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# The Comparative Effects of Digital Green Nudging, Gamification, and Monetary Incentives on Return Motivation in E-Commerce

Caterina Rauh, Eric Sucky, and Christian Straubert

## ABSTRACT

Online fashion retailers often use lenient return policies to compensate for the lack of physical product experience, effectively turning customers' homes into fitting rooms. This convenience, however, contributes to high return rates. Digital nudges are widely used in e-commerce to influence decision-making. When these nudges promote environmentally friendly behavior, they are referred to as digital green nudges. Drawing on self-determination theory, this study examines how and whether digital green nudges influence return motivation. Within e-commerce loyalty programs, digital green nudging is often combined with other measures, such as gamification or financial incentives. Therefore, we analyze and compare how and whether combining digital green nudges with gamification or gamification and monetary incentives influences return motivation. Using structural equation modeling, we analyze data from a survey-based online experiment with US online shoppers ( $n=1949$ ). Among other results, we show that these measures directly affect return motivation, indicating their role as extrinsic motivators. This study is the first to compare digital green nudges and their combinations with gamification and monetary incentives in the context of online returns. Overall, our results show that all three measures can help mitigate the challenges of lenient return policies. However, we observe side effects on intrinsic motivation that reduce purchase motivation.

## KEYWORDS AND PHRASES


Digital green nudging;  
online gamification;  
monetary incentive; online shopping behavior; online returns; self-determination theory

## Introduction

Business-to-consumer (B2C) e-commerce has transformed the way people acquire goods and services. However, the convenience of shopping from home also has a dark side: product returns. Especially in the fashion industry, returns are a significant and complex challenge. On the one hand, clothing, footwear, and fashion accessories are the most popular items among online shoppers. On the other hand, however, the average return rate for online apparel orders in the US, for example, is 24.4%, nearly eight percentage points higher than the overall online return rate, which translates to \$38 billion in returns and an estimated \$25.1 billion in handling costs in 2023 [60].

Many reasons for product returns are logistical in nature (e.g., wrong delivery, delivery of damaged products, or late delivery) or related to consumer satisfaction [84]. Upon receiving

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the product, customers compare their personal expectations, such as appearance and quality, with reality and evaluate the product. If their expectations are not met, the customer returns the product. Moreover, a notable share of returns in online fashion retail arises from behavioral factors, such as fraud and abuse of the return policy (e.g., bracketing, wardrobing, and staging) [72]. Nevertheless, the success of fashion companies depends entirely on the “tangibility” of their products. Online fashion retailers facilitate this qualitative element of the shopping journey by offering a generous return policy (e.g., free returns, long return windows, and full refund) that allows customers to use their home as a fitting room. Research shows that a lenient return policy (1) reduces perceived purchase risk, (2) leads to a positive image and higher trust in the online retailer (e-tailer), (3) thereby increasing sales, and (4) promotes customer loyalty [107]. In this sense consumers say, free shipping (96%), free returns (76%), and fast shipping (74%) are the most important factors when shopping online [101]. In addition, 69% of online shoppers (often or sometimes) read the retailer’s return policy before completing a purchase [60], and 55% of consumers have decided not to buy from retailers due to restrictive return policies [5]. Moreover, 89% consumers would make more purchases if they had positive return experiences. While stricter return policies can have a long-term negative impact on customer loyalty and future spending, positive return experiences contribute to customer satisfaction and loyalty [5]. As a result, many online retailers view high levels of returns as a necessary evil and believe they need a generous return policy to increase their share of the wallet. However, it has been pointed out that such lenient return policies actually increase the volume of returns [106]. Lenient return policies train consumers to no longer limit return reasons to defects or shipping errors. Worse, this customer attitude creates a problem for online fashion retailers: lenient return policies increase sales but also increase the return rate [27, 66, 79]. This relationship can be characterized as the lenient return policy trap. If lenient return policies are considered necessary to increase sales, which in turn increase returns, how can online fashion retailers escape this trap?

Online returns represent lost sales as well as significantly increase costs in fashion retailers’ supply chains [50, 138]. Particularly in online fashion retail, returns often cannot be resold and have to be disposed of, even if they are in perfect condition, for image reasons or due to the fast-moving nature of fashion [43]. The massive negative impact on the environment appears to be significant [27]. It is obvious that the processing of returns results in a doubling of logistics emissions from road, sea or air freight, as well as packaging and labelling waste [27, 106]. It is estimated that the carbon footprint of the returns is 30% greater than the carbon footprint of the initial deliveries [127]. In the US, for example, an estimated 24 million tons of CO<sub>2</sub> were generated by product returns in 2022. In addition, it is estimated that returned goods contribute to approximately 9.5 billion pounds of landfill waste annually in the US [95]. However, it is difficult to measure and quantify the environmental impact caused by product returns [139]. Moreover, not every returned product inevitably causes negative impacts on the environment. It is important to differentiate between the return causes and the whole purchase and return process. For example, it could be necessary to consider whether (1) the returned product can be resold, and the retailer intends to do so (i.e., the return avoids the production of a new product), or (2) the customer could try on the product in a brick-and-mortar store, potentially causing more CO<sub>2</sub> emissions. However, for some product returns, the negative environmental impact is obvious. With the rise of e-commerce, it has become easier for customers to take advantage

of lenient return policies when it comes to bracketing, wardrobing, and staging. With 69% of online shoppers admitting to buying an item for a specific occasion and returning it afterward, especially wardrobing has increased in recent years [96]. Correspondingly, avoiding staging and wardrobing reduces the environmental impact of such associated returns. Reducing the deliberate use of lenient return policies would further reduce the environmental impact of returns.

In this study, we analyze three measures that are easy to implement and combine in an online fashion retailer's app or website: digital green nudging, gamification, and monetary incentives. These three measures aim to reduce avoidable product returns and thereby reduce the associated negative environmental impact. In addition, these measures could also be applicable to foster more conscious online shopping behavior.

Digital nudging describes the implementation of design elements to shape individual behavior in digital decision-making contexts [90, 134]. An important application of digital nudging is in the context of e-commerce, where it is used to promote the purchase of certain products, steer consumer behavior in a desired direction, and assist customers with their purchase decisions. In addition, digital nudges have been widely used in e-commerce to promote environmentally friendly consumer behavior [25]. Nudges designed to encourage sustainable behavior are known as green nudges. In the context of e-commerce, there has been a growing interest in the use of digital green nudges over the past few years [25]. However, their potential role in reducing product returns remains an understudied area of research.

Another promising concept in e-commerce that can boost customer loyalty, motivation, and engagement is gamification [17, 128]. The goal of gamification is to increase participant motivation by incorporating game elements that encourage specific behaviors, thereby creating a strong driving effect to promote desired user actions [51]. Gamification elements implemented on online retailer's website have the potential to increase trust in an online shop, motivate online shoppers to use a brand more often than usual, and increase purchase intention. Gamification goes beyond traditional loyalty programs (LPs) by adding fun and excitement to app-based LPs with animations such as Bingo, Monopoly, Connect Four, or wheels of chance [59]. It is also a promising approach to influence motivation towards eco-friendly behavior or sustainable consumption [49, 116]. Similar to digital green nudging, research on the effect of gamification in reducing the motivation to return a product remains scarce.

Monetary incentives are also a well-established way to encourage pro-environmental behavior [48, 83]. A monetary incentive (e.g., discounts and vouchers) refers to a reward or compensation in the form of money to encourage individuals to perform certain actions to achieve certain goals. Monetary incentives are an integral part of current loyalty programs. The positive effects of LPs include (1) increased purchase quantities and frequencies, (2) higher lifetime values and wallet shares, and (3) increased customer satisfaction [61].

As mentioned earlier, reducing returns can be considered as environmentally friendly behavior. Due to high return rates and the associated negative consequences for both e-tailers and the environment, effective return management is becoming increasingly important [81]. Although it is known that many e-tailers are taking various preventive measures to manage returns [122], it is evident that return rates in e-commerce have continued to rise in recent years [5]. Some e-tailers (e.g., Zara or H&M) try to discourage returns by implementing stricter return policies, such as

return fees [18]. However, lenient return policies are a very important factor for most consumers when shopping online [101]. Digital green nudging, gamification as well as monetary incentives are useful approaches to promote eco-friendly consumer behavior in e-commerce [30, 48, 83]. Since all three measures have not been well studied in terms of their impact on preventing returns, we will examine their potential to escape the mentioned lenient return policy trap. The question arises as to whether the number of returns can be reduced while still maintaining a lenient return policy. Accordingly, our main research question is:

**RQ1:** What effects do (1) digital green nudging and its combination with (2) gamification or (3) gamification and monetary incentives have on consumer return motivation?

Motivation is the driving force that initiates and sustains action and aims to achieve a goal. By definition, motivation is the willingness to behave in a certain way [10, 109]. In our context, return motivation refers to the willingness to return a product bought online. Consequently, it can be assumed that the influence on individual return motivation will also have a subsequent effect on future return behavior. Furthermore, we want to analyze not only whether the three alternatives (1), (2), or (3) are effective, but also how these three combinations compare with each other. Our second research question is thus:

**RQ2:** Does combining (1) digital green nudging with (2) gamification, or (3) gamification and monetary incentives considerably increase the effect on consumers' return motivation?

To analyze the measures and effects mentioned in the research questions, we use the psychology of human motivation, in particular, the well-established self-determination theory (SDT) built by Deci and Ryan [36]. SDT focuses on human motivation and considers the factors that drive behavior. The central idea of SDT is to focus on the type rather than the amount of motivation, which encompasses a continuum from intrinsic motivation to extrinsic motivation [108]. Obviously, the measures we are considering initially represent extrinsic motivators. Therefore, their effect will be mainly extrinsic in nature. However, the interaction between intrinsic and extrinsic motivation should be taken into account. External motivators can crowd out intrinsic motivation or, conversely, foster the development of intrinsic motivation [35]. Therefore, our analysis focuses not only on whether our approaches influence return motivation in terms of sustainability, but also on how the presented measures influence return motivation.

In the context of eco-friendly consumer behavior, SDT makes a valuable contribution by showing how these approaches affect individuals' motivation levels and, consequently, affect their sustainable preferences. Furthermore, based on the SDT, we are able to identify and evaluate spillover effects (e.g., positive and negative side effects) of these approaches. In the following, we examine digital green nudging, gamification, and monetary incentives in the context of return management and develop our hypotheses (H) based on SDT. We then present a survey-based online experiment with US online shoppers ( $n=1949$ ) and the results of structural equation modeling. We conclude with a discussion, theoretical and management implications, limitations, and outlook.

## Measures to Reduce Returns in Online Fashion Retail

In online fashion retail, managing and reducing return rates is essential for both profitability and sustainability, as excessive returns increase operational costs, waste resources, and exacerbate environmental impacts. The absence of a “feel and touch” experience makes online fashion purchases inherently risky. Consequently, one of the primary drivers of returns is the mismatch between customer expectations and product attributes, such as incorrect sizing or color discrepancies [3, 122]. To address this, retailers have introduced various measures designed to reduce dissatisfaction-driven returns, including zoomable product images, product videos, customer reviews, detailed size guides (e.g., model sizing), and 3D scanning technologies (e.g., for footwear). However, a considerable share of returns stems from permissive return policies that encourage practices such as bracketing and wardrobing. The approaches proposed here primarily target such behavior (namely, selection orders, impulse purchases, or the exploitation of lenient return policies) by encouraging consumers to adopt more environmentally responsible shopping habits.

Our analysis begins with the question of whether digital green nudging, an easily implementable tool, can influence consumers’ return-related behavior. Rooted in the seminal work of Thaler and Sunstein [126], nudge theory builds on psychological and behavioral economics research demonstrating that individuals often deviate from rational economic models. Psychological studies reveal that human behavior is strongly shaped by unconscious cognitive processes and can be influenced by seemingly irrelevant environmental factors [47, 65]. Nudges aim to steer decision-making in a predictable direction through subtle reinforcement and implicit suggestion, without constraining individual choice [126].

Technological advances have extended nudging from physical into digital environments [19, 110]. The integration of behavioral economics with digital technologies has given rise to a new era of persuasive design, centered around the concept of digital nudging [19, 123]. Digital nudging refers to the application of interface design elements to guide user behavior in digital decision-making contexts [134]. Compared to analog contexts, digital nudges offer distinct advantages: they can be implemented quickly and cost-effectively at scale [89], tailored through user tracking for personalization [98], and precisely managed in terms of information flow [38]. They may take the form of pop-up prompts, visual cues, algorithmic recommendations, or other interactive features that encourage specific user actions [40].

A systematic review [19] identified 231 digital nudges across 109 studies, categorized into ten types: default, social, feedback, disclosure, friction, warning, commitment, scarcity, deception, and reinforcement. Default nudges reduce cognitive load by preselecting options aligned with the preferences of the majority [9]. Social nudges influence behavior by signaling prevailing norms [120]. Feedback nudges provide users with constructive evaluations of products or services [58, 105, 119], while disclosure or information nudges present essential information, such as product specifications, to aid or influence decision-making [75, 137]. Friction and warning nudges intervene in high-stakes decisions, such as account deletion [24]. Commitment nudges encourage adherence to beneficial goals [75], whereas reinforcement nudges incentivize the repetition of positive behaviors [62]. Scarcity nudges emphasize product availability constraints [58]. Finally, deception nudges, such as decoy effects, subtly steer consumer choice [24].

A structured literature review found that the transfer of nudges from the offline to the online context has resulted in more potent interventions and accompanying ethical concerns [21]. Similarly it is shown [19], that digital nudging interventions can yield three potential outcomes: forming, altering, and reinforcing. In an empirical analysis, five dominant nudge types were identified [69], with default and social proof nudges being the most prevalent, while feedback, commitment, and scarcity nudges appeared less frequently. More broadly, digital nudging mechanisms include default settings, social proof and norms, salience and framing, reminders and prompts, gamification, and personalization [69]. Similarly, a taxonomy based on 88 studies was proposed [129], classifying digital nudges along four dimensions: context (e.g., social, health, privacy, revenue, workplace), form (e.g., framing, loss aversion, anchoring, messenger effects, priming), intrusiveness (low vs high), and user impact (positive, neutral, or negative) [129, 130].

Recent studies further highlight how digital platforms exploit cognitive biases through design features such as infinite scrolling, autoplay, and real-time notifications to drive impulsive behavior [62, 123]. Such features can constitute “dark patterns”, deliberately designed to capture user attention or mislead consumers [2, 40, 120]. Examples include “confirmshaming”, where opt-out choices are framed negatively (e.g., “No, I prefer to pay more”), or obscuring critical information such as hidden fees or automatic subscriptions [120]. These practices deviate from the original intent of nudge theory and are labeled “sludge” [125] or “digital dark nudges” [31]. Accordingly, these nudges must be critically discussed in light of ethical considerations [76].

This article concentrates on the sustainability dimension of e-commerce, with a specific focus on reducing product returns. From both an environmental and economic perspective, it is crucial to explore how consumers’ behavioral motivations can be reshaped through digital green nudges. In e-commerce, nudges are commonly employed to promote product purchases, influence consumer behavior, or support decision-making throughout the customer journey [46, 113]. Their scalability and adaptability allow retailers to exert fine-grained control over the flow of information directed at users [e.g., 34, 38, 90, 98, 110]. The most common digital nudges include (1) default nudges that pre-select options for users, (2) social nudges that highlight other customers’ purchase decisions, (3) priming or framing that enhance attention and perception, and (4) nudges that facilitate validation of product choices (e.g., by indicating fit) [19]. Recommendation systems are also common in e-commerce. They offer online retailers an effective targeted marketing strategy by providing each user with a personalized list of specially selected items. These systems are cited as a typical application domain for nudges [19] or are referred to as nudges themselves [80].

Conversely, pressure-driven nudges, such as scarcity messages (“Only 3 left in stock!”), can create psychological stress [46]. It has been demonstrated that scarcity-related nudges (limited quantity vs limited time) increase purchase intention, with quantity-based scarcity eliciting more positive responses [20]. Yet, caution was expressed that such tactics may generate short-term gains at the expense of long-term customer satisfaction, leading to increased returns [46]. Because these nudges exploit cognitive vulnerabilities and induce “fear of missing out,” they are classified as dark patterns [120].

In contrast, digital green nudges seek to harness behavioral economics to encourage sustainable consumer choices [121]. Interest in such interventions has grown substantially in recent years, particularly in the context of online retail [25]. Systematic reviews [15, 16, 140] and empirical studies [57] categorize these nudges by timing (“before”, “during”, or

“after” the action), intended behavioral outcome (“altering”, “reinforcing”, or “forming”), or targeted environmental behaviors according to the Green Five taxonomy [94] (e.g., “changing”, “protecting”, “avoiding harm”, “influencing others”, “taking initiative”). A study [37] highlighted the general sustainability benefits of digital nudges in online retail. For the purpose of this study, we adopt a threefold taxonomy of digital green nudges in e-commerce: (1) nudges promoting sustainable product choices [30, 88, 99, 115], (2) nudges supporting eco-friendly shipping options [22, 87], and (3) nudges encouraging sustainable return behavior. In the context of product returns, several studies have examined the effectiveness of digital green nudges that highlight the environmental consequences of returning items. Research demonstrates that such nudges can lower return rates [100, 103, 114, 131]. In a field experiment [46], comparing the effects of different nudges on consumers’ purchasing and return behavior, it was found that while nudges increased sales, they also led to higher return rates, a noteworthy unintended consequence. Similarly, a field study was conducted testing a green nudge that informed consumers about the environmental impact of returns [131]. Their results demonstrate that even a simple, low-cost intervention can significantly reduce return rates. However, digital green nudges may generate unintended spillover effects that extend beyond or even undermine their intended purpose [93, 103]. These spillover effects influence behaviors not directly targeted by the intervention [93]. Emphasis has shown that motivational mechanisms must be considered when designing and evaluating nudges [28]. Addressing this research gap, our study investigates the role of consumers’ underlying motivations for returning products.

Gamification is another alternative for influencing online shoppers’ motivation to return a product. Defined by applying game elements to non-gaming contexts [39], gamification is mostly integrated with software applications, apps, or websites in order to provide a gameful experience for users. Gamified applications are found mainly in the fields of education, learning, health, and e-commerce [7, 73]. The goal of gamification is to influence human behavior, attitudes and other states with game-derived interventions by creating a valuable game experience [11, 51, 74, 77].

Two studies show that gamification is an emerging concept in e-commerce that can boost customer loyalty, motivation, engagement, and fun [17, 128]. Gamification is often used in loyalty programs. Animated games (e.g., Bingo, Monopoly, or wheels of chance) help to make app-based loyalty programs more enjoyable and interesting [59]. Several studies showed positive effects of gamification elements implemented on e-tailer websites or apps (e.g., reward points, badges, leaderboards, statuses, and levels) on online shoppers’ behavior and attitudes [8, 33, 102]. Gamification has the potential to increase users’ trust in an online retailer, motivate online shoppers to use a brand more often than usual, and increase purchase intent [1, 85, 91]. Frequently used gamification elements are points (P), badges (B), and leaderboards (L), which are referred to as the PBL triad [124]. PBL are considered closely related and can be used together to optimize the efficiency of gamified online retail and increase sales [8]. Previous research also suggests that gamification can be an effective way to influence the motivation for pro-environmental behavior or sustainable consumption [49, 63, 116, 135]. With respect to different types of motivation, our analysis focuses not only on whether gamification affects return motivation, but also on how gamification influences return motivation.

Another way to encourage pro-environmental behavior is through monetary incentives [48, 83]. Monetary incentives refer to cash rewards that can take the form of direct

payments, rebates, or potential lottery winnings. Attaching monetary benefits to a product increases the likelihood of purchase [104]. In the context of sustainable consumer behavior, a study suggested that providing monetary incentives is one of the best motivators for consumers to adopt green products [53].

Many online fashion retailers use at least one of the approaches mentioned to improve the shopping experience for their customers, to motivate the purchase of (certain) products, to influence consumer behavior, or to support customers in their shopping decisions. For example, BERSHKA provides helpful information (details on the model's clothing size and body measurements), while Marc O'Polo uses phrases such as "Only 6 left in stock!" to create psychological pressure. However, loyalty programs often combine two or even all three measures [59]. For example, the adidas loyalty program adiclub includes a variety of nudges as well as free access to the premium version of the adidas Running app. This app contains challenges (e.g., run 30 km in a month) for which points can be collected. These points can then be redeemed in the adidas online store. One prominent example of a company that overdoes all three measures is Temu, a company that connects shoppers directly with Chinese manufacturers and wholesalers through its online marketplace. Customers are flooded with targeted advertising, influencer recommendations, limited time offers and flash sales. The shopping experience is also gamified, with "spin the wheel" discounts, "group buy" offers, and lotteries that encourage larger purchases.

Our analysis focuses on sustainable shopping behavior in online fashion retail. As mentioned, digital green nudging, gamification as well as monetary incentives are useful approaches to promote eco-friendly consumer behavior in e-commerce [30, 48, 83]. Therefore, we analyze and compare if and how digital green nudging, gamification, and monetary incentives are suitable to motivate customers to reduce returns. However, when these measures are used in combination, as is often the case in practice, it is important to consider whether they reinforce each other's effects or whether they may even have opposite effects. A change in lenient return policy not only affects the number of returns, but also influences the purchase motivation [68]. Digital green nudging and gamification (with and without monetary incentives) can be perceived as part of an online fashion retailer's returns policy. Therefore, our analysis explicitly considers not only the return motivation but also the purchase motivation.

## Theoretical Foundation and Research Model

Influencing behavior requires an understanding of what motivates individuals to behave in a certain way (e.g., return a product purchased online). Therefore, this paper is based on the psychology of human motivation, in particular the well-known self-determination theory (SDT) [36]. SDT is a comprehensive theory, since it addresses a continuum of distinct types of motivation. The core tenet of SDT is the focus on types rather than amount of motivation, ranging from intrinsic to extrinsic motivation [108]. Activities that draw on intrinsic motivation are those that a person finds interesting and that are performed without any conditions solely because of the sheer pleasure of the activity (e.g., achieving personally relevant goals). Extrinsic motivation is a construct that comes into play whenever an activity is performed with the goal of achieving a definable result. Extrinsic motivation thus contrasts with intrinsic motivation, which refers to the fact that an activity is performed simply for the enjoyment of the activity itself, rather than for its instrumental value [109].

Informing consumers about the negative consequences of returns through a digital green nudge can be seen as psychological pressure, as it highlights the consequences of their morally questionable behavior. Thus, digital green nudging can act as an extrinsic motivator that directly reduces return motivation. Gamification is a goal-oriented system in which rewards such as points are used to incentivize certain behaviors. As a result, gamification can also act as an extrinsic motivator and directly influence return motivation. Game elements have the potential to change an individual’s effort to obtain rewards [118]. Accordingly, consumers may change their thoughts or behavior due to the reward process [4]. However, individuals want to act according to external moral and social values and may refrain from purchasing and returning at all [13]. Therefore, the digital green nudge, as well as the combination with gamification, may directly reduce purchase motivation. On the one hand, our monetary incentive is an extrinsic motivator, which also directly reduces return motivation. On the other hand, our monetary incentive depends indirectly on the amount purchased (i.e., the more that is purchased and not returned, the higher the incentive), so we expect to see an increase in purchase motivation. Accordingly, we hypothesize (see Figure 1):

**Hypothesis 1:** Digital green nudging, gamification, and monetary incentives directly reduce return motivation (RM) on top of each other.

**Hypothesis 2:** Digital green nudging and gamification directly reduce purchase motivation (PM) on top of each other while monetary incentives directly increase purchase motivation compared to the gamification scenario.

Note that the existing literature typically examines whether interventions such as digital green nudging can increase (extrinsic and/or intrinsic) motivation for a desired behavior

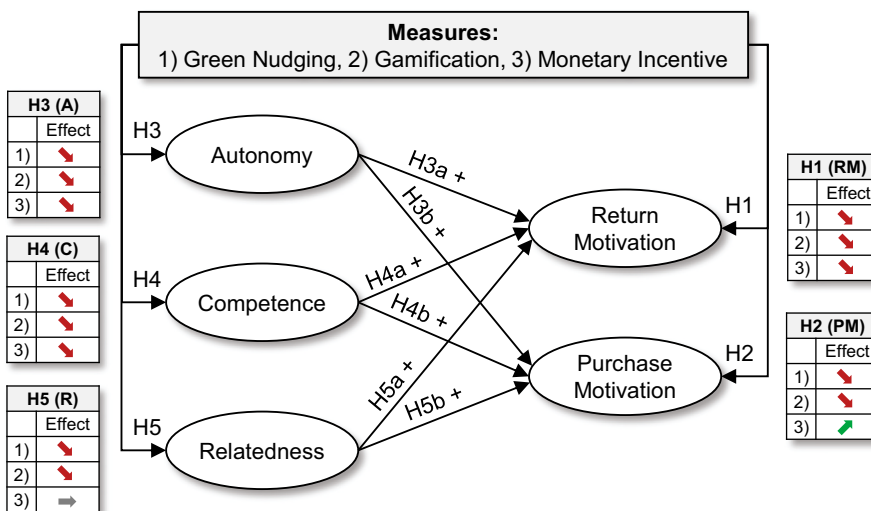


Figure 1. Model Hypotheses.

[26, 64, 78]. Our goal, however, is to reduce the existing return motivation, as this would result in fewer returns. If the customer's return motivation is decreased by the measures under consideration, this is intentional. It should be noted that there is a potential unintended side-effect of reducing purchase motivation as well.

In addition to the mentioned direct effects that are triggered by extrinsic stimuli (e.g., digital nudges, game elements such as points and rewards, or monetary incentives), indirect effects on individuals' intrinsic motivation must be considered. How extrinsic stimuli affect people's intrinsic motivation depends on how they perceive these stimuli [109]. Individuals who perceive extrinsic stimuli as informational rather than controlling may experience higher intrinsic motivation from these stimuli. In contrast, individuals who perceive extrinsic stimuli as pressure may experience lower intrinsic motivation [86]. Therefore, digital green nudging, gamification, as well as monetary incentives may have both effects: they may increase intrinsic motivation or decrease intrinsic motivation if they are perceived as controlling [32]. In order to derive hypotheses regarding the indirect effects of the measures considering purchase motivation and return motivation, the basic relationships from self-determination theory are first considered.

SDT focuses on the satisfaction of individual needs. According to SDT, individuals are intrinsically motivated to engage in a behavior when three basic psychological needs are satisfied [108]: (A) the need for autonomy, (C) the need for competence, and (R) the need for relatedness. The need for autonomy reflects the desire for self-determination and control, such as experiencing freedom of choice. The need for competence is the drive for self-mastery and personal growth, such as learning new skills and receiving feedback. The need for relatedness centers on the desire to feel a sense of belonging and connection within a social environment. Cognitive evaluation theory (CET), a sub-theory of SDT [36], identifies factors that explain variability in intrinsic motivation. In summary, the CET framework describes how social environments can promote or inhibit intrinsic motivation by supporting or thwarting people's innate psychological needs [109]. It has been clearly demonstrated that there is a strong link between intrinsic motivation and the satisfaction of the needs for autonomy and competence. Satisfying the need for relatedness is also important, at least in a remote sense, for intrinsic motivation [109]. In our survey, we asked respondents about their perceived autonomy (A), competence (C), and relatedness (R) when imagining using a fictitious online fashion store. This includes purchasing and possibly returning goods if they do not meet customer expectations. Therefore, according to SDT, we hypothesize in our study that the satisfaction of the three basic psychological needs A/C/R is positively correlated with purchase and return motivation because these actions are perceived as more enjoyable (H3a/H3b, H4a/H4b, H5a/H5b; see [Figure 1](#) for the model hypotheses).

There is often an intrinsic motivation to behave in an eco-friendly way. Extrinsic incentives then provide additional motivation to initiate behavioral change [97]. However, extrinsic incentives can reduce people's intrinsic motivation to adopt pro-environmental behavior [35]. According to SDT, extrinsic motivators, such as monetary incentives, can shift motivation from intrinsic to extrinsic. In two online laboratory experiments, it was found that gamification is associated with extrinsic motivation when games are linked to monetary rewards, because people no longer play for the fun of it, but for the extrinsic motivation of getting a reward [12]. This effect is referred to as motivation crowding out [44]. However, there is also evidence to the contrary [41].

All three measures (digital green nudging, gamification, and monetary incentives) change the context of online shopping. Accordingly, perceived autonomy can be affected by contextual conditions, such as a digital green nudge toward socially desirable behavior [108]. If consumers are informed about which behavior is desirable, they will reconsider their behavior and try to conform to this desired behavior in order to avoid negative social consequences [82]. This reduces their perceived autonomy [133]. When online shopping is combined with a gamification approach that judges an individual's return behavior, this also can have an impact on the individual's perceived autonomy. Our gamification approach aims to reduce returns through points, badges, and rewards. Rewards in particular can be perceived as controlling, thus reducing autonomy [36, 45, 71]. Furthermore, it must be considered that the perceived autonomy when using an online shop can be reduced through gamification, while at the same time the game itself is perceived as entertaining and enjoyable. While the game itself may or may not be entertaining, the agenda behind the gamification approach may reduce perceived autonomy when using the online shop. The effects of monetary incentives on intrinsic motivation are generally unclear [83]. They might be perceived as external pressure and thus reduce the perceived autonomy [12, 26]. Hence, we assume the following:

**Hypothesis 3:** *Digital green nudging, gamification, and monetary incentives cumulatively reduce perceived autonomy (A) and thereby decrease RM and PM (H3 mediated through H3a and H3b).*

Perceived competence is a person's self-perception of their abilities and their ability to control their environment and situation. It indicates how skillful and effective a person thinks he or she is in a particular situation [111]. In the context of digital green nudging, the potentially powerful dimension of social undesirability reappears. Consumers may feel less competent as individuals because their environmentally harmful behavior is perceived as morally reprehensible and antisocial. Therefore, digital green nudging could lead to a reduction in perceived competence. With regard to the gamification approach, the associated rules can be perceived as controlling and thereby increase the complexity of using the online shop, which can lead to a reduction in perceived competence [36, 45, 71]. Therefore, both digital green nudging and gamification may lead to a reduction in perceived competence. As mentioned above, the effects of monetary incentives on motivation are generally unclear [83]. However, they may reduce perceived competence due to the complexity of the approach. Therefore, we hypothesize the following:

**Hypothesis 4:** *Digital green nudging, gamification and monetary incentives cumulatively reduce the perceived competence (C) and reinforce each other and thereby decrease RM and PM (H4 mediated through H4a and H4b).*

The need for social relatedness refers to the need to feel connected and have a sense of belonging to others [70]. A digital green nudge can be perceived as social pressure to behave in an environmentally friendly way, leaving consumers feeling left out. Consumers may not develop a sense of belonging because their behavior is perceived as less desirable. Therefore, digital green nudging could lead to a decrease in perceived relatedness. Our gamification approach focuses on achievement and competition, rather than collaboration among online

shoppers. Previous research has shown that purely competitive gamification is suboptimal for creating an enjoyable environment [92]. Our gamification approach focuses less on social relatedness and more on competitive relatedness. Therefore, our gamification approach may lead to a decrease in perceived relatedness. In contrast, monetary incentives have no salient relationship with perceived relatedness. Therefore, we hypothesize:

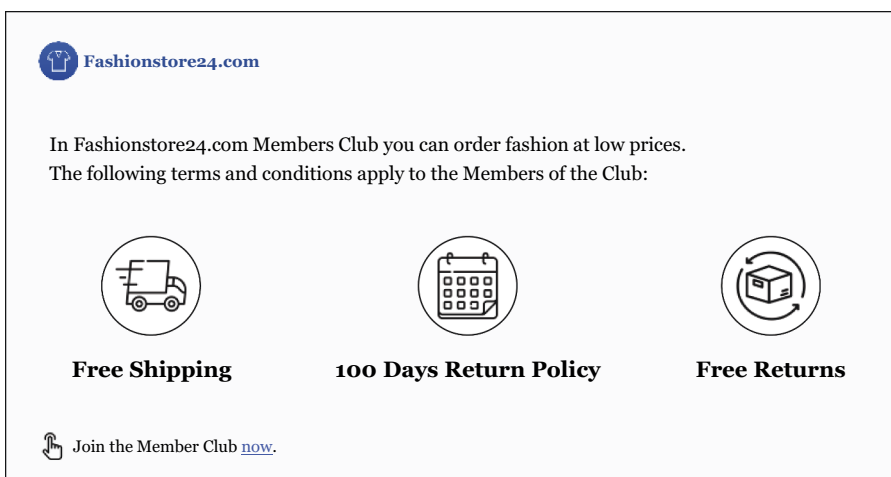
**Hypothesis 5:** *Digital green nudging and gamification cumulatively reduce perceived relatedness (R) and thereby decreases RM and PM (H5 mediated through H5a and H5b).*

## Research Method

### Research Design

In our study, participants were asked to imagine the free loyalty program “Member Club” of a fictitious online store called Fashionstore24, assuming they were already familiar with it. The loyalty program “Member Club” offers a lenient return policy (free shipping and a 100-day free return policy). The participants were then randomly assigned to one of four groups: The control group (CG), the digital green nudging group (NG), the gamification group (GG), and the monetary incentive group (MG). The control group (CG) saw only the general terms and conditions of the free loyalty program “Member Club” of the online shop Fashionstore24 (see Figure 2). All other groups were then presented with additional components of the online store’s free “Member Club” loyalty program. The digital green nudging group (NG) received additional information (i.e., a digital green nudge, see Figure 3) informing them of the negative consequences of product returns.

The gamification group (GG) was presented with a scenario, where the digital green nudge was still present, i.e., the Member Club was extended with different game elements. Accordingly, the GG was confronted with the combination of the digital green nudge and a gamified scenario including some gamification elements: (1) points (positive for each



**Figure 2.** The Displayed General Terms and Conditions of Fashionstore24.



Figure 3. The Displayed Digital Green Nudge.

product customers kept and negative for each product they returned), (2) different levels, status, and badges, (3) profile options, (4) leaderboards and (5) rewards (additional points). Based on the points collected, participants can reach levels and badges that are associated with a specific score. In this scenario, participants are rewarded for their behavior by reaching new levels or earning badges. However, they do not receive any tangible or monetary rewards. In our gamification scenario (see Figure 4), the Environmental

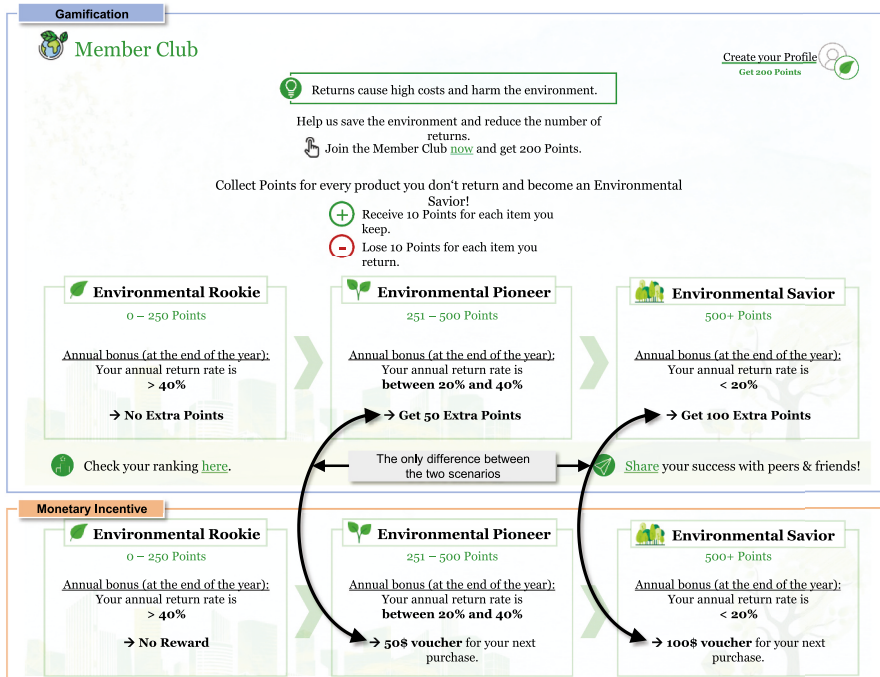


Figure 4. The Gamification and Monetary Incentive Scenarios.

Rookie, Environmental Pioneer, and Environmental Savior levels are based on the points earned throughout the game rather than on the return rate itself. Only individuals who use the online shop regularly can participate in the game (i.e., individuals who do not purchase products are not eligible). Therefore, the level achieved does not reflect how someone acts in other situations or compared to individuals who do not use the online shop. The primary goal of online retailers is to maximize their revenue. In our gamification scenario, this is implicitly considered by emphasizing the relative economic importance of high-revenue customers. Consequently, customers who place large orders but return few items are given preference over those who place smaller orders and rarely return products. The scoring system was set up so that participants receive 10 points for each product they keep and lose 10 points for each product they return. Thus, the return rate itself does not directly classify individuals; it is their score that determines their level and classification. Furthermore, the return rate only matters for the annual bonus (e.g., additional points) that can be earned based on each level. In addition, participants were ranked on a leaderboard based on their scores and had the opportunity to share that status. We utilized a storyboard to graphically depict our gamification scenario. Storyboards can be used to illustrate interfaces and usage contexts to help survey participants imagine how a gamification approach would look in a real gamified system [112]. By comparing this scenario to the first, we can evaluate the broader impact of gamification.

The monetary incentive group (MG) was presented with the enriched storyboard from the GG: The scenario included additional monetary incentives. Therefore, the monetary incentive group (MG) was presented with a combination of all three measures (digital green nudge, gamification, and monetary incentive). In the MG, participants can now receive a voucher (i.e., monetary incentive) based on their annual points collected. A comparison of this scenario with the first two scenarios allows us to evaluate the broader effects of monetary incentives. Figure 4 shows the only difference between the scenario that was shown to the GG and the scenario that was shown to the MG.

The three scenarios build on top of each other. That is, the digital green nudge is also present in the gamification scenario, and most of the gamification scenario is also present in the monetary incentive scenario. This allows us, for example, to at least approximately extract the digital green nudging effect from the gamification scenario. Taking into account possible interaction effects of the combined measures, we can identify tendencies of the effects of the game elements.

Next, the participants were asked about their sociodemographic information, their purchase motivation (PM) and return motivation (RM), as well as their perceived autonomy (A), competence (C), and relatedness (R) when evaluating the Fashionstore24 Member Club. The respondents were then asked to express their environmental consciousness (EC). Last, a realism check was conducted to measure the respondents' perceptions of the authenticity of the scenarios. All responses were recorded on a 7-point Likert scale (ranging from 1 = "strongly disagree" to 7 = "strongly agree"). We used established scales from previous literature to measure all constructs (A, C, R, PM, RM, and EC). Adapted scales from Xi and Hamari [136] were used to measure A, C, and R. Typically, these questions were formulated as "I feel free from outside pressures when I am using the Fashionstore24 Member Club" [A], "I feel like an expert in the Fashionstore24 Member Club" [C], "When I use the Fashionstore24 Member Club, I feel supported by other users" [R]. To measure PM and RM, we used adapted scales [54, 55], e.g., "I have a positive attitude towards buying

products [product returns] on Fashionstore24 Member Club”. The Green Scale [52] was used to measure EC, e.g., “I am concerned about wasting the resources of our planet”. We pre-tested the experimental design prior to the field phase to ensure the comprehensibility and logic of the questionnaire. See our online appendix for more information about the data collection, detailed sample characteristics, and the questionnaire.

**Measurement Model**

A structural equation model (SEM) was developed for evaluation of direct and indirect effects of the three measures (digital green nudging, gamification, and monetary incentives) on return motivation and purchase motivation. As Figure 5 illustrates, the three measures have a direct effect ( $\beta_4/\beta_5$ ) on return motivation ( $Y_1$ ) and purchase motivation ( $Y_2$ ). Moreover, the three measures have a direct effect on autonomy ( $\beta_1$ ), competence ( $\beta_2$ ), and relatedness ( $\beta_3$ ). This leads to an indirect effect of the three measures on return motivation and purchase motivation through autonomy ( $X_1$ ), competence ( $X_2$ ), and relatedness ( $X_3$ ). For example, the indirect effect on return motivation results in a decrease in return motivation when the three basic psychological needs are reduced and multiplied by the positive correlation between the three basic psychological needs and return motivation according to the correlations based on SDT. The variable “Intervention” in our linear model represents the comparison between the control group and the respective treatment group (i.e., NG, GG, or MG). See our online appendix for detailed information and equations (6) to (27) of the latent factors. In the three treatment groups the intervention variable is set to “1” as the groups were exposed to the respective measures. The control group had no intervention, thus the intervention variable is set to “0”. The linear model, where  $\epsilon$  is the error term, can be written as:

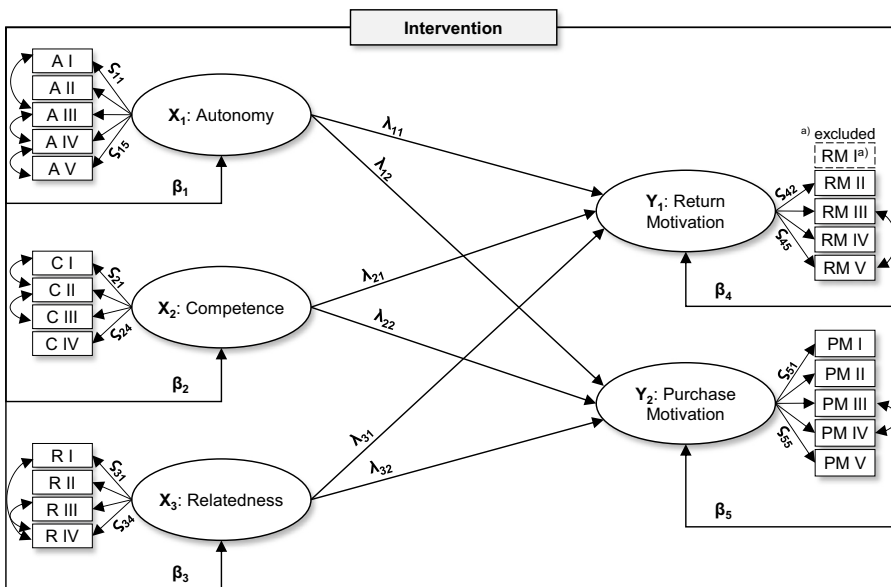


Figure 5. The Structural Equation Model.

$$Y_1 = \lambda_{11} \cdot X_1 + \lambda_{21} \cdot X_2 + \lambda_{31} \cdot X_3 + \beta_4 \cdot Intervention + \varepsilon_1 \quad (1)$$

$$Y_2 = \lambda_{12} \cdot X_1 + \lambda_{22} \cdot X_2 + \lambda_{32} \cdot X_3 + \beta_5 \cdot Intervention + \varepsilon_2 \quad (2)$$

$$X_1 = \beta_1 \cdot Intervention + \varepsilon_3 \quad (3)$$

$$X_2 = \beta_2 \cdot Intervention + \varepsilon_4 \quad (4)$$

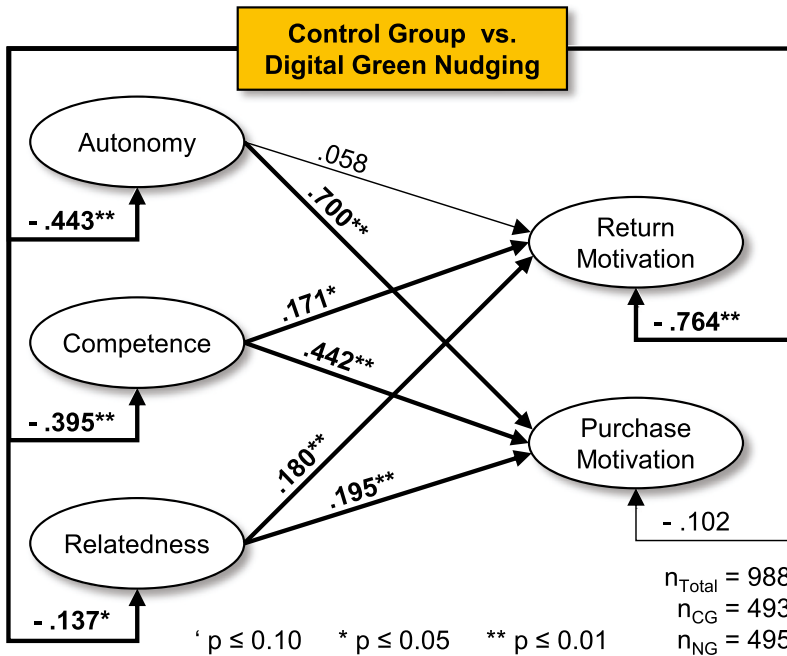
$$X_3 = \beta_3 \cdot Intervention + \varepsilon_5 \quad (5)$$

### Assessment of Reliability and Validity

We evaluated the model's validity and reliability through an exploratory factor analysis (EFA) aimed at extracting and validating the most important independent factors (i.e., the latent variables). The EFA results showed that each observed variable loaded adequately on its underlying latent variable (A, C, R, PM, or RM), with all loadings being significant across all groups. To ensure that we selected the appropriate variables, we followed the recommendations from the EFA literature [29]. In particular, we used the maximum likelihood method with oblique rotation (direct oblimin) because we assume correlations between A, C, R, PM, and RM in our proposed model. Due to cross-loadings ( $< .50$ ) on two latent variables, "RM I" was excluded during EFA. Bartlett's test of sphericity was significant ( $p < .001$ ), and the Kaiser–Meyer–Olkin measure of sampling adequacy was .949, representing a "marvelous" factor analysis [42]. We examine convergent validity using average variance extracted (AVE), while we calculate composite reliability (CR) and Cronbach's alpha (CA) to assess internal consistency. See Table 1 to view the validity and reliability assessment of

**Table 1.** Validity and Reliability

Variables	Item	Loadings	CA	CR	AVE
Return motivation	RM I	Excluded	0.919	0.917	0.736
	RM II	.714			
	RM III	.907			
	RM IV	.931			
	RM V	.864			
Purchase motivation	PM I	.813	0.966	0.955	0.810
	PM II	.879			
	PM III	.978			
	PM IV	.981			
	PM V	.835			
Autonomy	A I	.669	0.898	0.850	0.533
	A II	.658			
	A III	.702			
	A IV	.800			
	A V	.806			
Competence	C I	-.822	0.910	0.868	0.625
	C II	-.875			
	C III	-.632			
	C IV	-.811			
Relatedness	R I	.838	0.941	0.907	0.709
	R II	.747			
	R III	.871			
	R IV	.904			



Not depicted: Covariances between A↔C, A↔R, C↔R, and RM↔PM

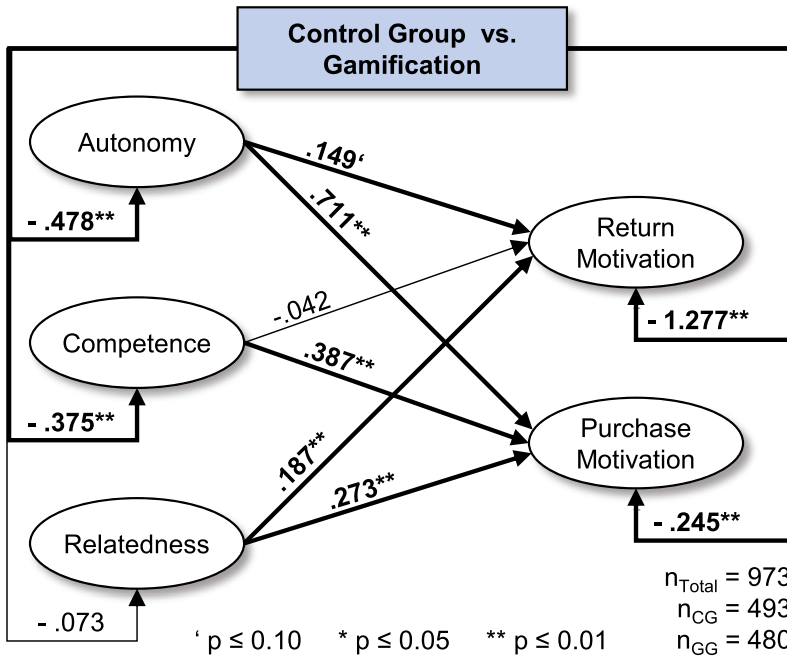
Model fit: CFI = .974   TLI = .968   RMSEA = .052   SRMR = .043

**Figure 6.** SEM Control Group vs. Digital Green Nudging.

the model, which is displayed graphically in Figure 5. The measurement model also includes the covariances between the observed variables that we specified in our structural equation model. See our online appendix for detailed model fit statistics.

## Results and Discussion

The fitted structural equation models in the following Figures 6, 7, and 8 show the group comparisons between the control group and the three scenarios (CG vs NG; CG vs GG; CG vs MG). The comparison of the control group and the digital green nudging group (Figure 6) shows that digital green nudging led to a direct reduction in return motivation, but not to a significant reduction in purchase motivation (NG → RM<sub>NG</sub>:  $-.764^{**}$ ; NG → PM<sub>NG</sub>:  $-.102$ ). With regard to the basic psychological needs, it can be seen that digital green nudging reduces all three dimensions of SDT. However, perceived autonomy and competence are reduced substantially more than relatedness (NG → A<sub>NG</sub>:  $-.443^{**}$ ; NG → C<sub>NG</sub>:  $-.395^{**}$ ; NG → R<sub>NG</sub>:  $-.137^*$ ). Furthermore, we see that a decreased perceived autonomy and competence due to digital green nudging correlates rather strongly with a decreased purchase motivation (i.e., mediated indirect effect on purchase motivation through A/C; A<sub>NG</sub> → PM<sub>NG</sub>:  $.700^{**}$ ; C<sub>NG</sub> → PM<sub>NG</sub>:  $.442^{**}$ ), whereas the other correlations between A/C/R and RM/PM are rather weak.

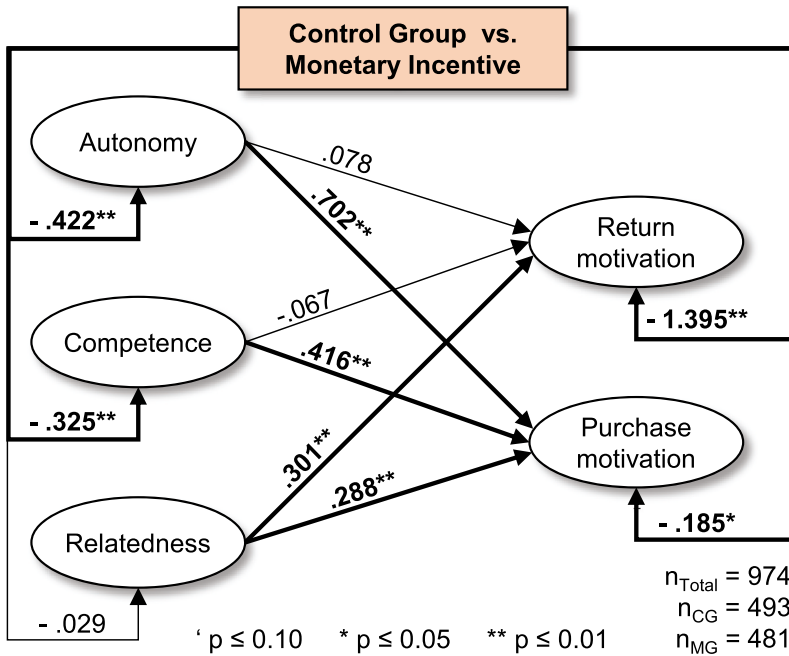


Not depicted: Covariances between  $A \leftrightarrow C$ ,  $A \leftrightarrow R$ ,  $C \leftrightarrow R$ , and  $RM \leftrightarrow PM$

Model fit: CFI = .977 TLI = .972 RMSEA = .050 SRMR = .044

**Figure 7.** SEM Control Group vs. Gamification.

Continuing with the comparison between the control group and the gamification group (see Figure 7), we see that the combination of digital green nudging and gamification had a strong significant direct effect on return motivation, but also a weak direct effect on purchase motivation ( $GG \rightarrow RM_{GG}: -1.277^{**}$ ;  $GG \rightarrow PM_{GG}: -.245^{**}$ ). Note that the gamification group was confronted with the combination of the digital green nudge and the gamification elements. Compared to solely digital green nudging, the combined scenario (i.e., digital green nudge and gamification) had a stronger direct effect on return motivation and purchase motivation. Concerning A, C, and R, there does not seem to be much difference between the digital green nudging and the gamification scenario ( $GG \rightarrow A_{GG}: -.478^{**}$ ;  $GG \rightarrow C_{GG}: -.375^{**}$ ;  $GG \rightarrow R_{GG}: -.073$ ). That is, perceived autonomy and perceived competence are reduced by gamification, but not significantly further (or less) than by digital green nudging. Moreover, a decreased perceived autonomy and competence due to gamification is still strongly correlated with a decreased purchase motivation (i.e., mediated indirect effect on purchase motivation through A/C;  $A_{GG} \rightarrow PM_{GG}: .711^{**}$ ;  $C_{GG} \rightarrow PM_{GG}: .387^{**}$ ). Interestingly, though, while the perceived competence did not change in any significant way compared to the first scenario, the importance and effect of perceived competence on RM did change. We performed a moderation analysis with the digital green nudging group and the gamification group, with the result that gamification in combination with digital green nudging (i.e., the gamification scenario) significantly changed the



Not depicted: Covariances between A↔C, A↔R, C↔R, and RM↔PM

Model fit: CFI = .977 TLI = .972 RMSEA = .050 SRMR = .038

Figure 8. SEM Control Group vs Monetary Incentive.

Table 2. The (In)Direct Nature of the Observed Effects

	D	I	TE	Percent D	Percent I
		<b>Effect of ... on Return Motivation</b>			
Nudging	-0.764	-0.118	-0.882	87%	13%
Gamification	-1.277	-0.069	-1.346	95%	5%
Monetary Incentive	-1.395	-0.020	-1.415	99%	1%
		<b>Effect of ... on Purchase Motivation</b>			
Nudging	-0.102	-0.511	-0.613	17%	83%
Gamification	-0.245	-0.505	-0.750	33%	67%
Monetary Incentive	-0.185	-0.440	-0.625	30%	70%

Note: D, direct effect; I, indirect effect; TE, total effect.

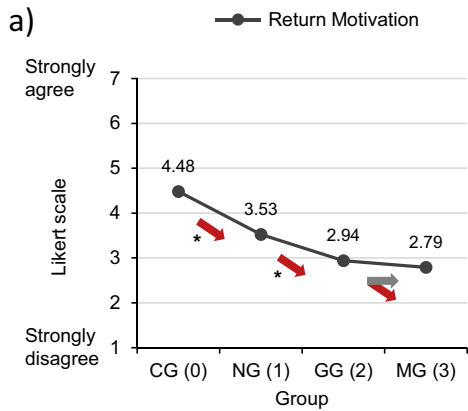
relationship between perceived competence and return motivation. In the gamification scenario, higher perceived competence actually seems to be correlated with lower return motivation, while in the digital green nudging scenario it is the other way around. Although this change is not very strong, it is certainly quite peculiar and warrants further investigation in future research.

Finally, when looking at Figure 8, which contains the comparison between the monetary incentive group and the control group, we see that adding the monetary incentive to the gamification scenario resulted in slight improvements in all observed dimensions compared to the pure gamification scenario (MG → RM<sub>MG</sub>: -1.395\*\*; MG → PM<sub>MG</sub>: -.185\*; MG →

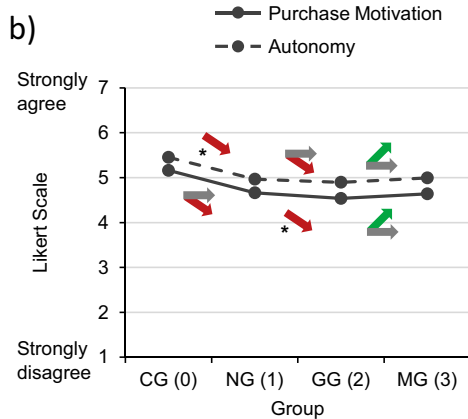
$A_{MG}$ :  $-.422^{**}$ ;  $MG \rightarrow C_{MG}$ :  $-.325^{**}$ ;  $MG \rightarrow R_{MG}$ :  $-.029$ ). That is, return motivation decreased further, and moreover the decrease in purchase motivation, perceived autonomy, competence, and relatedness was not as strong. Other than that, however, not much has changed.

Considering all three figures at the same time, it is noticeable that digital green nudging, gamification, and monetary incentives primarily have a direct effect on return motivation (see Table 2). The comparison also shows that the share of direct effect increases with each additional measure. For example, the monetary incentive scenario is likely to have had an almost entirely direct effect on return motivation (99% direct effect share). In contrast, all three scenarios have a rather indirect effect (via A, C, and R) on purchase motivation. Notably, the results indicate that 83% of the effect of the digital green nudging scenario on purchase motivation was indirect. Both observations suggest that gamification and monetary incentives work in a more extrinsic way than digital green nudging.

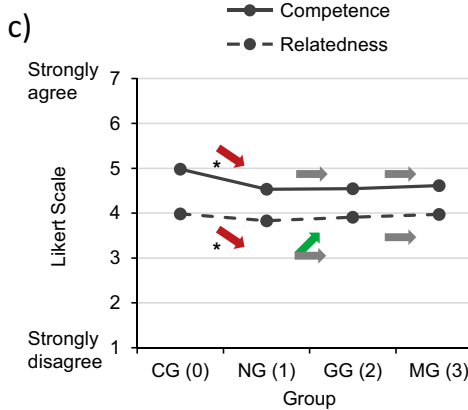
The effects listed in Table 2 warrant a more detailed analysis. Therefore, we analyze in Figure 9 the mean Likert scale values of RM (Figure 9A), PM and A (Figure 9B), and C and R (Figure 9C) for the four different scenarios, i.e., the control group, the digital green nudging group, the gamification group, and the monetary incentive group. This allows for a rough, easy-to-understand comparison of the four scenarios. The arrows in the figures marked with an \* indicate statistically significant decreases ( $p < 0.10$ ). In the following paragraphs, we will report the exact  $p$ -values, which are based on the SEM models presented above. The other arrows in the figure indicate effects that appear to exist but are not statistically significant when the groups are compared directly. Recall that the scenarios build on each other (0: CG; 1: NG; 2: GG; 3: MG). Therefore, the effects should be understood as additional effects to the previous scenario, which result from the combination of the existing measure (e.g., digital green nudging with gamification or monetary incentives). Figure 9A indicates that return motivation decreases with each combination extension (Likert scale means:  $RM_{CG} = 4.48$ ;  $RM_{NG} = 3.53$ ;  $RM_{GG} = 2.94$ ;  $RM_{MG} = 2.79$ ; SEM significances:  $RM_{CG}$  vs  $RM_{NG}$ :  $p < .001$ ;  $RM_{NG}$  vs  $RM_{GG}$ :  $p < .001$ ;  $RM_{GG}$  vs  $RM_{MG}$ :  $p = .135$ ). This is good, at least at first glance, because the measures seem to be serving their intended purpose. However, in a direct group comparison the difference between the gamification group and the monetary incentive group is not statistically significant ( $p > .05$ ). In general, since the scenarios we presented to the survey participants build on each other, we cannot exactly determine which of the three measures has the strongest effect. However, we are still able to detect tendencies in the effects of the measures and their combination. For example, in terms of return motivation, our results show that digital green nudging seems to have the strongest effect. With regard to return motivation, it is evident that it continues to decrease with each combination based on digital green nudging. Therefore, it can be assumed that digital green nudging, gamification, and monetary incentives reduce return motivation. However, with each additional combination extension, the effect seems to increase only slightly: The combination extension of measures follows the law of diminishing returns [117]. This could be because the effect of digital green nudging is already very strong, and the combination with additional measures does not substantially increase the effect on consumers' return motivation. A more practical explanation is that some aspects of return motivation cannot be influenced by soft measures such as digital green nudging. For example, some clothes may simply not fit at all or may not be suitable for the customer's intended purpose. In any case diminishing returns are inevitable



- Digital Green Nudging, Gamification, and Monetary Incentives all reduce Return Motivation on top of each other (H1).
- The increase in effect seems to decrease with each additional measure.



- Digital Green Nudging and the combination with Gamification appear to reduce Purchase Motivation and Autonomy.
- The combination of Digital Green Nudging and Gamification with Monetary Incentives seem to be perceived as positive and may alleviate the negative feelings caused by the other measures and combinations.



- Surprisingly, only Digital Green Nudging seems to decrease Competence and Relatedness.
- Not surprisingly, Relatedness is not substantially affected by our scenarios, probably because we asked about a new, fictitious online shop.

\* statistically significant

**Figure 9.** Group Comparisons (Likert Scale).

at some point because our Likert scale (and motivation in general) had a lower bound of one (“strongly disagree”; in other words, negative return motivation is impossible). Therefore, a linear or progressive decrease in return motivation would only be possible for a limited number of measures.

Although the measures seem to fulfill their intended purpose (reduction in RM), there also seem to be negative side effects on purchase motivation ( $PM_{CG} = 5.16$ ;  $PM_{NG} = 4.66$ ;  $PM_{GG} = 4.54$ ;  $PM_{MG} = 4.64$ ; SEM significances:  $PM_{CG}$  vs  $PM_{NG}$ :  $p < .168$ ;  $PM_{NG}$  vs  $PM_{GG}$ :  $p < .056$ ;  $PM_{GG}$  vs  $PM_{MG}$ :  $p = .610$ ). Although only the gamification group (GG) showed a significant direct negative effect on purchase motivation, there are also indirect negative effects in the NG and the GG on purchase motivation through decreased perceived autonomy, competence and relatedness need satisfaction. Indeed, the indirect effects are so strong that the Likert scales in [Figure 9B](#) show a quite substantial reduction in purchase motivation. Therefore, the negative effect on return motivation is probably more extrinsic in nature, while the negative effect on purchase motivation is likely to be more intrinsic. However, this is not true for the displayed monetary incentive. The monetary incentive appears to reduce return motivation and at the same time increase purchase motivation. On the one hand, monetary incentives seem to be better than digital green nudging and gamification in this regard. On the other hand, monetary incentives usually also entail higher monetary costs.

Regarding perceived autonomy ([Figure 9B](#)), we observe that digital green nudging has a significant decreasing effect, whereas gamification did not further reduce perceived autonomy in a significant way ( $A_{CG} = 5.45$ ;  $A_{NG} = 4.97$ ;  $A_{GG} = 4.90$ ;  $A_{MG} = 4.99$ ;  $A_{CG}$  vs  $A_{NG}$ :  $p < .001$ ;  $A_{NG}$  vs  $A_{GG}$ :  $p < .473$ ;  $A_{GG}$  vs  $A_{MG}$ :  $p = .332$ ). These findings agree with the rationale presented above that digital green nudging acts primarily indirectly via reduced perceived autonomy (intrinsic mediation), while gamification acts more directly on motivation without significantly affecting perceived autonomy. The displayed monetary incentive again appears to have had a positive effect and seemingly increased perceived autonomy, although this uptick is not statistically significant in a direct group comparison between the gamification and monetary incentive groups.

Only digital green nudging significantly reduced perceived competence ([Figure 9C](#)), while surprisingly, the combination with gamification and the monetary incentive did not lead to further reductions ( $C_{CG} = 4.98$ ;  $C_{NG} = 4.53$ ;  $C_{GG} = 4.55$ ;  $C_{MG} = 4.62$ ; SEM significances:  $C_{CG}$  vs  $C_{NG}$ :  $p < .001$ ;  $C_{NG}$  vs  $C_{GG}$ :  $p < .864$ ;  $C_{GG}$  vs  $C_{MG}$ :  $p = .478$ ). We expected that the additional rules of the gamification scenario and the calculations needed for evaluating the monetary incentive would further reduce feelings of competence. However, our scenarios were apparently not too complicated. Interestingly, although the digital green nudge did not add any additional complexity compared to the control group scenario, it is the only scenario, which led to a reduction in perceived competence. This gives raise to the interpretation that the digital green nudge questions one’s perceived competence as a person. Customers who return products comparatively often may feel that their competence as a person is challenged by the nudge because they are implicitly accused of not being a valuable member of society.

With regard to relatedness ([Figure 9C](#)), the results show that only digital green nudging led to a weak but significant reduction in relatedness. In the gamification scenario, we observe a weak uptick in relatedness, but it is not statistically significant. One might think that the gamification scenario would have led to an increase in relatedness, since it

contained several elements aimed at creating relatedness. The fact that there was only a slight increase in relatedness, which, moreover, is not statistically significant, indicates that the respective game elements only had a very weak effect, if any. In general, the mean relatedness score (Likert scale) of all scenarios is approximately equal to the neutral answer option ( $R_{CG} = 3.98$ ;  $R_{NG} = 3.83$ ;  $R_{GG} = 3.91$ ;  $R_{MG} = 3.97$ ; SEM significances:  $R_{CG}$  vs  $R_{NG}$ :  $p < .039$ ;  $R_{NG}$  vs  $R_{GG}$ :  $p < .420$ ;  $R_{GG}$  vs  $R_{MG}$ :  $p = .603$ ). This could be because we presented our fictitious online shop scenarios only once during the survey and thus may not have been able to elicit strong feelings of relatedness. Such emotions are likely to arise from long-term relationships, which we were unable to establish during our survey. See our online appendix for a summary of results.

We also conducted moderation analyses with demographic characteristics (gender, age, education) and environmental consciousness. Concerning demographics, the results showed significant interaction effects only with the participants' gender (1 = male, 2 = female, nonbinary gender excluded). The following effect sizes are based on a SEM that was fitted on data from all groups (0 = CG, 1 = NG, 2 = GG, 3 = MG). The results show that the decreasing effect of the scenarios on perceived autonomy is stronger for women. The fitted SEM regression over all groups (0 = CG, 1 = NG, 2 = GG, 3 = MG) estimates a negative slope in perceived autonomy of  $-.075$  for men and  $-.168$  for women, i.e., a significant difference of  $-.093^*$ . Furthermore, in our data environmental consciousness (measured on a 7-point Likert scale ranging from 1 = low EC to 7 = high EC) significantly moderates the effects of the scenarios on perceived A, C, and R, but not on RM and PM. We find that, the more environmentally conscious a person is, the less perceived autonomy, competence, and relatedness are negatively affected by the three measures. For example, the fitted SEM regression over all groups (0 = CG, 1 = NG, 2 = GG, 3 = MG) estimates a negative slope in perceived autonomy of  $-.290$  for persons with a low environmental consciousness (i.e., EC = 1) and  $-.038$  for persons with a high environmental consciousness (i.e., EC = 7), i.e., a significant moderation effect of size  $.042^*$ . Similar moderation effect sizes can be observed with regard to perceived competence ( $.040^*$ ) and relatedness ( $.036^*$ ). It should be noted that there is no strong significant correlation between gender and environmental consciousness in our sample. Therefore, the interaction effects of gender and environmental consciousness outlined above are likely to coexist in parallel.

## Theoretical and Management Implications

This study contributes to existing literature in various ways. First, our study extends existing research about the potential of digital nudging and its combinations (with gamification or gamification and monetary incentives) on preventing product returns in e-commerce. Second, this study is the first to examine the effects of the mentioned measures using the self-determination theory. As outlined in a systematic literature review, it was demonstrated that the utilization of psychological theories, such as SDT, in conjunction with digital nudging necessitates further investigation [120]. The present study addresses this issue by leveraging the principles of self-determination theory. SDT subsequently offers insights into the mechanisms through which individuals motivate their actions and decisions under the influence of digital nudging. SDT focuses on the satisfaction of the three basic psychological needs: autonomy, competence, and relatedness [108]. In our study we analyzed the effect of digital green nudging and its combination with gamification or gamification and monetary

incentives. One of the most discussed ethical issues of digital nudging is their possible violation of autonomy [76, 132]. This is particularly relevant in the context of e-commerce, where autonomy enhances the experience of hedonistic consumption [2]. Furthermore, the influence of digital nudging (and its combination with gamification or gamification and monetary incentives) on the basic psychological needs may result in unintended side effects. Based on SDT, we are able to evaluate our results regarding these possible side effects. As outlined earlier, our results considering SDT indicate that our analyzed measures have a rather indirect (intrinsic) impact on purchase motivation by affecting autonomy and competence. In contrast, the impact on return motivation is rather direct (extrinsic).

The measures we examined are not only highly relevant to science, but also to business practice. Starting with digital green nudging, we see that this is a fairly simple yet effective measure to influence return motivation. To increase the effect, it is conceivable to personalize the message of the nudge, which would be relatively easy to implement technically. This is referred to as data-driven digital nudging (DDN) [110]. DDN has emerged as a promising digital marketing strategy that builds on behavioral economics principles to guide consumer decision-making [23]. Given the challenges of information overload in online retail, such as vast product assortments and excessive user information, DDN plays a critical role in simplifying decision-making and enhancing the online shopping experience [56]. In the context of product returns in e-commerce, for example, a personalized intelligent green nudge was presented by von Zahn et al. [131]. Leading online retailers (e.g., Zalando or H&M) commonly use digital nudges to prevent unintended repurchases or selection orders, thereby preventing returns. However, it should be noted that although data-driven interventions provide a more responsive and personalized user experience, they also pose ethical risks. The hidden nature of such algorithmic decision-making tools can have a negative impact on individual autonomy and potentially reduce trust, as users are guided without transparent disclosure or meaningful consent [14].

Our research focuses on online fashion retailers because this sector is particularly affected by the abuse of lenient return policies through bracketing, staging, and wardrobing. Regardless of the product category, some customers frequently return 20% to 30% or more of their online purchases, which can significantly impact profitability and, accordingly, the environment. For example, in the US, online sales across all categories of \$1.477 trillion were offset by product returns worth \$362.16 billion in 2024 [5]. In e-commerce, online retailers typically track customer purchase and return data. Analyzing how frequently a customer returns items can reveal patterns that go beyond normal shopping behavior. A digital green nudge can make high-frequency returners aware of the environmental impact of their ordering and return behavior. Considering the negative effects of DDN, we suggest that e-tailers should primarily use DDN to reduce returns from customers with high return rates regardless of the product category.

However, the nudge primarily affects return motivation extrinsically, which may indicate that the effect is more short-term. The indirect intrinsic reduction in autonomy, competence, and relatedness and the sizeable reduction in purchase motivation should also not be neglected. Furthermore, it is necessary to differentiate between digital nudging per se and digital green nudging. While digital nudging in general can be a cost-effective, targeted, and powerful tool, it is important to ensure that it does not create excessive pressure that leads to unintended side effects. This is particularly important when designing IT tools, such as digital green nudges, to motivate consumers to engage in sustainable behaviors.

Although our gamification scenario had a substantial direct effect on return motivation, it did not yield any other notable effects. The additional effect of the gamification scenario on RM is primarily extrinsic in nature, and it remains to be seen how the effects can be internalized. Considering the effort required to integrate the game elements into a website or app, it is questionable whether this is a worthwhile endeavor. Nevertheless, the potential harm that could be caused by gamification is minimal. Consequently, it may be a costly and time-consuming but relatively low-risk approach to reduce return motivation, provided that digital green nudging is not part of the gamification scenario. Monetary incentives appear to be beneficial, as they reduce return motivation. In addition, there is a possibility that they may also lead to a slight enhancement of purchase motivation, which may be even more beneficial. However, the monetary incentive is costly to implement and, as expected, primarily has an extrinsic effect on return motivation. It is therefore uncertain whether such an approach will result in long-term effects.

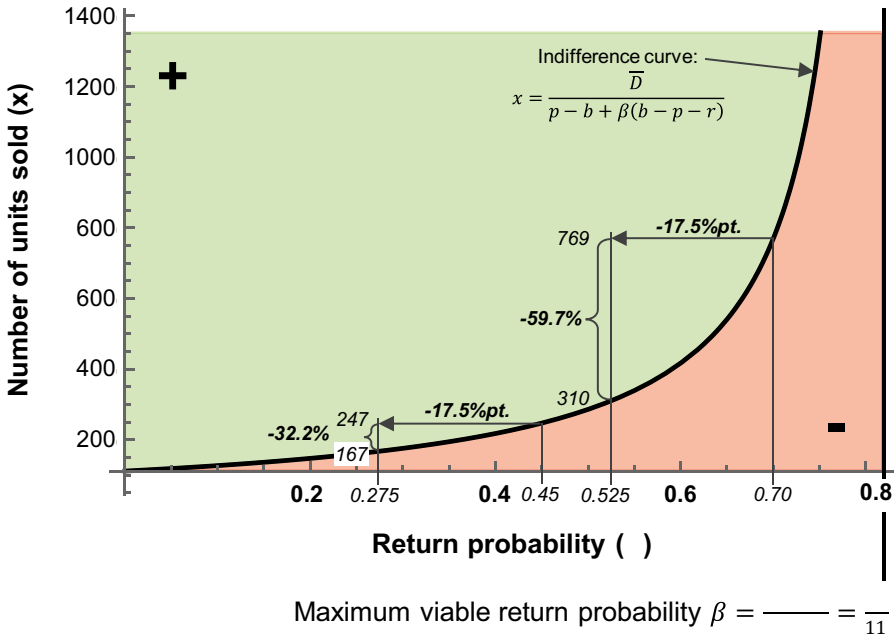
Online retailers often consider high return rates as a necessary evil, fearing that a change in their lenient return policy might result in a decline in sales [68]. These concerns are justified by the results of our study, which demonstrate that in the gamification scenario purchase motivation was directly reduced. We observe a similar tendency in the case of digital green nudging, although these results are not statistically significant. One study even found that the green nudge they used in their field experiment did not affect sales at all [131]. Nevertheless, for a final assessment, it is necessary to consider the interaction between the return rate and sales. For example, a simple contribution margin calculation, with  $D$  = contribution margin,  $p$  = price of the product,  $x$  = number of units sold,  $\beta$  = return probability,  $b$  = monetary incentive/bonus when not returned, and  $r$  = return cost per returned item, could be performed as follows:

$$D = px - \beta xp - (1 - \beta)xb - \beta xr \quad (28)$$

An alternative formulation for calculating the relationship between return rate and contribution margin has been presented by Karl et al. [67]. The fashion industry is characterized by very high beta return rates of up to 50% [122]. It should be noted that the beta return rate is calculated as the sum of returned items divided by the sum of sent items and multiplied by 100% [6]. For a specific target total contribution margin  $\bar{D}$ , the return indifference curve (i.e., all combinations of  $x$  and  $\beta$  that result in the same  $\bar{D}$ ) can be determined by the following equation:

$$x = \frac{\bar{D}}{p - b + \beta(b - p - r)} \quad (29)$$

For an illustrative example ( $\bar{D} = 1000$ ;  $p = 10$ ;  $r = 2$ ;  $b = 1$ ), Figure 10 shows the contribution margin as a function of the number of units sold and the return probability (beta return rate). Note that the course of the indifference curve shown in Figure 10 also applies to the case without monetary incentive (i.e., for  $b=0$ ). This illustrates that particularly in sectors with typically high return rates, the side effect (decrease) on purchase motivation does not necessarily result in a decline in contribution margin due to the exponential shape of the curve. That is, the reduction in return probability has a stronger positive effect than the corresponding reduction in units sold, which is why the resulting contribution margin is still positive.



**Figure 10.** The Return Indifference Curve.

Figure 10 shows that, for example, based on a return probability of 45%, a reduction in the beta return probability of 17.5% (through a suitable measure) can lead to a reduction in the number of units sold of up to 32.2% without reducing the contribution margin. The example also shows that, based on a higher return probability (e.g., 70%), a reduction in the number of units sold of up to 59.7% can be accepted for an equivalent reduction in the return probability (–17.5%), without any change in the contribution margin. Accordingly, our presented measures are particularly useful and low-risk in industries with typically high return rates, as the side effects on purchase motivation are neglectable.

### Conclusion, Limitations, and Outlook

This study is the first to analyze and compare digital green nudging, gamification, and monetary incentives in the context of online return management. The results show that all three measures yield promising results when applied in combination. Digital green nudging, gamification, and monetary incentives are particularly suitable for influencing return motivation in the fashion sector, given that high return rates are common in this industry. However, our results must be interpreted with caution because it is particularly difficult to distinguish clearly between the individual measures and the resulting effects, as the scenarios were designed to build on each other. Our results show that digital green nudging already leads to a very strong reduction in return motivation. Adding another measure (i.e., gamification or gamification and monetary incentives) extends the reduction, at least to a small extent. However, we cannot determine whether this is solely due to the addition of

another measure or to combination effects. Future research could therefore investigate pure gamification and monetary incentive approaches. Similarly, it is not possible to determine the impact of the individual (game) elements, including points, levels, rewards, etc. Moreover, we have not conducted a long-term study or real-world experiment, which constrains our ability to comment on the long-term effects and the degree of internalization that might result. Accordingly, the participants in our study were probably unable to develop a genuine relationship with the online shop, as evidenced by our results regarding relatedness. Consequently, a real-life experiment would be required to investigate the long-term effects, and particularly the occurrence of a habituation effect. Personalized measures could also be explored, with the objective of tailoring them to different consumer characteristics. It is possible that different shopping and return types might respond differently to certain measures. Furthermore, individuals with a higher level of environmental consciousness may respond more favorably to the digital green nudge, and different player types may react differently to certain game elements. For example, it can be assumed that individuals who generally enjoy playing are more likely to respond to game elements than those who do not enjoy playing.

Based on our findings and the results of the research by von Zahn et al. [131], it is reasonable to initially use digital green nudges to avoid and reduce product returns. Gamification and monetary incentives are already successfully used in customer loyalty programs and represent useful additions to combine with digital green nudging. Our study shows the potential negative side effects of digital green nudging, and the combinations considered. However, the positive effects predominate, which leads us to the assumption that the potential harm caused by digital green nudging and the combinations considered is neglectable. Despite the existing limitations and newly emerging research questions, our results show that all three measures presented are promising tools to escape the lenient return policy trap and the resulting high return rates in e-commerce.

## Disclosure Statement

No potential conflict of interest was reported by the author(s).

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## Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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