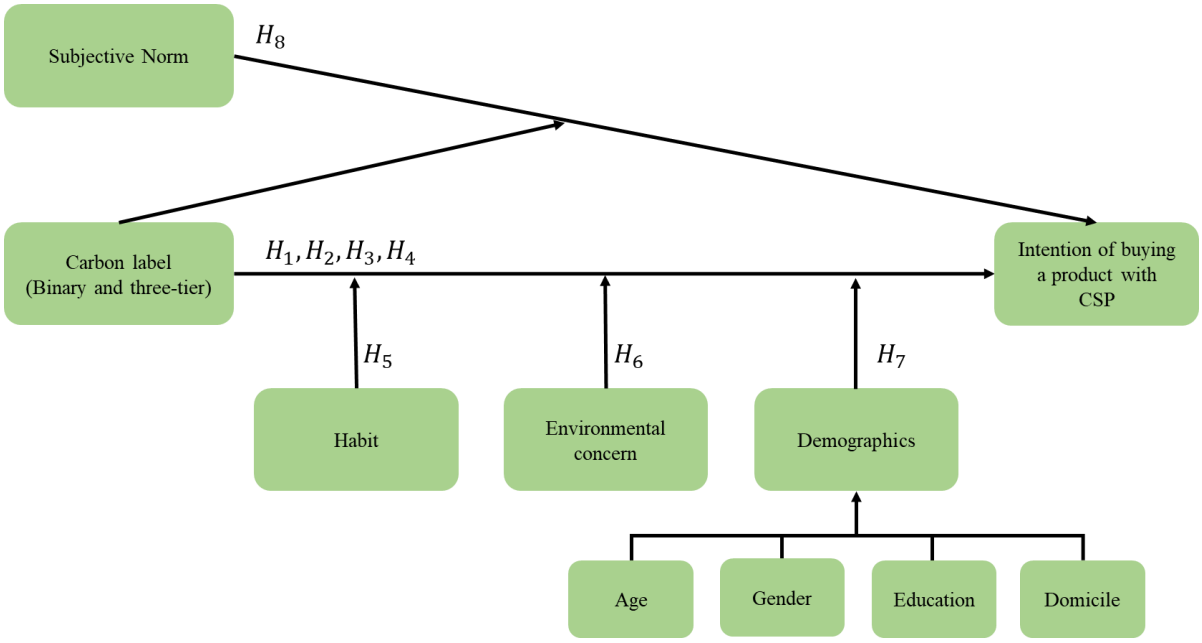
$$Y = i_Y + b_1X_1 + b_2W_2 + b_3XW + e_y$$

In this model, the dependent variable *Y* is being predicted by three independent variables, *X*, *W*, and *XW* (the latter being a product of X and W, the moderating effect), as visualized in the figures below.

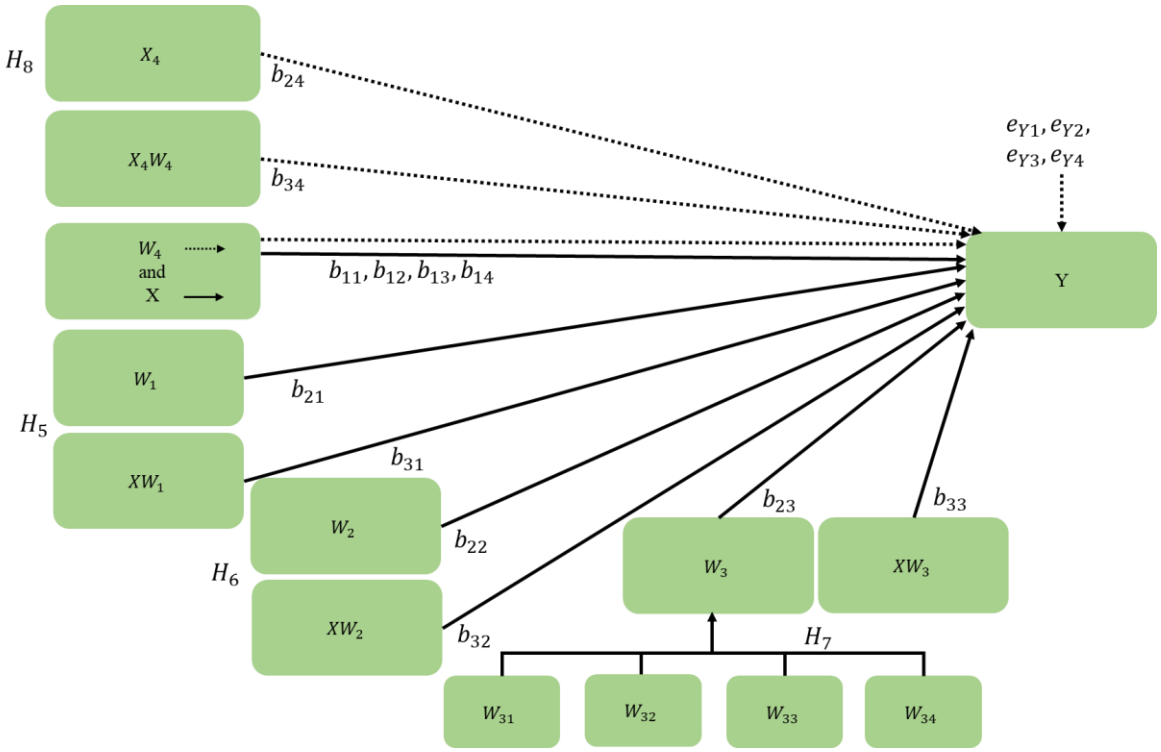




Our research model is presented in its conceptual and statistical form below.



Research model in conceptual form



Research model in statistical form

Appendix J: Moderator Analysis – Habit on carbon label's effect on choice of CSP or non-CSP

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_111	-0.021	0.8808	-0.0239
W	b_211	-0.0941	0.2023	-0.4653
X*W	b_311	0.1369	0.2606	0.5255
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Habit, control vs both groups

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_112	-0.5915	1.0534	0.5744
W	b_212	-0.0941	0.2023	0.6417
X*W	b_312	0.2822	0.3149	0.3701
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Habit, control vs binary

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_113	0.4991	1.0369	0.6303
W	b_213	-0.0941	0.2023	0.6417
X*W	b_313	0.0059	0.306	0.9847
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Habit, control vs graded

Appendix K: Moderator Analysis – Habit on carbon label's effect on choice of PET or non-PET

		Consequent		
		Y (choice of **PET**, non-PET)		
Antecedent		Coeff[i]	SE	p
X	b_111pet	0.8081	1.0826	0.4554
W	b_211pet	-0.0902	0.2714	0.7397
X*W	b_311pet	-0.084	0.3211	0.7936
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Habit, control vs both groups

		Consequent		
		Y (choice of **PET**, non-PET)		
Antecedent		Coeff[i]	SE	p
X	b_112pet	0.9573	1.2349	0.4382
W	b_212pet	-0.0902	0.2714	0.7397
X*W	b_312pet	-0.0767	0.3689	0.8353
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Habit, control vs binary

		Consequent		
		Y (choice of **PET**, non-PET)		
Antecedent		Coeff[i]	SE	p
X	b_113pet	0.6675	1.2079	0.5805
W	b_213pet	-0.0902	0.2714	0.7397
X*W	b_313pet	-0.0916	0.3606	0.7995
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Habit, control vs graded

Appendix L: Moderator Analysis – Environmental concern on carbon label's effect on choice of CSP or non-CSP

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_121	0.3097	0.665	0.6414
W	b_221	0.3203	0.1725	0.0632
X*W	b_321	0.049	0.2111	0.8163
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Environmental Concern, control vs both groups

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_122	0.0101	0.774	0.9895
W	b_222	0.3203	0.1725	0.0632
X*W	b_322	0.1174	0.248	0.6359
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Environmental Concern, control vs binary

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_123	0.5904	0.7592	0.4368
W	b_223	.32.03	0.1725	0.0632
X*W	b_323	-0.0153	0.2406	0.9493
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Environmental Concern, control vs graded

Appendix M: Moderator Analysis – Age on carbon label's effect on choice of CSP or non-CSP

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_1311	1.6556	0.5303	0.0018
W	b_2311	1.0625	0.4422	0.0163
X*W	b_3311	-1.462	0.5772	0.0113
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Age, control vs both groups

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_1312	0.9808	0.5833	0.0927
W	b_2312	1.0625	0.4422	0.0163
X*W	b_3312	-0.7849	0.6441	0.223
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Age, control vs binary

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_1313	2.8214	0.8427	0.0008
W	b_2313	1.0625	0.4422	0.0163
X*W	b_3313	-2.6298	0.882	0.0029
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Age, control vs graded

Appendix N: Moderator Analysis – Gender on carbon label's effect on choice of CSP or non-CSP

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_1321	0.9045	0.3925	0.0212
W	b_2321	-0.4223	0.35	0.2276
X*W	b_3321	-0.6422	0.4643	0.1666
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Gender, control vs both groups

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_1322	0.2877	0.4449	0.5179
W	b_2322	-0.4223	0.35	0.2276
X*W	b_3322	0.0701	0.5339	0.8956
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Gender, control vs binary

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_1323	1.6487	0.5501	0.0027
W	b_2323	-0.4223	0.35	0.2276
X*W	b_3323	-1.4722	0.6195	0.0175
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Gender, control vs graded

Appendix O: Moderator Analysis – Education on carbon label's effect on choice of CSP or non-CSP

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_1331	-0.05	0.3892	0.8978
W	b_2331	-0.2552	0.3653	0.4847
X*W	b_3331	0.6764	0.4597	0.1412
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Education, control vs both groups

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_1332	-0.4994	-1.1384	0.2549
W	b_2332	-0.2552	-0.6987	0.4847
X*W	b_3332	1.2303	2.3054	0.0211
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Education, control vs binary

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_1333	0.5403	0.4938	0.2739
W	b_2333	-0.2552	0.3653	0.4847
X*W	b_3333	0.0075	0.5662	0.9894
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Education, control vs graded

Appendix P: Moderator Analysis – Domicile on carbon label's effect on choice of CSP or non-CSP

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_1341	0.4129	0.2932	0.1591
W	b_2341	0.0321	0.3252	0.9213
X*W	b_3341	0.0369	0.4137	0.9289
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Domicile, control vs both groups

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_1342	0.3638	0.3427	0.2884
W	b_2342	0.0321	0.3252	0.9213
X*W	b_3342	-0.0756	0.4901	0.8774
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= Domicile, control vs binary

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_1343	0.4669	0.3544	0.1876
W	b_2343	0.0321	0.3252	0.9213
X*W	b_3343	0.1063	0.4851	0.8266
[i]Coefficients in ln (**OR**)				

X= Carbon label, W= domicile, control vs graded

Appendix Q: Moderator Analysis – Carbon label on subjective norm's effect on choice of CSP or non-CSP

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_141	0.0423	0.2075	0.8386
W	b_241	-0.1006	0.9963	0.9196
X*W	b_341	0.1447	0.2652	0.5853
[i]Coefficients in ln (**OR**)				

X= Subjective Norm, W= Carbon label, control vs both groups

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_142	0.0423	0.2075	0.8386
W	b_242	-0.8694	1.202	0.4695
X*W	b_342	0.3319	0.3246	0.3065
[i]Coefficients in ln (**OR**)				

X= Subjective Norm, W= Carbon label, control vs binary

		Consequent		
		Y (choice of CSP, non-CSP)		
Antecedent		Coeff[i]	SE	p
X	b_143	0.0423	0.2075	0.8386
W	b_243	0.5938	1.1587	0.6083
X*W	b_343	-0.0196	0.3057	0.9489
[i]Coefficients in ln (**OR**)				

X= Subjective Norm, W= Carbon label, control vs graded

Appendix R: Consumer segment variables

We wanted to check for the moderating effect of the consumer segments of Vinmonopolet, but neither of the segments had a statistically significant moderating effect on the carbon label.

The consumer segment variables we made were based on Vinmnopolet's own consumer segmentation, see figure below.

To create the different consumer segment variables, we set the "Price Focused" respondents to be those who had an average score >= 4 on the questions "I value price over quality" and "When I purchase wine, I normally choose between a set which I am previously familiar with". This led 100 respondents out of 453 to be placed in the price focused segment.
The "Searching" consumer segment was found by averaging the questions "When I buy wine, I am normally open to try new wines", "When I buy wine I want to try new wines", and "I value price over quality". There were 77 respondents who had an average >=4, and thus were identified as searching consumers.

To identify the "Conscious" consumer, we averaged the answers to the questions "I have wide knowledge of wine", "When I purchase wine, I normally choose between a set which I am previously familiar with", and "I value quality over price", resulting in 51 respondents being labelled conscious.

The "dedicated" consumer were those respondents who had an average >=4 on the questions "I have wide knowledge of wine", "I regard myself as a wine expert", "When I buy wine, I am normally open to try new wines", "When I buy wine, I want to try new wines", and "I value quality over price". 35 respondents were identified as dedicated consumers.