Why not from tap? The role of reward in the deposit system for still water from single-use bottles in Germany

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Author's Declaration

I, Teresa Geidel, hereby declare that I am the sole author of this thesis. To the best of my knowledge, this thesis contains no material previously published by any other person except where due acknowledgment has been made. This thesis contains no material which has been accepted as part of the requirements of any other degree or non-degree program, in English or any other language. This is a true copy of the thesis, including final revisions.

Date: June 16th, 2020

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Abstract

In the search for reasons why people consume still bottled water, where tap water is cheap, and its quality is excellent, this thesis investigates the role of the deposit system for single-use bottles in Germany to inform more sustainable policies. Based on the observation that people who return their bottles to a designated deposit machine feel rewarded, this study reveals that the reward feeling of the participants is primarily tied to the deposit fee that they receive. Through an integrated quantitative and qualitative assessment (N=650), it is found that the main driver for people feeling rewarded and for them returning the bottles is the deposit fee. By testing two modified deposit fee scenarios, the respective treatment group that receives back more money than what they initially paid, would increase their consumption of bottled water even more.

Acknowledgments

I take this opportunity to express my sincere gratitude to my thesis supervisor Professor Anand Murugesan for the continuing, genuine help and support, especially the patience with survey creation and distribution process. The encouragement empowered me to learn a lot. I would like to thank the School of Public Policy for funding that enabled me to have a representative sample through a survey distribution platform, and with this, thank you to all the survey participants. Considering that this thesis was produced under circumstances of the COVID-19 pandemic, I am grateful for the privilege of flexibility in planning, that allowed me to continue this work. I am grateful for the tracks by Ludovico Einaudi and the Pachanga Boys, whose music motivated me throughout to read and type.

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Introduction

According to data of the Association of German Mineral Water Producers, the consumption of still bottled water still grew by 3% in 2019 while the overall consumption of mineral water for the first time in years saw a slight decrease While the total consumption of bottled water in Germany has decreased for the first time in years from 2018 to 2019, the margin of still, bottled water showed a positive trend over the past decade, in 2019 it grew by 3% (Verband Deutscher Mineralwasser, 2019).

Consumers pay up to 200x more for a liter of bottled water as compared to tap water (Ballantine et al., 2019). In countries such as Germany, where the tap water quality is of excellent quality, this is puzzling. As still water sales from single-use bottles continue to increase in Germany and in other countries with high-quality tap water, the reasons why people bear additional, partially monetary costs, to consume bottled water, are not understood sufficiently. Different types of deposit schemes for different materials are established to ensure a high- return rate that enables appropriate disposal or Recycling (Dyie Mar, 2018). The deposit return systems (DRS) in Germany is split into two separate systems; this thesis focuses on the system for single-use bottles.

While wanting to encourage Recycling, the government has not sufficiently studied the effects of the deposit fee system, which is internationally celebrated as being exceptionally effective (Deutsche Welle, 2018; Packaging News 2018, Government Europa, 2019). While the rate of collection is indeed noteworthy, the recycling rate lags behind.

The researcher hypothesizes that the system has the unintended consequence of increasing the consumption of bottled water in the first place, by making people feel rewarded, once they return bottles.

Different reasons drive people to purchase still water, while high-quality tap water is available as an alternative. This thesis investigates in the role of the deposit system, that sparks a reward-feeling in consumers and makes them believe that upon to the consumer returning the bottle, they have successfully contributed to the Recycling of the bottles. As an established system with positive signal upon return of bottles to consumers, the deposit fee system for single-use bottles in Germany is based on a direct cost reflection through a deposit fee of 25 cents per bottle.
In addition to the price of the beverage, the consumer is typically charged 25 cents (- depending on the type of bottle -) as a deposit, which can be claimed back when returning the bottle to a bottle collection machine, usually in supermarkets or bottle shops.

For many people, the deposit fee they get back is considered 'extra money,' which can be used as a buffer or to cover expenses of upcoming grocery shopping. Consumers express that they are often surprised how much money they get back when returning several bottles and that they feel good when doing so. But why?
This thesis assesses what the individuals feel when returning single-use bottles, and to what extent this reward feeling encourages the person to continue buying still bottled water. This potential, unintended consequence of the deposit system has been overlooked as a powerful driver of bottle sales, as the system forms and confirms habits. The reward mechanism ultimately is making it less likely to consider tap water as an alternative.

The resulting consumption patterns, with their entire lifecycle from bottle production to final disposal, have serious, negative impacts on the environment. Despite what many people believe, while the deposit fee system collects the bottles, it is not guaranteed that they will actually be recycled. The rate of Recycling for single-use bottles into new bottles stands at 32,6% in Germany (Stracke& Homann, 2017). Only around 30% of bottles have a second life as a bottle. In addition, the final disposal impacts, the resource cost for cooling, transportation, and production of single-use bottles are substantial: it takes around 3 liters of water and 250 ml of crude oil to produce 1 liter of bottled water (Saylor et al., 2012) which leads to an immense waste of water as high as 100 billion liters of water annually only used for the production of bottled water globally (van der Linden, 2015). In the light of growing pressure on global water freshwater resources, also in Germany, the management and protection of existing resources become increasingly important for a sustainable supply of clean drinking water.

The role of the deposit system in decision making to purchase still, bottled water for consumers, is subject to this investigation. The assumption is that people who feel rewarded through the deposit system will be less likely to question the need for their purchase.
Throughout this thesis, the notion of bottled water is defined as still water packaged in single-use bottles. The research question of this thesis is:

Does the deposit system for single-use bottles in Germany indirectly motivate people to purchase bottled water by sending a positive signal when receiving money back upon return of the bottle?

Based on the analysis of existing literature, three hypotheses are used in order to refine the research question further:

(1) The main motivation for a person to return a single-use bottle to the deposit machine is to collect the deposit fee.

(2) If a person received back less money per bottle, compared to what they originally paid, it will reduce the number of bottles the person buys.

(3) The effect of receiving 25 cents per bottle as the last step of consuming still, bottled water, makes people feel rewarded.

Context

Since 2003, one-way beverage packaging (plastic- and glass-bottles) are part of the deposit fee system. Many households purchase single-use bottled water in supermarkets where they pay 25 cents per bottle as a deposit fee, which is paid back (25 cents/ bottle) when the person hands back the bottle. Every shop selling bottles under the deposit system is obliged to also accept the returns. The last step of the deposit fee system for the customer is the interaction at the machine in the supermarket, where bottles are individually inserted, and a receipt is printed with the respective amount (25cents x N bottles). The customer uses this receipt to receive cash at the cashier or to pay for new supermarket purchases.

Table 1

Bottle	**Deposit Fee**
Reusable Beer Bottles (glass, all sizes)	8 cents
Reusable Beer Bottles with hooplock	15 cents
Reusable Mineral Water (glass or PET)	15 cents, exceptionally 25 cents
Reusable bottles for juice or soda	15 cents
Some 1,0 L wine bottles	2 or 3 cents
All one-way bottles and cans	25 cents

The Kantar Emnid-Survey commissioned by the working group on reusable bottles (Arbeitskreis Mehrweg) found in 2017 that 43% of Germans believe that a bottle that is part of the deposit system will be refilled (Mehrweg,2017). In reality, these bottles, although part of the deposit

system, only get collected, but are not refilled afterward. Instead, they get shredded and potentially recycled or are exported to other countries for downcycling or disposal.

Interacting with the deposit system

" Bottled water is a public policy issue that suffers from agenda denial." (Nelson et al., 2019, Page 26), also in Germany, where despite tap water being of good quality, cheap and highly accessible, citizens often choose to buy still bottled water. If bottled water consumption is reduced, vast amounts of resources are protected and preserved. However, consumers are well acquainted with buying beverages and bringing the empty bottles back to the deposit machine.

Depending on the number of bottles returned, the entire cost of the new purchases at the stores can be paid, leaving the person with a good feeling that they did not spend money on the purchase. Another common situation is that children are put in charge to return bottles and either purchase new groceries for a family or are allowed to keep the deposit fee and buy treats for it, for instance. Hence, it is not uncommon that a child who returns bottles say ten bottles, enters the store with ten empty plastic bottles, and can leave the store with two ice-creams, for instance. This would clearly make a child feel rewarded.

Even if bottles are left in or next to a public rubbish bin, and someone else picks it up, they reap the benefit of the reward, and the person who disposed of it there does not feel bad, knowing that it will be brought to a deposit machine in return for money. In that sense, 25 cents, which is a rather high amount to collect per bottle, ensures that the bottles are re-collected. The fact that an institutionalized and well running system is established for single-use bottles enables consumers to return their bottle in a seemingly responsible manner, but also leads to the

fact that they may not question the consumption and the need to buy such still, bottled water altogether.

The German market of single-use bottles

Despite excellent tap water quality throughout Germany, the consumption of still, bottled water in Germany is rising every year with detrimental effects on the environment. Still, bottled water is consumed in glass and plastic bottles, with very few brands also offering tetra-packaged water still water. In 2019, 43, 6% of all water was sold in reusable bottles, 8,5% of bottled water was sold within the direct recycling circular system called „*PETCycle/ Rücklauf*", while 44, 9% were sold in PET single-use bottles and 2% in so-called environmentally advantageous packaging (Verband Deutscher Mineralwasser, 2019).

In Germany, around 16.4 billion single-use bottles are sold every year (Deutsche Umwelthilfe, 2020). Single-use bottles are being transported for longer distances because they are bottled in fewer sites, and then get distributed across the country. A single-use bottle is transported around 450 km on average. This is also caused by the fact that most of the imported bottled water, primarily from France and Italy, is still water.

Of all the containers in which bottled water is sold, single-use Polyethylene terephthalate (PET)-bottles have the biggest share: 44.9% (Stracke & Homann, 2017). Single-use bottles are frequently sold in wrapped six-pack quantities or are offered in crates. They rose in popularity as they are a light-weight alternative to glass bottles.

Problem statement

Single-use bottles and the environment

PET bottles can be recycled but are barely used for the production of new bottles. Due to limited technological capacity, a new PET bottle contains only 28% recycled materials on average. Because the concentration of recycled materials is so low and the market for secondary plastic is oversaturated, it is essential to reduce plastic production in the first place.

PET bottles generate around 450,000 tons of plastic waste annually, says Nabu consultant Katharina Istel. Thereof 33% is used for making new bottles, 22 percent is recycled to fibers, and 28 percent is used to manufacture industrial film, a material of lower quality compared to the plastic needed for new bottles, according to the industry association for plastic packaging. The remaining 16% go abroad or are being burned. Kai Nebel, an expert in textile process engineering and interactive materials from Reutlingen University, criticizes this: *„ Many PET products are unnecessary if you think about sustainability and regionality."*(Sträter, 2018)

This has substantial, negative consequences for the environment, from production to disposal. The manufacturing of one liter of bottled water takes three liters of water and 350ml of crude oil on average (Saylor et al., 2012). Transportation, cooling, and disposal increase the carbon footprint of bottled water even more.

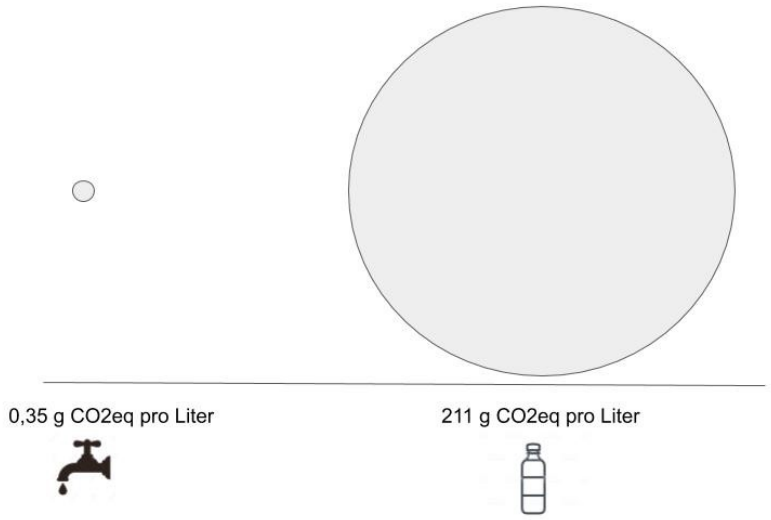

Figure 1:Difference in carbon output between bottled and tap water, adapted from a tip: tap (Fischer, 2019)

It takes 0,35 Co2 equ. to provide 1litre tap water while the average carbon footprint of bottled water is 211g/liter, around 600 times as much (Atip: tap, 2019). Amongst bottled water, there are differences in terms of glass or plastic as packaging-material, different lengths of transport chains, cooling, and reusability to incineration. While it is prognosed that the sale of bottled will continue to increase in the upcoming years (Stracke & Homann, 2017) from an environmental perspective, tap water is clearly preferable to bottled water, at least in Germany.

Moreover, breaking down of bottles into smaller pieces that are ingested by marine mammals, or even microplastics that are often enriched with toxins and then travel up the food chain (Thompson et al. 2009). Apart from negative consequences for ecosystems and mammals, different studies show that human health is often also directly impacted, as small particles leach from the bottle or toxins are released when bottles are exposed to sunlight for too long. This can partially be connected to the lack of regulation for bottled water producers, which do not have to guarantee

that bottled water is safe or safer than tap water (van der Linden, 2015). These adverse effects on human health, combined with the negative impact that plastic bottles have on the environment, needs to be questioned, especially since a replacement, namely tap water in Germany, is readily available.

Industry ambitions and deposit system failures

Less than half of German people can differentiate a reusable from a single-use plastic bottle, and the attempt of labeling the bottles has not shown much improvement.

Germany has two deposit fee systems for bottles of beverages, that run separately from one another. The deposit systems are regulated through the so-called packaging ordinance (Verpackungsverordnung – *VerpackV*). According to the packaging, ordinance entered into force in 2003, as amended in 2014 and 2019 (Gesetze im Internet, 2019) with the goal to increase the share of reusable packaging and increase the share of so-called environmentally- advantageous materials that are easier to recycle. Together they should hold a market percentage of at least 70% (Umweltbundesamt, 2016). However, if the goal is not met, there are no repercussions. To date, the quota of reusable bottles is at 39% of all bottles, a wide gap to the anticipated 70%, and a strong drop from 93% reusable bottles in 1991.

One captures reusable bottles that are refilled made from thicker plastic, or glass that is washed, refilled, sealed, and then sold again. The deposit-fee system of reusable bottles does not fall under the packaging ordinance, which adds another layer of confusion. This means that retailers are not obliged to take back all reusable bottles (Verbraucherzentrale, 2020). The other system is for single-use bottles, that are not refilled by the collector.

Hence, when having reusable bottles rejected, customers are more likely to consume beverages from single-use bottles instead (Mehrweg,2020). The federal consumer association has released in-depth articles criticizing the lack of information campaigns that could have helped educate people about the deposit system. There is a relatively low understanding amongst people living in Germany about the different symbols, differences amongst one-way and reusable bottles, and what happens to bottles after they are returned (Deutsche Welle 2018; ZDF, 2019). The researcher believes that the confusion over the systems also hinders to question the initial consumption because it distracts people. According to statistics of the German Association for Plastic Packaging and Films (IK: Industrievereinigung Kunststoffverpackungen e.V.), more than 93% of all PET-bottles in Germany are used for other applications after they have been collected. While this number exceeds the norm of the European Union (EU), the definition of Recycling in Germany only means that the bottles reach a recycling site, then being processed further. The quota for what is called Recycling is very high in Germany. A bottle is considered recycled if it is re-collected, the lid and etiquette have been removed and it enters a recycling site, where the PET is processed into recycled raw material. Within this, 93% of all single-use PET bottles that are part of the deposit system are collected and used for other purposes. However, the bottles are barely recycled in the sense that new bottles are made from the same plastic, which is referred to as rPET (GVM, 2018).

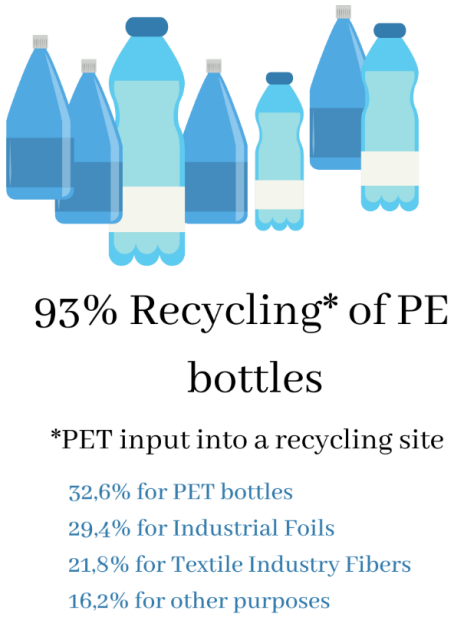

Figure 2: Rate of bottles that reach recycling point, adapted from GVM, 2018

According to Dr. Isabell Schmidt, CEO of IK, e.V., the beverage industry aims to increase the percentage of recycled material per bottle. Currently, only 26,6% of a PET bottle is from non-virgin materials (Newsroom, 2019). It is intended that those bottles which have a special certification called *RAL-Gütezeichen* would have a concentration of 50% of recycled PET until 2022, and the association claims that more impulses and incentives from the trade sector are needed to increase the concentration even further. The share that single-use PET bottles with this certification will have from the total PET bottles is not determined.

The deposit system for single-use bottles and confusion over bottles overall

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The deposit-fee system of reusable bottles does not fall under the packaging ordinance, which adds another layer of confusion. This means that retailers are not obliged to take back all reusable

bottles. Hence, when having reusable bottles rejected, customers are more likely to consume beverages from single-use bottles instead (Mehrweg,2020). Additionally, there is a relatively low understanding amongst people living in Germany about the different symbols, differences amongst one-way and reusable bottles, and what happens to bottles after they are returned (Deutsche Welle 2018; ZDF, 2019). The lack of informational campaigns is criticized by the federal consumer association (Verbraucherzentrale, 2020). The researcher believes that the confusion over the systems also hinders to question the initial consumption because it distracts people.

Literature Review

This literature review conveys that previous studies have been made in countries with a functioning tap water system, reveals reasons why people decide to purchase bottled water regardless and introduces the reader to reward-feeling through deposit systems, which has not been covered in previous research.

By building on previous studies about bottled water consumption, highlighting the consumers' beliefs and relationship to the products, this literature review highlights the need for researching other embedded factors such as the role of reward in the deposit system.

Purchasing bottled water despite tap water access

According to a Gallup poll in 2010, the most prevalent reason in the United States (U.S.) for choosing bottled water was related to health concerns with tap water (Gallup, 2010). Six years later, a summary report of the beverage association celebrates the fact that the bottled water industry has increased its volume steadily. In 2016 bottled water was the most popular beverage bought before all other packaged beverages (Rodwan, 2016). Global bottled water sales continue to increase, in countries where public water provision is lacking, and in those, where it is excellent, like in Germany.

In the literature about individual's preferences for choosing bottled water in the context of countries where tap water is potable, two main streams of study have formed. On the one hand, bottled water is analyzed as a marketing phenomenon of managing to sell a superfluous product, both positively and negatively (Rodwan, 2009, Parag and Roberts, 2009; Gleick, 2019). On the other hand, the

behavioral- and belief- tied factors of consumption decisions are studied, analyzing all possible factors of influencing consumption decisions (Doria, 2006; Etale et al., 2018; Viscuci, 2012).

In 2006, Doria connected both streams of literature in a critical study that reveals that organoleptic factors of perceived taste and odor of water and health risk concerns over tap water, in contrast to bottled water (Doria, 2006). He argues that smart marketing strategies, including branding and packaging design, exploit the health concerns of people and use it for the advantage of selling bottled water. Rodwan, 2009, adds, that recent trend patterns of an increased desire for hydration and the notion that bottled water can be a healthy substitute instead of sweeter, bottled beverages, play a role (Rodwan, 2009). Parag and Roberts criticize that strong marketing campaigns of bottled water companies, undermine the capacity of the state to secure clean, publicly provided drinking water.

Ward et al. (2009) determine the purity of water, safety, and taste as the main driving factors of people to buy bottled water in a study focusing on health aspects. The study found that both generic, as well as specific beliefs about the health of bottled water, don't contribute to the decision to buy it, but convenience, price, and taste were influential.

In a study on the influence of social norms and eliciting effect as a driver for bottled water consumption, as they see affect, similarly to experience, as an important factor, i.e., you are more likely to continue or repeat an action, if your first encounter was positive. Etale et al. compare Swiss and German attitudes that yield to water purchasing. By incorporating both psychological and non-psychological factors, this study investigates thoroughly the factors that influence people's choice of water. The authors highlight the contributing factors to the influences they find: a.) norms matter and b.) individual preference is most likely supported by the personal experience.

Convenience is also significant and impacted bottle purchases negatively, as participants expressed that it is cumbersome to buy and transport the water home (Etale et al., 2018).

In a study on the Irish context of bottled water that focuses on the branding mechanisms that led to the popularity of bottled water, Collins and Wright performed a pilot study, where participants were unable to significantly identify any taste differences between tap- and bottled water (Collins and Wright, 2014). Unlike in Etale et. Al and Ward's research, in this study, convenience had a positive effect on bottled water consumption, as the authors portray convenience as practicability, i.e., bottled water is easy to purchase on the way and cool in the refrigerator. It is important to note that framing the influencing factors differently, also determines, and sometimes limits the expressiveness of arguments. The research provided recommendations for future strengthening of the bottled water market in Ireland and government regulation of it.

A range of literature exists about contexts, where the water is not homogeneously potable, which is still worth to note for their approaches and findings: In an ambition to go beyond grasping the general factors, Quansah et al. investigated in the relationship of demographic variables into decisions to buying bottled water in Accra, Ghana, finding the level of education to be the most significant factor (Quansah et al., 2015) In a university study in Java, Indonesia, Kumar (2014) finds perceived quality of water and its packaging influences consumers choice most. In his comparative study of Drinking Water Choices, Qian (2018) has highlighted the role of personal norms through the theory of planned behavior (Ajzen, 2006). The guilt that people feel when drinking bottled water due to environmental concerns, summarized as the self-impact, as well as the intention to raise awareness about the environmental effects of bottled water to others, are tied to the personal norms a person holds. Awareness of both reduce the consumption of bottled

water a person, which shows that policies targeted at informing the personal norms can advance the desired behavioral change (Qian, 2018), potentially also in Germany.

Building on the research in this area, it becomes apparent that different factors underpin the choice to purchase still bottled water. In order to bridge the past research to the German context and understand the popularity of single-use bottles, the operational aspects of the deposit fee system must be understood to uncover the reward feeling and other aspects that contribute to a person to buy, and barely question their consumption of bottled water.

While the implementation of a deposit scheme for containers, such as bottles, increases return rates (Viscuci, 2012), the system is by far not as sustainable as reusable bottles. Already in 2008, Groth criticizes the underlying functions of the deposit system as it is enacted. He predicted that the important objective of increasing the share of reusable packaging would be missed due to a lack of incentives for the demand side to buy such bottles. Instead, packaging taxes on single-use bottles as an alternative policy instrument that leads to more sustainable outcomes.

The role of reward with respect to the deposit system

As several authors have shown the relevance of different factors, the deposit system is a factor that has not been studied thus far. Due to a relatively long tradition of the deposit system, it is unquestioned to be a vehicle for collecting bottles. This section establishes that the way the deposit system operates and is embedded in everyday life, can affect consumption levels:

To the best knowledge of the researcher, so far, there is no literature that investigates the effect that deposit systems of beverages have on initial consumption. However, one experiment on unintended consequences of Recycling revealed that paper usage that yielded in participants using

more paper, when having a recycling bin next to them, the fact that recycling options can spark an increase in consumption (Wang& Catlin, 2002), which can also hold for recycling bottles.

In the case of single-use bottles, the fact that people are rewarded a deposit fee when they bring back the bottle suggests that they did something morally right, by doing "their part" for Recycling. In her paper on fostering moral concerns in social decision making, Laetitia B. Mulder (2008) explains that in order to change an individual's behavior, the moral norms that are tied to their actions should be understood. She argues that while*,,...rewards communicate a voluntary rule",* (Page 1436), punishments are better at conveying moral concerns.
With respect to the willingness to return bottles, Thörnelöf (2016) studied the Swedish recycling rates for aluminum cans that were introduced with a new deposit system in 2010. The rate of deposit was negatively correlated, while the level of education is positively correlated: the more educated a person is, the responsive they are to a change in the deposit.

Another guiding consideration for the reward feeling of deposit systems was the concept of 'warm-glow' giving, which refers to pro-social behavior that causes donors to experience positive feelings, irrespective of whether their giving makes a difference (Evren & Minardi, 2015). People can be driven to act in a manner that serves the wider society through the warm-glow- effect, where *,,social image concerns or a desire for acclaim may also drive pro-social behavior"* (Evren & Minardi, 2015, Page 1381). This phenomenon may lead to situations, where individuals deem their social image and satisfaction by serving as so important, that the reward they feel by completing it may be more important than the anticipated monetary value, such as a deposit fee. In the case of deposit fee, it likely leads to the same outcome: people who anticipate the deposit fee and people who want to feel like they did the right thing, will both return the bottles.

If the utility that an individual receives from the act of giving is valued as very high, the individual will find a monetary compensation or even an official acknowledgment as something negative, as both strips the individual from the pure choice of being pro-social or pro-environmental (Evren & Minardi, 2015). This matter for the deposit system to differentiate the warm glow effect and alternative motivations leading to benevolent behavior to inform the policies and instruments in the system.

Prior studies lack insight into this potential reason to inform packaging policies and messages that reflect the la. Amongst other factors that influence people's decision to consume still bottled water, the fact that people are rewarded for returning a bottle makes it a positive experience of disposal, not reflecting the real cost. To what extent are people incentivized to buy bottled water because of the 25 cents, high deposit return?

Research Focus: The reward feeling at the deposit machine

,, I return the bottles to the deposit machine because I get money, and I can buy something new from it, such as a few packages of capsules of cream."

Survey Participant

The German deposit system for single-use bottles suggests that a person completed their task in the system upon return of the bottle, which can have the unintended consequence that people purchase more bottles. Receiving back the deposit fee: 25 cents per bottle makes people feel rewarded at the moment when they return the bottle, and the general belief is that they have contributed to Recycling.
Additionally, the complexity of the deposit system may lead to confusion, while the institutionalized and widely spread system causes people to get used to it easily. The high return rate (99% of all bottles are returned on average) creates a positive image of the fact that this system is in place, and it is relatively unquestioned.

The perception of rewards is not objective. In the case of returning bottles, one can argue that upon return, the German deposit system objectively does not give a reward to the person. But at the moment, the deposit fee that is returned may feel like a reward, and it is clearly an incentive to make the person return the bottle. If they don't, they are punished by losing the money that they paid for the bottle. In this flow of argument, the deposit system has an expressive function, where it signals to the person that it is expected from society and seen positively if they returned the bottle (for Recycling).

Warm glow effect as a driver of bottled water purchases

In relation to the deposit fee system of single-use bottles, there is the societal and environmental pressure to 'do the right thing' makes people return the bottles because they feel good after they return the bottles, which can be described with the 'warm glow effect,' where individuals act pro-socially to suit a social norm or feel good about themselves while compromising potential costs that action they perform incur.

Despite contingency variables such as the collection and storage at home, planning to bring the bottles to the store and potentially waiting in line, increase the cost for a person to return the bottles. This represents the decision tied to the monetary value of the bottle: one can collect the 25 cents upon return or give up on 25 cents per bottle by not returning it.

In the case of the deposit fee system in Germany, consumers of bottled beverages can feel the warm glow effect, either by returning the bottle, or by' donating' the bottle to a person who will return it for them, and that person collects the deposit fee. Specific straps are often attached to public garbage bins where people can place their deposit bottles so that a person who wants to collect them does not have to poke in the trash bin.

This research focuses on the link between the reward feeling that that deposit system has to the decision of a person to purchase more bottles in the context of single-use bottle usage in Germany for packaging still water. This approach is novel because it tries to assess to what extent and in which ways a person feels rewarded by returning a bottle, which could eventually lead to them buying more bottles.

Methodology

This thesis project is based on a quantitative survey, which is distributed to people living in Germany in May 2020 online. By gathering data from over 600 participants through an online survey, the researcher gains insight into the level of reward feeling that the people perceive from receiving the deposit fee and how this influences their purchasing decision (outcome). The survey was prepared parallel to the literature review and based on previous research on why people drink still bottled water in Germany. The language of the survey in German.

Data preparation

The process of background research, in the beginning, has helped inform the questions of interest and synthesize the research questions and hypothesis for the survey preparation.

Qualtrics were used to create the survey, which enabled the researcher to include randomization of questions, different pathways, and introducing the different scenarios smoothly. This platform was also chosen due to the possibility of integrating it with prolific, the distribution platform. This platform also allowed for variations of questions and methods of scales for answers were tested. The survey mainly consists of statements that participants can strongly agree to strongly disagree to, by ticking one option per question on the Likert scale.

The format of an online survey with mainly multiple-choice replies enabled a wide pool of participants to participate, which increases representativeness and sound comparisons. This was especially necessary for having robust outcomes while the participants are split into the treatment groups.

Survey Design

The survey includes a question in the beginning that leads people who purchase still water from single-use bottles to a different part to understand their motives for doing so. Therefore, in the beginning, there is a split into one group that purchases still bottled water and another group that purchases any kind of beverage in single-use bottles. This enables the researcher to understand the participants' attitudes to still, bottled water and compare it to existing literature. The participants are exposed to different statements that reflect known reasons for buying still bottled water. By indicating the extent to which they agree (or disagree) to the statement, priorities in the decision to buy still, bottled water, can be understood.

Thereafter the participants are exposed to the questions about how rewarded they feel when returning the bottles to the deposit machine. The questions are the same for both groups. As the reward feeling of returning bottles should not depend on the content of the bottles, the researcher decided to include participants who drink from the single-use bottles, not exclusively people who purchase still water from single-use bottles for answering questions about reward. Then, participants are randomly exposed to one of three scenarios, where 100 responses per scenario are presented in the data analysis. In two scenarios, a modification of the real system is introduced, which are the different treatment groups:

Scenario A: the participants pay 25 cents/ bottle and receive back 50 cents/ bottle.

Scenario B: they pay 25 cents/ bottle and receive back 1 cent/ bottle.

Scenario C: reflects real case scenario, which was included to have a second baseline for the comparison, participants pay 25 cents/ bottle and receive back 25 cents/ bottle.

Each participant only sees one out of three scenarios. The survey asks participants to indicate the number of bottles they buy underneath three images of differently sized bottles (0,25 liters; 0,5 liters; 1,5 liters) for the researcher to be able to distinguish whether the size of the bottles might play a role. Participants are requested to fill in the values before (based on their real-life purchases) and after (being part of a modified treatment group). The aim is to be able to compare the number of bottles of people living in Germany buy, and what they indicate they would buy if the deposit system is modified. The randomly assigned treatment allows for examining the self-reported behavior in hypothetical scenarios and compare it with the control (or as it treatment).

The groups were asked after the treatment how many bottles of water they buy of the three respective sizes, and the data shows that people who were exposed to the scenario of paying 25cents per bottle, receive 50 cents per bottle increased their purchases of bottles. Participants who were exposed to the scenario of paying 25cents per bottle, receive 1 cent per bottle increased their purchases of bottles.

In a follow-up question, participants were asked what they would do if they would continue to pay 25 cents per bottle but not receive any money back when returning the bottle. Different alternatives to disposal could be selected, including the option to continue to return the bottles.

Data collection

The survey was distributed through the service platform prolific. A pre-screening was applied so that the survey was only sent out to people who are residents in Germany. From this pool, 320 participants filled out the survey in the week from 11.05.2020 to 15.05.2020. The survey took each participant around 5 minutes to fill out. A second, slightly modified survey was shared between

the 21.05.2020 to the 14.05.2020, as the first survey had not captured one important step. Due to the loss of data in the first data, only the data of the second data can be used for comparing the change in purchase amounts.

Data processing

In order to answer the research question- *Does the deposit system for single-use bottles in Germany indirectly motivate people to purchase bottled water by sending a positive signal when receiving money back upon return of the bottle?* Three different hypotheses were introduced that are answered through the following analysis methods:

Hypothesis 1: The main motivation for a person to return a single-use bottle to the deposit machine is to collect the deposit fee.

To accept or reject this hypothesis, an objective technique through a sentence completion test is used for the purpose of uncovering participants' motivation without guiding input. For this purpose, after consent was given in the survey, the participants were asked to complete the sentence,, I return single-use bottles to the deposit machine because…" (Ich bringe die Flaschen zum Pfandautomaten zurück, weil..."). This sentence stem allows participants to reply with a few words, but also to elaborate if they wish to do so. This technique sheds light on the motivation of participants, including motivations and attitudes (Soley& Smith, 2008). The 320 responses by the participants were analyzed by color- coding and identifying multiple dominating themes, as well as highlighting unexpected responses. The coding was based on identifying the trends of responses (Donoghue, 2018), that could be anticipated through the literature review and based on discussions with people who drink from single-use bottles.

Hypothesis 2: If a person received back less money per bottle, compared to what they originally paid, it will reduce the number of bottles the person buys.

Regression analysis is used to compare responses in the treatment group with the control group and control for other covariates, which may affect the purchase of bottled water. The regression framework also allows us to check if the reward feeling is associated with the purchase in the treatments. In order to assess the different potential correlation of reward- feeling to the number of bottles people buy, the data of all participants, water and beverage drinkers of all three bottle sizes that the participants could pick from, are regressed against the variable 'rewardfeeling' (Likert scale values) and in a separate regression against the variable 'worthreturn,' which represents the reward feeling tied to the monetary incentive that a person has.

Economic equation:

The following econometric equation will be used for the regression:

Purchase after treatment – Purchase before treatment = α_0 + α_1 Treatment A (Water Drinkers difference in purchase) + α_2 Treatment C (Water Drinkers difference in purchase) + control + error

Hypothesis:

Expect α_1 to be positive and α_2 to be negative, as people would buy more bottles, if they get a higher deposit fee back (50 cents) and fewer bottles, if they get less deposit fee back (only 1 cent) than what they initially paid (25 cents).

Control variables:

Level of education (in ten different categories), income (in 8 different income brackets for net annual income), age, gender, household size, urban/rural

Hypothesis 3: The effect of receiving 25 cents per bottle as the last step of consuming still, bottled water, makes people feel rewarded.

The responses to different statements about reward, that were captured in the survey through the Likert scale and by multiple-choice options are analyzed based on the respective percentage of people that strongly disagreed to strongly agreed to a statement. Additionally, the count of each selected reason for why a person feels rewarded is captured.

A second regression was run to analyze if there is a significant correlation between reward feeling and the change in bottles before and after treatment, with the modified economic equation:

Purchase after treatment – Purchase before treatment = α_0 + α_1 Treatment A (Water Drinkers difference in purchase) + α_2 Treatment C (Water Drinkers difference in purchase) + rewardfeeling + worthreturn + Control + error

The methodology of this thesis consists of a literature review, empirical research through quantitative data analysis of participants' survey responses, and an interpretation with policy

recommendations. By analyzing the data and understanding how the answers of people differ in the different scenarios, policy suggestions can be made.

Descriptive Statistics

The survey could be taken by anyone living in Germany who regularly purchases beverages from single-use bottles and had 651 responses. The survey has a considerably representative sample, which is presented in this section through the demographic factors that were incorporated as control variables and by showing why the participants of this survey buy still bottled water. These reasons are revealed as descriptive statistics and not in the results section, as they are not the focus of the thesis, but an important basis for the reward-analysis.

At the beginning of the survey participants were asked if they purchase still water from single-use bottles, which was the case for 54.62 % of the participants, which resonates with the fact that the numbers of still, bottled water purchases are high or even growing, compared to other sectors of beverages.

Table 1 shows the different variables that were included in the experiment of the number of bottles purchased:

Table 1

Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
Version	181	2	0	2	2
Group	176	1.949	.844	1	3
treat_50cent	176	.381	.487	0	1
treat_1cent	176	.33	.471	0	1
education	353	6.02	1.484	1	10
income	353	3.813	2.187	1	8
age	337	28.694	9.026	0	65
HHsize	353	2.499	1.234	1	5
rural_urban	352	1.23	.422	1	2
female_dummy	326	.331	.471	0	1
WDallbottles	181	.61	8.558	-25	69
WDdifsmall	181	1.177	7.788	-10	70
WDdifmedium	181	-.213	2.473	-12	10
WDdifbig	181	-.354	3.228	-18	10
worthreturn	355	4.208	1.066	1	5
rewardfeeling	355	3.549	1.219	1	5

General data

The variables' Group' and 'Version' have been included in the table of the descriptive statistics to reveal to the reader the narrowing down of the applicable participants depending on the experiment. 'Version' (2) refers to the second survey distribution, which is the data that can be used for experiment 3 to compare the number of purchased bottles. The variable 'Group' enables the researcher to differentiate between the respective treatments, which include the treatments' treat_50cent' and 'treat_1cent', two of the three scenarios that were shown to the participants. The third scenario reflects the real system and is, therefore, the baseline group. Each participant only saw one scenario.

'WDallbottles' is the sum of the water drinkers (WDs) difference in consumption after treatment substracted by before treatment value. This difference in consumption is tied to one of three bottle sizes, as 'WDdifsmall,' 'WDdifmedium,' 'WDdifbig.'

The variables of 'education' and 'income' cannot be displayed in the table with understandable values, as participants did not enter their direct education level or income. Instead, for purposes of usability, a scale of 1-10 different levels of education and 1-8 different income brackets as net annual income were options, respectively.

Income range

Percentage of participants	*Annual net income*
21.71%	less than €10.000 per year
16.28%	between €10,000 to 19,999
13.33%	between €20,000 to 29,999
17.05%	between €30 000 to 44 999
8.84%	between €45 000 to 55 000
8,53%	between€55 000 to 74 999
4,50%	between €75 000 or more
9,77%	prefer not to say

Level of education

Less than 1% have not graduated from school, 1.09% has the minimum school graduation (leaving school after grade 9), 7,29% left school after grade 10, 2.95% have a vocational diploma, 25,74% graduated with an Abitur, the highest form of high school education, 7,13% have vocational training, over half of the participants (51.94 %) have a secondary education degree and 2.79% have a doctoral degree.

Gender

From the total number of participants, 39,38% of participants identify as female, 59.84% identify as male, and less than 1% do not identify with either of the two groups. From the second survey distribution, which is the basis of data for the bottle purchasing comparison, 43.12% identify as female, 56,57% of participants identify male, and less than 1% prefer not to state. 74 females and 106 male participants took part in the comparison of bottled water purchases before and after treatment.

Age

35,33% are between the age of 18 and 24, 47,74% are between the age of 25 and 34, 11,62% are between the age of 35-44, 3,71% are between the age of 45- 54, 1,6% are between the age of 55-65.

Household size

Of the total number of participants, 24,96% of participants live alone, 33.94 are in a two-person household, 21.09% live in a household of 3 people, 13,33% live in a household of 4 people, 7,23% live in a household of 5 people, or more.

Rate of urban population

76.48% of the participants consider themselves to live in an urban area, while 23.52% of people consider their living situation as rural. This reflects reality well, as 77,3% of people in Germany lived in an urban setting (Statista, 2019).

Reasons for buying still, bottled water

People who buy still, bottled water from single-use bottles in Germany have different reasons for doing so. 355 survey participants indicated that the purchase still, bottled water, which is 54.62 % of all participants and resonates with the fact that the numbers of still, bottled water purchases are high or even growing, compared to other sectors of beverages.

The participants have clearly indicated that they find bottled water attractive for reasons of practicability, to cool and to take it along easily. 80,51% of the respondents agree or strongly agree with this statement. 73, 45% of participants say that they agree or strongly agree with the statement that they have good experience with drinking bottled water. Thus practicability and experience were found to be the strongest reasons for participants to purchase still water from single-use bottles. Similarly, 56,21 people interviewed stated that they agree or strongly agree to the statement that they reused to buying still bottled water.

In a statement aimed at investigating the social norm and pressure that people feel from the expectations of others, 64,12% of people state that they agree or strongly agree that they feel more comfortable with offering still bottled water to guests, rather than tap water.

The level of awareness of the participants concerning the environmental impact of bottled water is high, which shows by over 62% of participants indicating that they still have a bad conscious for producing waste, even if they return the bottles.

It was found that taste differences, lifestyle and image concerns, price, and trust (the fact that the bottles are industrially sealed) play only secondary roles.

Results

The motivation of returning bottles

The participants revealed that receiving back money and wanting to protect the environment are the main motivations for bringing back the bottles to the deposit machine. This information was captured by analyzing the second parts of sentences that participants concluded with their own words.

In their sentences, the participants revealed two main themes in their responses: Money and Environment. None of the responses was identical to the other, but the vast majority of participants stated that they bring back their bottles in order to get back the deposit fee or the money. Both 'Money' and 'Deposit Fee' are categorized for the theme of monetary reward. Some of the participants included the fact that they cover new purchases with the newly gained deposit fee when doing groceries.

The other main theme, environment, is a category based on responses that people,, hope the bottles will be recycled", ,, want to do something good for the environment", ,, want to lead a sustainable life" and other, similar statements. In this category, it is important to highlight, that through the responses, it was visible, to what extent people are concerned about the environment, as some participants formulated that "at least I somewhat compensate for the consumption" or that "they believe that returning the bottles is the most sustainable option, currently available." This shows that some participants are strongly concerned about the environmental impacts of the bottles they consume. In many of the responses, the two main trends were combined,

as participants would conclude the sentence with, the bottles will be recycled, and I get money back" and similar replies.

Fewer respondents revealed that freeing space in their household by stating that,, I don't have the space to store them", or,, they are disturbing me when they are lying around at home." These responses, 13 in total that primarily mentioned the aspect of feeing space, wanting it to be tidy at home was not anticipated by the researcher beforehand as an important factor for why bottles are returned. Six respondents also mentioned space aspects in a separate question where an additional text-field was provided, about why a person feels rewarded, when returning bottles.

Additionally, some participants responses were categorized as 'social norm being relevant' which includes such responses that state,, it is how it should be", ,, this is logical", ,, this is what one should do", ,, the bottles belong there" as completions of the sentence.

It was interesting to see that this is the intuitive, first response that some people had to conclude the sentence and shows how the deposit system, and using it, became a norm. One other important insight for future research were two responses that exclusively expose that the participants are used to returning the bottles. They end the sentence with ,,because I am used to it," and, what else should I do with it?". As these are only two replies, it is questionable how valid this insight is, but it was interesting for the researching having learned through the process that habit and affect seem to have a significant impact on the decision to purchase bottled water, also, because people question their activities less, when they became a habit. Further research should investigate the role of habit- formation in bottled water consumption, especially in the German context, where many people always purchased sparkling water, which does not come from the tap, and recently

started buying tap water.

While environmental consciousness, the idea of freeing space and serving the system/ social norm, also plays a role. The predominant reason why people feel rewarded is the collection of the deposit fee; therefore, hypothesis (b) can be accepted.

Adaption of purchase numbers according to the modified deposit system

Participants indicated a change in consumption after they were exposed to either of the modified deposit-fee systems as treatment groups. The groups were asked after the treatment how many bottles of water they buy of the three respective sizes, and the data shows that people who were exposed to the scenario of paying 25cents per bottle, receive 50 cents per bottle increased their purchases of bottles. Participants who were exposed to the scenario of paying 25cents per bottle, receiving 1 cent per bottle back, decreased their purchases of bottles.

The first experiment investigates how the number of bottles a person buys, changes after they have been exposed to one of the three scenarios. As each participant only sees one out of three scenarios, it is expected that for scenario one (25/50), the consumption of bottles will increase, whereas participants who see scenario 3 (25/1) would indicate to buy fewer bottles. This experiment captures the variation of bottle purchases across scenario A and scenario C:

Purchase after treatment – Purchase before treatment = α_0 + α_1 Treatment A (Water Drinkers difference in purchase) + α_2 Treatment C (Water Drinkers difference in purchase) + control + error

The hypothesis is: Expect alpha1 to be positive and alpha2 to be negative, which proves to be correct: In table 2 we can see the total difference in bottle purchases, which is water drinker data for all bottle sizes with different control variables, where the correlation between an increase in bottle purchases for those participants who were exposed to the scenario (25cents/50 cents) became clear. The rise of bottle sales after the scenario exposure treatment_50cents and treatment_1cent is significant at the 1% level, and there is a robust correlation between a participant having a higher or lower deposit return fee and the change of purchased bottles before and after having seen the scenario. We can observe a downward bias for the 1-cent treatment when not controlling for omitted variables and an upward bias for the 50cent treatment, before adding the control variables.

Table 2: Regression of both all bottles with both treatments

	(1)	(2)	(3)
treat 50cent	3.978***		3.162***
	(0.731)		(0.921)
treat 1cent		-3.677***	-2.061**
		(0.739)	(0.939)
education			0.319
			(0.278)
income			-0.0219
			(0.196)
age			0.003
			(0.0436)
Household size			0.394
			(0.365)
Rural/urban			-0.720
			(0.906)
female_dummy			-1.031
			(0.762)
Observations	317	317	284
R-squared	0.086	0.073	0.124

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In this experiment, the focus lay on the indicated consumption of still water drinkers, before and after the treatment. The data reveals, that hypothesis (c) can be accepted, as people reduce their initial consumption if they don't receive the full bottle deposit fee of 25 cents back. There is a high association between the scenario and the change in bottles purchased. However, the reduction bottle purchases after seeing the (25/1cent) scenario for all the sizes of bottles is proportionally less strong than the increase in the small and big bottles when participants saw the (25/50cent scenario).

This regression has taken the total amount of bottles, but in the data, it is also visible that the size of the bottle matters for the change in purchase: the changes in bottles purchased are particularly strong for small and big bottles, which can be seen in Table 4 in the appendix. This can be explained by the relatively stronger popularity of smaller and big bottles, as compared to medium-sized bottles.

The role of reward feeling

Participants have indicated that they feel rewarded for returning bottles to the deposit machine. 650 people have responded to this part of the survey, that observed the attitudes of people toward feeling rewarded. Here, both still water and any other kind of beverage consumers were considered, as the feeling of reward should be equal regardless of the content of the single-use bottle. 62.46 % of participants have indicated that they agree or strongly agree that they feel rewarded when they return the bottles to the deposit machine. In order to test the relationship of reward to the monetary reward that people receive back, the participants were also asked whether they feel rewarded because it is worth it for the money. 83,07% of participants agreed or strongly

agreed to this statement. These two statements with their collective responses are reflected in table 3 as 'rewardfeeling,' which is the direct response to how rewarded one feels and the statement about financial incentive. Reward feeling is slightly negatively correlated to the 1cent scenario and to the 50cent scenario, while the 'worthreturn' variable has a slight positive correlation with both scenarios. Both variables are insignificant; however, they still reveal that depending on which of the three scenarios the participants saw, they might adapt their consumption (Table 3). It is important to state that the variable 'worthreturn' and 'rewardfeeling' are not clear indicators, so while the regression reveals that the variables are not significant, the reward feeling a person has, especially if it is not tied to the monetary incentive, can still play a role.

Table 3: Regression of both all bottles with both treatments with reward feeling

	(1) 50 cent	(2) 1cent	(3) All controls
treat 50cent	3.958***		3.121***
	(0.735)		(0.926)
treat_1cent		-3.686***	-2.095**
		(0.741)	(0.944)
education			0.327
			(0.280)
income			-0.031
			(0.197)
age			0.003
			(0.0442)
Household Size			0.391
			(0.368)
Rural/urban			-0.736
			(0.909)
female_dummy			-1.049
			(0.768)
rewardfeeling	-0.100	-0.240	-0.111
	(0.283)	(0.284)	(0.311)
worthreturn	0.101	0.148	0.211
	(0.318)	(0.320)	(0.353)
Observations	317	317	284
R-squared	0.087	0.075	0.125

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In a separate block, participants were asked about why they feel rewarded, the observation that people feel rewarded overall was confirmed, regardless of the effect on bottle purchases: the strongest trend in the participants' choices of why they feel rewarded is because they get back the money. („It is worth it financially to return the bottles; therefore I always return bottles.") was ticked by over 82% of participants, followed by the fact that 'it feels right to return the bottles (67,72%). Slightly fewer, but respectively still over 60% of participants feel rewarded because

they are doing something good for the environment, and 23% indicated they feel that it is expected of them to return the bottles.

Therefore, the hypothesis (a) stating that the effect of receiving 25 cents per bottle as the last step of consuming still, bottled water, makes people feel rewarded can be accepted, but it is not possible to make a statement about the effect on purchase numbers.

Discussion

The results suggest that even though there is a high level of environmental consciousness and awareness that single-use bottles harm the environment, people continue to buy them, also for still water. Participants reveal that when they feel rewarded when they return bottles, but there is no significant connection to the purchase increase and decrease after seeing one of the scenarios. Regardless of the reward feeling, participants adapt their purchase behavior if the monetary incentive is modified. This can also be explained with the sentence- completion responses revealed that receiving back the deposit as being the main motivation for returning bottles.

As some participants expressed that they use the collected deposit fee as a buffer at the end of the month or to cover grocery expenses immediately, the value is directly translated into the ability to cover expenses from it. This reveals that the pattern of purchasing and returning bottles is very embedded in the routine of people, including those who are financially constrained, as they decide to purchase bottled water, instead of taking it from the tap.
It is assumed that due to the fact that participants feel rewarded when returning the bottles and feel that it is simply part of the system, they don't question the need to purchase still water since they get reimbursed for the bottle price.

Consistent with previous research, the participants revealed that the factors for buying bottled water, were tied to practicability and experience, but some comments also show that social norm has an effect.

As several authors have found that habit plays an important role in the choice to consume bottled water, there is no research on the exact habit formation for drinking bottles water in Germany. As Russel and Fielding describe habit to be an „ *automatic response, rather than deliberative*

reasoning" (Russel& Fielding, 2010, page 6). in a paper on water conservation, it is interesting to understand habit's effect in relation to reward feeling, which can reinforce the habit. The fact that over half of participants consume still bottles water can be interpreted as another reason why the habit of buying bottled water, being used to it, can have more power than critically questioning the cost to the environment and own spending, where tap water would be a cheaper alternative.

Returning the bottles is the last step of the interaction with the bottle as a consumer. While the participants have not been made aware of this fact, it is important to note that by handing the bottle to the deposit machine, the responsibility of the consumer ends, and they have fulfilled their part by returning the bottle, which is what the deposit fee they receive, suggests. The investigation of this research showed that participants feel rewarded at this stage of returning bottles. While it reveals that receiving the deposit fee back is the main motivation to return bottles, while environmental consciousness, social norms, and creating space at home are other factors for returning bottles, it cannot be clearly stated how much they contribute to a person feeling rewarded. The fact that over 83% of participants feel (strongly) rewarded due to the monetary reward stands in contrast with the fact that over 45% of the participants indicate that they would continue to return the bottles, even if they don't receive any money back. This shows that the monetary reward aspect is not the only factor and raises the question of what a systematic reduction of the return-fee may cause people to still return their bottles but also question the need to consume still bottled water.

It can also be a strong indicator of the motivation of people to return the bottles, not just for receiving the deposit fee, but because they feel that they have 'done the right thing' or do so in order to recycle. A combination of emptying space (or saving space in their trash bin) and wanting

to do something good for the environment may lead consumers to feel rewarded, regardless of the monetary incentive.

The main aim of this study was to reveal in what ways the deposit system for single-use bottles in Germany indirectly incentivizes people to purchase still, bottled water. This has been done by surveying over 600 people who live in Germany and consume still, bottled water about their motivation to return the bottles, by testing whether they feel rewarded and by investigating their purchase behavior in modified conditions.

Limitations

The results and data analysis are based on their own empirical research wit survey participants from across Germany and a strong representative sample. However, as one important step, the clear identification of the treatment groups was not captured during the first survey, the survey was run a second time two weeks later. Therefore, some analysis has been computed with the responses of all participants, so a sample of 650 participants, whereas the part about the consumption level before and after treatment could only be calculated from a smaller sample, 320 replies, from the second survey round. While 320 participants, and therefore over 100 participants per treatment can be deemed representative, the other questions have even higher reliability, as the participant numbers were double.

This research relies on the capacity of the participants to envision the new scenarios, which are modified versions of the deposit system. This means that the statements are based on what people say they would (not) change when it comes to purchasing bottles, rather than measuring the exact numbers a person would buy in a real-life pilot study. This is a potential limitation for how the number of bottles bought would rise or drop when the real purchases could be measured.

One of the results is that people feel rewarded when they return the bottles. While the measurement of purchasing bottles says something about what happens when the deposit fee is modified, it cannot make a final claim about any other factors that may lead to reward, such as environmental consciousness, etc., neither could it be shown empirically that reward feeling influences the number of bottles that participants buy.

The researcher acknowledges that people living in Germany have a limited understanding when it comes to the difference between reusable and single-use bottles. B, including specific, clarifying the information in the beginning, only participants who purchase single-use bottles should fill in the survey. Therefore, the results are only applicable to the system of single-use bottles. It would be interesting to integrate research on consumers of reusable, usually glass- bottles, that have a lesser effect on the environment but are not negligible.

Unfortunately, this research is solely based on the literature review and the empirical, quantitative survey. Due to time constraints, the researcher was unable to pursue qualitative interviews, which would have given more nuance as to what people perceive as most relevant for their reward-feeling, and whether the reward feeling contributes to them not questioning the fact that they buy bottled water.

Conclusion

This thesis explores to what extent the factors lead to a person returning the bottles and how the well-functioning system makes people not consider consumption volumes in the first place. All three hypothesis has been tested positively as (a) people feel rewarded when returning their single-use bottles, while (b) the main driver for returning bottles is the monetary incentive and (c) they would buy fewer bottles if they would receive less money back upon returning the bottles than what they initially paid.

Therefore the research question can be answered positively: The current deposit fee system in Germany for single-use bottles has the unintended consequence that people buy more still, bottled water, as they are compensated for returning the bottles back. While the monetary reward plays the strongest role, participants expressed that they also feel rewarded, because they have done the right thing and because they have contributed to Recycling.

In Germany, the sale of single-use plastic bottles amounts to 92.000 billion of plastic waste annually, little of which is recycled. The problem becomes more pressing considering, less than half of the bottles are finally recycled. Despite the high ambitions of the German government for recycling rates of single-use bottles, but the real numbers are failing. Many of the bottles contain still water, which could be taken from the tap instead. As previous research has shown, the packaging waste has a negative impact on the environment and resources. This thesis sought to contribute to resolving this issue by investigating the role of the current deposit system for single-use bottles. Considering that it has an influence on the purchase of bottles, this research hopes to help determine what should be done to reverse the trend of bottled water usage.

As the associated consequences of bottled water consumption are multidimensional, and effect both environment and societies, they are specifically interesting to study. Inducing behavioral change could substantially reduce the number of bottles produced and reduce environmental degradation.

Policy recommendations

The deposit system for single-use bottles manages to effectively collect close to the total amount of bottles that were sold. Despite this fact, less than a third of the bottles are made to new bottles. Collecting and utilizing the bottles that are generated, helps, but these efforts and advanced regulations have proven insufficient to reverse the trend of high bottled water sales.

It is important to note that people who live in Germany are environmentally conscious but appear to be not educated enough for the specific harmful effects of bottled water, to question their purchases altogether. The lack of knowledge about reusable bottles and single-use bottles should be a policy priority to create more transparency.

By informing about water quality, provision, and environmental implications, the final goal should be to have tap water as the default for drinking water, and secondly, strengthening the reusable bottle market and providing more information in order to decrease single-use bottles, also for other beverages.

Promoting tap water

This research revealed that practicability and social norm are the leading reasons why people purchase still bottled water. To enhance the practicability of tap water, more public water stations should be provided to enhance accessibility and to re-build trust in the public water system, by:

1) restoring institutional trust by strengthening the communication around the high quality of tap water, including setting examples of exclusively consuming tap water by public officials, which has been previously suggested (Parag and Roberts, 2009).

2) reducing misconceptions about tap water and actively promoting its high quality, taking into account consumers' worries, by explaining why it is safe to use for baby food, etc.

Reducing incentives for single-use bottles

Due to its resource- intensity, the usage of single-use bottles must be disincentivized, from an environmental perspective, by:

1) Increasing public knowledge about downcycling and environmental costs of single-use bottles to raise awareness.
2) Ending the confusion in bottle systems: By harmonizing the reusable and single-use bottle system opting for reusable bottles will become a viable alternative.
3) Supporting long-term investments into reusable bottles, as the deposit return systems are only truly sustainable when they turn to reusable bottle systems (Schleicher, 2020).

Increasing transparency

Participants revealed, that they are responsive to the height of the deposit fee, but that other factors also play a role, such as wanting to be mindful of the environment. However, the lack of knowledge about environmental impacts should be addressed by

1) Addressing the lack of regulation of bottled water publicly: Bottled water companies currently don't adhere to the same quality standards as tap water, as the best-controlled food item in Germany.

2) Widening campaigns that consider different audiences, such as the informational material by a tip: tap that is provided in different languages, so that people who move to Germany, are also informed.
3) Providing facts about labels and the different deposit systems in a clear, concise manner, that reduces confusion and limits distraction to increase the chance of people questioning the need to purchase water altogether.
4) Considering norm induced information provision, which shows the clearest effects in people reconsidering their bottled water purchases (van der Linden, 2015).

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Appendix

Table 4: Different bottle sizes correlated with treatments

	(1) WDdifsmall	(2) WDdifmedium	(3) WDdifbig
treat 50cent	2.807***	-0.0299	0.385
	(0.890)	(0.267)	(0.349)
treat_1cent	-0.239	-0.677**	-1.145***
	(0.907)	(0.272)	(0.356)
education	0.368	-0.0358	-0.013
	(0.269)	(0.0806)	(0.105)
income	0.177	-0.107*	-0.092
	(0.189)	(0.0569)	(0.0743)
age	-0.0164	0.00536	0.014
	(0.0421)	(0.0127)	(0.0165)
Household size	0.350	0.141	-0.097
	(0.353)	(0.106)	(0.138)
Rural/urban	-0.645	0.387	-0.462
	(0.875)	(0.263)	(0.343)
female_dummy	-1.437*	0.134	0.271
	(0.736)	(0.221)	(0.289)
Observations	284	284	284
R-squared	0.076	0.053	0.099

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1