

Faculté des bioingénieurs

To what extent does Gender modify choice behavior related to Green Packaging?

A Discrete Choice Experiment in Belgium

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*The
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Abstract

The packaging industry is projected to become the largest end-users of plastic by volume in Europe. Plastic water bottles and the beverage sector are significant beneficiaries of this market. Now modern concerned stakeholders are paying more concentration in green packaging than conventional packaging, which is fossil-based, although this packaging carried out desirable properties to protect the product. The plastic itself is not the problem all the time; the complication is the mixing up with other waste (e.g., food waste, oils or different varieties of plastics), making the processing economically and environmentally ineffective. Especially, the plastic wrappings (shrunked films used to hold cans/bottles), when processed with heavier, larger and more rigid recycled plastics, increases the risk of clogging in the processing machinery. Treatment of packaging waste in European countries is already impressive in many countries, with Belgium leading the path in the European Union. But still, the wrong or non-disposal of the plastic debris resulted in landfills where leakage in the environment generate pollution risk. Thus, the market expansion of this kind of packaging will cost us dreadfully. To address the issue, consumer purchasing decisions can make a substantial difference. Using a hypothetical Choice Experiment, this study explores consumer preferences and willingness to pay for environmentally friendly packaging alternatives for beverage cans with 206 Belgian consumers. The analyzed cases are Coca-Cola original and Coca-Cola Zero sugar 33cl cans. In addition to a conditional logit model, a mixed logit and a latent class model are estimated to account for heterogeneity in the preferences of eco-friendly packaging alternatives among men and women. The results revealed considerable preference heterogeneity across men and women, e.g., for example, we found men as less sensitive to price than women. Still, on average, they derive positive and significant values from eco-friendly attributes. People are willing to pay the highest mean premium for the 100% recyclability of all materials used for packaging after price attribute. While dealing with the beverage, we have to keep in mind that consumers choice behavior is motivated by consumers age, income, sugar/taste preference, and presence of eco-friendly features.

List of Abbreviations

CL	Conditional Logit
DCE	Discrete Choice Experiment
LCM	Latent Class Model
MN	Multinomial Logit
MXL	Mixed Logit
PE	Polyethylene
RP	Revealed Preference
RPL	Random Parameter Logit
RUT	Random Utility Theory
SP	Stated Preference
WTP	Willingness To Pay

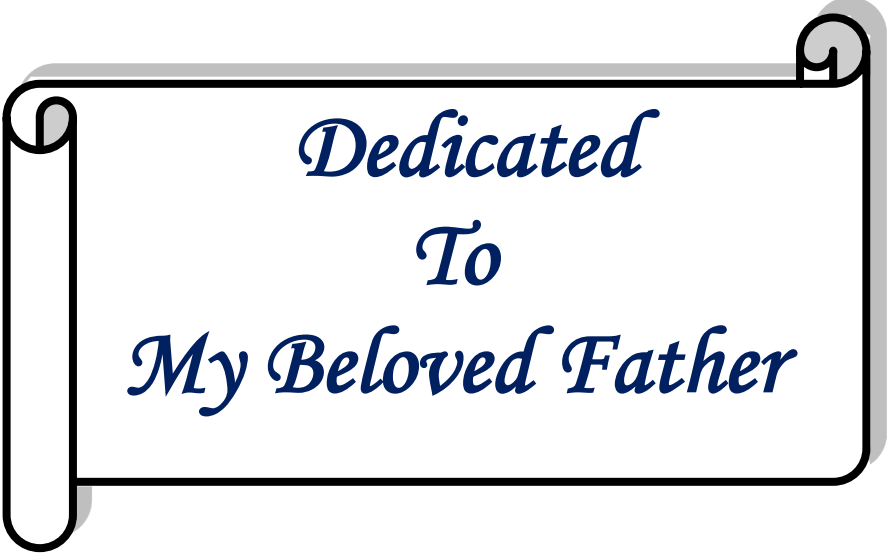
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*Dedicated
To
My Beloved Father*

CHAPTER 1: INTRODUCTION

Our planet is at risk of drowning in plastic pollution. We have become addicted to using single-use or disposable plastic due to its growing and uncontrolled presence in the environment. As a result, the last two decades have seen a growing trend towards environmental risks by accumulating plastic debris. This debris constitutes between 60% and 80% of global waste (Derraik, 2002) and single-use plastic is responsible for up to 50% of the European beach litter (European Commission, 2018). Approximately 40% of the plastic demand is on packaging and 61% of the total post-consumer collected plastic waste results from packaging (PlasticsEurope, 2018). The inappropriate use and wrong disposal of plastic packaging and bags is increasingly perceived by consumers to be a problematic issue for our environment (Hartley et al., 2018; Lotze, Guest, O'Leary, Tuda, & Wallace, 2018). This especially applies to food packaging such as snacks bags, beverage plastic wrappings or drink bottles and this has also received much media attention in recent years (Laville, 2020). The new Packaging Waste Directive (EU) 2018/852 (European Commission, 2018) intends to stimulate eco-design in packaging, as a crucial step in achieving high quality in respect of plastic waste end-of-life management. In recognition of the negative and skyrocketing environmental pollution consumers, legislative bodies across the globe, which constitute the major groups of stakeholders, have become more aware about the negative environmental impact of packaging. So, researchers have been motivated to examine the trade-off between the marketing functions of packaging and the environment (Prendergast & Pitt, 1996). Other research (Rokka & Uusitalo, 2008) found that green packaging was a vital criterion for consumer choice, thereby highlighting the increased importance consumers give to protecting the environment. Generally, consumers view "greening of packaging" as less packaging, as reusable and recyclable packaging, which will reduce food waste, consume less energy to be produced (Molina-Besch, 2016). In order to assess consumer demand for packaging with improved environmental attributes, several survey studies were conducted during the last years. Most of these studies show that consumers are preferring greener over initial packaging and are even changing products when the packaging is perceived as excessive or environmentally unfriendly. Very few empirical studies take gender into account when analyzing sustainable consumption and consumer behavior in the context of beverage and those studies are not without shortcomings. This study introduces a new way of conceptualizing and researching gender and consumer behavior by investigating the results of discrete choice experiments with Belgian consumers.

The analyzed products are Coca-Cola Original and Coca-Cola Zero 33 cl cans. These cans are wrapped with shrunk films made from polyethylene (PE). It is harder to recycle those wrappings and much of this unnecessary (perceived as overpackaging) single-use plastic ends up in landfill or as packaging waste. Nevertheless, there are also studies that indicate how consumers consider plastic packaging and plastic bags to be convenient and functional, such as the way they help to protect products (Phillips, 2017).

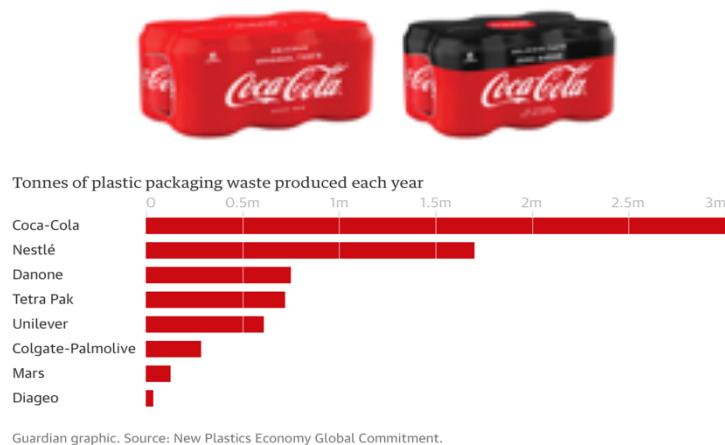


Figure 1: Plastic packaging waste by the major multinational brands each year

Its packaging footprint is equivalent to 108bn bottles a year - more than one-fifth of the world's plastic bottle output and Coca-Cola already revealed that it produces 3m tonnes of plastic packaging a year – equivalent to 200,000 bottles a minute! (Sandra Laville, 2019). Although, the brand has prospects to make 100% of its packaging recyclable globally by 2025—and use at least 50% recycled material in its packaging, will be resultant with reduced GHG emissions (absolute) 25% by 2030 along with an ambition to achieve net-zero carbon emissions by 2050 (Quincey, 2021). Coca-Cola, as part of its sustainability goals, if replace the overpackaged hard-to-recycle shrink films with different levels of recyclability features with a reduction of PE content that is used for current packaging, how would consumers react to this new packaging materials? Willing to trade off with price or convenience? Or not caring at all! Indeed, beverages like Coca-Cola are perceived as unhealthy product (responsible for obesity and diabetes). The truth is bitter; products of the Coca-Cola company are consumed at the rate of more than one billion drinks per day (<http://heritage.coca-cola.com/>). However, Coca-Cola keeps in mind its consumers choices, hence came up with varieties of sugar reduction strategies. Coca-Cola Zero sugar thereby is a popular alternative to the Original formula and this new addition continued to show a strong growth by double digits in many territories

(Quincey, 2021). A growing body of literature recognizes that people do care about environmentally friendly features, whether the product is beverage or organic. For example, (Rokka & Uusitalo, 2008) examined the significance of environmentally friendly packaging features such as recyclability compared to other product attributes of functional drinks. It is apparent from that study is that green packaging stands for 34% of overall product utility, just after the price attribute. Birgelen, Semeijn, & Keicher, (2009) carried out an online survey investigation concerning beverages and ascertained that people are willing to sacrifice product features such as brand, healthiness, functionality and design in the interest of eco-friendly packaging, keeping the price and taste of the respective beverage constant. Similarly, Thøgersen, (1999) found that consumers are willing to buy eco-designed packaging only if they expect the selected packaging has a significant impact on the environment while keeping the cost attribute constant and women being more aware of purchasing eco-friendly goods (McKeage, 1994). In the same vein, a willingness to pay for green features exclusively for recyclability was also found by several other authors (Ferreira & Marques, 2015; Karousakis & Birol, 2008; Klaiman, Ortega, & Garnache, 2016). Efforts to recycle packaging can help to reduce plastic waste (White and Lockyer, 2020). Interestingly, women are more devoted to recycling than are (Johnson, Bowker, & Cordell, 2004; Schultz, Oskamp, & Mainieri, 1995). It is making an impression that consumers become more and more sensitive to the impacts of packaging waste and the development of the circular economy (shifting from take-make-dispose system to reduce-reuse-recycle phase). Moreover, the design measures adopted for recycling are only effective if the consumer makes the right decision at the purchase and disposal phases. So, understanding consumer choices is crucial as well as complex because choices targeted here are about products and packaging. It tends to follow even more complex mechanism if there exists eco-gender gap i.e., gendered design and marketing of products or gendered actions/tasks induce some changes in behaviors from consumers of the opposite sex and that is used to position the product.

If less 'socially desirable' ('less sustainable') behaviors in presence of gendered marketing and eco-gender gap evolves then there is an urgent need to give the right incentives to producers to stop to play with this lever and to consumers to change their choice behaviors. Gendered marketing is outdated or ousted which indeed pointing to a favorable context to change minds. However, beverage sector is a laggard, as this sector is heavily relied on gendered marketing. But it is Coca-Cola (gendered packaging is pervasive not true anymore with Coca-Cola)! Gender contamination and strategy- we will counter this with Zero Sugar. To work on the eco-

gender gap, a stated preference technique will be used in this study, namely a choice experiment approach. This approach corresponds a survey where consumers are confronted with a hypothetical scenario and are asked to choose different alternatives represented on cards. The choice experiment will also examine the possible links between the various characteristics of the respondents (gender, age, education, level of income etc.) and their respective preferences.

The purpose of this study is to determine the main findings and the most important attributes used on DCEs that analyse consumers' preferences for an eco-friendly choice; (2) to summarize and compare the WTP estimates of different attributes for men and women; and (3) to obtain important insights for the beverage, and packaging companies develop packaging strategies to improve consumer willingness to pay for green packaging. This information can also benefit government officials, waste management companies, and packaging companies to select proper channels to incentivize consumers to live greener.

This thesis is composed of six chapters and is organized as follows: Chapter 2 presents background information on green packaging, Chapter 3 provides theory and test methods on sustainable packaging, Chapter 4 describes design of the experiment carried out for this study, Chapter 5 presents the results and analysis of this study, Chapter 6 reviews findings and suggests discussion points for future research. Supplemental documents are presented in the annex.

CHAPTER 2: GREEN/SUSTAINABLE PACKAGING

Terms like eco-design, green packaging design, eco-friendly packaging, sustainable design, design for the environment and environmentally conscious design have also been used interchangeably by researchers studying this matter (Boks & Stevels, 2007).

2.1 Functions of packaging

Previous studies have prompted various categorizations for the numerous functions of packaging (Marsh & Bugusu, 2007; Prendergast & Pitt, 1996). Those literature on the functions of packaging highlighted on three broad arenas. These are containment and handling, protection and preservation and information and communication. The containment function keeps the goods together and accommodates handling simultaneously from the supply chain to the final consumer (Marsh & Bugusu, 2007). This function also includes convenience logistics in terms of making the sorting and moving arrangement easy throughout the whole supply chain (Prendergast & Pitt, 1996). Moving to the second main function of packaging, “protection”, this feature refrain outside influences (e.g., chemical, physical or biological influences) on the product and maintaining the quality of the product i.e., it performs like a safeguard (Marsh & Bugusu, 2007; Rundh, 2005). Concurrently, packaging can assist by conserving the favorable product aspects, specifically for the beverages by preserving the carbon dioxide (Harper et al., 2018). Communication and information provision is another significant function of packaging which enable customers to categorize products and brands, draw attention to a specific product, and provide suitable information about the uses of the product (Prendergast & Pitt, 1996; Underwood et al., 2001; Wells & Armstrong, 2007).

2.2 Packaging impacts on environment and green packaging

Packaging can perform all of these functions, but not without a cost. This combines both financial and environmental burden caused by the packaging (Kassaye, 1992; Simms & Trott, 2010). But the reduction of food waste due to packaging throughout the supply chain outweigh the packaging waste itself in many cases (Williams & Wikström, 2011), particularly when packages can be recycled or reused. However, from the consumer perception, packaging frequently perceived as wastefulness, and is observed as a symbol of “take-make-dispose” system (Roper & Parker, 2013). In addition, the plastic packaging leakage to the environment is increasing at a risky level and it is an issue of urgent attention (Chae & An, 2018; Dilkes-Hoffman, et al., 2019; Henderson & Green, 2020). The problem is not only with the landscape

attack but also with soil, marine and freshwater ecosystems particularly arising from microplastics, resultant with the serious problems to the living organism as well as may cause health issues to the human being (Henderson & Green, 2020; Leal Filho et al., 2019). Consumers are no longer welcoming economic development at the price of unsustainable utilization of natural resources and skyrocketing pollution (Leal Filho et al., 2019). Consumers understand the benefits for them and for the environment. Hence, “Green packaging” emerges as new eco-friendly characteristics product (attributes), with various aspects of environmental protection (Hurley et al., 2013). According to the definition of Zhang & Zhao, (2012) green packaging is packaging that is completely made from plants, can be recycled and/or reused, susceptible to degradation as well as giving promotion to sustainable development during the product’s whole lifecycle. In addition, it should not be harmful to the environment, the human body, including livestock health. Green packaging is related with four principles (4R1D)-reduce, reuse, reclaim, recycle and degradable. It can also be defined as the packaging developed from eco-friendly/biodegradable/composite materials which can be dismantled and assimilated by natural way return to the common earth components for instance oxygen and hydrogen (Dharmadhikari, 2012). To a certain extent, consumers are inclined to use green packaging and are willing to pay for it (Norbisimi, 2010)

2.3 Factors influence sustainability perceptions

Most of the factors influencing consumer perceptions are demographics, including age, gender, education, and income levels. These factors on sustainable purchase behaviors can either be positive or negative (Chekima et al., 2016). Other factors that affect consumer behaviors on sustainability are country and region of origin (Wikström & Venkatesh, 2016). Role identity, i.e., personal or social, has been an essential factor affecting sustainable behaviours. For example, the theory of planned behavior argues that participants will be willing to take up recycling behavior if the activities are an essential aspect of their self-identity (Terry & White, 1999). Thøgersen, (1999) studied the influence of moral norms on preferring environmentally friendly packaging at purchase. Chen et al., (2017) examined the effect of excess packaging on an eco-friendly green brand image and consumer attitudes and found a negative attitude towards overpackaging. It is also revealed that overpackaging is a sensitive matter for private labels products as they can choose to reduce or remove overpackaging by replacing it with a sustainable development image. However, they might be risking consumer acceptability. They also found out that participant perception of environmental friendliness and expensiveness

improves, but convenience decreases with the removal of overpackaging. Furthermore, consumer perceptions of green brands influence their hostile behavior towards overpackaging and their affinity for green brands (Monnot, Parguel & Reniou, 2015) consumer view on green brands governs the negative attitude toward excess packaging and the attachment for the green brands. Earlier studies on environmentally friendly packaging have shown that price and taste is a significant barrier affecting consumer purchase behavior (Chekima et al., 2016; Martinho & Fonseca, 2015).

2.4 Green-Feminine stereotypes

It has also been noted that gender affects purchase behavior based on human-nature and eco-labels orientation. (Chekima et al., 2016). For example, Women with a mean age of 50 were shown to have the highest preference for environmentally friendly packages than their male counterparts (Martinho et al., 2015). Women are more responsible in selecting products needed in the household and are likely to be more sensitive to ecological, health and environmental concerns hence involved in sustainable purchase and disposal than men (Johnsson-Latham, 2007; Khan et al., 2015; OECD, 2006)

2.5 Women and the circular economy

A circular economy is based on common sense, care, intelligence and innovativeness; involving women in the circular economy would be because these are the aspects that millions of women across different countries of the world practice every day in their struggle to comfort their families and localities. Not just for her inherent norms, she has better knowledge of handling circular behaviors, such as reuse, repair, and simply prolonging the use of an item for as long as possible. To foster gender equality, a circular economy can play a significant role by providing women more green jobs as women are still fighting with low pay, low security and constrained mobility (ILO, 2015).

CHAPTER 3: APPROACHES ON SUSTAINABLE PACKAGING

3.1 Testing Methods on Sustainable Packaging Consumer Research

A number of studies have begun to understand the preferences for environmental alternatives in behavior studies by individuals or groups, but still, the magnitude is limited (Goucher-Lambert & Cagan, 2015). The design and implementation of sustainable packaging need some extra caution as it is often the case that sustainable packaging has to struggle to establish its existence in the competitive marketplace despite the fact that significant deliberation from the consumers (Goucher-Lambert & Cagan, 2015). Conjoint and discrete choice analysis are some of the methods established for appraising consumer preferences which incorporate the detection of continuous and discrete facets (Goucher-Lambert & Cagan, 2015). Although these are popular approaches but still lack visual and descriptive stimuli concurrently as well as accumulating environmental impact properties as an explanatory variable perceived as few of the impediments related with the consumer studies on the products which attributed with sustainable features (Goucher-Lambert & Cagan, 2015). The synthesis of sustainable packaging on consumer preference towards sustainable packaging assimilates general attitude related models, holistic methods (concentrates on consumer perceptions and symbiology), and analytic methods (encompass the impact of distinct packaging design cues) (Steenis et al., 2017). Research work based on general attitude models e.g., TPB (Theory of Planned Behavior) elucidates the choice of consumers for sustainable packaging based on environmental awareness, knowledge, and concern (psychological factors) along with some other factors like perceived behavioural control and subjective norms (M. Van Birgelen et al., 2009; Magnier & Cri  , 2015; Prakash & Pathak, 2017). These models frequently encompass various test methods to investigate consumer leaning towards sustainability-related pre and post purchasing behaviors but do not consider a specific design that can affect consumer behavior or the significance of packaging sustainability to consumer (Steenis et al., 2017). In holistic approaches, specific characteristics of a packaging are not considered separately rather packaging characteristics are weighs up as a whole. The principle behind this theory is that the influence of the package evolves from the combination of different elements and pleads to an attitude or behavior all together. Findings using this approach reveals that the formation of judgements on sustainable packaging conclusively rely on material cues, but these studies do not give an explanation of how consumer responses differently to specific packaging materials (Lindh, 2016). A popular method, Conjoint analysis, generally used in the field of psychology

and economics based on generating utility score employing the data collected from a survey-type investigation. There is also a development of Aesthetic assessments in combination with optimization frameworks. Again, packaging studies sporadically following analytical methods. These kinds of methods take into account the isolation of specific cues of the specific of the sustainable packaging. In previous research works different cues already examined such as color and labels (Magnier & Crié, 2015; Steenis et al., 2017) single vs. multi-serve formats (Ilyuk & Block, 2016), shape/volume (Folkes & Matta, 2004) and transparency (Deng & Srinivasan, 2013). Studies that analyze the influence of specific environmental attributes of packages are limited but impactful to determine consumer behaviors (Rokka & Uusitalo, 2008) and purchasing attitude (Iyer, 2007; Magnier & Crié, 2015) alongside the association between sustainable features and functional and price attributes. The analytical approaches in previous research demonstrate that sustainable components integrate graphical or verbal cues. In addition, the structural elements such as type of material are indispensable as well (Steenis et al., 2017).

3.2 Willingness to Pay (WTP)

You are paying and being paid: but what for and why? Price is always perceived as an essential variable in marketing, both in purchasing decisions made by (Granger, 1961; Hamelin, 2000) and corporate practices (Simon, 1995). It generates sales volumes, margins and product positioning, which makes it crucial to evaluate consumer perceptions of prices. When it is about setting prices, we predominantly enforce the concept of price elasticity and demand curve. These can be adaptive for all consumers and point towards the number of buyers willing to pay a give price. Nevertheless, there are new pricing practices which tend to customize prices e.g., pay-per-use or online auctions (Le Gall-Ely, 2009). Within the frame of reference, the concept of willingness to pay (WTP), which is also called as the reservation price, can be defined as the maximum amount that a given consumer willing to pay for a specified good or service which is of rich characteristic in individual information (Le Gall-Ely, 2009). How to measure it? How to influence the willingness to pay by negotiating the product, values or sales environment? The ability of measuring WTP allows the determination of demand curve according to price and to establish a price which hands over the best possible margin. When it is possible to customize price, the known WTP could yield optimized sales volumes and margins. Having the knowledge about the factors which are responsible for influencing WTP enables the opportunities of accelerating sales volumes for a given price, or when necessary to customize prices. Several methods (Figure 1) currently exist for the measurement of WTP, but

the most traditionally used categories are revealed and stated preference methods (Breidert, 2006). From the figure, we can see that the approaches can be differentiated based on the fact that if those techniques adopt surveying methods or those are grounded on real or simulated price-response data. When it is about response data, market observed values can be accustomed or data can be created by different experiments (e.g., lab-based experiment, field experiment or auctions). Outcomes gathered from price-response are commonly known as revealed preference data. The term revealed preference (RP) first introduced by Samuelson (1938) referring that consumers' behavior mirrors on the choices they made where their utility (preferences) can be determined. The Revealed Preference theory has been advanced and extended for the assessment of choice experiments where revealed preference data is acquired through direct observations of actual behavior. On the contrary, survey based (direct or indirect) approaches are regularly known as stated preference for estimation of WTP (Louviere et al., 2010). Particularly, with direct surveys, intended consumers are asked to state the price they would be willing to pay for a specific product whereas rating or ranking techniques are applied in indirect surveys (e.g., conjoint and discrete choice analysis) for the purpose of estimating preference structure from which WTP can be derived later on. Contingent Valuation Methods and choice experiments fall under the discrete choice analysis section.

Stated Preference (SP) techniques use answers to questions and surveys to extract what consumers would value how consumers would value different good/service choices by asking individuals to impose rank, rate or select between various product/service alternatives with the combination of different attributes as a means to deduce preference elicitation. Although the SP methods predominantly grew in their performance, some researchers criticized the stated intentions, which are prone to bias and may not replicate the actual behavior (Abley, 2000) . Henceforth, when we have available data, revealed preference techniques are frequently adopted as they provide us more accurate reflections of consumer's real preferences. Nevertheless, it is not always the case that we have available data, which enforce us to choose SP tactics. Practically, choosing a feasible method for determining WTP is constrained by time and available monetary resources. Stated preference approaches are typically more economical and can be more efficiently utilized by the intended researchers to study their specific research questions.

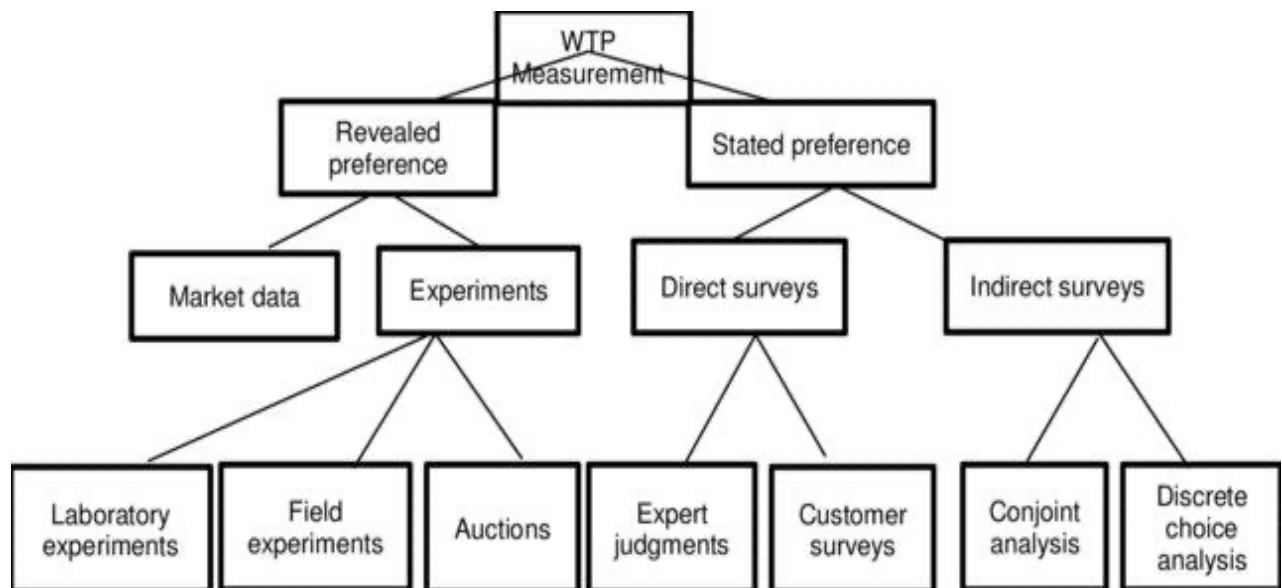


Figure 2: Classification framework for methods to measure willingness-to-pay
Source: Breidert, C., Hahsler, M., & Reutterer, T., 2006

3.3 Discrete Choice Experiments

DCEs have become a popular stated preference approach to evaluate individual's preferences over different hypothetical scenarios or alternatives. Originally, choice experiment was used to estimate consumer preferences in the field of marketing and transport. To date, several other sectors such as health economics (Clark et al., 2014), tourism (Kelly, 2007; Martín, Román, & Mendoza, 2018), the food sector (Ortega et al., 2011), environmental sciences (Hoyos, 2010), energy efficiency (Banfi & Jakob, 2008) and agricultural economics (Rigby & Burton, 2005) employed this tool to better understand consumers' preferences. Using this approach, researchers have been able to reveal valuable information about individual's utility with the aid of specially designed surveys where consumers must select between two or more alternatives which are varying by systematically altering different attribute levels grounded on some experimental design method.

A significant advantage of this kind of tool is that it helps determine the relative importance of different attributes and their levels, specifically when a consumer makes a decision and estimates the trade-offs between them. These benefits enable DCEs for extensive use in research and policy. Another advantage of using this methodology is that it allows us to incorporate new products or attributes that do not exist in the real market and for which there is no data available.

In addition, DCEs, at some points, can be employed for demand prediction, while this tool also become valuable when there is the unavailability of data from the actual markets because there is no way to observe how consumers are making decisions directly. Conclusively, this technique allows obtaining willingness to pay estimates for different attributes if we include a cost coefficient in the experimental design, which can be advantageous for cost-benefit analysis (Cantillo & Román, 2020). This approach conjoins consumer theory, experimental design theory and econometric analysis and is pertinent to the random utility theory (RUT) (McFadden, 1974; Thurstone, 1927) and Lancasterian consumer theory (Lancaster, 1966). This consumer theory proposes that utilities for goods can be decomposed into separate utilities for their component features or attributes, i.e., it assumes consumer utility is not directly acquired from the goods themselves but rather from their distinguishing characteristics. Before this paper, economists considered utility from the entire good. The basic assumption of RUT is that individuals, as decision-makers, seek to maximize their expected utility; consumers choose the alternative that offers them the highest utility constrained by a budget. These utility levels, of course, are unobservable by the researchers (Louviere et al., 2010). To make it in operation mode, the systematic utility can be represented by the attributes and their levels and the individual's characteristics

To illustrate, an individual i 's utility associated with the choice of an alternative j as,

$$V_{ij} = \hat{V}_{ij} + \epsilon_{ij} \quad (1)$$

V_{ij} represents the utility function and ϵ_{ij} is a random error component, implying from the researcher's viewpoint, that the true utility remains unobservable. The error term can also be identified as the difference between the real utility and the utility determined by the estimated model (Kenneth-Train, 2002). From the consumer's viewpoint, the process of utility maximization consists of selecting an alternative that yields the highest utility. Thus, if the i th consumer selects type j , then V_{ij} is the highest utility obtainable from among the J possible choices. Hence, the statistical model of the probability (P_{ij}) that alternative j is chosen by individual i is given by

$$P_{ij} = \text{Prob} (V_{ij} > V_{ia}; \quad a = 1, 2, \dots, J; a \neq j)$$

$$P_{ij}(\epsilon_{ij} - \epsilon_{ia} > (\hat{V}_{ij} - \hat{V}_{ia}); \quad a = 1, 2, \dots, J; a \neq j) \quad (2)$$

$$\text{where, } \hat{V}_{ij} = X_{ij} \beta;$$

β is the parameter of individual preferences to estimated. According to Maddala (1997), the residuals are independently and identically distributed succeeding a Type I extreme value distribution, such as:

$$F(\epsilon_{ij}) = \exp(-e^{-\epsilon_{ij}})$$

then suggests that the difference in error terms, displayed in equation (2) has a logistic distribution. Therefore, a multinomial (conditional) logit model can represent the i^{th} consumers probability of selecting the j^{th} alternative. The models employed for the study are briefly discussed in chapter 4, section 4.3.

CHAPTER 4: DESIGN OF THE CHOICE EXPERIMENT

4.1 Dimension of a choice experiment

In a typical choice experiment, consumers judge various levels of attributes across several alternatives, consistent with what a consumer faces when making decisions in a real-world scenario. In doing so, it ends in stated preferences for a product. For this study, a choice experiment design was chosen because it allows the researcher to study how consumers weigh several different product attributes concurrently. The subsequent five features can outline the dimensionality of a choice experiment: the number of attributes, the assignment of the levels for the corresponding attribute, the range of the attribute levels, the number of alternatives displayed in a choice task and, finally, the number of choice tasks to be included for the experiment (Mariel et al., 2021)

4.1.1 Number of Choice Tasks

People who are involved in designing a DCE are usually afraid of displaying respondents with too many choice tasks. There is mixed evidence of keeping numerous choice tasks in the experiment. Several studies suggested keeping choice cards more than four to six might be complex or tiresome for the respondents. However, the literature does not support this idea all the time. For example, Meyerhoff & Weller, (2015) in their study presented the participants with 6, 12, 18 and 24 choice tasks by splitting the respondents and they were not able identify clear signs of fatigue or tendency to drop out from the study. This study corroborates with (Czajkowski & Greene, 2014); testing the participants with 26 choice tasks. In addition, a higher number of choice tasks can also be weighty if determining individual-specific WTP values because these conditional values are only worthy when an adequate number of choices is available for each participant (Kenneth-Train, 2002; Sarrias, 2020). In either way, it is crucial to test prior to the survey whether the planned number of choice tasks can be considered manageable for the average respondent. Based on a prior survey, for our study, we decided to make 12 choice tasks divided into 2 blocks so that each respondent confronted with only 6 choice cards in each block.

4.1.2 Selection and Assignment of levels of attributes

Identifying relevant attributes for the selected good is a crucial step for a choice experiment. Researcher has the job to identify the appropriate attributes and assigning their levels for the study being studied. The attributes we select for our study is based on the available literature reviews, consultations within the master thesis supervising team and a focus group discussion with 6-7 consumers (who drinks Soda). For example, Birgelen et al., (2009) conducted a study

regarding beverages purchase and disposal decisions and discovered that consumers are willing to tradeoff product features such as brand, healthiness, functionality, and design in good turn of eco-friendly packaging keeping price and taste of the respective beverage same. In this study, we chose four (04) attributes for our selected product i.e., price, two eco-friendly attributes: proportion of PE used for packaging and recyclability of materials used for packaging and sugar content. The following table 1 discloses the selected attributes and their levels.

Table 1: Selected attributes and assigned levels of attributes

Attributes	Attributes levels	Description
Price	€ 0.50 € 0.60 € 0.70 € 0.80	These prices were based on the available market price with an adjustment of average, maximum and minimum value for both original and zero sugar varieties.
Proportion of PE used for packaging	100% Polyethylene -25% Polyethylene -50% Polyethylene No Polyethylene anymore	Refers to the ability to reduce the material used for the shrink plastic (PE) film used to hold individual cans together in a pack of cans. "100% Polyethylene" is the actual amount of material, with no reduction in the amount used.
Recyclability of materials used for packaging	Materials used for secondary packaging are not recyclable 50% of the materials used for secondary packaging are recyclable All materials used for secondary packaging are recyclable	Refers to the property of a material, which can be recycled to produce new packaging and new containers of the same type for the same product (here, cans of Coca-Cola). We distinguish here three levels of recyclability of packaging used for Coca-Cola (material of the can but also other packaging used to present these cans).
Sugar content	Original Zero sugar	Choose the one that corresponds to Coca-Cola Original or that of Coca-Cola Zero (sugar-free and calorie-free).

4.1.3 Number of Alternatives

Number of alternatives have a significant effect on the response efficiency of a choice experiment (Mariel et al., 2021). In our study we include two unlabeled alternatives that exhibit a hypothetical choice scenario by four attributes with varying levels. Additionally, we incorporate a status quo or opt-out option representing that a consumer is not willing to buy any of the two alternatives. Providing an opt-out alternative in choice experiments can often be perceived as important as this presents choice situations even more realistic in different contexts (Meyerhoff & Liebe, 2009). An example of a choice card used in this experiment is given below:

Characteristics	Option A	Option B	Option C
Price	 € 0.70	 € 0.50	
Proportion of PE used for packaging	100% Polyethylene	-25% Polyethylene	I would not buy either alternative A or B
Recyclability of materials used for packaging	50% of the materials used for secondary packaging are recyclable	Materials used for secondary packaging are not recyclable	
Sugar content	 Original	 Zero sugar	

Figure 3: Sample of a choice card used in the choice experiment

4.1.4 Statistical Construction of Choice Tasks

The purpose of an SP study is to estimate the parameters of individual preferences. The advantage of using an SP survey is that, in contrast to RP, we have the control into the choices we present to the intended consumers. While designing these choice scenarios, on one hand, we should take into account two criteria cautiously. First, the choices presented to the participant need to be relevant. On the other hand, from the statistical perspective, the design needs to be maximized based on informational content (Mariel et al., 2021). We need to introduce respondents with the trade-offs that provide researchers the best possible information about the preferences in the sample of interest (i.e. the slope coefficients of the utility function). With all the available attributes with their various levels, many different choice scenarios can be fitted in the experiment. For example, in this research, there are two attributes with four levels, one with three and the another is with two levels. Therefore, the resultant possible choice scenarios become: 96 ($=4*4*3*2$). We could have employed full factorial/fractional factorial design and performing this way would make it possible to determine all main and interaction effects between attributes levels. Generally, experimental are grounded on main effects

between parameters (Mariel et al., 2021). For this study we consider only the main effects as main effects are already capable of capturing 80% of the variance in the data (Louviere et al., 2010). Nevertheless, implementing orthogonal experiment is quite lengthy and challenging for the intended respondents. Although, orthogonal designs validate zero correlation among the levels of the attributes and this design is also optimal in linear economic models (e.g., linear regression model). Contrariwise, while dealing with discrete choice experiments (highly non-linear), this equivalence no longer exists.

We use a D-efficient design to select optimal number of choice cards to 12 by using Ngene software (ChoiceMetrics, 2018). This design allows us to minimize the correlation between the attribute levels in the choice experiment and to minimize the standard errors of the parameter coefficients but to achieve this level the Efficient design expects prior information about the preference estimates. Prior information (sometimes called as educated guesses) generally be found from similar or related past research works or by performing a pilot survey (ChoiceMetrics, 2018). It is always possible to obtain at least some information about the estimates even if it is an expected sign as well. For instance, price attributes are conventionally perceived as negative, while comfort and service are attributes which are expected to give positive utility to the respondents. So, employing a slight positive or negative value to the respective parameters already ensure an improve design rather than imposing prior parameter value equal to zero (ChoiceMetrics, 2018). In our study, we use a small positive or negative number to indicate whether we expect a positive or negative effect for a specific attribute. We expect decrease of PE for packaging, recyclability, and sugar content (sugar reduction strategies might bring a positive attitude considering health issues) will bring positive influence and a negative (positive: it happens sometimes different group of people really don't care about the price rationality) effect for price. Using dummy coding the utility functions are given below:

```
U(alt1) = b1. [0.01|-0.01|-0.02] * Price levels
+ b2. [0.01|0.02|0.03] * Decrease PE
+ b3. [0.01|0.02] * Recyclability
+ b4. [0.01] * Sugar content
```

```
U(alt2) = b1. [0.01|-0.01|-0.02] * Price levels
+ b2. [0.01|0.02|0.03] * Decrease PE
+ b3. [0.01|0.02] * Recyclability
+ b4. [0.01] * Sugar content
```

```
U(alt3) = 0
```

We use Ngene software to generate the design and it was specified that the design should be modeled to estimate a multinomial logit regression.

4.2 Data Collection

This section discusses aspects related to data collection. It focuses, firstly, on the development and testing of the questionnaire and the survey mode used for this study.

4.2.1 Structure of the Questionnaire

Response rate of a discrete choice experiment is significantly related with the development of a good questionnaire. A good should be like a conversation that has a clear, logical order (Dillman et al., 2008). It is also evident that interesting survey topic has a potentiality of increasing response rate (Groves & Dipko, 2004; Zillmann, 2014). Our respondents were introduced firstly with the survey topic with their consent to participate. The questionnaire solicited information regarding respondents' socio-demographics, food purchasing habits, soda (Coca-Cola) purchasing behavior and attitudes about the categories of preference, packaging materials, questions involving choice modeling, follow up questions to the choice tasks (e.g., most important choice attributes, ignored attributes etc.), finally questions on environmental attitudes and norms. We made two versions of our questionnaire: English and French to minimize the language barriers problem. Belgium has three official languages: Dutch, French and German in its three major regions (Brussels, Flanders, Wallonia) and the former two are the major languages. A survey from the Université catholique de Louvain (2006), reveals that Flanders is more multilingual and the difference between knowing English is considerable: 53% Flemings know English where as the only 17% Walloons know English. The questionnaire was pretested before launching among 10-12 participants (e.g., academic personnel and MS students) for ensuring the sufficiency, credibility of the information provided by the questionnaire.

4.2.2 Mode of Survey

Concerning the survey mode, DCEs can be carried out by mail, telephone, face-to-face or web surveys. Each of these survey modes has its advantages and limitations. Considering the COVID-19 issue, we decide to implement our survey in online platform. For our study, we use Google Forms online survey because of its user-friendly features (compatible for both laptop/mobile). The target was to involve as many respondents as possible but still there is a potential probability of having major respondents who are students, researchers and their friends and family. In web survey, respondents generally select themselves for the survey and not everybody is well equipped with internet facilities, which can cause biased sample. But if

take into accounts the trade-offs among other survey mode, web survey has specific benefits over other survey methods. For example: (i) presentation of randomized questions, choice cards are easy to execute in web survey compared to mail or face-to-face surveys as well as telephone surveys, (ii) visual elements such as images and short videos, that help to understand choice attributes or choice tasks, can be effortlessly incorporated in web surveys, (iii) interviewer effects and socially desirable response is low or even absent compared to face-to-face and telephone surveys, (iv) one of crucial benefit is that web surveys are less costly and less time consuming than face-to-face and telephone surveys. It is also evident from several studies comparing different survey approaches regarding environment valuation signify that the implementation of web survey performs similarly as other survey techniques, specifically with respect to willingness-to-pay (Mariel et al., 2021).

4.3 Econometric Models

4.3.1 CLogit (Multinomial Logit) and Mixed logit model

The conditional logit (CLogit) model (McFadden, 1974) is the economic workforce for analyzing discrete choice data. Despite the wide popularity of CLogit, this model possessed with several limitations. One big drawback is the axiom of independence of irrelevant alternatives (IIA). This implies that (conditional upon observed characteristics) utility levels of any two alternatives are independent (assumed that random components are independent) which can lead to unrealistic predictions especially when two or more alternatives are very similar. The multinomial logit and the conditional logit model are often used interchangeably although available econometric literature makes dissimilarities between these two models. The term multinomial points to a situation where the consumers presented with more than two alternatives. Both the multinomial and the conditional logit models are designed to characterize observed choices. The difference between the multinomial and the conditional model evolves in the use of exogeneous variables. The multinomial logit model demonstrates the observed choices only by means of characteristics of the individuals (e.g., gender and age). The conditional logit model, on the other hand allows choices to be observed through the features of the available alternatives (e.g., size, color, or cost). The latter are henceforth denoted as (product) attributes. It is good practice to combine individual-specific and alternative-specific variables, leading to the mixed logit model, which is also called as Random Parameters Logit (RPL) and this model can overcome the drawbacks of the CLogit. In this study data management and analysis were performed using STATA 16.0.

Moreover, these models are identical from a mathematical perspective, which is briefly discussed below:

Let X_i denotes the characteristics of consumer i and W_{ij} for the characteristics of the j^{th} alternative for individual i , with the equivalent parameter vectors, symbolized by the β and α , consecutively. Let, J be the number of unlabeled alternatives (for the current moment we assumed it as constant for all individuals) and P_{ij} denotes the probability of choosing alternative j by individual i . The choice probabilities for Multinomial and Conditional Logit models given below:

$$MNLogit: P_{ij} = \frac{\exp(X_i \beta_j)}{\sum_{k=1}^J \exp(X_i \beta_k)} \quad (I)$$

For $k=1, \dots, J$

$$CLogit: P_{ij} = \frac{\exp(W_{ij} \alpha)}{\sum_{k=1}^M \exp(W_{ik} \alpha)} \quad (II)$$

In a mixed model case, both the features of alternatives and individual are considered

$$Mixlogit: P_{ij} = \sum_{K=1}^M \frac{\exp(X_i \beta_j + W_{ij} \beta)}{\exp(X_i \beta_k + W_{ik} \alpha)} \quad (III)$$

In the Multinomial logit model, the independent variables ($\mathbf{X}$), being characteristics of the consumers are themselves remain constant across the alternatives. Subsequently, those characteristics can influence choice probabilities only by possessing different impact on the different alternatives. As a result, practically, MNLogit estimates a set of $\mathbf{J-I}$ coefficients (β_j) for each exogenous variable. The predicted coefficients exhibit the resultant effect of $\mathbf{X}$ variables on the probability of selecting each alternative that imparts as common benchmark. Because of the arbitrary scaling of the coefficients, there exists only $\mathbf{J-I}$ coefficients. Hence, it becomes necessary to normalize on one set of coefficients, generally by placing it equal to zero.

The associated probability for this alternative is $\frac{1}{\sum \exp(X_{ij} \beta_j)}$, since $\beta = 0$ and $\exp(0) = 1$.

On the contrary, in the CLogit model, the exogeneous variables ($\mathbf{W}$) for each specific alternatives assumed different values, while the impact of a unit of $\mathbf{W}$ is particularly (although not necessarily) assumed to be constant across different alternatives. In this situation, only a single slope coefficient is calculated for each $\mathbf{W}$ variable, which in result brings an impact on

the probabilities of choice estimated from the difference in its value through alternatives. Therefore, in the standard CLogit expression, a **W** (or **X**) variable without any variation across alternatives does not have any ramification on the probabilities of choices. To make the difference clear between MNLogit and CLogit we can divide equations (I) and (II) can be rewritten by dividing through by the numerator:

$$MNLogit: P_{ij} = \frac{1}{\sum_{k=1}^J \exp[X_i(\beta_k - \beta_j)]} \quad (IV)$$

$$CLogit: P_{ij} = \frac{1}{\sum_{k=1}^J \exp[(W_{ik} - W_{ij})\alpha]} \quad (V)$$

Here, we can see that the probability of equation (IV) and (V) depends on the differences in the slope coefficients across various alternatives. Conversely, for equation (V), the probability relies on the differences in the value of the characteristics across alternatives.

4.3.2 Latent Class Model (LCM):

Although the multinomial logit model has provided the foundation for the analysis of discrete choice modelling, its fundamental limitations, most notably its assumption of independence from irrelevant alternatives (IIA), have motivated researchers to consider alternative specifications. The mixed logit model is regarded as the most significant among several innovations in terms of the range of behavior it can accommodate and its overall flexibility. In some respects, the latent class model is a semi-parametric variant of the MNL model that resembles the mixed logit model. Nevertheless, the latent class model is less flexible than mixed logit. For example, this model conjoins the fundamental continuous distribution with a discrete one. One more advantage is that the Latent class model does not demand the researcher set specific assumptions about the nature of the distribution population parameters followed across individual traits. Hence, each model has its drawbacks and virtues (Louviere et al., 2010). Latent class model (LCM) hypothesizes the existence of correlation across some of the random parameters in the model. Preference parameters are random (discrete) but assumed the same for several “classes” of preferences. In addition, a probability of each respondents’ membership in each class is determined as a function of their socio-demographic characteristics. As a result, there is a probability of belonging to a specific class. So, the conception behind the LCM is that the population of decision makers can be characterized as an accumulation of different groups or segments, each one being characterized by a unique

preference pattern (Louviere et al., 2000). Hence, this model emphasizes that consumers characteristics indirectly influences choice through the impact on segment membership (Karousakis & Birol, 2008). where each segment has its specific utility function and choice probabilities. Within each of these segments, preference homogeneity and linearity of random error components can be assumed (Louviere et al., 2010).

CHAPTER 5: EMPIRICAL RESULTS

5.1 Descriptive statistics of sample population

The socio-demographic characteristics of the sample population (206) are reported in the table below. The sample showed an adequate dispersion with respect to gender composition. A higher proportion of females (66%) than males (34%). A large majority (45%) of our respondents belong to the younger age group (18-24). Most of the respondents (51%) were highly educated. The net income was less than 1000€/month for 5% of the respondents and the highest number of individuals (20%) were belonging to between 1000 and 2000€/month. A share of respondents (15%) did not state their income in the survey.

Table 2: Socio-economic characteristics of respondents

Demographic Characteristics	Number of observations	% Of sample
Gender		
Male	70.0	34%
Female	136.0	66%
Age		
18-24	92.0	45%
25-34	49.0	24%
35+	65.0	31%
Income		
Less than 1000€/month	11.0	5%
Between 1000 and 2000€/month	41.0	20%
Between 2000 and 3000€/month	36.0	17%
Between 3000 and 4000€/month	28.0	14%
Between 4000 and 5000€/month	35.0	17%
More than 5000€/month	25.0	12%
Prefer not to report Income	30.0	15%
Education		
Secondary School	32.0	16%
Bachelor or equivalent	68.0	33%
Master/doctorate or equivalent	106.0	51%

5.1.1 Coca-Cola buying habits

The table below illustrates the buying practices of Coca-Cola of Belgian consumers. Most of our respondents (28%) are buying Coca-Cola multiple times in a year, followed by almost never buying (24%). A major group of individuals (36%) are preferring Coca-Cola original. The Belgian consumers most preferred materials for serving Coca-Cola is the glass bottles.

Table 3: Frequency distribution of Coca-Cola buying habits

Response option	Number of responses	% Of sample
Frequency of Coca-Cola buying		
Daily	04	2%
Almost weekly	21	10%
Almost monthly	29	14%
Multiple times in a year	58	28%
Once a year	39	19%
Almost never	02	1%
Never	50	24%
Other	03	2%
Preferred categories of Coca-Cola		
Original Cola	74	36%
Zero Cola	39	19%
Both Original & Zero Cola	28	14%
Not preferred Soda	61	30%
Preferred another brand	04	2%
Preferred materials for single-serve Coca-Cola container		
Plastic	37	18%
Glass	85	41%
Aluminum can	47	23%
No preference	35	17%
Other	02	1%

5.1.2 Perceptions of environmental issues related to plastic and packaging

It is suggested for a typical DCE survey to incorporate few questions on attitudes or norms which in turn will help us to explain heterogeneity of stated preferences ((Mariel et al., 2021). Moreover, when it is about beverages researcher argued that eco-friendly purchasing and disposal behavior are associated with the level of environmental awareness and eco-friendly attitude of the consumers (Van Birgelen et al., 2009)

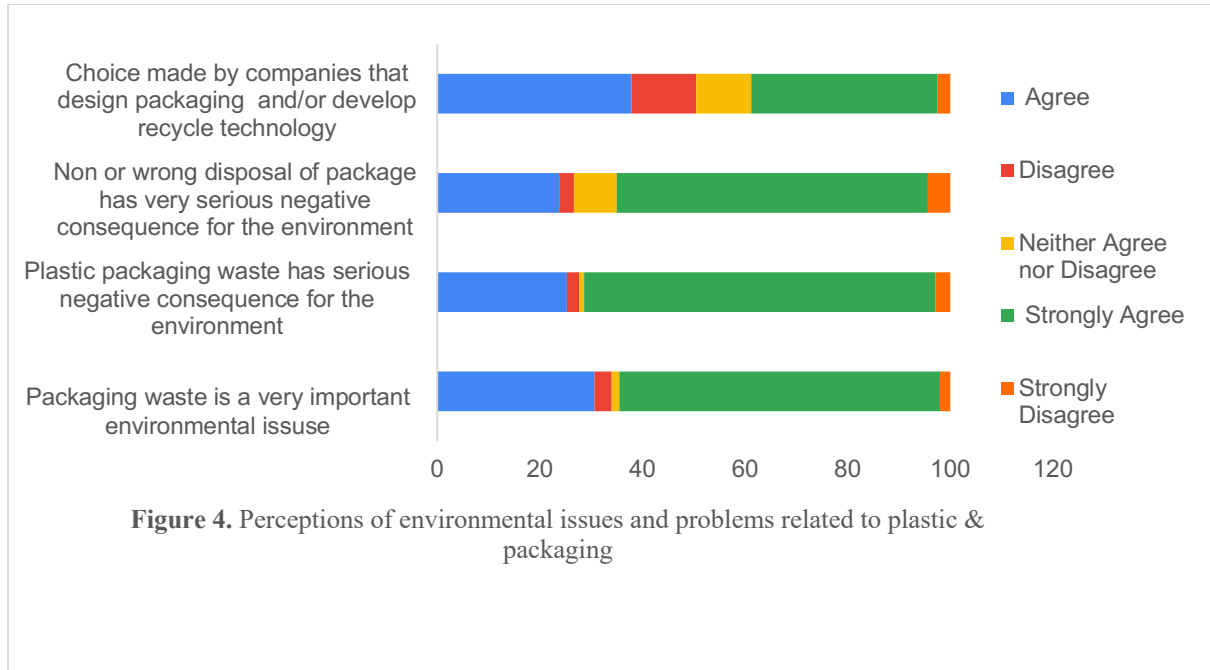


Figure 4 summarizes responses to the 5-point Likert scale statements regarding the understanding of the plastic and packaging pollution on the environment. The bulk of the respondents of Belgium strongly agreed with the issue of “Plastic packaging waste has serious negative consequences for the environment” and “Packaging waste is a very important environmental issue” and “Non or wrong disposal of packages has very serious negative consequences for the environment”. The largest respondents strongly disagreed with the statement “Choices made by companies that design packaging and/or develop recycling technologies is the main cause of negative consequences for the environment”

5.2 Choice Experiment: estimation of sample preferences and preference heterogeneity:

5.2.1 Conditional Logit and Mixed Logit Model

In the present study, two regression modes were used to estimate the results of the Discrete Choice Experiment (DCE). In table 1, the outcomes of simple Conditional Logit Model (CL) for the full sample, male and female are narrated. The complete data set is composed of 3708 observations (206 participants*6 choice sets* 3 alternatives per choice set).

The CL model (Table 4) displays a negative insignificant ASC (represents the utility of choosing the opt-out option). This result suggests the absence of status quo bias (choosing the status quo irrespective of attribute levels). And that the consumers made decisions strictly based on the level of the attributes. The price coefficient is negative and significant at 1% level

of significance, indicating that lower prices are preferred by consumers. The co-efficient for proportion of PE used for packaging: -50% PE and no PE anymore are positive and significant, implying that the presence of these attributes increases consumers utility. The highest utility increment after price occurs due to the presence of recyclability of all materials used for packaging. Consumers here do not prefer zero sugar as it decreases their utility. In the female section, it is evident that the co-efficient of attributes turns out to be significant same as the complete sample except for No PE anymore and zero sugar. Turning now to the experimental evidence on the male segment, one unanticipated finding was that the price attribute is not significant but achieved expected negative sign. In addition, the price coefficient is the largest one in magnitude but with a sizeable standard error which advocates that it has potentials of enormous impact but here we are not able to prove it. This strongly demonstrates a presence of heterogeneous preference for a lower price; different people react differently. A small sample proportion for the male could also be a reason.

The Mixed Logit with fixed and random price also signals the same results (Table 5; Annex:1). What stands out in the table 2 with the full data set is that the marginal utility parameters of the utility functions are significant similar to the CL model except the ASC which turns out to be significant at 5% level of significance with a negative sign. This suggests that consumers generally get negative utility with the selection of status quo alternative. The significant standard deviations (SD) refer to the heterogeneous preferences across consumers. The findings of MXL model for male counterpart also reported the same way, as CL did before with the exception of having a negative sign in the ASC coefficient. The next is the female segment where we can see a slightly different choice pattern. Interestingly, women are now getting negative utility from the reduction of sugar content (Zero sugar) and from reduced PE at -25% level. The co-efficient for ASC found as significant here at 5% level of significance.

Table 4: Conditional logit Regression

	Full sample	Male	Female
	b (se)	b (se)	b (se)
ASC	-0.342 (0.432)	-0.368 (0.732)	-0.365 (0.544)
Price	-1.238*** (0.459)	-0.909 (0.775)	-1.470** (0.578)
-25% PE	0.189 (0.147)	0.504** (0.251)	0.018 (0.183)
-50% PE	0.327** (0.147)	0.312 (0.257)	0.325* (0.181)
No PE anymore	0.423** (0.170)	0.661** (0.294)	0.287 (0.211)
50% recyclable	0.513*** (0.108)	0.497*** (0.178)	0.517*** (0.137)
All materials are recyclable	1.065*** (0.119)	0.833*** (0.203)	1.179*** (0.150)
Zero sugar	-0.298*** (0.096)	-0.533*** (0.163)	-0.172 (0.120)
Observations	3708	1260	2448
Log likelihood	-1266	-420	-831

Note: Significant effects are indicated with *p<0.1, **p<0.05, ***p<0.01 ((based on a pr-test for dummy variables and a two-sample t-test for continuous variables).

Table 5: MXL Regression

	Full Sample		Male		Female	
	Mean b (se)	SD b (se)	Mean b (se)	SD b (se)	Mean b (se)	SD b (se)
ASC	-2.285** (0.896)	4.886*** (0.600)	-2.053 (1.532)	4.968*** (1.034)	-2.669** (1.161)	4.990*** (0.712)
Price	-2.857*** (0.800)		-1.582 (1.294)		-4.038*** (1.086)	
-25% PE	0.352 (0.268)	1.121*** (0.284)	1.024** (0.414)	-0.344 (0.805)	-0.101 (0.378)	1.609*** (0.406)
-50% PE	0.579** (0.261)	-0.047 (0.783)	0.616 (0.439)	-0.395 (0.738)	0.559* (0.339)	-0.038 (0.558)
No PE anymore	0.910*** (0.324)	-0.082 (0.555)	1.379** (0.552)	-0.771 (0.535)	0.652 (0.423)	-0.027 (0.394)
50% recyclable	1.037*** (0.177)	0.060 (0.434)	1.010*** (0.290)	0.015 (0.610)	1.085*** (0.242)	0.229 (0.605)
All materials are recyclable	2.071*** (0.253)	0.243 (0.572)	1.620*** (0.397)	-0.015 (1.115)	2.434*** (0.353)	-0.140 (0.543)
Zero sugar	-0.915*** (0.294)	2.976*** (0.343)	-1.196** (0.474)	2.497*** (0.526)	-0.796** (0.402)	3.488*** (0.504)
Observations	3708		1260		2448	
Log likelihood	-873		-297		-562	

Note: Significant effects are indicated with *p<0.1, **p<0.05, ***p<0.01 ((based on a pr-test for dummy variables and a two-sample t-test for continuous variables).

5.2.2 Estimating willingness-to-pay for product attributes (CLogit and MXLogit)

As expressed above, in the multinomial/conditional logit/mixed logit, the coefficients cannot be directly interpreted as the direct effects of the respective explanatory variables on the probability of choosing each alternative type. Instead, they represent the immediate effects associated with each of the explanatory variables on the (unobservable) utility function, which can be used to calculate the mean willingness-to-pay estimates for each attribute. Each of the estimates was calculated using the ratio of the coefficient associated with the attribute of interest over the Price coefficient (Burton et al., 2001). Therefore, to calculate the mean willingness to pay for each attribute, we estimate the corresponding ratios:

$$WTP = -\frac{\hat{\beta}_{\text{attribute}}}{\hat{\beta}_{\text{price}}}$$

For comparison purposes, the mean WTP estimates, which were calculated using coefficients reported in Table 7 along with 95% confidence interval. The premium for all the levels of the eco-friendly attributes (decrease PE content of packaging and recyclability) is positive irrespective of the different regression models as well as for full sample, male and female counter part although the attribute level -25% PE earned a negative mean premium when fitted with Mixed logit regression. Zero sugar has a negative mean WTP, suggesting that on average consumers value zero cola less than original, which holds true for complete sample, male and female segment. People are willing to pay the highest mean premium for the 100% recyclability of all materials used for packaging.

Table 6: WTP estimates Conditional logit Regression

Attribute	Full sample Mean [95% Confidence Interval]	Male Mean [95% Confidence Interval]	Female Mean [95% Confidence Interval]
-25% PE	0.15€ [-0.07€, 0.97€]	0.55€** [-6.45€, 6.89€]	0.01€ [-0.22€, 0.62€]
-50% PE	0.26€** [0.02€, 1.35€]	0.34€ [-4.49€, 4.99€]	0.22€* [-0.02€, 1.33€]
No PE anymore	0.34€** [0.05€, 1.70€]	0.73€** [-8.01€, 8.67€]	0.20€ [-0.07€, 1.38€]
50% recyclable	0.41€*** [0.17€, 1.62€]	0.55€*** [-5.42€, 5.98€]	0.35€*** [0.12€, 1.62€]
All materials are recyclable	0.86€*** [0.43€, 3.29€]	0.92€*** [-9.30€, 9.82€]	0.82€*** [0.37€, 3.53€]
Zero sugar	-0.24€*** [-0.62€, -0.10€]	-0.59€*** [-5.04€, 4.20€]	-0.12€ [-0.33€, 0.08€]

Table 7: WTP estimates MXL Regression

Attribute	Full sample Mean [95% Confidence Interval]	Male Mean [95% Confidence Interval]	Female Mean [95% Confidence Interval]
-25% PE	0.12€ [-0.05€, 0.53€]	0.65€** [-6.78€, 7.91€]	-0.02€ [-0.18€, 0.24€]
-50% PE	0.20€** [0.02€, 0.71€]	0.39€ [-5.03€, 5.84€]	0.14€ [-0.02€, 0.53€]
No PE anymore	0.32€*** [0.08€, 1.00€]	0.87€** [-9.12€, 10.67€]	0.16€ [-0.03€, 0.62€]
50% recyclable	0.36€*** [0.20€, 0.90€]	0.64€*** [-5.53€, 6.85€]	0.27€ [0.13€, 0.65€]
All materials are recyclable	0.72€*** [0.41€, 1.76€]	1.02€*** [-9.64€, 11.23€]	0.60€ [0.33€, 1.40€]
Zero sugar	-0.32€*** [-0.66€, -0.13€]	-0.76€** [-6.51€, 4.71€]	-0.19€** [-0.44€, -0.001€]

5.3 Empirical results from Latent Class Model:

From the previous empirical results, we believe that segments or groups exist in our sample population and that consumers in these specific segments behave differently. For example, the segments may be consumers with different age groups, income levels, gender or buying preferences or other classifications. Latent Class Model allows us to recognize and have knowledge about these unobserved groups of people. Additionally, we would be able to know who is more likely to be in a group and how the characteristics of that group differ from the other groups.

5.3.1 Diagnostic procedure for determining optimal number of classes:

There are two common measures Akaike Information Criteria (AIC), and Schwartz Bayesian Criteria (SBC/BIC) are used to compare the performance of different processes. These two measures indicate about how well the data fitted. The lower the value of AIC/BIC, the better the model. Comparing all the AIC and BIC of different potential model with different class, the model with four classes fits the best to the sample. However, from the table we can see that adding four class are decreasing AIC/BIC, but the change is much smaller from shifting to three to four class. According to the principle of parsimony, this study will go with the three class.

Table 8: Model selection Criterion

No. of classes	Log likelihood	Parameters	AIC	BIC
2	-1003.42	17	2114.4	2 097.41
3	-9075.46	26	1979.6	1 953.62
4	-8828.82	35	1987.2	1952.24

5.3.2 LCM regression results with three classes

Three classes determined by the LCM split the full sample into three classes, with a probability of belonging to class 1 of 45%, class 2 of 23% and to class 3 of 32%. The classes strongly differ in their preferences except for the “all materials are recyclable”. The ASC for the consumers who belonged to class 1 and class 2 is highly significant with a negative sign implying that people of these two classes get positive utility with the selection of not going for an opt-out option. The scenario is opposite for class 3 with an insignificant positive ASC. The price coefficient for both class 1 and class are highly significant with expected negative sign, whereas this is not true for class 2. For all the classes, presence of 100% recyclability of materials used for packaging exhibit a strong positive preference. We got an interesting result when it comes about sugar content, people belonged to class 1 showed a highly positive significant utility for having zero sugar cola. On the contrary, class 2 displayed a highly negative significant attitude towards intaking zero sugar. Class 3 ended up with an insignificant utility from the reduced sugar attribute.

Table 9: Results of Latent Class Model

	Class 1 Class share= 45%	Class 2 Class share= 23%	Class 3 Class share= 32%
	b	b	b
	(se)	(se)	(se)
ASC	-3.012*** (0.801)	-17.803*** (3.779)	0.260 (1.633)
Price	-2.174*** (0.786)	3.683 (4.431)	-4.675*** (1.781)
-25% PE	0.234 (0.216)	-18.400*** (1.666)	-0.439 (0.588)
-50% PE	0.184 (0.259)	-19.080*** (1.575)	0.334 (0.453)
No PE anymore	0.389 (0.273)	-18.842*** (1.706)	0.427 (0.567)
50% recyclable	0.623*** (0.163)	0.213 (0.744)	0.841 (0.521)
All materials are recyclable	1.179*** (0.182)	1.995** (0.808)	1.699*** (0.542)
Zero sugar	0.476*** (0.132)	-24.089*** (-17.803)	-0.134 (0.372)
Observations	3708		
Log likelihood	-908		

Note: Significant effects are indicated with *p<0.1, **p<0.05, ***p<0.01 ((based on a pr-test for dummy variables and a two-sample t-test for continuous variables).

5.3.2 Comparison of the probabilities to belonging to a specific latent class

According to the comparison among three classes according to the distinct socio-economic characteristics with different buying preference and different patterns of perception displayed in Table 10. It is apparent from the table that consumers are younger in class 1 and this class has a higher student share as it already expected from the younger age of the consumers. Class 3 has a higher probability to be composed of consumers who are female and is significantly correlated to belong to one class rather than another.

With respect to household characteristics the table demonstrated that class 2 has a higher probability to be formed with more male consumers who are living in household with higher income. Class 1 which is composed of a larger share of household with lower income compares to class 2 and 3. A comparison of the 3 classes with regard to their buying cola or not buying cola reveals that class 1 is composed of the individuals who has a higher probability to buy cola and class 3 has the lowest probability to buy cola. Turning now to the categories of preferred Coca-Cola, class 2 has higher probability of decomposed of consumers who preferred

original cola, whereas class 1 has a higher probability of having consumers who preferred zero cola. Result shows that class 3 has a higher probability of not preferring soda. The bottom half of the table shows that class 2 is a group of consumers who has a higher probability of perceiving taste as the distinguishing feature between original and zero sugar and considering sugar as the most important attribute for making their choice decision. On the other hand, class 1 has a higher probability to have consumers who perceive sugar as the main distinguishing feature between original and zero cola and they consider price as the most helpful attribute influencing their decisions. Interestingly, class 3 which has a higher probability of compiling consumers who consider all attributes for making decision ended with higher probability of preferring recyclability attribute.

Table 10: Comparison of Latent Class Model with three classes

	Class 1 Class share= 45%		² Test 1-2		Class 2 Class share= 23%		Test 2-3		Class 3 Class share= 32%		Test 3-1	
	Mean	SD ¹	t ³	pr ⁴	Mean	SD	t	pr	Mean	SD	t	pr
Individual characteristics												
Male	0.34	0.478			0.46	0.504			0.25	0.434	*	
Female	0.66	0.478			0.54	0.504			0.75	0.434	*	
Age category												
Aged between 18-24	0.45	0.500			0.44	0.501			0.45	0.501		
Aged between 25-34	0.29	0.456			0.23	0.425	***		0.17	0.378		
Aged between 35-80	0.26	0.440			0.33	0.476	***		0.38	0.490		
Education category												
Secondary school	0.10	0.297			0.19	0.394	**		0.22	0.414		
Bachelor or equivalent	0.30	0.461			0.38	0.489			0.34	0.477		
Master or doctorate or equivalent	0.60	0.492	***		0.44	0.501	**		0.45	0.501		
Student	0.32	0.470			0.29	0.459			0.31	0.465		
Household characteristics												
Income less than 1000€/month	0.06	0.247			0.02	0.144			0.06	0.242		
Income between 1000 and 2000€/month	0.22	0.413			0.19	0.394			0.18	0.391		
Income between 2000 and 3000€/month	0.23	0.420	**		0.08	0.279			0.17	0.378		
Income between 3000 and 4000€/month	0.15	0.360			0.10	0.309			0.14	0.348		
Income between 4000 and 5000€/month	0.13	0.337	*		0.31	0.468			0.12	0.331	*	
Income more than 5000€/month	0.11	0.311			0.13	0.334			0.14	0.348		
Prefer not to report Income	0.11	0.311			0.17	0.377			0.18	0.391		
Number of Adults	2.88	1.58			3.00	1.52			2.95	1.57		
Number of Children	0.41	0.84			0.60	1.28			0.66	1.51		
Consumption behavior: Coca-Cola												
Buying Coca-Cola	0.80	0.405			0.71	0.459	*		0.37	0.486	*	
Not buying Coca-Cola	0.20	0.405			0.29	0.459	*		0.63	0.486	*	
Categories of Preferred Soda												
Original Cola	0.24	0.427	*		0.81	0.394			0.20	0.403	*	
Zero Cola	0.27	0.446	*		0.02	0.144			0.20	0.403	*	
Both Original & Zero Cola	0.25	0.434	*		0.02	0.144	*		0.06	0.242		
Not preferred Soda	0.22	0.413			0.15	0.357	*		0.52	0.503	*	
Preferred another brand	0.03	0.178			0.00	0.000			0.02	0.124		
Difference: Original VS Zero												
Taste: main difference	0.37	0.484	*		0.81	0.394			0.38	0.490	*	

Sugar: main difference	0.44	0.499	*		0.04	0.202			0.38	0.490	*	
Sugar and taste same	0.19	0.397			0.15	0.357			0.23	0.425		
Preferred attribute												
Price	0.23	0.420	**		0.08	0.279			0.12	0.331		
Decrease in PE	0.05	0.227			0.04	0.202			0.05	0.211		
Recyclability	0.25	0.434			0.21	0.410			0.26	0.443		
Sugar Content	0.28	0.451	*		0.48	0.505	**		0.14	0.348	*	
Consider all attributes	0.19	0.397			0.19	0.394	*		0.43	0.499	*	

Note: One sided t-test, significant effects are indicated with * $p<0.1$, ** $p<0.05$, *** $p<0.01$

¹Standard deviation; ²Here tests are comparing whether the means of Class 1 and Class ³t-test; ⁴Proportion-test

This table is quite revealing in several ways. However, the single most striking observation emerging from the data comparison for each of the classes is that there is a significant statistical difference among all the 3 segments for a particular characteristic i.e., “sugar content is the most preferred attribute for making decisions”. This strongly suggests that the probability to belong to one class rather than another is significantly correlated with the attribute “sugar content”. The people who take “sugar content”, as the most helpful attribute for making choices, increases the probability to belong to class 2 and, decreases the probability to belong to class 1.

CHAPTER 6: DISCUSSION & CONCLUSIONS

6.1 Summary of key results

6.1.1 Preference for price

Consistent with the literature, this research found that consumers from class 1 and 3 preferred to lower prices. Surprisingly, price was found insignificant and positive for the individuals who belong to class 2. Class 2 is composed with higher male counterparts relative to other 2 classes with higher income. A possible explanation for this scenario could be the case that men do not care about the price, or they might be less sensitive to price, the exact opposite of women. For instance, women tend to be looking forward to promotional offer or coupon availability whereas men just take products immediately. Differences between class 1 and 2 include education level, categories of preferred of cola and preferred attributes while making decisions.

6.1.2 Preference for decrease PE content used for packaging

This attribute is not preferred significantly by all respondents, as expected. Although, the people who had a higher probability to belong to class 1 and class 3 were having somewhat positive magnitude (except for -25% PE for class 3) but not significant. Specially, the members of class 2 were achieving highly negative utility from the reduction of PE content, although this class was expressing their highest utility for all materials recyclability with a larger magnitude. The result may be explained that green packaging is not solely about being sustainable, when it is about packaging people really care about the convenience, reusability and protective capability (Hao et al., 2019)

6.1.3 Preference for recyclability

It is remarkable that recyclability accommodates consumers with the higher increment to the utility just after price for all the 3 classes. This finding corroborates evidence from previous several observations (Ferreira & Marques, 2015; Karousakis & Birol, 2008; Klaiman et al., 2016; PlasticsEurope, 2018; Rokka & Uusitalo, 2008; White & Lockyer, 2020)

6.1.4 Preference for sugar content

We can observe a positive and statistically significant parameter value on zero sugar for class 1, which class is more likely to comprise with younger, female students, buying Coca-Cola more, highly educated and with a higher probability to stay in the lower income group. Class

1 and class 3 are more likely to be formed with more female members relative to males. Differences between class 1 and 3 are gender, income, buying Coca-Cola and preferred categories of Coca-Cola, preferred categories of Coca-Cola, sugar and taste perception and preferred attributes in decision making. Turning to the evidence for class 2, this segment was comprised with more males who were kind of addicted to the Coca-Cola original.

Together these interpretations, we found all the three classes are somewhat counterintuitive, in a nutshell, class 1 members and class 3 are such a group which comprised with more female with low income and high income respectively. Interestingly, class 1 is somewhat addicted to buy Coca-Cola on the other hand class 2 did not prefer soda (which gets clear if we see the positive ASC for this class) who are more likely to put emphasize to the recyclability as preferred attribute. This finding may give a reason to call class 1 as “Eco-Conscious-Coca-Cola buyers” and class 3 as “Eco-Conscious- non-Coca-Cola buyers”. What name would be appropriately defined class 2? Cautiously, “Price-insensitive Coca-Cola buyers”. A closer inspection for “Eco-Conscious-Coca-Cola buyers” is that this group were somewhat balancing their choices among different categories of Coca-Cola (original-zero sugar-both original and zero sugar) with a high perception towards sugar as the main difference between original and zero cola and achieved positive utility from the reduced sugar content. Whereas our “Price-insensitive Coca-Cola buyers” were making decisions solely by choosing Coca-Cola original and thought taste was the distinguishing feature for original and zero cola and got negative utility from the sugar reduction. Finally, “Eco-Conscious- non-Coca-Cola buyers”, remained somewhat indifferent as they hardly bought Coca-Cola.

6.2 Limitations

As with choice experiment, the first and foremost problem is the potential bias stemming from the hypothetical experimental set up for our stated preference approach. Given that preferences are stated and not revealed. In this study we did not address the issue of attribute non-attendance. In standard DCE, we assume that participants consider all displayed attributes while making their decisions. However, there is a potential chance of ignoring one or more attributes when deciding between choices, often when the number of attributes are large and make their choices by using only a subset of the attributes. This phenomenon is commonly referred to as attribute non-attendance (ANA) or attribute ignoring. A note of caution is due about the interpretation of men (33%) counterpart as our sample composition was a bit unbalanced. Another problem is the lack of diverse population since almost half of our sample

were students who might exaggerate green packaging issue and might state that they are willing to pay more than what they would do in real life situation.

6.3 Implications

As the quantity of packaging sold increases, waste from the packaging has also increased. Belgian consumers are already concerned since a larger portion of our sample consumers (67%) had the knowledge of green packaging; companies have a pressure to produce more environmentally friendly products. Our results show that consumers already placed highly positive utility for packaging recyclability. Companies like Coca-Cola should focus on sustainable marketing campaigns to enhance recycling rather than launching new packaging in the name of sustainable packaging but lacking with the advantages of packaging benefits e.g., convenience. This study can act like a platform for companies for acquiring knowledge about consumer choice behavior and packaging designs which resemble consumers preferences and influence their purchasing behavior. Future research could examine whether our results generalize to the consumers from other European countries.

REFERENCES

- Abley, J. (2000). Stated Preference Techniques and Consumer Decision Making: New Challenges to Old Assumptions. *Cranfield School of Management*, 1–40.
- Banfi, S., Farsi, M., Filippini, M., & Jakob, M. (2008). Willingness to pay for energy-saving measures in residential buildings. *Energy Economics*, 30(2), 503–516.
- Birgelen, M. Van, Semeijn, J., & Keicher, M. (2009). Proenvironmental Consumption Behavior Investigating Purchase and Disposal. *Environment And Behavior*, 41(1), 125–146.
- Boks, C., & Stevels, A. (2007). Essential perspectives for design for environment. Experiences from the electronics industry. *International Journal of Production Research*, 45(18–19), 4021–4039.
- Breidert. (2006). Willingness to pay as patient preference to bariatric surgery. *Innovative Marketing*, 17(1), 73–81.
- Burton, M., Rigby, D., Young, T., & James, S. (2001). Consumer attitudes to genetically modified organisms in food in the UK. *European Review of Agricultural Economics*, 28(4), 479–498.
- Cantillo, J., Martín, J. C., & Román, C. (2020). Discrete choice experiments in the analysis of consumers' preferences for finfish products: A systematic literature review. *Food Quality and Preference*, 84(November 2019), 103952.
- Chae, Y., & An, Y. J. (2018). Current research trends on plastic pollution and ecological impacts on the soil ecosystem: A review. *Environmental Pollution*, 240, 387–395.
- Chekima, B. C., Syed Khalid Wafa, S. A. W., Igau, O. A., Chekima, S., & Sondoh, S. L. (2016). Examining green consumerism motivational drivers: Does premium price and demographics matter to green purchasing? *Journal of Cleaner Production*, 112, 3436–3450.
- Chen, Y. S., Hung, S. T., Wang, T. Y., Huang, A. F., & Liao, Y. W. (2017). The influence of excessive product packaging on green brand attachment: The mediation roles of green brand attitude and green brand image. *Sustainability (Switzerland)*, 9(4).
- ChoiceMetrics. (2018). Ngene 1.2 user manual & reference guide. *Australia*, 1–12.
- Clark, M. D., Determann, D., Petrou, S., Moro, D., & de Bekker-Grob, E. W. (2014). Discrete Choice Experiments in Health Economics: A Review of the Literature. *PharmacoEconomics*, 32(9), 883–902.
- Comission, E. (2018). *A European Strategy for Plastics in a Circular Economy*.
- Czajkowski, M., Giergiczny, M., & Greene, W. H. (2014). Learning and fatigue effects revisited: Investigating the effects of accounting for unobservable preference and scale heterogeneity. *Land Economics*, 90(2), 324–351.
- Deng, X., & Srinivasan, R. (2013). When do transparent packages increase (or decrease) food consumption? *Journal of Marketing*, 77(4), 104–117.
- Derraik, J. G. B. (2002). The pollution of the marine environment by plastic debris: A review. *Marine Pollution Bulletin*, 44(9), 842–852.
- Dharmadhikari. (2012). Eco-friendly packaging in supply chain. *The IUP Journal of Supply Chain Management*, 7(2), 7–14.

- Dilkes-Hoffman, L., Ashworth, P., Laycock, B., Pratt, S., & Lant, P. (2019). Public attitudes towards bioplastics – knowledge, perception and end-of-life management. *Resources, Conservation and Recycling*, 151(September), 104479.
- Dillman. (2008). Internet, mail, and mixed-mode Surveys: the tailored design method. 3rd Revised Edn. Wiley, Hoboken, NJ, 0, 3–4.
- European. (2018). *Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions. Commission Work Programme 2019*.
- Ferreira, S., & Marques, R. C. (2015). Contingent valuation method applied to waste management. *Resources, Conservation and Recycling*, 99, 111–117.
- Folkes, V., & Matta, S. (2004). The effect of package shape on consumers' judgments of product volume: Attention as a mental contaminant. *Journal of Consumer Research*, 31(2), 390–401.
- Goucher-Lambert, K., & Cagan, J. (2015). The Impact of Sustainability on Consumer Preference Judgments of Product Attributes. *Journal of Mechanical Design, Transactions of the ASME*, 137(8).
- Granger, A. G. and C. W. J. (1961). *On the Price Consciousness of Consumers Authors (s): Andre Gabor and C. W. J. Granger Published by: Wiley for the Royal Statistical Society Stable URL: <http://www.jstor.org/stable/2985208> Accessed: 28-03-2016 12: 46 UTC Your use of the JSTOR arch. 10(3), 170–188*.
- Groves, R. M., Presser, S., & Dipko, S. (2004). The role of topic interest in survey participation decisions. *Public Opinion Quarterly*, 68(1), 2–31.
- Hamelin, J. (2000). *Le prix de référence : un concept polymorphe Author (s): Jordan Hamelin Source : Recherche et Applications en Marketing , 2000 , Vol . 15 , No . 3 , LE PRIX (2000) , Published by : Sage Publications , Ltd . on behalf of Association Française du Marketi. 15(3), 75–88*.
- Hao, Y., Liu, H., Chen, H., Sha, Y., Ji, H., & Fan, J. (2019). What affect consumers' willingness to pay for green packaging? Evidence from China. *Resources, Conservation and Recycling*, 141(April 2018), 21–29.
- Harper, A. B., Wiltshire, A. J., Cox, P. M., Friedlingstein, P., Jones, C. D., Mercado, L. M., ... Duran-Rojas, C. (2018). Vegetation distribution and terrestrial carbon cycle in a carbon cycle configuration of JULES4.6 with new plant functional types. *Geoscientific Model Development*, 11(7), 2857–2873.
- Hartley, B. L., Pahl, S., Veiga, J., Vlachogianni, T., Vasconcelos, L., Maes, T., ... Thompson, R. C. (2018). Exploring public views on marine litter in Europe: Perceived causes, consequences and pathways to change. *Marine Pollution Bulletin*, 133(December 2017), 945–955.
- Henderson, L., & Green, C. (2020). Making sense of microplastics? Public understandings of plastic pollution. *Marine Pollution Bulletin*, 152(October 2019), 110908.
- Hoyos, D. (2010). The state of the art of environmental valuation with discrete choice experiments. *Ecological Economics*, 69(8), 1595–1603.
- Hurley, B. R. A., Ouzts, A., Fischer, J., & Gomes, T. (2013). PAPER PRESENTED AT IAPRI WORLD CONFERENCE 2012 Effects of Private and Public Label Packaging on Consumer Purchase Patterns. *Packaging and Technology and Science*, 29(January), 399–

- ILO. (2015). Policy brief: Gender Equality and Green. *Policy Brief, 2015*, 1–12.
- Ilyuk, V., & Block, L. (2016). The effects of single-serve packaging on consumption closure and judgments of product efficacy. *Journal of Consumer Research*, 42(6), 858–878.
- Iyer. (2007). Consumer recycling: Role of incentives, information, and social class. *Journal of Consumer Behaviour*, 50, 35–50.
- Johnson, C. Y., Bowker, J. M., & Cordell, H. K. (2004). Ethnic variation in environmental belief and behavior: An examination of the new ecological paradigm in a social psychological context. In *Environment and Behavior* (Vol. 36).
- Johnsson-Latham. (2007). A study on gender equality as a prerequisite for sustainable development. *Report to the Environment Advisory Council, Sweden*, 90.
- Karousakis, K., & Birol, E. (2008). Investigating household preferences for kerbside recycling services in London: A choice experiment approach. *Journal of Environmental Management*, 88(4), 1099–1108.
- Kassaye. (1992). Balancing traditional packaging functions with the new “green” packaging concerns. *SAM Advanced Management Journal*, 57(4), 15–25.
- Kelly. (2007). Stated preferences of tourists for eco-efficient destination planning options. *Tourism Management*, 28(2), 377–390.
- Kenneth-Train. (2002). Discrete choice methods with simulation. *Discrete Choice Methods with Simulation*, 9780521816, 1–334.
- Khan. (2015). Gender Difference and Sustainable Consumption Behaviour. *British Journal of Marketing Studies*, 3(3), 29–35.
- Klaiman, K., Ortega, D. L., & Garnache, C. (2016). Consumer preferences and demand for packaging material and recyclability. *Resources, Conservation and Recycling*, 115, 1–8.
- Lancaster, K. (1966). A New Approach to Consumer Theory Author (s): Kelvin J . Lancaster A NEW APPROACH TO CONSUMER THEORY *. *Journal of Political Economy*, 74(2), 132–157.
- Laville, S. (2020). Removing plastic packaging from fresh produce – what’s the impact? *Nutrition Bulletin*, 45(1), 35–50.
- Le Gall-Ely, M. (2009). Definition, Measurement and Determinants of the Consumer’s Willingness to Pay: A Critical Synthesis and Avenues for Further Research. *Recherche et Applications En Marketing (English Edition)*, 24(2), 91–112.
- Leal Filho, W., Saari, U., Fedoruk, M., Iital, A., Moora, H., Klöga, M., & Voronova, V. (2019). An overview of the problems posed by plastic products and the role of extended producer responsibility in Europe. *Journal of Cleaner Production*, 214, 550–558.
- Lindh, H. (2016). Elucidating the Indirect Contributions of Packaging to Sustainable Development: A Terminology of Packaging Functions and Features. *Packaging and Technology and Science*, 29, 399–412.
- Lotze, H. K., Guest, H., O’Leary, J., Tuda, A., & Wallace, D. (2018). Public perceptions of marine threats and protection from around the world. *Ocean and Coastal Management*, 152(September 2017), 14–22.
- Louviere, J. J., Flynn, T. N., & Carson, R. T. (2010). LFCJofCM10.pdf. *Journal of Choice Modeling*, 3(3), 57–72.
- Louviere, J. J., Hensher, D. A., Swait, J. D., & Adamowicz, W. (2010a). Combining sources

- of preference data. In *Stated Choice Methods*.
- Louviere, J. J., Hensher, D. A., Swait, J. D., & Adamowicz, W. (2010b). Combining sources of preference data. In *Stated Choice Methods*.
- Magnier, L., & Crié, D. (2015). Communicating packaging eco-friendliness: An exploration of consumers' perceptions of eco-designed packaging. *International Journal of Retail and Distribution Management*, 43(4–5), 350–366.
- Mariel. (2021). *Environmental Valuation with Discrete Choice Experiments Guidance on Design, Implementation and Data Analysis*. SpringerBriefs in Economics.
- Marsh, K., & Bugusu, B. (2007). Food packaging - Roles, materials, and environmental issues: Scientific status summary. *Journal of Food Science*, 72(3).
- Martín, J. C., Román, C., & Mendoza, C. (2018). Determinants for sun-and-beach self-catering accommodation selection: A stated preference approach. *Tourism Economics*, 24(3), 319–336.
- Martinho, G., Pires, A., Portela, G., & Fonseca, M. (2015). Factors affecting consumers' choices concerning sustainable packaging during product purchase and recycling. *Resources, Conservation and Recycling*, 103, 58–68.
- McFadden. (1974). Econometric Models of Probabilistic Choice. *Working Paper, University of California, Berkely*, 198–272.
- McKeage, B. B. and K. (1994). How Green Is My Value: Exploring the Relationship Between Environmentalism and Materialism. *Advances in Consumer Research*, 21, 1–12.
- Meyerhoff, J., & Liebe, U. (2009). Status quo effect in choice experiments: Empirical evidence on attitudes and choice task complexity. *Land Economics*, 85(3), 515–528.
- Meyerhoff, J., Oehlmann, M., & Weller, P. (2015). The Influence of Design Dimensions on Stated Choices in an Environmental Context. *Environmental and Resource Economics*, 61(3), 385–407.
- Molina-Besch, K. (2016). Prioritization guidelines for green food packaging development. *British Food Journal*, 118(10), 2512–2533.
- Monnot, E., Parguel, B., & Reniou, F. (2015). Consumer responses to elimination of overpackaging on private label products. *International Journal of Retail and Distribution Management*, 43(4–5), 329–349.
- Norbisimi. (2010). Social Aspect of Sustainable Packaging. *Packaging and Technology and Science*, 23, 317–326.
- OECD. (2006). *Annual Report on Sustainable Development Work in the Organisation for Economic Co-operation and Development (OECD)*.
- Ortega, D. L., Wang, H. H., Wu, L., & Olynk, N. J. (2011). Modeling heterogeneity in consumer preferences for select food safety attributes in China. *Food Policy*, 36(2), 318–324.
- Phillips, C. (2017). Discerning ocean plastics: Activist, scientific, and artistic practices. *Environment and Planning A*, 49(5), 1146–1162.
- PlasticsEurope. (2018). Annual Review 2017-2018,. *Association of Plastic Manufacturer*, 14–35.
- Prakash, G., & Pathak, P. (2017). Intention to buy eco-friendly packaged products among young consumers of India: A study on developing nation. *Journal of Cleaner Production*, 141, 385–393.

- Prendergast, G., & Pitt, L. (1996). Packaging, marketing, logistics and the environment: Are there trade-offs? *International Journal of Physical Distribution & Logistics Management*, 26(6), 60–72.
- Quincey. (2021). Coca-Cola Business & Environmental report, Social and Governance Report, 2020. *The Coca-Cola Company*, pp. 1–4.
- Rigby, D., & Burton, M. (2005). Preference heterogeneity and GM food in the UK. *European Review of Agricultural Economics*, 32(2), 269–288.
- Rokka, J., & Uusitalo, L. (2008). Preference for green packaging in consumer product choices – Do consumers care? *International Journal of Consumer Studies*, 32(5), 516–525.
- Roper, S., & Parker, C. (2013). Doing well by doing good: A quantitative investigation of the litter effect. *Journal of Business Research*, 66(11), 2262–2268.
- Rundh, B. (2005). The multi-faceted dimension of packaging: Marketing logistic or marketing tool? *British Food Journal*, 107(9), 670–684.
- Sandra Laville. (2019). Coca-Cola admits it produces 3m tonnes of plastic packaging a year | Business | The Guardian. *The Guardian*.
- Sarrias, M. (2020). Individual-specific posterior distributions from Mixed Logit models: Properties, limitations and diagnostic checks. *Journal of Choice Modelling*, 36(June), 100224.
- Schultz, P. W., Oskamp, S., & Mainieri, T. (1995). Who recycles and when? A review of personal and situational factors. *Journal of Environmental Psychology*, 15(2), 105–121.
- Simms, C., & Trott, P. (2010). Packaging development: A conceptual framework for identifying new product opportunities. *Marketing Theory*, 10(4), 397–415.
- Simon. (1995). Le prix, souci numéro un du marketing. *Décisions Marketing*, 6(7), 1–10.
- Steenis, N. D., van Herpen, E., van der Lans, I. A., Ligthart, T. N., & van Trijp, H. C. M. (2017). Consumer response to packaging design: The role of packaging materials and graphics in sustainability perceptions and product evaluations. *Journal of Cleaner Production*, 162, 286–298.
- Terry, D. J., Hogg, M. A., & White, K. M. (1999). The theory of planned behaviour: Self-Identity, social identity and group norms. *British Journal of Social Psychology*, 38(3), 225–244.
- Thøgersen. (1999). The Ethical Consumer . Moral Norms and Packaging Choice. *Journal of Consumer Policy*, 22, 439–460.
- Thurstone, L. L. (1927). A law of comparative judgment. *Scaling: A Sourcebook for Behavioral Scientists*, (107), 81–92.
- Underwood, R. L., Klein, N. M., & Burke, R. R. (2001). Packaging communication: Attentional effects of product imagery. *Journal of Product & Brand Management*, 10(7), 403–422.
- Van Birgelen, M. J. H., Wetzels, M. G. M., & Van Dolen, W. M. (2008). Effectiveness of corporate employment web sites: How content and form influence intentions to apply. *International Journal of Manpower*, 29(8), 731–751.
- Wells, L. E., Farley, H., & Armstrong, G. A. (2007). The importance of packaging design for own-label food brands. *International Journal of Retail & Distribution Management*, 35(9), 677–690.
- White, A., & Lockyer, S. (2020). Removing plastic packaging from fresh produce – what’s the

- impact? *Nutrition Bulletin*, 45(1), 35–50.
- Wikström, F., Williams, H., & Venkatesh, G. (2016). The influence of packaging attributes on recycling and food waste behaviour – An environmental comparison of two packaging alternatives. *Journal of Cleaner Production*, 137, 895–902.
- Williams, H., & Wikström, F. (2011). Environmental impact of packaging and food losses in a life cycle perspective: A comparative analysis of five food items. *Journal of Cleaner Production*, 19(1), 43–48.
- Zhang, G., & Zhao, Z. (2012). Green Packaging Management of Logistics Enterprises. *Physics Procedia*, 24, 900–905.
- Zillmann. (2014). Survey topic and unit nonresponse. *Qual Quant*, 48.

ANNEXE

ANNEXE: 1 MXL Regression Random price

	Full Sample		Male		Female	
	Mean	SD	Mean	SD	Mean	SD
	b	b	b	b	b	b
	(se)	(se)	(se)	(se)	(se)	(se)
ASC	-2.590***	4.505***	-2.295	5.166***	-3.040	4.750***
	(0.953)	(0.673)	(1.693)	(1.377)	(1.204)	(0.813)
Price	-3.481***	4.428***	-1.941	5.227	-4.426	3.039
	(0.980)	(1.111)	(1.581)	(1.546)	(1.221)	(1.532)
-25% PE	0.383	1.297***	1.189***	0.549	-0.108	1.684***
	(0.286)	(0.303)	(0.460)	(0.610)	(0.388)	(0.427)
-50% PE	0.656**	-0.040	0.768	0.467	0.577*	0.041
	(0.278)	(0.592)	(0.481)	(0.830)	(0.349)	(0.531)
No PE anymore	1.017***	-0.008	1.685***	-0.835	0.665	0.004
	(0.346)	(0.636)	(0.627)	(0.609)	(0.432)	(0.403)
50% recyclable	1.118***	0.125	1.172***	-0.089	1.111***	0.154
	(0.191)	(0.473)	(0.334)	(1.019)	(0.248)	(0.992)
All materials are recyclable	2.250***	0.349	1.906***	0.447	2.510***	-0.274
	(0.287)	(0.646)	(0.474)	(0.680)	(0.378)	(0.516)
Zero sugar	-0.966**	3.134***	-1.277**	2.779***	-0.798	3.576***
	(0.318)	(0.369)	(0.528)	(0.623)	(0.420)	(0.529)
Observations	3708					
Log likelihood	-869					

Note: Significant effects are indicated with * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ ((based on a pr-test for dummy variables and a two-sample t-test for continuous variables).

