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Insights into Recycling Intentions of Consumers: Predictors of Participation in the Dutch Deposit Return System

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ABSTRACT

This study investigated the predictors of recycling behaviour within the Dutch deposit return system, an important initiative for promoting a circular economy and mitigating environmental impact. Despite the Dutch governmental goal of achieving a 90% return rate for eligible bottles and cans, recycling behaviour has been disappointing. The study aimed to enhance the understanding of individual and contextual predictors influencing recycling behaviour within this system. The central research question was: *"What are the most important individual and contextual factors in predicting consumers' intention to recycle using the Dutch deposit return system?"*.

The research methodology included desk research, qualitative interviews, and a quantitative survey. The literature review identified significant demographic (age, gender, education, income), individual (environmental values, social norms, habit strength, past behaviour), and contextual factors (location of recycling systems, financial incentives) influencing recycling behaviour. Five interviews at a deposit return machine provided additional insights, highlighting environmental concerns, financial incentives, packaging state, habitual behaviour, and convenience as key factors.

A survey of 227 adults in the Netherlands, conducted via Qualtrics, gathered data on demographic variables, individual factors, and contextual attributes related to recycling intentions. Statistical analyses using SPSS employed hierarchical multiple regression and conjoint analysis.

The study identified habit strength and past recycling behaviour as the strongest predictors of recycling intention, with habit strength also being the strongest predictor of past behaviour. Social norms were positively, and environmental values were negatively associated with past recycling behaviour. The distance to recycling machines had the most significant impact on recycling likelihood in the conjoint analysis, followed by packaging state and number of items. Financial incentives were ineffective unless substantially increased.

The study concluded that habit strength, past recycling behaviour, and distance to recycling machines are primary predictors of recycling intentions in the Dutch deposit return system. Policy recommendations for achieving higher recycling rates include increasing the number of conveniently located recycling machines, improving packaging designs to prevent leakage, and enhancing deposit machines to accept damaged packaging.

Future research should aim for larger, more diverse samples, advanced statistical methods to mitigate ceiling effects, and longitudinal designs to capture behavioural changes over time. This study provides valuable insights for policymakers aiming to increase recycling rates and support a circular economy, emphasising the importance of convenience and habitual behaviour over financial incentives. Such interventions can help achieve the 90% recycling target, contributing positively to environmental sustainability and climate change mitigation.

Keywords: Recycling behaviour, Dutch deposit return system, Habit strength, Quantitative research, Environmental sustainability

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 CHAPTER 1: Introduction

1.1 Introduction to the subject

Global climate change poses a critical threat to our planet, putting at risk human health, well-being, economic growth, security, and access to food and water (Ebi et al., 2021). One of the human actions that can positively affect climate change is engaging in behaviour that supports a circular economy. The main circular strategies suitable for packaging include refuse, rethink, reduce, reuse, and recycle (Kirchherr et al., 2017). One strategy that can be used to promote packaging recycling is offering financial incentives. To reduce litter in the Netherlands, a new, nationwide **deposit return system** has become operational for small plastic bottles in July 2021 and for cans in April 2023 (Ministerie van Infrastructuur en Waterstaat, 2023). The government has stipulated that 90% of the bottles and cans eligible for recycling should be returned, but the recycling intent has been disappointing so far, although the percentages are gradually increasing. In the first quarter of 2024, only 75% of cans and 78% of small plastic bottles were recycled using the Dutch deposit return system (Moeys, 2024). The Dutch mountain of uncollected deposits of plastic bottles and cans has grown significantly in the past two years. It is projected that €140 million in deposits will remain uncollected in 2024 (Het Financieele Dagblad, 2024). Based on 2023 sales figures; the total potential deposits, including those for cans and small and large plastic bottles, amount to €708 million (Verpact, June 2024).

Contrary to the popular belief that individual actions are too insignificant to impact global issues such as climate change, research has shown that shifts in **consumer behaviour** can play a crucial role in addressing climate change (Steg, 2023). Many individuals may underestimate the collective power of individual actions, but studies show that when consumers make more sustainable choices, it can lead to positive outcomes for the environment (Steg, 2023). This highlights the importance of educating and motivating individuals to adopt environmentally friendly behaviour to contribute effectively to global sustainability efforts. Consequently, there has been an increased focus on understanding the mechanisms behind sustainable behaviours and strategies to stimulate behavioural change. Various studies have explored the factors that predict recycling of packaging materials, including demographic, social influence, contextual and individual factors (reviewed by Corona et al., 2024). Studies have linked demographic factors such as age, education, and gender to packaging recycling behaviour. Furthermore, contextual factors such as the accessibility of recycling systems may influence package recycling behaviour. In addition, individual factors such as environmental values, health conscientiousness and past behaviour are associated with packaging recycling (Novoradovskaya et al., 2020; Corona et al., 2024). In the study by Novoradovskaya et al. (2020), potential predictors of the sustainable behaviour of using a reusable hot drink cup were explored under students and staff (n=270) from Australian universities. Participants completed an online questionnaire with questions about their previous and intended use of a reusable cup, habit strength, and several personality constructs, and retrospectively reported use of their reusable cup one week later. Using

hierarchical multiple regression, age, intention to reuse a cup, and environmental values were found to be predictive of using a reusable cup. These findings support previous research, where intention to partake in sustainable behaviours was one of the strongest predictors of these behaviours (Bamberg & Möser, 2007). However, intentions rarely fully predict behaviour, a phenomenon known as the **intention-behaviour gap**. Strong intentions provide better predictions of behaviour, thereby reducing the intention-behaviour gap (Conner & Norman, 2022). Another factor which may help in bridging the gap between intention and behaviour is habit strength (Gardner et al., 2011). In the study by Novoradovskaya et al., a moderation effect of habit strength was not found, however. A meta-analysis by Geiger et al. (2019) aimed to identify the most important factors related to recycling across 91 studies. From this meta-analysis it became clear that both individual and contextual factors were related to recycling. Individual and contextual factors performed better in predicting intention to recycle than in predicting self-reported and observed recycling behaviour. In another meta-analysis of 22 studies by Maki et al. (2016), the effect of financial incentive interventions on sustainable behaviours, including recycling, was evaluated. Financial incentives were found to have a small-to-medium effect on sustainable behaviour.

The Dutch deposit return system has not yet achieved the desired effect. However, successful outcomes in other European countries suggest that the 90% recycling rate target should be feasible. Germany, for example, has achieved a 98% return rate using their deposit return system (Sensoneo, 2024). The reasons why so many consumers in the Netherlands do not return their bottles and cans have not yet been explored. Both individual and contextual factors could influence their intention to recycle and actual recycling behaviour (Geiger et al., 2019).

1.2 Research questions

The present study centres around factors related to consumer participation in the Dutch deposit return system for recycling cans and plastic bottles. The study aims to identify the main factors that are significantly positively associated with the intentions of adults in the Netherlands to participate in this recycling system. Various individual factors associated with the intention to recycle will be examined. In addition, it will be explored to what extent specific contextual factors causally affect recycling intent.

This leads to the following central research question: ***What are the most important individual and contextual factors in predicting consumers' intention to recycle using the Dutch deposit return system?***

To address this, the following theoretical sub-questions will be explored:

1. What individual and contextual factors have been identified in previous studies as predictive of recycling behaviour in consumers?
2. What demographic characteristics have previous studies identified as predictive of recycling behaviour in consumers?

Additionally, the following empirical sub-questions will be investigated:

1. Which of the explored demographic factors are significantly associated with consumers' intention to recycle?
2. Which of the individual factors examined are significantly associated with consumers' intention to recycle and what is their relative importance?
3. Which of the explored demographic factors are significantly associated with consumers' past recycling behaviour?
4. Which of the individual factors examined are significantly associated with consumers' past recycling behaviour and what is their relative importance?
5. Among the investigated contextual factors, which ones causally influence consumers' intention to recycle and what is their relative importance?

1.3 Research methods and hypotheses

This study will incorporate desk research and qualitative research, alongside descriptive and causal research using a survey format. For the qualitative research, five adults will be interviewed at a deposit return machine to obtain further insights into potentially important individual and contextual factors. For the descriptive and casual research, a prospective study design will be employed, where at least 200 adults living in the Netherlands will be asked to complete an online survey. To create and conduct the survey, the online tool Qualtrics will be used. To distribute the survey, various social media platforms such as LinkedIn and WhatsApp will be used. Due to the nature of the distribution process of the survey, it is anticipated that university students will be overrepresented in the study sample. The survey will be categorised into three main sections. Firstly, demographic questions will gather respondent information such as age and gender. Secondly, questions will be asked about intention to recycle, recent recycling behaviour, and various personality constructs, largely following Novoradovskaya et al. (2020). Thirdly, conjoint questions will aim to find a causal relation between specific contextual attributes and the intention to recycle, using random conjoint profiles created by SPSS. Statistical analyses will be performed with the obtained data using SPSS. Hierarchical multiple regression will be used to explain variance in the intention to recycle and past recycling behaviour for each independent variable while accounting for all other variables. For the conjoint analysis, the rating of conjoint profiles, symbolising the likelihood to recycle, will be regressed on the attribute levels of the profiles.

It is hypothesised that age, gender, education, income, environmental values, social norms, habit strength and past recycling behaviour will be significantly associated with the intention to recycle. The second hypothesis is that age, gender, education, income, environmental values, social norms and habit strength will be significantly associated with past recycling behaviour. Furthermore, it is hypothesised that the contextual factors distance to recycling machines, the state of the packaging, the magnitude of the financial

incentive and the number of packages to be recycled will causally affect recycling intentions, with the size of the financial incentive expected to be the most important attribute.

1.4 Study relevance

This study will enrich the body of knowledge regarding individual and contextual predictors of the recycling behaviour of individuals using the Dutch deposit return system. The results of this study can be of great value for policymakers when considering interventions to increase sustainable recycling behaviour, particularly in the Netherlands. Failure to reach the goal of recycling 90% of plastic bottles and cans will result in unacceptable growth of the Dutch mountains of uncollected deposits and unrecycled packaging waste. If we want to battle climate change and its detrimental effects on our planet, no time should be wasted in taking the necessary measures when it comes to recycling.

2 CHAPTER 2: Theoretical Framework

2.1 Introduction to the subject

2.1.1 Consequences of climate change

Human-induced climate change presents a multifaceted threat, affecting health, economic stability, security, and access to essential resources for billions of people worldwide (Steg, 2023). The frequency of extreme weather events such as heatwaves, floods, cyclones, wildfires and droughts is on the rise, indicating the frightening reality of climate change (Ebi et al., 2021; Steg, 2023). The year 2023 has been the hottest year on record, with records broken for ocean heat, sea level rise and Antarctic Sea ice loss (World Meteorological Organization, 2024). Patz et al. (2005) estimated that over 150,000 deaths and 5 million disability-adjusted life years (DALYs) per year can be attributed to climate change, mainly in developing countries. If global warming continues to increase, the adverse effects of climate change are expected to worsen. The Intergovernmental Panel on Climate Change (IPCC) has projected that limiting global warming to 1.5°C instead of 2.0°C will significantly reduce the impact of climate change on the occurrence of extreme weather events, sea-level rise, biodiversity, food production and water shortages (IPCC, 2018).

2.1.2 Recycling in a circular economy

One of the human actions that can contribute to addressing climate change is supporting a circular economy through individual behaviour (Steg, 2023). Supporting a circular economy includes avoiding excessive consumption, waste, and the use of fossil fuels by promoting practices such as reusing, refurbishing, repurposing, repairing, and recycling materials and products. Circular strategies that can be used for packaging include rethink, reduce, reuse, and recycle (Kirchherr et al., 2017). Recycling helps to combat climate change by reducing the use of raw materials and preventing waste from going into landfills. Using scraps to produce aluminium cans, for example, saves 95% of the energy needed as compared to making cans from raw materials (Robinson & Huun, 2023).

In 2009, around 4% of all oil and gas production in the world was used as raw material for plastics and a further 3 to 4% was used for their manufacture (Hopewell et al., 2009). Less than 10% of all plastics worldwide are recycled, however (The Organization for Economic Co-operation and Development, 2022). Most of the plastic that is not recycled ends up in rivers and oceans. This does not only threaten animals and plants, but also poses a critical threat to the climate since plastic releases greenhouse gasses during its slow breakdown. Furthermore, microplastics may affect the ability of plankton to absorb carbon dioxide and produce oxygen. According to the World Economic Forum (2023) more than half of the Earth's oxygen is produced in the ocean, making it of vital importance to our ecosystem. In a study by Morales-Caselles et al. (2021), plastic bottles were found to be the second most widespread waste item polluting the world's oceans at 11.9% of all waste. Furthermore, aluminium beverage cans were found to be tenth most polluting at 3.9% of all waste.

Even though Europe is one of the most advanced continents regarding recycling of plastics, recycling rates were still at only 30% in 2019. Plastics for packaging are the most prevalent plastic in Europe at 39.9% of all plastics and additionally are the most common plastic waste on European beaches (The European Recycling Industries' Confederation, 2020). In the Netherlands, the rate of plastic packaging recycling was 54.5% in 2022, which is above the average recycling rate in Europe (Plastics Europe, 2022). The Single-use Plastics Directive has defined targets for the separate collection for recycling of plastic beverage bottles in Europe (Directive (EU) 2019/904). By 2025, Member States must meet the target of 77% for the separate collection for recycling of these bottles. By 2029, 90% of single-use plastic bottles must be recycled. One strategy that can be used to try to achieve these targets of single-use plastic bottle recycling is offering financial incentives.

2.1.3 The Dutch deposit return system

Until 2021, the Dutch deposit return system for beverage packaging covered large plastic bottles and refillable beer bottles. To further reduce litter in the Netherlands, a new, nationwide deposit return system has become operational for small plastic bottles of soft drinks and water in July 2021 and for aluminium cans in April 2023 (Ministerie van Infrastructuur en Waterstaat, 2023). The system ensures that these bottles and cans are charged with a deposit, to encourage recycling. When people return their cans to supermarkets, they receive a small amount of money back as an incentive for recycling. By introducing this new system an additional 2.7 billion packaging units are covered by a deposit annually: 1.8 billion cans and 900 million small plastic bottles (CE Delft, 2017). The implementing foundation for this new deposit system is Statiegeld Nederland, which is part of Verpact. The government has stipulated that Statiegeld Nederland must ensure that 90% of the bottles and cans eligible for the deposit return system are returned.

Recycling efforts have fallen short of the governmental recycling targets of 90%, however. In 2023, approximately 70% of small plastic bottles and 65% of cans eligible for the deposit return system were recycled, and in the first quarter of 2024, this had increased to 78% and 75%, respectively (Verpact, April 2024; Moeys, 2024). It is projected that €140 million worth of deposits will go uncollected in 2024 (Het Financieele Dagblad, 2024). Based on 2023 sales figures; the total potential deposits, including those for cans and small and large plastic bottles, amount to €708 million (Verpact, June 2024).

The governmental target of a 90% recycling rate using a deposit return system has been achieved in various European countries. For instance, Finland has achieved a 97% return rate, Germany 98%, Denmark 93%, and Slovakia 92% (Sensoneo, 2024). Although there are differences between the populations and the specific deposit return systems of these countries and the Netherlands, the successful outcomes in these countries indicate that reaching the 90% target should be feasible for the Dutch deposit return system.

One of the options to improve the recycling behaviour in the Netherlands that is currently being explored by the Inspectorate for the Living Environment and Transport (ILT), is increasing the deposit for small bottles and cans from €0.15 to €0.50 (Van Mersbergen & Nolles, 2024). Verpact is not in favour of this

measure as it could decrease overall sales of cans and bottles (Moeys, 2024). One could argue, however, that this decrease in sales should be seen as a positive as it benefits the environment.

2.2 Sustainable consumer behaviour

2.2.1 Introduction

Before diving into the factors predicting consumer packaging recycling behaviour, the factors associated with sustainable consumer behaviour in general will be explored. These factors include climate change beliefs, personal values, social implications and positive feelings associated with engaging in sustainable behaviour. The Value-Belief-Norm (VBN) theory of environmentalism will also be addressed. This theory explains how these individual values, beliefs, and norms contribute to the development of pro-environmental behaviours (Stern et al., 1998; Stern, 2000).

2.2.2 Factors predicting sustainable consumer behaviour

Despite the common assumption that individual actions have little impact on global processes like climate change, research indicates that changes in consumer behaviour can significantly contribute to addressing climate change and other sustainability challenges (Gardner & Stern, 2008; Dietz et al., 2009; Rettie et al., 2012; Novoradovskaya et al., 2020; Nielsen et al., 2021; Whitmarsh et al., 2021; Steg, 2023). As a result, there has been increasing attention to understanding the underlying mechanisms of sustainable behaviours and developing strategies to encourage behavioural change.

The extent to which people believe in climate change significantly influences their motivation to engage in sustainable behaviour. Three types of **climate change beliefs** have been identified: belief in the reality of climate change, belief in the fact that it is primarily caused by humans and belief in its negative consequences. These beliefs are strongly interconnected; if individuals perceive climate change as real, they are more likely to attribute it to human actions and to recognise its negative effects (Steg, 2023; Van Valkengoed et al., 2021). Consequently, people with these beliefs are more inclined to engage in sustainable behaviour (Brink & Wamsler, 2019; Mildenberger et al., 2019; Van Valkengoed et al., 2021).

Personal values also play a crucial role in influencing climate-related behaviour. Four key types of values have been identified: hedonic, egoistic, altruistic and biospheric values (reviewed by Steg, 2023). Hedonic values focus on improving personal feelings such as pleasure and fun. Egoistic values are related to enhancing personal resources, such as wealth and social power. Altruistic values emphasise increasing the welfare of others and benefiting society. Finally, biospheric values prioritise caring about nature and the environment. Strong altruistic and particularly biospheric values generally promote sustainable behaviours, given their positive impact on others, nature, and the environment (Bouman et al., 2020; Nordlund & Garvill, 2002; Sharpe et al., 2021; Steg et al., 2014; Taylor et al., 2014; Jansson et al., 2011; Corner et al., 2014). Strong hedonic and egoistic values, on the other hand, often hinder sustainable behaviour, as such

behaviour may involve personal costs in the short term, such as inconvenience or financial costs (Stern et al., 1998; Honkanen & Verplanken, 2004; Nordlund & Garvill, 2002; reviewed by Steg, 2023).

In a study conducted by Bouman et al. (2020), for example, data from the European Social Survey Round 8, which included 44,387 respondents from 23 countries, were analysed to explore the link between climate change worry and motivation for climate action. As anticipated, individuals who expressed greater concern about climate change were more likely to engage in climate-related actions. Additionally, worry about climate change was partially influenced by biospheric values, and these values were directly and positively related to personal climate mitigation behaviours.

When considering climate actions, people do not only consider the individual and environmental costs and benefits but also the **social implications** (Farrow et al., 2017). Individuals are more likely to engage in climate-related behaviours when they feel this is expected from others (Barth et al., 2016; Kastner & Stern, 2015; Bamberg et al., 2015). Additionally, the belief that others will also engage in sustainable behaviour positively influences an individual's intention to participate in such behaviour (Noppers et al., 2019; Rai et al., 2016). Furthermore, people are motivated to engage in sustainable behaviour when they feel this reflects positively on themselves or signals something positive to others (Griskevicius et al., 2010; Kastner & Stern, 2015; Noppers et al., 2014; Stoll-Kleemann & Schmidt, 2016; White & Sintov, 2017).

Sustainable behaviour that aligns with people's core values can also evoke **positive feelings** and contribute to individual well-being (Perlaviciute et al., 2018; Creutzig et al., 2022, Zawadzki et al., 2020; Venhoeven et al., 2016). When individuals expect to feel good after engaging in sustainable behaviours, they are more likely to act (Jia & Van der Linden, 2020; Odou & Schill, 2020; Perlaviciute et al., 2018). For example, individuals who expect to feel good after recycling have been found to be more inclined to recycle (Geiger et al., 2019; Kraft et al., 2005).

2.2.3 The Value-Belief-Norm theory

The **Value-Belief-Norm (VBN) theory of environmentalism** explains how individual values, beliefs, and norms contribute to the development of pro-environmental behaviours (Stern et al., 1998; Stern, 2000). This theory suggests that individuals with stronger biospheric and altruistic values (and weaker egoistic and hedonic values) are more likely to recognize the climate impact of their actions and to realise that their behaviour can contribute to mitigating climate change. As a result of these beliefs, individuals develop a sense of moral obligation or personal norms to take action to mitigate climate change. These personal norms result in pro-environmental behaviours, such as recycling (reviewed by Steg, 2023). Individuals with strong altruistic and biospheric values tend to be intrinsically motivated to participate in climate-related actions (Steg, 2016; Van der Linden, 2015; Van der Linden, 2018). The VBN theory has successfully explained a diverse range of climate-related actions, including intentions to reduce car use, sustainable apparel consumption, and willingness to make sacrifices for climate mitigation (Bronfman et al., 2015; Chen, 2014; Gomes et al., 2022; Hiratsuka et al., 2018; Lind et al., 2015; Ünal et al., 2019; Wolske et al., 2017).

2.3 Factors predicting consumer packaging recycling behaviour

2.3.1 Introduction

Multiple studies have investigated the factors that predict recycling of packaging materials, including demographic, social influence, contextual and individual factors (Corona et al., 2024). In the paragraphs below, these factors will be reviewed. Furthermore, the theory of planned behaviour (TPB) will be discussed. According to this theory, the primary predictor of behaviour is the intention to perform it (Ajzen, 1991). In addition, the intention-behaviour gap will be addressed (Conner & Norman, 2022).

2.3.2 Demographic and social influence factors

Demographic factors found to be associated with packaging recycling behaviour include age, education, income and gender (Hines et al., 1987; Afroz et al., 2010; Zelezny et al., 2000; Mtutu & Thondhlana, 2016; Izagirre-Olaizola et al., 2014; Zambrano-Monserrate & Alejandra Ruano, 2020). Older individuals have been found to engage more in packaging recycling than younger individuals (Afroz et al., 2010; Mtutu & Thondhlana 2016; Reijonen et al., 2021). Furthermore, women are more likely to engage in recycling behaviour than men (Zelezny et al., 2000; Izagirre-Olaizola et al., 2014; Zambrano-Monserrate & Alejandra Ruano, 2020).

Several studies have explored the influence of the social environment on packaging recycling behaviour (Kirakozian, 2015; Ofstad et al., 2017; Sorkun, 2018). **Social influence factors** that have been found to predict recycling behaviour include social norms, personal norms, reputational concern, and empathy (Ghazali et al., 2019; Alpizar & Gsottbauer 2015; Pivetti et al., 2020; Ding et al., 2021).

2.3.3 Individual factors

Various **individual factors** such as environmental values and concern, health conscientiousness, green mindfulness, connectedness to nature, ecological worldview, future orientation, voluntary simplicity, low materialism, past behaviour and socially desirable traits such as agreeableness, extraversion and openness to experience have been found to predict packaging recycling behaviour (Vicente & Reis, 2008; Afroz et al., 2010; Kirakozian, 2015; Liu & Segev, 2017; Poškus & Žukauskienė, 2017; Dharmesti et al., 2020; Gkargkavouzi et al., 2018; Novoradovskaya et al., 2020; Balunde et al., 2020; Reijonen et al., 2021; Klug & Niemand, 2021; Ong et al., 2019; Corona et al., 2024).

In a US study by Liu and Segev (2017), for example, environmental concern was shown to predict recycling behaviour among both Hispanic immigrants and non-Hispanic whites. Furthermore, Klug and Niemand (2021) found that voluntary simplicity, low materialism, environmental orientation, and consumer independence were predictors of packaging recycling in German consumers. In a study in adolescents in Lithuania, the intention to recycle and self-reported recycling behaviour was higher for those with high scores on socially desirable traits such as conscientiousness, agreeableness, extraversion and openness to experience (Poškus & Žukauskienė, 2017).

In the study by Novoradovskaya et al. (2020), potential predictors of using a reusable hot drink cup were explored under students and staff (n=270) from Australian universities. Participants completed an online questionnaire with questions about their previous and intended use of a reusable cup, habit strength, intolerance of uncertainty, need for structure, conscientiousness, and environmental values. One week after completing the first questionnaire, the participants retrospectively reported the use of their reusable cups. Using hierarchical multiple regression, age, intention to reuse a cup, and environmental values were found to be predictive of using a reusable cup.

In the first questionnaire, one question was asked about the previous use of a reusable hot drink cup. If the answer to the question of whether the participant had ever used such a cup before was yes, the participants were asked how often they had used such a cup in the past three months from 'once or more a day' to 'never'. Two questions were asked about the intention to use a reusable hot drink cup over the next week (Ajzen, 2002). Answers to these questions were given on a 7-point Likert scale from 'strongly disagree' to 'strongly agree'.

To assess habit strength, the self-report habit index (SRHI) was used (Verplanken & Orbell, 2003). This is a scale consisting of 12 items which measure the extent to which the behaviour is habitual. Answers are given on a 7-point Likert scale, from 'strongly disagree' to 'strongly agree', and the final score is the mean of scores on the 12 items (Verplanken & Orbell, 2003).

To assess environmental (biospheric) values, the scale developed by De Groot & Steg (2007) was used. This scale measures the strength of four environmental values: respecting the earth, unity with nature, protecting the environment and preventing pollution. Respondents were asked to evaluate these values on a scale from −1 (opposed to this value) to 7 (extremely important value). The mean scores of the four items represent the final overall score. The scale of Verplanken and Roy (2016) was used to assess personal involvement and personal norms in relation to the environment (Verplanken & Roy, 2016). Items were evaluated on 5-point Likert scale, ranging from 'strongly disagree' to 'strongly agree', and mean scores were calculated for the final score for both personal involvement and personal norms.

Using hierarchical multiple regression, age, intention to reuse a cup, and environmental values were found to be predictive of using a reusable cup.

2.3.4 The theory of planned behaviour and the intention-behaviour gap

The findings by Novoradovskaya et al. (2020) support previous research, where the intention to engage in sustainable behaviours was one of the strongest predictors of these behaviours (Klöckner, 2013; Bamberg & Möser, 2007; Morren & Grinstein, 2016; Chan & Bishop, 2013). According to the **theory of planned behaviour** (TPB), the primary predictor of behaviour is the intention to perform it (Ajzen, 1991). This intention is in turn predicted by attitudes toward the behaviour, subjective norms, and the perceived behavioural control regarding that behaviour. With recycling behaviour, environmental concerns are the most relevant attitudes. Subjective norms are perceived external social pressures to recycle. Perceived

behavioural control refers to people's perception of the ease or difficulty of performing the behaviour. This perceived behavioural control is assumed to influence both intention and behaviour directly. The TPB has been extensively used in investigating recycling behaviour (Klöckner, 2013; Bamberg & Möser, 2007; Morren & Grinstein, 2016; Chan & Bishop, 2013; Greaves et al., 2013; Tonglet et al., 2004; Wan et al., 2014).

However, intentions hardly ever fully predict behaviour, a phenomenon called **the intention-behaviour gap**. Strong intentions provide better predictions of behaviour, thereby narrowing the intention-behaviour gap (Conner & Norman, 2022). Additionally, habit strength plays a role in bridging the gap between intention and behaviour (Gardner et al., 2011).

In the study by Novoradovskaya et al. (2020), a moderation effect of habit strength was not found, however. The investigators hypothesised that this could be partly explained by the fact that the behaviour of using a reusable hot drink cup was relatively novel in Australia at the time the study took place and thus had not yet reached the level of habit strength.

2.3.5 Contextual factors

Contextual factors such as the location of recycling systems and financial incentives have also been found to influence recycling behaviour. In the study by Reijonen et al. (2021), for example, the distance to collection points was negatively associated with Finnish recycling behaviour. Furthermore, in a study in Germany by Keuschnigg and Kratz (2017), an increase in walking distance to drop-off recycling sites of one km reduced the predicted probability of recycling by 21 percent for plastics. In addition, Maki et al. (2016) performed a meta-analysis of 22 studies to evaluate the effect of financial incentive interventions on sustainable behaviours, including recycling. Financial incentives were found to have a small-to-medium effect on sustainable behaviour. Cash incentives had a stronger effect on recycling behaviour whereas non-cash incentives had a stronger effect on sustainable travel behaviour.

A meta-analysis by Geiger et al. (2019) aimed to identify the most important factors related to recycling across 91 studies. Both individual and contextual factors appeared to be significantly related to recycling. Among these, recycling self-identity, past recycling, perceived behavioural control over recycling, personal norms towards recycling, the possession of a bin and house ownership were most strongly related to recycling. These individual and contextual factors better predict intention to recycle than self-reported recycling behaviour, and particularly than observed recycling behaviour.

2.4 The present study

The reasons why not all consumers in the Netherlands return their bottles and cans have not yet been explored. Both individual and contextual/situational factors could influence their intention to recycle and their actual recycling behaviour (see Geiger et al., 2019). This has not been studied for the Dutch deposit return system yet, however. In order to increase recycling in the deposit return system it is important to understand the factors affecting recycling behaviour.

The present study centres around the individual and contextual factors related to participating in the Dutch deposit return system for recycling cans and plastic bottles. The study aims to identify the main factors that are associated with the intentions of adults in the Netherlands to participate in this recycling system and to assess their relative importance.

To this end, the following hypotheses will be empirically tested:

1. The demographic factors age, gender, education and income are significantly associated with the intention to recycle.
2. The individual factors environmental values, social norms, habit strength and past recycling behaviour are significantly associated with the intention to recycle.
3. The demographic factors age, gender, education and income are significantly associated with past recycling behaviour.
4. The individual factors environmental values, social norms and habit strength are significantly associated with past recycling behaviour.
5. The contextual factors distance to recycling machines, the state of the packaging, the magnitude of the financial incentive and the number of packages to be recycled causally affect recycling likelihood.
6. The size of the financial incentive is the most important attribute causally affecting recycling likelihood.

3 CHAPTER 3: Methodology

3.1 Research method and design

This study incorporated desk research and qualitative research as well as descriptive and causal research using a survey format.

3.1.1 Desk research and qualitative research

The desk research provided a strong basis for the Likert scale questions which were used in the survey to measure the predicting ability of different individual factors on recycling behaviour.

The intention to engage in sustainable behaviours appears to be one of the strongest predictors of these behaviours (Ajzen, 1991; Klöckner, 2013; Bamberg & Möser, 2007; Morren & Grinstein, 2016; Chan & Bishop, 2013). It is well-known that self-reported behaviour might be biased, especially if behaviour is socially desirable, a phenomenon called **socially desirable responding** (van de Mortel, 2008). For that reason, it was decided to primarily focus on the intention to engage in recycling. However, since there is an intention-behaviour gap, as previously described, participants were also asked one question about **past recycling behaviour** to obtain insights into actual recycling behaviour as well,

In the study by Novoradovskaya et al. (2020), several predetermined scales related to factors predicting recycling behaviour were used, which had been found to have a very high internal consistency in previous research. The survey of this study also incorporated some of these scales or their subscales to ensure internal consistency.

Two questions were asked about the **intention to recycle** plastic bottles and cans using the deposit return system over the following week (Ajzen, 2002).

The survey included questions about habit strength, as this has been shown to play a role in bridging the gap between intention and behaviour (Gardner et al., 2011). To assess **habit strength**, a four-item automaticity subscale of the Self-Report Habit Index, the so-called Self-Report Behavioural Automaticity Index (SRBAI), was used (Verplanken & Orbell, 2003; Gardner et al., 2012). This subscale has been found to adequately capture habitual behaviour patterns. The SRBAI consists of 4 items which measure the extent to which the behaviour is habitual. As only 3 of the 4 items were applicable to this survey, one item was left out.

Questions about **environmental values** were included as these have been found to predict packaging recycling behaviour (Novoradovskaya et al., 2020). To assess environmental (biospheric) values, the scale developed by De Groot & Steg (2007) was used. This scale measures the strength of four environmental values: respecting the earth, unity with nature, protecting the environment and preventing pollution.

Questions about age, education, income and gender were included as these **demographic factors** have been strongly associated with packaging recycling in previous studies (Hines et al., 1987; Afroz et al., 2010;

Zelezny et al., 2000; Mtutu & Thondhlana, 2016; Izagirre-Olaizola et al., 2014; Zambrano-Monserrate & Alejandra Ruano, 2020; Reijonen et al., 2021).

Furthermore, as **social norms** had also been found to be significantly associated with recycling behaviour in previous research, two of the four 7-point Likert scale questions about social norms that were used in the study by Ofstad et al (2017) were included in the survey.

For the **qualitative research**, five short interviews were held at a deposit return machine in an Albert Heijn supermarket with people with different demographical characteristics such as age and gender. The transcripts of these interviews can be found in Appendix A. From the interviews and the desk research, several contextual factors were discovered, which served as the attributes for the conjoint analysis. The first factor was the distance to the recycling machine (Reijonen et al., 2021; Keuschnigg and Kratz, 2017). The second factor was the size of the financial incentive. This was mentioned by most of the interviewees and was found to have a small-to-medium effect on sustainable behaviour in the meta-analysis by Maki et al. (2016). Interviewees also mentioned the state of the packaging as a factor determining their recycling behaviour (sticky and smelly, damaged etc). Furthermore, the number of items to be recycled was mentioned as a factor of influence. It was noticeable that the interviewees did not seem to find their packaging recycling behaviour to be a sensitive subject. The impression was that they gave genuine answers to the questions asked.

3.1.2 Quantitative research

The survey that was used for the quantitative and causal research has been categorised into four main sections. Firstly, demographic questions gathered essential respondent information on their age, gender income and education.

Secondly, questions were asked about the respondents' intention to recycle using the deposit return system. Answers to these questions were given in percentages of all eligible bottles and cans consumed in the following week. Two comparable questions were asked to increase internal consistency in the answers of respondents. In addition, participants were asked one question about past recycling behaviour regarding the deposit return system. Answers were again given in percentages.

Thirdly, Likert scale questions were asked to assess the individual factors habit strength, environmental values and social norms. Four questions were asked about habit strength, four about environmental values, and two about social norms. For each of these factors, the average of the answers to the various questions of the different scales was taken and subsequently used in the analyses. Furthermore, an attention check question was added. The question was 'Choose the answer option 'agree' if you read this question', and any responses where the respondent answered something different were left out of the analysis.

Lastly, conjoint questions were asked to find a causal relationship between the four identified contextual attributes of recycling using the Dutch deposit return system and recycling intent. The recycling intent was rated on a scale of 1 to 10. The contextual attributes each had four different attribute levels. A total of 16

random conjoint profiles were created by the SPSS orthogonal design function, of which each respondent saw 10 profiles, randomly selected by Qualtrics. The complete survey, including the 16 conjoint profiles, can be found in Appendix B.

3.2 Sampling

The target population of this study was adults aged 18-65 situated in the Netherlands. The survey has been distributed via social media platforms such as WhatsApp and LinkedIn as well as via the online platform SurveySwap. The aim was to have a minimum of 200 respondents, to ensure representativeness. To efficiently conduct the survey, Qualtrics, an online survey platform, was used. Given the strategy of distributing the survey through online channels, Qualtrics' online environment fitted well.

This research made use of non-probability sampling. It used convenience and snowball sampling, as it was impossible to utilise probability sampling due to limited time and resources. Due to the nature of the sampling methods, bias was unavoidable. Firstly, there was non-response bias, as respondents who chose to respond to the survey may have differed systematically from those who chose not to. Furthermore, there is a high chance of sampling bias as it is likely that a higher percentage of students is reached than present in the population. In addition, the validity of the data may not be optimal as respondents may not remember their recent recycling behaviour or be able to accurately quantify intentions. While answering the Likert scale questions, the respondents could be subject to a form of response bias such as middle response bias.

3.3 Data analysis

The data obtained from the survey were exported to the statistical software programme IBM SPSS, and both hierarchical regression analysis and conjoint analysis were performed with the data. The conjoint analysis method was chosen because causal conclusions can be made about the obtained data without the need for time-consuming, expensive and complex data-gathering methods.

Descriptive statistics were used to describe the sample of this study and to evaluate whether the sample was representative.

Hierarchical regression analysis was used to explain variance in the intention to recycle using the Dutch deposit return system for each independent variable while accounting for all other variables. The intention to recycle was the independent variable. At step one of hierarchical regression age, gender, income and education were entered as control variables. Education, income and gender were asked as categorial variables in the survey and were added in the hierarchical regression as dummy variables, with one reference category omitted. In step two, the individual factors environmental values, habit strength and social norms were entered. In step three, past behaviour was added to the model.

A second hierarchical regression analysis was performed to assess variance in the past recycling behaviour using the Dutch deposit return system for each independent variable while accounting for all other

variables. In this second regression analysis, the past recycling behaviour was the independent variable. At step one of hierarchical regression age, gender, income and education were again entered as control variables. Education, income and gender were asked as categorical variables and were added in the hierarchical regression as dummy variables, with one reference category omitted. In step two, the individual factors environmental values, habit strength and social norms were entered.

For the conjoint analysis, the recycling intent of conjoint profiles was regressed on the attribute levels of the profiles, leaving out one reference category to avoid perfect multicollinearity.

4 CHAPTER 4: Results & discussion

4.1 Results of the interviews

The thematic analysis of the five interviews (see Table 5 in Appendix B) identified several key factors influencing recycling behaviour using the deposit return system. These factors include environmental concerns, financial incentives, the state and carry load of packaging, habitual behaviour, and convenience and effort. These insights, along with factors identified in the literature, were incorporated into the survey.

4.2 Results of the survey

The survey has been answered by 241 adults situated in the Netherlands. However, as 14 respondents did not complete the survey or gave a wrong answer to the attention check question, the results of 227 respondents were used in the analyses.

4.2.1 Descriptive statistics

The descriptive statistics of the survey respondents are shown in Table 1.

Table 1: Descriptive statistics

Characteristics	Number of respondents	Mean/proportion
Age	227	31.00 [12.57]
Gender	227	
Male		0.581
Female		0.419
Highest educational qualification obtained	227	
Doctorate		0.018
Master's degree		0.247
Bachelor's degree		0.339
Current bachelor student		0.260
High school diploma		0.115
Less than high school		0.022
Yearly gross income household	227	
> €150.000		0.084
€100.000-€150.000		0.093
€60.000-€99.999		0.233
€30.000-€59.999		0.225
€0-€29.999		0.278
Prefer not to say		0.088

The standard deviations are between square brackets and the categorical variables are expressed in proportions rather than means.

As can be seen in the Table, 58.1% of the respondents were male and 41.9% female. The mean age of respondents was 31.00 years. In Figure 1, the age distribution of the respondents is shown.

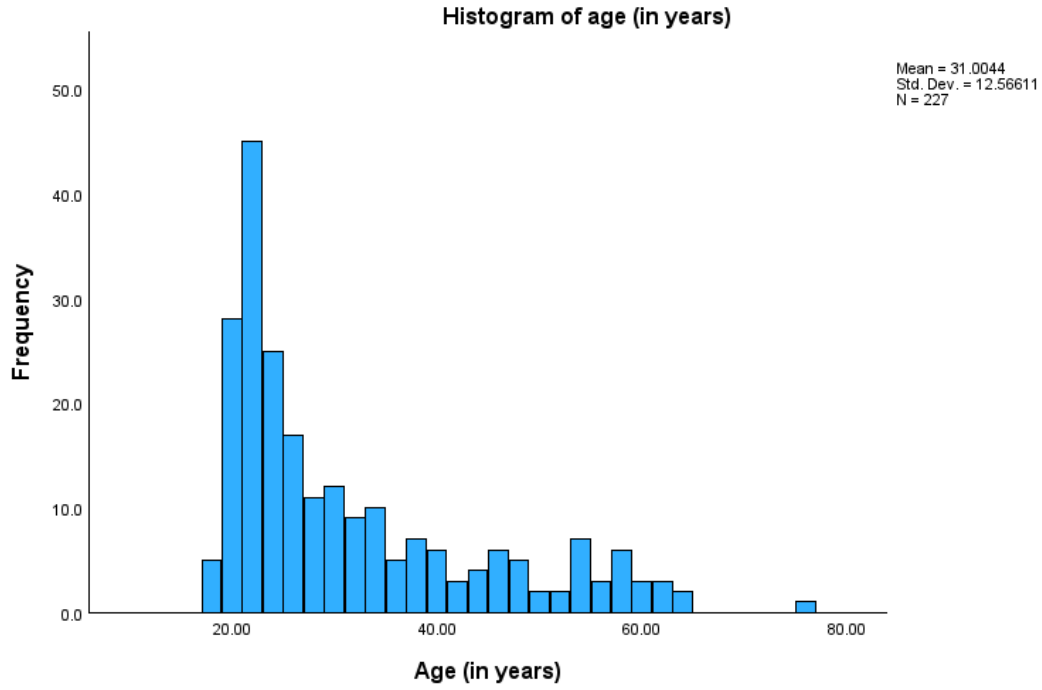

Figure 1: Histogram of the age distribution in the survey sample

As can be seen from Figure 1, the age distribution of the sample is right-skewed, likely caused by the distribution method of the survey preferentially targeting students. The youngest respondent in the sample was 18 years old, while the oldest was 75.

The mean age of the Dutch population, which included children, was 42.4 years in 2022 (CBS, 2022). This is higher than the mean age observed in the survey sample, which excluded children. This indicates a sample bias towards younger adults, likely predominantly students.

Of the respondents, 33.9% reported to have a bachelor's degree as their highest educational qualification obtained, making this the most common qualification, whereas 26.0% were current bachelor students. Only 1.8% of respondents had a doctorate, and only 2.2% had less than a high school diploma. The most frequent average gross household income was between €0-€29.999, possibly caused by the high frequency of students living in student housing in the sample. Only 8.4% of respondents had a gross income above €150.000.

In Figure 2, a scatter plot of the relationship between age and the intention to recycle is shown. As can be seen, there is a large cluster of observations at a 100% intention to recycle at all ages, indicating the presence of a ceiling effect. This ceiling effect implies that many respondents reached the maximum score for intention to recycle. This reduces the variability in the data, which can make it difficult to detect any true association between age and intention to recycle. This lack of variability may lead to misleading

conclusions about the association between age and recycling intentions. For example, it might incorrectly suggest no variation in intention to recycle across different ages.

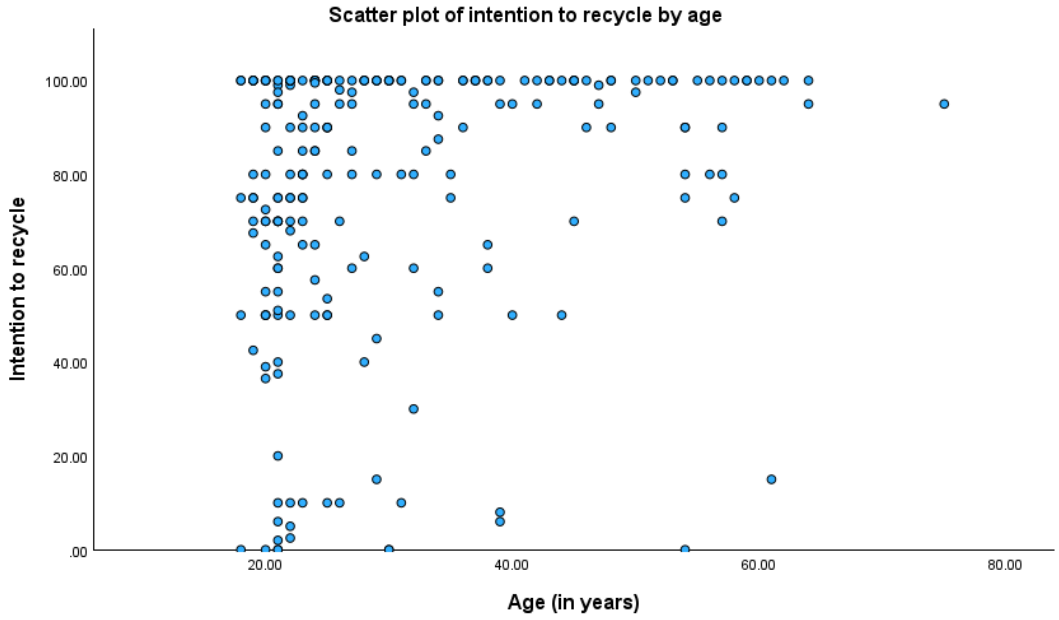

Figure 2: Scatterplot of the association between age and the intention to recycle in the survey sample

In Figure 3, a histogram of the intention to recycle in the sample, expressed as percentage of consumed bottles and cans in the coming week, can be seen. There is a spike at the tail end of the distribution at 100% intention to recycle. This suggests that there is a ceiling effect, leading to reduced variability in intention to recycle and large standard errors in the regression analyses, making it more difficult to identify true associations with independent variables.

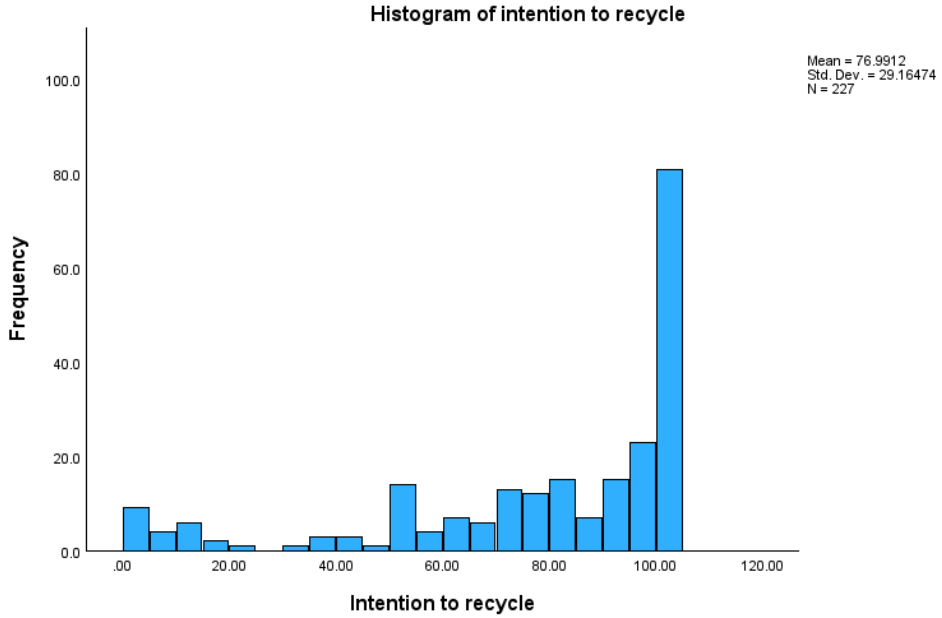

Figure 3: Histogram of the distribution of intention to recycle in the survey sample

4.2.2 Regression analyses

4.2.2.1 First regression analysis: Intention to recycle

The first hierarchical regression analysis examined the variance in the intention to recycle attributable to each independent variable while controlling for all other variables.

The intention to recycle was the independent variable. In step one of hierarchical regression age, gender, income and education were entered as control variables. Education, income and gender were asked as categorical variables and were added in the hierarchical regression as dummy variables, with one reference category omitted. In step two, the individual factors environmental values, habit strength and social norms were entered. In step three past recycling behaviour was entered.

As certain categories of the categorical variables had very low frequencies, which could introduce multicollinearity and instability in the regression model as well as a lack of statistical power for t-tests on individual regression coefficients, these infrequent categories were combined. The combined categories were master's degree and doctorate, less than high school and high school graduate, and a household gross income of €100.000-€150.000 and of > €150.000. This approach helped to reduce the number of dummy variables.

In the regression analysis, the 'Prefer not to say' response in the gross household income variable was accounted for by creating a separate dummy variable for this category. This approach allowed for the inclusion of respondents who chose not to disclose their income, thereby maintaining the sample size and avoiding potential biases from excluding these respondents. Furthermore, this made it possible to examine whether the decision not to disclose income information was associated with the dependent variable, intention to recycle.

The regression model used was as follows:

$$\textbf{Recycling intent}_i = \beta_0 + \beta_1\ \textbf{Age}_i + \beta_2\ \textbf{Male}_i + \beta_3\ \textbf{Current BSc student}_i + \beta_4\ \textbf{Bachelor's degree}_i + \beta_5\ \textbf{Master's degree or doctorate}_i + \beta_6\ \textbf{Household gross income €30.000-€59.999}_i + \beta_7\ \textbf{Household gross income €60.000-€99.999}_i + \beta_8\ \textbf{Household gross income > €100.000}_i + \beta_9\ \textbf{Prefer not to say} + \beta_{10}\ \textbf{Environmental values}_i + \beta_{11}\ \textbf{Habit strength}_i + \beta_{12}\ \textbf{Social norms}_i + \beta_{13}\ \textbf{Past recycling behaviour}_i + u_i$$

The results of the first hierarchical regression analysis are summarised in Table 2 in Appendix A.

Intention to recycle model 1: Control variables

As can be seen in Table 2, the first model explains only 10.8% of the variance in the dependent variable ($R^2 = 0.108$). This model is significant at the 1% level ($F = 2.928$, $p < 0.01$), however, indicating that the control variables collectively explain a significant portion of the variance in the dependent variable. In this model, only age is a significant positive predictor at the 5% significance level. None of the other control variables (education, gender and income) are significant. The constant, which is the baseline level of recycling intent when all predictors are 0, is significant at a 0.1% significance level

Intention to recycle model 2: Adding individual factors

The second model adds individual factors and provides significant explanatory power beyond the first model, explaining an additional 28.4% of the variance in intention to recycle ($\Delta R^2 = 0.284$, $\Delta F = 33.390$, $p < 0.001$). In this model, age is still a significant positive predictor at the 5% significance level. Furthermore, household gross income between €30.000 and €59.999 is a significant positive predictor at the 5% significance level after accounting for the individual factors. Remarkably, environmental values are significantly negatively associated with intention to recycle in this model at the 5% significance level. Finally, habit strength shows a highly significant positive association at the 0.1% significance level with the dependent variable. Habit strength is the most important predictor in this model, as evidenced by the standardized coefficient ($\beta^* = 0.512$), which is the highest among all the significant predictors in this model.

Intention to recycle model 3: Adding past recycling behaviour

The third model, which includes past behaviour as a predictor, further increases the explanatory power of the model, explaining an additional 16.1% of the variance in the recycle intent ($\Delta R^2 = 0.161$, $\Delta F = 76.565$, $p < 0.001$). Age, which was a significant positive predictor in models 1 and 2, is no longer significant in the third model. Thus, although models 1 and 2 indicate that older adults are more likely to intend to recycle, this association disappears when past behaviour is accounted for in model 3. In this model, household gross income between €30.000 and €59.999 and environmental values are also no longer significantly associated with recycling intent at the 5% significance level. Both habit strength and past recycling behaviour are significantly positively associated with the intention to recycle at the 0.1% significance level in model 3. Their standardized coefficients are $\beta^* = 0.304$ and $\beta^* = 0.487$, respectively, highlighting their importance in explaining the variance in the intention to recycle. The final model explains a total of 55.3% of the variance in the dependent variable in the survey sample.

4.2.2.2 Second regression analysis: Past recycling behaviour

The second hierarchical regression analysis examined the variance in recycling behaviour in the past week attributable to each independent variable while controlling for all other variables.

In this regression, past recycling behaviour was the independent variable. At step one of this regression, age, gender, income and education were again entered as control variables. At step two, the individual factors environmental values, habit strength and social norms were entered.

The regression model used was as follows:

Past recycling behaviour$_i$ = β_0 + β_1 Age$_i$ + β_2 Male$_i$ + β_3 Current BSc student$_i$ + β_4 Bachelor's degree$_i$ + β_5 Master's degree or doctorate$_i$ + β_6 Household gross income €30.000-€59.999$_i$ + β_7 Household gross income €60.000-€99.999$_i$ + β_8 Household gross income > €100.000$_i$ + β_9 Prefer not to say + β_{10} Environmental values$_i$ + β_{11} Habit strength$_i$ + β_{12} Social norms$_i$ + u_i

The results of the second hierarchical regression analysis are summarised in Table 3 in Appendix A.

Past recycling behaviour model 1: Control variables

As can be seen in Table 3, only 9.0% of the variance in the dependent variable is explained in the first model ($R^2 = 0.090$). This model is still significant at the 5% level ($F = 2.394$, $p < 0.05$), however. In this model, age is again a significant positive predictor at the 5% significance level. As in the previous regression, none of the other control variables are significant. The constant is significant at a 0.1% significance level.

Past recycling behaviour model 2: Adding individual factors

The second model, which adds individual factors, provides significant explanatory power beyond the first model, explaining an additional 23.4% of the variance in past recycling behaviour ($\Delta R^2 = 0.234$, $\Delta F = 24.709$, $p < 0.001$). In this model, age is no longer a significant positive predictor at the 5% significance level. All individual factors are significantly associated with the dependent variable. Environmental values are significantly negatively associated with past recycling behaviour at the 5% significance level. Social norms are significantly positively associated with past recycling at the 5% significance level. Finally, habit strength shows a highly significant positive association at the 0.1% significance level with the dependent variable. Habit strength is the most important predictor again in this model, with a standardized coefficient $\beta^* = 0.427$, which is the highest among the three significant predictors in this model. The model explains 32.4% of total variance in past recycling behaviour in the survey sample.

In summary, habit strength and past recycling behaviour were identified as the strongest predictors of recycling intention in the first regression, accounting for a substantial part of the 55.3% variance explained by the third model in the first regression. Although demographic factors like age, household income, and environmental values were initially significant, their influence was mediated by past behaviour. Habit strength was also the strongest predictor of past recycling behaviour in the second regression. Social norms were positively associated with this behaviour as well, whereas environmental values were negatively associated with past recycling behaviour.

4.2.3 Conjoint analysis

To understand and evaluate the contextual factors influencing respondents' recycling intentions using the Dutch deposit return system, a conjoint analysis was conducted. Four key contextual attributes affecting

recycling intent were explored: the size of the financial incentive, the distance to the recycling machine, the number of bottles/cans to be recycled and the state of the packaging. These attributes were tested at four different levels.

The size of the financial incentive was tested at the levels: €0.15, €0.25, €0.35 and €0.50. The distance to the recycling machine was tested at the levels: You're already at the supermarket, 500m, 1000m and 2000m. The number of bottles/cans to be recycled was tested at the levels: 1, 5, 10 and 20. Finally, the state of the packaging was tested at the levels: Nothing wrong with the packaging, damaged packaging, sticky and smelly packaging, and damaged, sticky and smelly packaging. One level was left out of the model for each attribute as a reference case. The regression model used was as follows:

$$\textbf{Likelihood of recycling}_i = \beta_0 + \beta_1\ \textbf{€0.25}_i + \beta_2\ \textbf{€0.35}_i + \beta_3\ \textbf{€0.50}_i + \beta_4\ \textbf{500m}_i + \beta_5\ \textbf{1000m}_i + \beta_6\ \textbf{2000m}_i + \beta_7\ \textbf{5 bottles/cans}_i + \beta_8\ \textbf{10 bottles/cans}_i + \beta_9\ \textbf{20 bottles/cans}_i + \beta_{10}\ \textbf{Damaged packaging}_i + \beta_{11}\ \textbf{Sticky and smelly packaging}_i + \beta_{12}\ \textbf{Damaged, sticky and smelly packaging}_i + u_i$$

The results of conjoint analysis are summarised in Table 4 in Appendix A.

The initial conjoint analysis reveals several significant attributes and attribute levels predicting the likelihood of recycling. The utility estimators measure the change in the likelihood of recycling a profile with a specific attribute level, on a scale of 0-100, compared to the reference case for that attribute. The constant, which is 83.226 in the initial model and highly significant ($p < 0.001$), indicates that the average recycling intent for respondents in the survey sample is 83.226 when all attributes are at their reference levels (€0.15, you are already at the supermarket. 1 bottle/can, and nothing wrong with the packaging). The R2 of this model is 0.139, meaning 13.9% of the variance in recycling intent is explained by the model.

Only a financial incentive of €0.50 per bottle/can has a significant positive effect on recycling intent compared to the reference case in the survey sample ($p < 0.01$), with a utility estimator of 4.787.

For the distance to the recycling machine attribute, the analysis indicates that as the distance increases, the likelihood of recycling significantly decreases. Each attribute level has a highly significant negative effect on recycling intent ($p < 0.001$). The negative impact becomes more pronounced with increasing distance. The utility estimator is -15.360 for a distance of 500 meters, -19.067 for 1000 meters, and the greatest negative effect is observed at 2000 meters, with a utility estimator of -23.430.

Furthermore, as the number of bottles and/or cans increases, the likelihood of recycling also increases. Each attribute level has a highly significant positive effect on recycling intent ($p < 0.001$). The utility estimator is 7.274 for 5 bottles/cans, 10.857 for 10 bottles/cans, and the greatest positive effect is observed at 20 bottles/cans, with a utility estimator of 12.155.

Finally, all unpleasant package states explored have a highly significant negative effect on survey respondents' recycling intent ($p < 0.001$). Damaged packaging has a utility estimator of -11.749, sticky and smelly packaging has a utility estimator of -11.083 and the combination of the two (damaged, sticky and

smelly packaging) has the greatest negative effect on the likelihood of recycling the profile with a utility estimator of -14.651.

Figure 4 shows a bar chart of the relative importance of the different attributes investigated in the conjoint analysis. The distance to the recycling machine has the biggest effect on the likelihood of recycling a profile, with a relative importance of 42.6%, while the size of the financial incentive has the smallest effect at 8.7%.

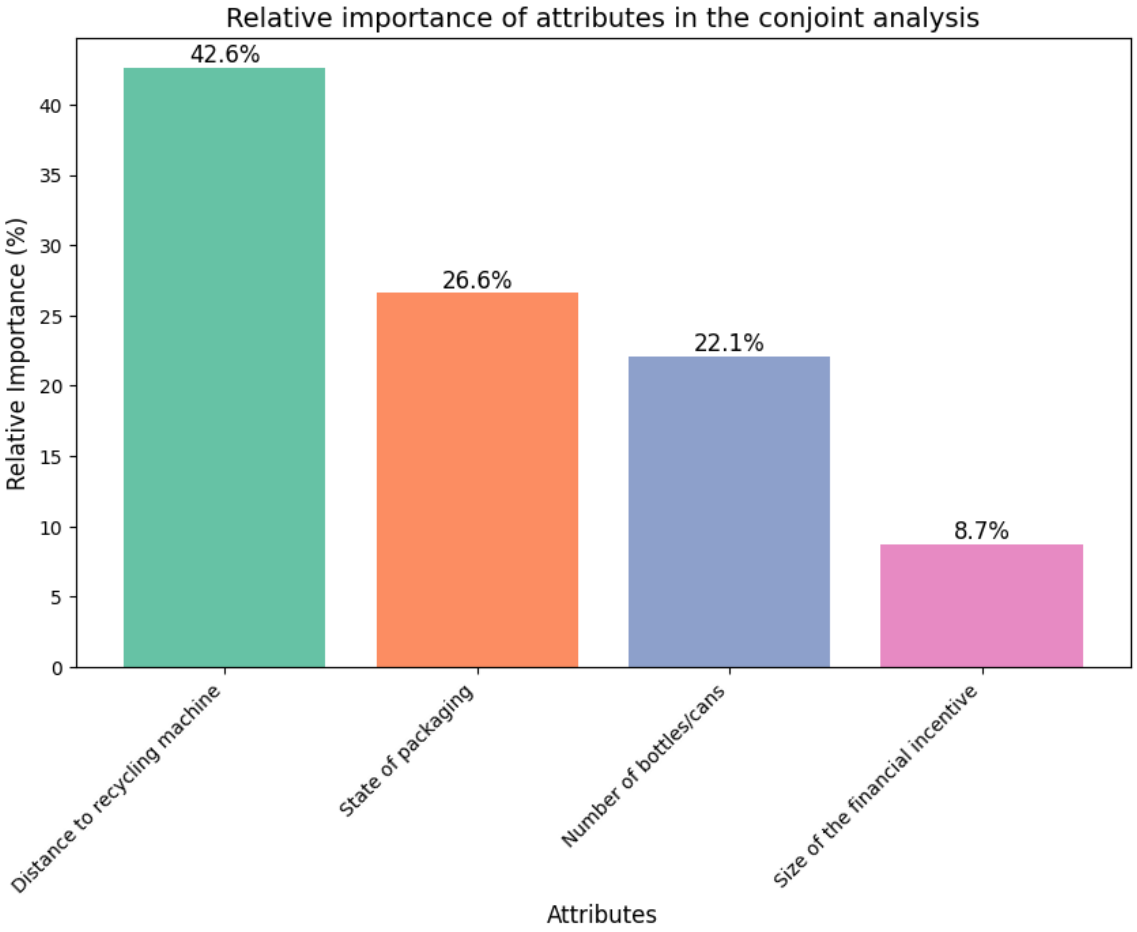

Figure 4: Bar chart of the relative importance of the different attributes in the conjoint analysis

There were 2 more conjoint analyses performed: one including all male respondents and one including all female respondents in the survey sample. For male respondents, the significant utility estimators are identical to those in the initial conjoint analysis. However, for the female respondents, the financial incentive level of €0.50 no longer has a significant positive effect on the dependent variable, indicating that no financial incentive level has a significant effect compared to the reference case for females.

Figure 5 depicts the effect sizes of the different attribute levels for males, females, and the overall sample.

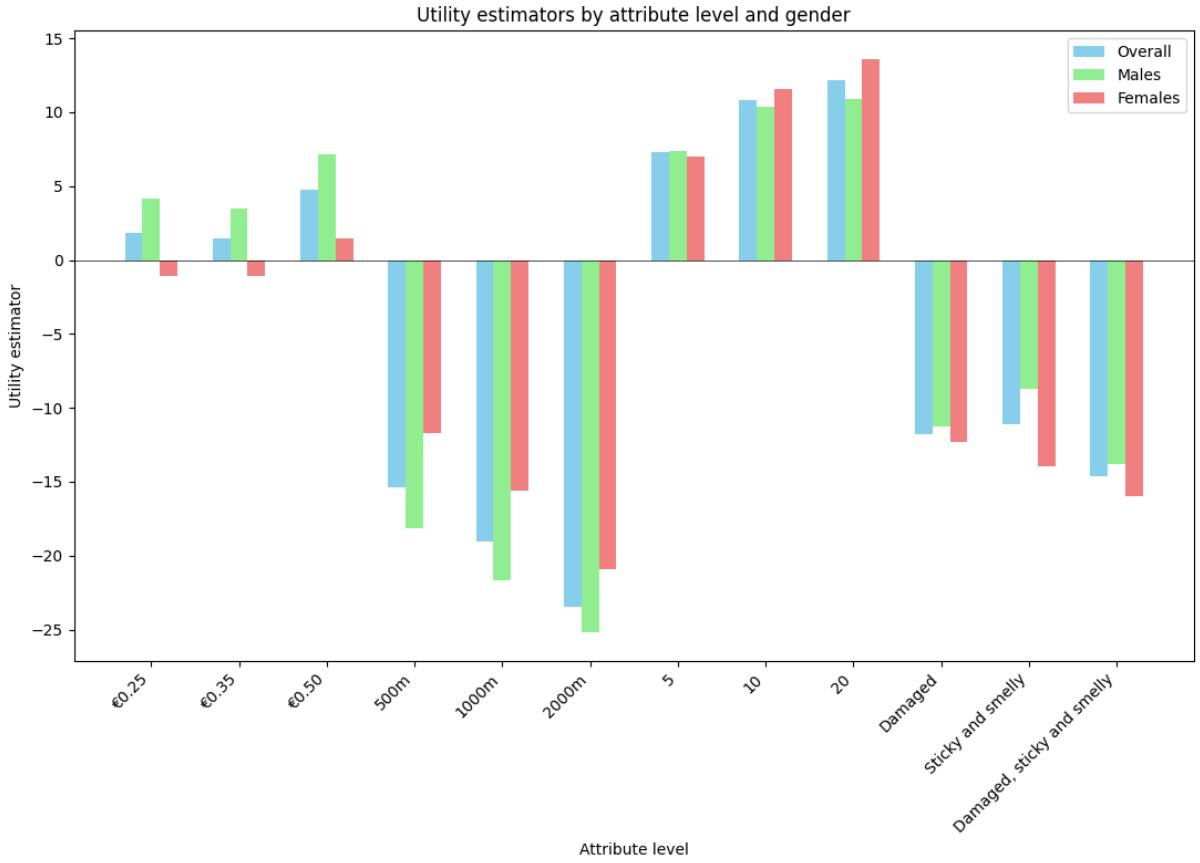

Figure 5: Grouped bar chart of utility estimators by attribute level and gender

This figure suggests the positive effect of the size of financial incentives on the likelihood of recycling might be larger for males, although it is important to note only the €0.50 level was found to be significant. Moreover, males appear to react more drastically to the distance to the recycling machine. The effect of the number of bottles/cans seems to be relatively similar between the two groups. Regarding the state of the packaging, female respondents might experience a more profound negative effect with sticky and smelly packaging, while their reaction to damaged packaging (and to the combination of the two) is similar to that of males.

Summarising, the conjoint analysis revealed that the distance to recycling machines had the most significant impact on recycling likelihood, followed by the state of the packaging and the number of items to be recycled. Financial incentives showed limited effectiveness unless substantially increased. A few differences were observed between male and female respondents, the most important being that none of the levels of financial incentives were significant for females while €0.50 was significant for males.

4.3 Discussion

The aim of this study was to identify the most important individual and contextual factors that are associated with the intention of adults to recycle using the Dutch deposit return system.

The thematic analysis of the five interviews highlighted several key factors influencing recycling behaviour using the deposit return system, including financial incentives, the condition and carry load of the packaging, and convenience. These insights, together with findings from the literature review, helped to refine the attributes for the conjoint analysis.

4.3.1 Statistical analyses

In the first, three-step hierarchical multiple regression with intention to recycle as the dependent variable, the final model showed that habit strength and past recycling behaviour were significantly positively associated with the intention to recycle. This model explained 55.3% of the variance in the dependent variable in the survey sample. Age, household gross income between €30.000 and €59.999 and environmental values were also significant predictors in models 1 and 2, but these variables were no longer significant in the third model. This suggests that the associations of age, household income and environmental values with recycle intent were likely mediated by the new variable included in the final model: past recycling behaviour. In other words, the variance in the dependent variable that was initially explained by these previous variables was better explained by past recycling behaviour.

In this hierarchical regression analysis, the overall model was consistently very significant at each step, indicating that the set of predictors collectively explained a significant portion of the variance in the intention to recycle. Moreover, the significant F change values suggest that each addition of new variables significantly improved the model fit.

It is noteworthy, however, that most individual predictors were not statistically significant. This can occur for several reasons. The first reason could be that the independent variables simply do not affect recycling intent using the Dutch deposit return system in the population. Although previous research found associations between packaging recycling behaviour and age, gender, income, education, environmental values and social norms (reviewed by Corona et al., 2024), the contexts and populations of these studies are different from the current study. An important difference lies in the fact that the current study focuses on a very specific type of packaging recycling, possibly involving different motivators such as financial incentives.

The second possible reason is the limited statistical power of the regression, which is influenced by the relatively small sample size of n=227. With a smaller sample size, the ability to detect smaller effect sizes diminishes, potentially leading to non-significant results. Especially categorical variables had a low sample size, leading to high standard errors, which limited the statistical power to detect significant predictors.

A third possibility is multicollinearity, where predictors are highly correlated with each other, leading to higher standard errors and non-significant individual coefficients. However, collinearity diagnostics revealed that all VIF values were below 5, indicating that multicollinearity is not a concern.

Finally, in examining the predictors of recycling intention, a potential ceiling effect was observed in the data. The intention to recycle variable is bounded at 100%, meaning respondents cannot report an intention higher than this threshold. This constraint led to a clustering of responses at the maximum value, as was seen in Figure 3. This ceiling reduces the variability in the dependent variable, making it more challenging for the model to explain the variance based on the independent variables. Consequently, the true relationships between the predictors and recycling intent may be underestimated.

In conclusion, the first hierarchical regression analysis demonstrated that while the variables age, income and environmental values initially have some impact, the individual factors habit strength and past recycling behaviour are the most crucial predictors of recycling intention. As the deposit return system has only become operational three years ago for small plastic bottles and one year ago for cans, it is possible that recycling habits using this system are still developing and the recycling percentage will come closer to the desired 90% (Ministerie van Infrastructuur en Waterstaat, 2023).

In the second, two-step hierarchical multiple regression with past recycling behaviour as the dependent variable, the final model habit strength, social norms and environmental values were significantly associated with the dependent variable. Habit strength was the most important positive predictor in this model, followed by social norms. Remarkably, the variable environmental values were negatively associated with past recycling behaviour. Age was also a significant predictor in the first model, but this variable was no longer significant in the second model, suggesting that this association was likely mediated by the variables included in the final model.

The reason why the variable environmental values were significantly negatively associated with past recycling behaviour is unclear. It is possible that due to the nature of the deposit return system, a subset of respondents with strong environmental values may opt for alternative recycling methods.

In this second hierarchical regression analysis, the overall model was significant at both steps, indicating that the predictors collectively explained a significant portion of the variance in the past recycling behaviour, and the F change value was significant. The final model explained 32.4% of the total variance in past recycling behaviour in the survey sample. None of the demographic predictors were significant in the final model. This may again be explained by the fact that these variables do not affect past recycling behaviour using the Dutch deposit return system in the population, the limited statistical power of the regression, and/or a potential ceiling effect in past recycling behaviour.

In the conjoint analysis, which was conducted to evaluate the contextual factors influencing respondents' recycling intentions, four contextual attributes were explored: the size of the financial incentive, the distance to the recycling machine, the number of bottles/cans to be recycled and the state of the packaging. The distance to the recycling machine appeared to have the biggest effect on the likelihood of recycling a

profile, with a relative importance of 42.6%, while the size of the financial incentive had the smallest effect at 8.7%. The state of the packaging and the number of bottles/cans had a relative importance of 26.6% and 22.1% respectively.

As the distance to the recycling machine increased, the likelihood of recycling significantly decreased, with each attribute level having a highly significant negative effect on recycling intent. Furthermore, with an increasing number of bottles and/or cans, the likelihood of recycling also increased,. with each attribute level having a highly significant positive effect on the intention to recycle. In addition, all unpleasant package states explored had a highly significant negative effect on survey respondents' recycling intent.

Only a financial incentive of €0.50 per bottle/can had a significant positive effect on recycling intent compared to the reference case of €0.15. The fact that incentives of €0.25 and €0.35 were not significant utility estimators compared to the reference case suggests that respondents may perceive these incentives as very similar, and not sufficiently distinctive to change their recycling decisions.

The strong negative impact of the increased distance to the recycling machine compared to the small positive effect of increasing the size of the financial incentive underscores the importance of convenience over small financial rewards.

It is important to note, however, that several respondents indicated, after completing the survey, that they viewed the number of bottles/cans largely as another measure of financial incentive. This suggests that the importance of a financial incentive may be greater than what the model indicates.

The model explained 13.9% of the variance in the dependent variable. While this R^2 of 0.139 may seem quite low, it is common for conjoint analyses to have lower R^2 due to human preferences being complex and influenced by various factors which are not always easily quantifiable in models and the subjective nature of survey responses. Another factor that may have contributed to the lower R^2 is a ceiling effect observed in the dependent variable, as the maximum likelihood of recycling a conjoint profile was 100.

A few differences were observed between male and female respondents, the most important being that none of the levels of financial incentives were significant for females while €0.50 was significant for males. Another difference was that males appeared to react more drastically to the distance to the recycling machine.

The results of this conjoint analysis support the findings of earlier studies, in which the distance to the recycling systems and financial incentives have also been found to influence recycling behaviour (Reijonen et al., 2021; Keuschnigg and Kratz, 2017; Maki et al., 2016). No studies were found where the effects of the state of the packaging and the number of bottles/cans on recycling intent were investigated, however.

In summary, the analysis of the survey data revealed several key findings about recycling behaviour using the deposit return system. The strongest predictors of the intention to recycle were recycling habits and past recycling behaviour, which explained a large portion of the variance in the intention to recycle. Although

age, income, and environmental values initially appeared to be important, their perceived influence was ultimately better explained by past recycling behaviour. The overall models used in the analysis were significant, indicating they effectively explained recycling intentions and past recycling behaviour. However, many individual predictors did not show significant effects, likely due to the small sample size, the specific context of the Dutch deposit return system, or a ceiling effect where many respondents already had high intentions to recycle. The conjoint analysis found that the distance to the recycling machine had the biggest impact on recycling likelihood, while the size of the financial incentive had the smallest impact. Increasing the number of bottles and cans and the state of the packaging also significantly influenced recycling decisions. Higher financial incentives only had a significant effect at the €0.50 level. Gender differences were observed, with men responding more to financial incentives and the distance to the recycling machine compared to women. Overall, the results highlight that while financial rewards are important, convenience and established recycling habits play a more crucial role in encouraging people to recycle.

4.3.2 Implications for policymakers

In this study, the distance to the recycling machine was found to have a significant, substantial impact on recycling likelihood. Therefore, policymakers could encourage recycling using the deposit return system by strategically placing more recycling machines, thereby reducing the distance to these machines. Verpact is already expanding the number of deposit machines in and near supermarkets and at other popular locations, such as educational institutions, public transport, restaurants, shopping centres, festivals, beaches and airports. This expansion will provide consumers with more opportunities to recycle using the deposit return system (Verpact, 2024).

Additionally, recycling habits were identified as significant, strong predictors of the intention to recycle using the deposit return system. Verpact (June 2024) recently reported that the recycling rate for cans using this system increased from 61% in the third quarter of 2023 to 75% in the first quarter of 2024. Similarly, the recycling rate of small bottles rose from 70% in 2023 to 78% in the first quarter of 2024. These trends indicate that recycling habits are steadily developing, suggesting that achieving a 90% recycling rate is possible in the coming years with little to moderate governmental intervention. Successful outcomes in other European countries support this target. For example, Finland has a 97% return rate, Germany 98%, Denmark 93%, and Slovakia 92% (Sensoneo, 2024). Although there are differences in the populations and the specific deposit return systems between these countries and the Netherlands, the positive results suggest that reaching the 90% target is attainable for the Dutch deposit return system.

However, targeted interventions aimed at facilitating the development of recycling habits, such as increasing the number of recycling machines, could further accelerate the improvement in recycling rates among adults.

Moreover, the study revealed that the condition of the packaging significantly influenced recycling decisions. Innovations designed to make packaging less prone to leaking and other undesirable conditions could therefore effectively increase recycling behaviour. Additionally, improving the acceptance limits of deposit machines for damaged packaging could further promote packaging recycling.

Although the number of bottles and cans was identified as an important factor influencing recycling intent in this study, possibly due to its relation with financial incentives, policymakers have limited options for increasing recycling through this attribute.

Increasing the size of the financial incentive, as suggested by the Inspectorate for the Living Environment and Transport (Van Mersbergen & Nolles, 2024), does not appear to be the most impactful intervention, as substantial increases from €0.15 to €0.50 are required to achieve relatively small changes in recycling intent of approximately 4.8%. However, increasing the financial incentive may influence the number of bottles and cans sold. While this could have positive environmental impacts, it may also negatively affect the economy, leading Verpact to oppose this measure (Verpact, 2024).

Remarkably, environmental values did not have a significant positive association with recycling intent or past recycling behaviour in this study. This suggests that policymakers do not necessarily need to focus on the environmental benefits of recycling using the deposit return system in their communication aimed at improving recycling rates.

4.3.3 Limitations

Given the limited resources, the sample only consisted of 227 adults living in the Netherlands. Furthermore, the sample consisted predominantly of young adults, due to the sampling methods favouring students. This makes the results of this study less representative than would be preferred.

For future research, it would be better to collect more comprehensive data that includes a larger sample size and more diverse participants, which are more representative of the Dutch adult population. This would allow the results to be more generalisable.

The survey only evaluated a limited set of factors, meaning there could be additional demographic, individual and contextual factors influencing recycling behaviour. This could be explored by performing more qualitative research, including focus groups. In addition, the survey relied on what respondents reported about their intentions, which may not fully match their actual recycling behaviour. In subsequent research, actual recycling behaviour could be incorporated for a more objective analysis, for example by a follow-up survey or a field experiment.

Furthermore, the research methods used in this study were subject to ceiling effects. Future research could explore advanced statistical analysis methods to circumvent this problem or consider alternative ways to measure recycling intent or behaviour that are not subject to ceiling effects in the survey.

The survey used could be further optimised by including a level of €0.00 for the size of the incentive, as this would better measure the importance of the incentive. It would also be good to look at ways to better differentiate the number of bottles/cans from the size of the financial incentive. In addition, the level 'you're already at the supermarket' could be changed due to the unrealistic nature of being at the supermarket with a large number of packages eligible for recycling without already intending to recycle them.

Moreover, the study variables and survey questions could be refined and extended, based on the feedback of respondents. Respondents indicated that it would have been useful to accommodate for the common habit of keeping bottles/cans at home, collecting them and recycling them when the 'bag is full'. Another comment given was that there could be a difference in recycling behaviour between cans and bottles, as cans are more prone to leaking. This feedback should be considered in future research into recycling behaviour, especially in relation to the Dutch deposit return system.

There were some biases present, such as non-response bias, where respondents that chose to complete the survey may differ systematically from adults who chose not to. There was also sampling bias, as the survey respondents included a high number of students and friends and colleagues of the author's family. Lastly, the validity of the data may also not be optimal as respondents might be subject to a form of response bias such as middle response bias.

For future research these biases could be minimized by broadening the sample, distributing the survey more randomly, and pretesting the survey in a larger group of diverse respondents.

5 CHAPTER 5: Conclusion

5.1 Comparison of literature and study findings

The literature on recycling behaviour highlights several factors that influence individuals' recycling intentions and behaviour. Demographic factors such as age, gender, education, and income have been found to be significant predictors in various recycling contexts. Additionally, individual factors such as environmental values, social norms, habit strength, and past recycling behaviour are frequently reported as important predictors**.** Contextual factors such as the location of recycling systems and financial incentives have also been found to influence recycling behaviour.

This study identified habit strength and past recycling behaviour as the strongest predictors of recycling intention, accounting for a substantial part of the 55.3% variance explained by the third model in the first regression. Although demographic factors like age, household income, and environmental values were initially significant, their influence was mediated by past behaviour. Habit strength was also the strongest predictor of past recycling behaviour. Social norms were positively associated with this behaviour as well, whereas environmental values were negatively associated with past recycling behaviour. The conjoint analysis revealed that the distance to recycling machines had the most significant impact on recycling likelihood, followed by the state of the packaging and the number of items to be recycled. Financial incentives showed limited effectiveness unless substantially increased.

Both the literature and this study emphasise the importance of habit strength and past behaviour in predicting recycling intentions. However, this study found that environmental values did not have a significant positive association with recycling intent or past recycling behaviour, contrasting with some literature findings. Furthermore, age, gender, education, household income, and social norms were not found to be significantly associated with recycling intent, in contrast to previous findings. The substantial impact of the distance to recycling machines, aligns with the literature, while the limited role of financial incentives deviates slightly from the expected outcome based on previous studies.

5.2 Central research question

The central research question aimed to identify the key factors influencing recycling behaviour in the Dutch deposit return system. This study concludes that habit strength, past recycling behaviour, and the distance to recycling machines are the primary predictors of recycling intentions in the deposit return system. The state of the packaging and the number of items to be recycled were also found to be important contextual factors influencing recycling likelihood. Financial incentives play lesser roles compared to these factors.

5.3 Hypotheses

The first hypothesis of this study, which stated that the demographic factors age, gender, education, and income are significantly associated with the intention to recycle, was not accepted, despite age showing initial significance in the first and second models of the first regression.

The second hypothesis, stating that the individual factors environmental values, social norms, habit strength, and past recycling behaviour are significantly associated with the intention to recycle, was partially accepted. Habit strength and past recycling behaviour were found to have highly significant associations, but environmental values and social norms were not associated with the intention to recycle.

The third hypothesis, which proposed that the demographic factors age, gender, education, and income are significantly associated with past recycling behaviour was not accepted. Age was significant in the first model of the second regression, but this association was mediated by the individual factors added in the second model.

The fourth hypothesis, proposing that the individual factors environmental values, social norms, and habit strength are significantly associated with past recycling behaviour was accepted. However, whereas habit strength and social norms were significantly positively associated with past recycling behaviour as expected, environmental values showed a negative association.

The fifth hypothesis, which suggested that the contextual factors distance to recycling machines, the state of the packaging, the magnitude of the financial incentive, and the number of packages to be recycled causally affect recycling likelihood was accepted. All contextual factors were significant, with the distance to recycling machines having the highest relative importance.

The sixth and last hypothesis, suggesting that the size of the financial incentive is the most important attribute affecting recycling likelihood was not accepted. This attribute was found to have the lowest relative importance out of the four contextual factors studied.

5.4 Recommendations and limitations

In this study, recycling habits have been identified as strong predictors of the intention to recycle using the deposit return system. Verpact reported that recycling rates have improved over the last few months, with can recycling increasing from 61% to 75% and small bottle recycling rising from 70% to 78%. These trends suggest that the goal of a 90% recycling rate is achievable in the near future with minimal to moderate governmental intervention. Successful outcomes in other European countries, such as Finland, Germany, Denmark, and Slovakia, as reported by Sensoneo, further support the feasibility of this target for the Dutch deposit return system despite differences in populations and systems.

However, targeted interventions that facilitate the development of recycling habits could further accelerate improvements in recycling rates among adults. Therefore, it is recommended for policymakers to strategically place more recycling machines in convenient locations to increase accessibility. Furthermore,

efforts could be made to design packaging less prone to leakage and damage. Additionally, increasing the acceptance limits of deposit machines for damaged packaging can further improve recycling rates.

Despite the ILT advocating for a higher financial incentive per recycled can or bottle, the impact of increasing the financial incentive appears to be limited in this study. Substantial increases in incentives resulted in only modest changes in recycling likelihood, indicating that large incentives are necessary for small behavioural changes. Additionally, increasing financial incentives may have negative economic side effects, potentially impacting the overall sales of bottles and cans.

This study's limitations include a relatively small sample size, which may affect the generalisability of the findings. The specific context of the Dutch deposit return system might not be directly applicable to other regions or systems. Additionally, the study's reliance on self-reported data could introduce biases. Another limitation is the cross-sectional design of the study. This design does not allow for the study of changes in recycling behaviour over time.

For future research, collecting more comprehensive data with a larger sample size and more diverse participants representative of the Dutch adult population would improve the generalisability of the results. Additionally, future studies could explore advanced statistical methods or consider alternative measures of recycling intent and behaviour that are not subject to ceiling effects in surveys. Furthermore, to minimise biases, future research should broaden the sample, distribute the survey more randomly, and pretest the survey with a larger, more diverse group of respondents. Moreover, examining the interaction of financial incentives with other factors would be beneficial. Lastly, longitudinal studies would be beneficial in understanding how recycling behaviours and their predictors evolve and would be more suitable to evaluate actual recycling behaviour.

5.5 Personal reflection

Performing this quantitative study and writing this thesis have significantly improved my understanding and capabilities in conducting and reporting academic research. This process has provided me with valuable skills for future research. Furthermore, I enjoyed the independence of working on my own, without the need to accommodate other students. I particularly liked performing the statistical analyses. Throughout this research, I have become aware of the complexity involved in predicting recycling behaviour in the deposit return system. I sincerely hope that the findings of my research will make a meaningful contribution to the body of knowledge on the predictors of recycling behaviour using the Dutch deposit return system.

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APPENDIXES

APPENDIX A – Statistical results survey

Table 2: Hierarchical multiple regression predicting recycling intent among adults using the Dutch deposit return system

Variable	Model 1 (Control variables)		Model 2 (+ Individual factors)		Model 3 (+ Past behaviour)	
	β	β*	β	β*	β	β*
Constant	60.099***		21.983		16.746	
	(7.629)		(13.578)		(11.689)	
Age	0.466*	0.186	0.312*	0.135	0.203	0.087
	(0.186)		(0.156)		(0.135)	
Male	2.790	0.047	2.330	0.039	2.178	0.037
	(3.897)		(3.265)		(2.807)	
Current BSc student	-6.869	-0.104	-0.563	-0.008	0.141	0.002
	(6.316)		(5.308)		(4.564)	
Bachelor's degree	-1.625	-0.026	-0.272	-0.004	0.164	0.003
	(6.095)		(5.069)		(4.358)	
Master's degree or doctorate	1.776	0.027	1.958	0.030	1.980	0.030
	(6.640)		(5.559)		(4.779)	
Household gross income €30.000-€59.999	9.092	0.130	9.982*	0.143	6.495	0.093
	(5.435)		(4.534)		(3.919)	
Household gross income €60.000-€99.999	6.612	0.096	3.664	0.053	1.483	0.022
	(5.406)		(4.503)		(3.880)	
Household gross income > €100.000	0.407	0.005	0.963	0.013	-2.865	-0.038
	(6.337)		(5.299)		(4.576)	
Prefer not to say income	-11.081	-0.108	-9.401	-0.092	-5.630	-0.055
	(7.495)		(6.323)		(5.453)	
Environmental values			-4.382*	-0.128	-2.335	-0.068
			(2.024)		(1.756)	
Habit strength			10.022***	0.512	5.943***	0.304
			(1.265)		(1.184)	
Social norms			2.847	0.118	0.910	0.038
			(1.598)		(1.392)	
Past recycling behaviour					0.416***	0.487
					(0.048)	
R^2	0.108		0.393		0.553	
ΔR^2			0.284		0.161	
F	2.928**		11..526***		20.283***	
ΔF			33.390***		76.535***	

β = unstandardized coefficient; β* = standardized coefficient; n = 227; standard errors are in parentheses. All VIF values were <5, indicating multicollinearity wasn't a problem. The omitted dummy variables for education and income are less than high school or high school graduate and household gross income €0-€29.999, respectively. * p < 0.05 ** p < 0.01 *** p < 0.001.

Table 3: Hierarchical multiple regression examining factors associated with past recycling behaviour among adults using the Dutch deposit return system

Variable	Model 1 (Control variables)		Model 2 (+ Individual factors)	
	β	β*	β	β*
Constant	55.137***		12.586	
	(9.028)		(16.779)	
Age	0.440*	0.162	0.264	0.097
	(0.220)		(0.193)	
Male	1.236	0.018	0.365	0.005
	(4.612)		(4.035)	
Current BSc student	-8.713	-0.112	-1.693	-0.022
	(7.474)		(6.559)	
Bachelor's degree	-2.577	-0.036	-1.048	-0.015
	(7.213)		(6.263)	
Master's degree or	-0.713	-0.009	-0.052	-0.001
doctorate	(7.858)		(6.869)	
Household gross income	7.194	0.088	8.381	0.103
€30.000-€59.999	(6.432)		(5.603)	
Household gross income	8.422	0.104	5.241	0.065
€60.000-€99.999	(6.397)		(5.565)	
Household gross income	9.148	0.102	9.202	0.103
> €100.000	(7.499)		(6.548)	
Prefer not to say income	-11.892	-0.099	-9.062	-0.075
	(8.869)		(7.813)	
Environmental values			-4.920*	-0.122
			(2.501)	
Habit strength			9.803***	0.427
			(1.564)	
Social norms			4.656*	0.164
			(1.975)	
R^2	0.090		0.324	
ΔR^2			0.234	
F	2.394*		8.561***	
ΔF			24.709***	

β = unstandardized coefficient; β* = standardized coefficient; n = 227; standard errors are in parentheses. All VIF values were <5, indicating multicollinearity wasn't a problem. The omitted dummy variables for education and income are less than high school or high school graduate and household gross income €0-€29.999, respectively. * p < 0.05 ** p < 0.01 *** p < 0.001.

Table 4: Conjoint analysis regression results likelihood of recycling profile

Attribute	Level	Utility estimator (n=2220)	Range	Relative Importance	Utility estimator males (n=1274)	Utility estimator females (n=946)
Size of financial incentive	€0.25	1.833	4.787	8.70%	4.171	-1.055
		(1.875)			(2.439)	(2.934)
	€0.35	1.466			3.500	-1.062
		(1.817)			(2.365)	(2.846)
	€0.50	4.787**			7.173**	1.476
		(1.796)			(2.345)	(2.800)
Distance to recycling machine	500m	-15.360***	23.430	42.58%	-18.140***	-11.734***
		(1.789)			(2.329)	(2.798)
	1000m	-19.067***			-21.672***	-15.608***
		(1.787)			(2.338)	(2.779)
	2000m	-23.430***			-25.172***	-20.990***
		(1.894)			(2.457)	(2.981)
Number of bottles/cans	5	7.274***	12.155	22.09%	7.354**	6.984*
		(1.878)			(2.467)	(2.901)
	10	10.857***			10.339***	11.558***
		(1.891)			(2.485)	(2.922)
	20	12.155***			10.885***	13.573***
		(1.873)			(2.422)	(2.963)
State of packaging	Damaged	-11.749***	14.651	26.63%	-11.277***	-12.321***
		(1.795)			(2.351)	(2.791)
	Sticky and smelly	-11.083***			-8.706***	-13.969***
		(2.076)			(2.719)	(3.222)
	Damaged, sticky and smelly	-14.651***			-13.840***	-15.976***
		(1.777)			(2.309)	(2.790)
Constant		83.226***			83.783***	82.576***
		(2.338)			(3.004)	(3.719)

Standard errors are between parentheses. The reference case for the attributes size of the financial incentive, distance to recycling machine, number of bottles/cans and state of packaging are €0.15, you're at the supermarket already, 1 and nothing wrong with the packaging, respectively. R^2 is 0.139 for the initial regression (males and females grouped). *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

APPENDIX B - Interviews

Interviews were held in Dutch at a deposit return machine at an Albert Heijn in Rotterdam and subsequently translated to English for the transcripts.

Interview 1 (woman, around 50 years old):

A: Excuse me, hello, I saw that you were recycling and I was wondering if I could interview you for a study very quickly.
I: If it's very quick, then it's not a problem.
A: It only takes a minute or so. First of all, I would like to ask you why you are recycling. Is there a main reason for that?
I: Well, of course it's good for the environment, but I would be lying if I said it wasn't also for the money, because as you can see I have quite a lot, I recycled for more than five euros. So that is always a nice bonus.
A: And then another question. Do you always recycle your products?
I: Do you mean these bottles or in general?
A: Yes, bottles or cans.
I: I try to do as much as possible. But to be honest, I don't always do it.
A: And then one last question. What are a few reasons why you sometimes do it or sometimes don't do it?
I: Good question. Things that I honestly almost never recycle are bottles of Innocent and those juices and stuff. There's also a deposit on those. But I don't recycle them that much. I collect it until my bag is full. And then it starts to stink a bit. And then you have to clean it very well. So I just stopped with that honestly. It's also still the case that I recycle cans a little less. Because I'm still used to throwing it away. It hasn't been that long since you can recycle them. So bottles are easier. And cans also leak a bit more. So sometimes I'm like if it's going to have Cola sticking on the bottom I don't really feel like that. So I think those are the reasons. And if I buy a bottle or a can somewhere, and I'm not at home, then I'm not going to take it all the way home to put it in the bag and then bring it back to a supermarket. So I think those are the reasons. And I'm also sometimes a bit lazy to take a bag with me. So yes those are the reasons.
A: Okay, thank you very much for your time.

Interview 2 (woman, around 30 years old, with baby stroller)

A: Hello, would you mind if I do a quick interview for a study?
I: Yes, for what kind of study?
A: A study about recycling for my bachelor's thesis for the university.
I: Yes, fine.
A: Okay, thank you very much. Well, I saw that you were recycling. Actually, I wanted to ask you first, what is your main reason for recycling?
I: Well, to protect the environment.
A: To protect the environment, okay, thank you very much. Then the next question. Do you always recycle? Your cans and bottles anyway.
I: Yes, actually almost always, yes.
A: Almost always, okay, very good. And then a quick last question. What are a few reasons why you sometimes don't do it?
I: Well, there are... It sounds very strange. But sometimes there are very long queues here. People have also picked up cans and bottles from the area. And if it takes too long. And I have very little to recycle. Yes, then I sometimes take it home again. But yes, then I throw it away sometimes as well. And yes, sometimes it doesn't work. Sometimes I also have those brands that it doesn't recognize. Then I have to

throw it away separately again. Then I just throw it in the trash can beside the machine, so then I'm not really recycling it either. Those are... Yes, I am very consciously doing it. But that it just sometimes doesn't take everything, even if, for example, a bottle has been dented, it doesn't take it. Then I don't actually recycle.
A: Okay, thank you very much. Have a nice day.

Interview 3 (man, around 40 years old)

A: Hello, would you mind if I interview you really quickly?
I: No.
A: Thank you very much. I saw that you were just recycling. And actually, first of all, I was wondering what are the reasons that you are recycling at the moment?
I: Well, I think we all have to do something to help the environment. And you also get money, you also pay extra for it, so it's nice to get it back.
A: Very good. Then a second question. Do you always recycle your cans and bottles?
I: In most cases, yes. Yes, or my wife does it. Yes, in most cases I do.
A: Okay, and then one last question. Because you said that you do it in most cases. In the cases that you don't actually do it, why not?
I: Well, if our sons drink cans, they throw them in the trash can, then I won't take them out anymore. I also sometimes forget it myself. It's not quite in my system yet, I have to say. Bottles more than cans. I always do big bottles, because it also takes a lot of space in your garbage bag. But yes, the most important thing is just when our sons have already thrown it away, then I won't take it out anymore. That's just a little too far for me.
A: Okay, thank you very much. Have a nice day.

Interview 4 (woman, around 22 years old)

A: Hey, I was wondering if I could interview you quickly for a study.
I: Yes, a study for the supermarket?
A: A study for me, for my university. It's about recycling.
I: Oh, yes.
A: Okay, first of all, I saw that you were recycling. And I was wondering why you recycle?
I: Well, of course for the money, but also for the environment. A little for both
A: Very good. And then, are you always recycling or do you do it sometimes?
I: Sometimes. If I feel like it. I'm also too lazy to do it sometimes. It also depends on where I drink. If I bring cans home, I won’t recycle them afterwards. Then I just throw them in the trash can.
A: Okay, and then a quick last question. What are some further reasons why you don't recycle?
I: Well, if I drink it somewhere else. If it's one can or one bottle, then... If I drink more, then I'll recycle it sooner. Because then it pays a little more of course. If it’s one can, and if I have to go to the supermarket for it, then I keep it sometimes, but sometimes I’ll just throw it away.
A: Okay, that was it. Have a nice day.

Interview 5 (woman, around 40 years old)

A: Hello, sorry for the interruption, but I was wondering if we could do an interview for a study.
I: Yes.
A: Okay, thank you very much. First of all, I would like to ask you, I see that you are recycling. Why are you recycling?
I: Well, to get money back.
A: To get money back, okay, very good. And do you always recycle?
I: No, not always.
A: No, not always, okay. And what are the reasons why you sometimes don't do it?
I: No time.
A: No time? Okay, that was it, thank you very much.

Table 5: Thematic analysis of interviews on recycling behaviour

Theme	Interview 1	Interview 2	Interview 3	Interview 4	Interview 5
Environmental concerns	"Well, of course, it's good for the environment..."	"Well, to protect the environment."	"Well, I think we all have to do something to help the environment."	"Well, of course for the money, but also for the environment..."	
Financial incentives	"...but I would be lying if I said it wasn't also for the money..."		"...you also get money, you also pay extra for it, so it's nice to get it back."	"Well, of course for the money, but also for the environment..."	"Well, to get money back."
State and carry load of packaging	"...I collect it until my bag is full. And then it starts to stink a bit...cans also leak a bit more..."	"...if, for example, a bottle has been dented, it doesn't take it..."	"Bottles more than cans. I always do big bottles, because it also takes a lot of space in your garbage bag."		
Habitual behaviour	"...I'm still used to throwing it away. It hasn't been that long since you can recycle them."		"...it's not quite in my system yet, I have to say."	"If I feel like it. I'm also too lazy to do it sometimes."	
Convenience and effort	"...I'm also sometimes a bit lazy to take a bag with me."	"...sometimes I take it home again. But yes, then I throw it away sometimes as well."	"But yes, the most important thing is just when our sons have already thrown it away, then I won't take it out anymore."	"If I bring cans home, I won't recycle them afterwards. Then I just throw them in the trash can."	"No time."

APPENDIX C – Survey questions

Demographics

1: What is your age (in years)? 2:What is your gender? 3: What is the highest education level you have obtained? 4: What is the yearly income (in euros) of your household?

Intention to recycle

1: What percentage of plastic bottles and aluminium cans consumed do you intend to recycle in the deposit return system in the following week? 2: What percentage of plastic bottles and aluminium cans consumed do you plan to recycle in the deposit return system in the following week? Answers were given in percentages.

Past recycling behaviour

What percentage of plastic bottles and/or aluminium cans consumed by you did you (or someone in your household) recycle in the past week using the deposit return system? The answer to this question was given in a percentage.

Habit strength

Recycling plastic bottles and aluminium cans using the deposit return system (Statiegeldsysteem) is something 1. I do automatically. 2. I do without having to consciously remember. 3. I do without thinking. Answers were given on a 7-point Likert scale, from 'strongly disagree' to 'strongly agree', and the final score was calculated as the mean of scores of the 3 items.

Environmental values

1. In my opinion, respecting the earth is: 2. In my opinion, unity with nature is: 3. In my opinion, protecting the environment is: 4. In my opinion, preventing pollution is:

Answers were given on a Likert scale from 1 (extremely unimportant value) to 7 (extremely important value).

The mean scores of the four items represented the final overall score.

Social norms

1: Many people who are important to me recycle using the deposit return system. 2: I think many people who are important to me expect me to recycle using the deposit return system. Answers were given on a 7-point Likert scale, from 'strongly disagree' to 'strongly agree', and the final score was calculated as the mean of scores of the 2 items.

Conjoint analysis

1. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:
   Distance to the recycling machine: 1000m
   Size of the financial incentive (per bottle/can): €0.25
   State the bottles/cans are in: Sticky, smelly and damaged
   Number of bottles/cans to be recycled: 10
2. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:
   Distance to the recycling machine: 1000m
   Size of the financial incentive (per bottle/can): €0.50
   State the bottles/cans are in: Damaged
   Number of bottles/cans to be recycled: 1
3. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:
   Distance to the recycling machine: 2000m
   Size of the financial incentive (per bottle/can): €0.25
   State the bottles/cans are in: Sticky and smelly
   Number of bottles/cans to be recycled: 1
4. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:
   Distance to the recycling machine: 500m
   Size of the financial incentive (per bottle/can): €0.15
   State the bottles/cans are in: Damaged
   Number of bottles/cans to be recycled: 10
5. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:
   Distance to the recycling machine: You're already at the supermarket
   Size of the financial incentive (per bottle/can): €0.25
   State the bottles/cans are in: Damaged
   Number of bottles/cans to be recycled: 5
6. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:
   Distance to the recycling machine: 2000m
   Size of the financial incentive (per bottle/can): €0.50

State the bottles/cans are in: Nothing wrong with the packaging

Number of bottles/cans to be recycled: 10

7. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:

   Distance to the recycling machine: You're already at the supermarket

   Size of the financial incentive (per bottle/can): €0.50

   State the bottles/cans are in: Sticky, smelly and damaged

   Number of bottles/cans to be recycled: 20

8. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:

   Distance to the recycling machine: 2000m

   Size of the financial incentive (per bottle/can): €0.35

   State the bottles/cans are in: Damaged

   Number of bottles/cans to be recycled: 20

9. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:

   Distance to the recycling machine: You're already at the supermarket

   Size of the financial incentive (per bottle/can): €0.35

   State the bottles/cans are in: Sticky and smelly

   Number of bottles/cans to be recycled: 10

10. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:

    Distance to the recycling machine: 1000m

    Size of the financial incentive (per bottle/can): €0.35

    State the bottles/cans are in: Nothing wrong with the packaging

    Number of bottles/cans to be recycled: 5

11. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:

    Distance to the recycling machine: 500m

    Size of the financial incentive (per bottle/can): €0.35

    State the bottles/cans are in: Sticky, smelly and damaged

    Number of bottles/cans to be recycled: 1

12. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:

    Distance to the recycling machine: 500m

Size of the financial incentive (per bottle/can): €0.50

State the bottles/cans are in: Sticky and smelly

Number of bottles/cans to be recycled: 5

13. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:

    Distance to the recycling machine: 1000m

    Size of the financial incentive (per bottle/can): €0.15

    State the bottles/cans are in: Sticky and smelly

    Number of bottles/cans to be recycled: 20

14. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:

    Distance to the recycling machine: 2000m

    Size of the financial incentive (per bottle/can): €0.15

    State the bottles/cans are in: Sticky, smelly and damaged

    Number of bottles/cans to be recycled: 5

15. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:

    Distance to the recycling machine: You're already at the supermarket

    Size of the financial incentive (per bottle/can): €0.15

    State the bottles/cans are in: Nothing wrong with the packaging

    Number of bottles/cans to be recycled: 1

16. On a scale of 0-100, rate how likely you are to recycle plastic bottles/aluminium cans using the deposit return system in the following situation:

    Distance to the recycling machine: 500m

    Size of the financial incentive (per bottle/can): €0.25

    State the bottles/cans are in: Nothing wrong with the packaging

    Number of bottles/cans to be recycled: 20

APPENDIX D – Raw data output SPSS

Data output descriptive statistics survey

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
What is your age (in years)?	227	18.00	75.00	31.0044	12.56611	157.907

What is the highest education level you have obtained?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than high school	5	2.2	2.2	2.2
	High school graduate	26	11.5	11.5	13.7
	Current bachelor student	59	26.0	26.0	39.6
	Bachelor's degree	77	33.9	33.9	73.6
	Master's degree	56	24.7	24.7	98.2
	Doctorate	4	1.8	1.8	100.0
	Total	227	100.0	100.0	

What is the yearly income (in euros) of your household?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than €30,000	63	27.8	27.8	27.8
	€30,000 - €59.999	51	22.5	22.5	50.2
	€60,000 - €99.999	53	23.3	23.3	73.6
	€100,000 - €150,000	21	9.3	9.3	82.8
	More than €150,000	19	8.4	8.4	91.2
	Prefer not to say	20	8.8	8.8	100.0
	Total	227	100.0	100.0	

What is your gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	132	58.1	58.1	58.1
	Female	95	41.9	41.9	100.0
	Total	227	100.0	100.0	

Data output first hierarchical regression – Intention to recycle

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.329[a]	.108	.071	28.10596	.108	2.928	9	217	.003
2	.627[b]	.393	.359	23.35855	.284	33.390	3	214	<.001
3	.744[c]	.553	.526	20.08178	.161	76.535	1	213	<.001

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20813.409	9	2312.601	2.928	.003[b]
	Residual	171418.073	217	789.945		
	Total	192231.482	226			
2	Regression	75468.436	12	6289.036	11.526	<.001[c]
	Residual	116763.046	214	545.622		
	Total	192231.482	226			
3	Regression	106333.312	13	8179.486	20.283	<.001[d]
	Residual	85898.171	213	403.278		
	Total	192231.482	226			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	60.099	7.629		7.878	<.001	45.063	75.136		
	What is your age (in years)?	.466	.186	.201	2.504	.013	.099	.833	.638	1.566
	Male	2.790	3.897	.047	.716	.475	-4.892	10.471	.941	1.062
	Current_bsc	-6.869	6.316	-.104	-1.088	.278	-19.317	5.579	.454	2.205
	Bsc_grad	-1.625	6.095	-.026	-.267	.790	-13.638	10.388	.418	2.393
	Msc_doctorate	1.766	6.640	.027	.266	.791	-11.322	14.853	.406	2.464
	thirty_60	9.092	5.435	.130	1.673	.096	-1.620	19.805	.676	1.479
	sixt_100	6.612	5.406	.096	1.223	.223	-4.042	17.266	.665	1.503
	prefer_not_to_say	-11.081	7.495	-.108	-1.478	.141	-25.853	3.691	.771	1.297
	over_100	.407	6.337	.005	.064	.949	-12.084	12.898	.597	1.675
2	(Constant)	21.983	13.578		1.619	.107	-4.782	48.747		
	What is your age (in years)?	.312	.156	.135	1.997	.047	.004	.621	.625	1.600
	Male	2.330	3.265	.039	.713	.476	-4.106	8.766	.926	1.079
	Current_bsc	-.563	5.308	-.008	-.106	.916	-11.025	9.899	.444	2.254
	Bsc_grad	-.272	5.069	-.004	-.054	.957	-10.263	9.719	.417	2.396
	Msc_doctorate	1.958	5.559	.030	.352	.725	-8.999	12.915	.400	2.500
	thirty_60	9.982	4.534	.143	2.201	.029	1.044	18.920	.671	1.490
	sixt_100	3.664	4.503	.053	.814	.417	-5.213	12.540	.662	1.510
	prefer_not_to_say	-9.401	6.323	-.092	-1.487	.139	-21.864	3.063	.748	1.336
	over_100	.963	5.299	.013	.182	.856	-9.481	11.408	.590	1.696
	Environmental_values	-4.382	2.024	-.128	-2.165	.032	-8.372	-.392	.818	1.223
	Social_norms	2.847	1.598	.118	1.782	.076	-.303	5.997	.651	1.537
	Habit	10.022	1.265	.512	7.921	<.001	7.528	12.516	.679	1.472
3	(Constant)	16.746	11.689		1.433	.153	-6.295	39.787		
	What is your age (in years)?	.203	.135	.087	1.501	.135	-.063	.469	.619	1.614
	Male	2.178	2.807	.037	.776	.439	-3.356	7.711	.926	1.079
	Current_bsc	.141	4.564	.002	.031	.975	-8.855	9.137	.443	2.255
	Bsc_grad	.164	4.358	.003	.038	.970	-8.426	8.754	.417	2.396
	Msc_doctorate	1.980	4.779	.030	.414	.679	-7.441	11.400	.400	2.500
	thirty_60	6.495	3.919	.093	1.658	.099	-1.229	14.220	.664	1.506
	sixt_100	1.483	3.880	.022	.382	.703	-6.165	9.130	.659	1.516
	prefer_not_to_say	-5.630	5.453	-.055	-1.032	.303	-16.379	5.119	.744	1.345
	over_100	-2.865	4.576	-.038	-.626	.532	-11.886	6.156	.584	1.711
	Environmental_values	-2.335	1.756	-.068	-1.330	.185	-5.796	1.126	.803	1.245
	Social_norms	.910	1.392	.038	.654	.514	-1.833	3.653	.634	1.577
	Habit	5.943	1.184	.304	5.022	<.001	3.610	8.276	.574	1.743
	What percentage of plastic bottles and/or aluminium cans consumed by you did you (or someone in your household) recycle in the past week using the deposit return system? Please provide an estimate if you do not know.	.416	.048	.487	8.748	<.001	.322	.510	.676	1.480

a. Dependent Variable: Intention_to_recycle

Data output second hierarchical regression – Past recycling behaviour

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.301[a]	.090	.053	33.25951	.090	2.394	9	217	.013
2	.570[b]	.324	.286	28.86376	.234	24.709	3	214	<.001

a. Predictors: (Constant), over_100, Male, Bsc_grad, prefer_not_to_say, thirty_60, What is your age (in years)?, Current_bsc, sixt_100, Msc_doctorate

b. Predictors: (Constant), over_100, Male, Bsc_grad, prefer_not_to_say, thirty_60, What is your age (in years)?, Current_bsc, sixt_100, Msc_doctorate, Habit, Environmental_values, Social_norms

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23833.527	9	2648.170	2.394	.013[b]
	Residual	240044.349	217	1106.195		
	Total	263877.877	226			
2	Regression	85590.868	12	7132.572	8.561	<.001[c]
	Residual	178287.009	214	833.117		
	Total	263877.877	226			

a. Dependent Variable: What percentage of plastic bottles and/or aluminium cans consumed by you did you (or someone in your household) recycle in the past week using the deposit return system? Please provide an estimate if you do not know.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	55.137	9.028		6.107	<.001	37.343	72.930		
	What is your age (in years)?	.440	.220	.162	1.998	.047	.006	.875	.638	1.566
	Male	1.236	4.612	.018	.268	.789	-7.854	10.327	.941	1.062
	Current_bsc	-8.713	7.474	-.112	-1.166	.245	-23.444	6.017	.454	2.205
	Bsc_grad	-2.577	7.213	-.036	-.357	.721	-16.793	11.639	.418	2.393
	Msc_doctorate	-.713	7.858	-.009	-.091	.928	-16.200	14.775	.406	2.464
	thirty_60	7.194	6.432	.088	1.119	.265	-5.482	19.871	.676	1.479
	sixt_100	8.422	6.397	.104	1.317	.189	-4.186	21.030	.665	1.503
	prefer_not_to_say	-11.892	8.869	-.099	-1.341	.181	-29.372	5.589	.771	1.297
	over_100	9.148	7.499	.102	1.220	.224	-5.633	23.929	.597	1.675
2	(Constant)	12.586	16.779		.750	.454	-20.487	45.659		
	What is your age (in years)?	.264	.193	.097	1.363	.174	-.117	.645	.625	1.600
	Male	.365	4.035	.005	.091	.928	-7.587	8.318	.926	1.079
	Current_bsc	-1.693	6.559	-.022	-.258	.797	-14.621	11.235	.444	2.254
	Bsc_grad	-1.048	6.263	-.015	-.167	.867	-13.394	11.298	.417	2.396
	Msc_doctorate	-.052	6.869	-.001	-.008	.994	-13.592	13.487	.400	2.500
	thirty_60	8.381	5.603	.103	1.496	.136	-2.664	19.425	.671	1.490
	sixt_100	5.241	5.565	.065	.942	.347	-5.728	16.210	.662	1.510
	prefer_not_to_say	-9.062	7.813	-.075	-1.160	.247	-24.463	6.339	.748	1.336
	over_100	9.202	6.548	.103	1.405	.161	-3.705	22.108	.590	1.696
	Environmental_values	-4.920	2.501	-.122	-1.967	.050	-9.850	.010	.818	1.223
	Social_norms	4.656	1.975	.164	2.358	.019	.764	8.549	.651	1.537
	Habit	9.803	1.564	.427	6.270	<.001	6.721	12.884	.679	1.472

a. Dependent Variable: What percentage of plastic bottles and/or aluminium cans consumed by you did you (or someone in your household) recycle in the past week using the deposit return system? Please provide an estimate if you do not know.

Data output conjoint analysis – Whole sample

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.373[a]	.139	.134	30.009	.139	29.683	12	2207	<.001

a. Predictors: (Constant), Number_20, Distance_1000m, Incentive_€0.50, State_Damaged, State_Stickyandsmelly, Incentive_€0.35, Number_5, Distance_500m, Distance_2000m, Number_10, Incentive_€0.25, State_Stickysmellyanddamaged

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	320769.116	12	26730.760	29.683	<.001[b]
	Residual	1987497.630	2207	900.543		
	Total	2308266.746	2219			

a. Dependent Variable: Rating

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	83.226	2.338		35.600	<.001	78.642	87.811		
	Distance_500m	-15.360	1.789	-.207	-8.585	<.001	-18.868	-11.851	.671	1.490
	Distance_1000m	-19.067	1.787	-.258	-10.673	<.001	-22.571	-15.564	.670	1.493
	Distance_2000m	-23.430	1.894	-.309	-12.373	<.001	-27.143	-19.716	.624	1.602
	Incentive_€0.25	1.833	1.875	.025	.977	.328	-1.844	5.510	.609	1.643
	Incentive_€0.35	1.466	1.817	.019	.807	.420	-2.098	5.030	.670	1.493
	Incentive_€0.50	4.787	1.796	.065	2.666	.008	1.265	8.308	.665	1.503
	State_Damaged	-11.749	1.795	-.159	-6.544	<.001	-15.269	-8.228	.665	1.504
	State_Stickyandsmelly	-11.083	2.076	-.134	-5.338	<.001	-15.155	-7.011	.616	1.624
	State_Stickysmellyanddamaged	-14.651	1.777	-.209	-8.244	<.001	-18.136	-11.166	.604	1.654
	Number_5	7.274	1.878	.098	3.873	<.001	3.591	10.957	.613	1.632
	Number_10	10.857	1.891	.145	5.742	<.001	7.149	14.565	.613	1.630
	Number_20	12.155	1.873	.164	6.490	<.001	8.482	15.827	.612	1.633

a. Dependent Variable: Rating

Data output conjoint analysis – Men in the sample

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
	Gender_Male = 1 (Selected)				R Square Change	F Change	df1	df2	Sig. F Change
1	.393[a]	.154	.146	29.668	.154	19.171	12	1261	<.001

a. Predictors: (Constant), Number_20, Distance_1000m, Incentive_€0.50, State_Damaged, Distance_2000m, Incentive_€0.35, Number_10, State_Stickyandsmelly, Distance_500m, Incentive_€0.25, Number_5, State_Stickysmellyanddamaged

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	202488.600	12	16874.050	19.171	<.001[c]
	Residual	1109917.246	1261	880.188		
	Total	1312405.846	1273			

a. Dependent Variable: Rating

b. Selecting only cases for which Gender_Male = 1

c. Predictors: (Constant), Number_20, Distance_1000m, Incentive_€0.50, State_Damaged, Distance_2000m, Incentive_€0.35, Number_10, State_Stickyandsmelly, Distance_500m, Incentive_€0.25, Number_5, State_Stickysmellyanddamaged

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	83.783	3.004		27.887	<.001	77.889	89.677		
	Distance_500m	-18.140	2.329	-.246	-7.787	<.001	-22.709	-13.570	.670	1.492
	Distance_1000m	-21.672	2.338	-.293	-9.269	<.001	-26.259	-17.085	.672	1.488
	Distance_2000m	-25.172	2.457	-.334	-10.243	<.001	-29.994	-20.351	.631	1.584
	Incentive_€0.25	4.171	2.439	.057	1.710	.087	-.613	8.956	.611	1.636
	Incentive_€0.35	3.500	2.365	.047	1.480	.139	-1.139	8.140	.677	1.477
	Incentive_€0.50	7.173	2.345	.097	3.059	.002	2.573	11.773	.671	1.490
	State_Damaged	-11.277	2.351	-.152	-4.797	<.001	-15.889	-6.665	.665	1.504
	State_Stickyandsmelly	-8.706	2.719	-.106	-3.202	.001	-14.040	-3.373	.613	1.630
	State_Stickysmellyanddamaged	-13.840	2.309	-.200	-5.994	<.001	-18.370	-9.310	.605	1.653
	Number_5	7.354	2.467	.099	2.982	.003	2.515	12.193	.608	1.646
	Number_10	10.339	2.485	.137	4.160	<.001	5.463	15.214	.616	1.624
	Number_20	10.885	2.422	.150	4.495	<.001	6.134	15.636	.603	1.658

a. Dependent Variable: Rating

b. Selecting only cases for which Gender_Male = 1

Data output conjoint analysis – Women in the sample

Model Summary

Model	R Gender_Male = 0 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics: R Square Change	F Change	df1	df2	Sig. F Change
1	.357[a]	.127	.116	30.481	.127	11.355	12	933	<.001

a. Predictors: (Constant), Number_20, Incentive_€0.50, Distance_500m, State_Damaged, State_Stickyandsmelly, Number_5, Distance_1000m, Incentive_€0.35, State_Stickysmellyanddamaged, Distance_2000m, Number_10, Incentive_€0.25

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	126600.023	12	10550.002	11.355	<.001[c]
	Residual	866867.089	933	929.118		
	Total	993467.112	945			

a. Dependent Variable: Rating

b. Selecting only cases for which Gender_Male = 0

c. Predictors: (Constant), Number_20, Incentive_€0.50, Distance_500m, State_Damaged, State_Stickyandsmelly, Number_5, Distance_1000m, Incentive_€0.35, State_Stickysmellyanddamaged, Distance_2000m, Number_10, Incentive_€0.25

Coefficients[a,b]

Model		Unstandardized Coefficients: B	Unstandardized Coefficients: Std. Error	Standardized Coefficients: Beta	t	Sig.	95.0% Confidence Interval for B: Lower Bound	95.0% Confidence Interval for B: Upper Bound	Collinearity Statistics: Tolerance	Collinearity Statistics: VIF
1	(Constant)	82.576	3.719		22.205	<.001	75.278	89.874		
	Distance_500m	-11.734	2.798	-.157	-4.193	<.001	-17.226	-6.242	.670	1.493
	Distance_1000m	-15.608	2.779	-.211	-5.617	<.001	-21.061	-10.155	.663	1.509
	Distance_2000m	-20.990	2.981	-.276	-7.041	<.001	-26.841	-15.140	.610	1.640
	Incentive_€0.25	-1.055	2.934	-.014	-.360	.719	-6.813	4.703	.604	1.655
	Incentive_€0.35	-1.062	2.846	-.014	-.373	.709	-6.647	4.523	.657	1.522
	Incentive_€0.50	1.476	2.800	.020	.527	.598	-4.019	6.971	.655	1.528
	State_Damaged	-12.321	2.791	-.166	-4.415	<.001	-17.798	-6.844	.661	1.514
	State_Stickyandsmelly	-13.969	3.222	-.169	-4.335	<.001	-20.292	-7.645	.617	1.622
	State_Stickysmellyanddamaged	-15.976	2.790	-.226	-5.727	<.001	-21.451	-10.502	.601	1.665
	Number_5	6.984	2.901	.094	2.407	.016	1.290	12.678	.618	1.618
	Number_10	11.558	2.922	.155	3.955	<.001	5.823	17.292	.608	1.646
	Number_20	13.573	2.963	.177	4.582	<.001	7.759	19.387	.623	1.605

a. Dependent Variable: Rating

b. Selecting only cases for which Gender_Male = 0