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Exploring Digital Social Norms Nudges in E-Grocery: Typical Consumer Testimonials with a Warm Glow

Research Paper

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Abstract. Digitization offers several possibilities to alter consumer decisions to support social concerns. The objective of this study is to examine the impact of personalized digital social norm nudges on consumer decisions enriched with the theory of warm glow on e-grocery buying decisions with the aim of supporting social projects. Specific pro-social behaviors targeted were supporting fair payment of the producers of grocery goods, social inclusion projects and initiatives against poverty by deciding for a specific choice option. A between-subjects experiment was performed with the help of a questionnaire using a mock-up mobile grocery store to measure product choices. Results showed that claims supporting pro-social initiatives have a significant impact on buying decisions. Perceived product recommendation influenced our model positively, while we had a negative price impact. The study suggests that warm glow theory and enriched social norm nudges are effective tools for behavior change towards social initiatives.

Keywords: digital nudging, social justice, warm glow, e-grocery

1 Introduction

The rise of digital technologies and their presence in daily life is steadily evolving. Consumers are increasingly utilizing digital technologies for daily tasks, such as e-grocery shopping, in order to save both time and effort, *"like travel, transportation and in-store shopping time, as well as physical convenience"* (Gottschewski et al., 2022, pp. 1–2). Such everyday decisions on which grocery articles to buy can make a decisive contribution towards a more social, economic and ecologic sustainable world (Camilleri et al., 2019; Ganglmair-Wooliscroft and Wooliscroft, 2022). Along with the digitization of retail and grocery shopping as well as various other domains the opportunities for information systems (IS) research to contribute to the reduction of (digital) inequalities have expanded (Vassilakopoulou and Hustad, 2021). Its importance is very well known and already addressed in the research community, as *"sustainability constitutes the most important long-term problem that the world faces"* (Watson et al., 2021, p. 496). Yet, despite the evolving need for corporate social responsibility initiatives

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from both societal and regulative perspectives (Porter and Kramer, 2006), social concerns such as social justice, social inclusion, social equity and alike are currently underrepresented in IS research (Schoormann and Kutzner, 2020).

Grocery shopping, a routine task performed regularly, often requires minimal cognitive effort and relies on the use of heuristics (Ganglmair-Wooliscroft and Wooliscroft, 2022). So, the possibility to alter decisions towards the better (i.e., a more socially equal world) by exploiting these heuristics is given. A promising concept to foster behaviors aimed at the welfare of society is the concept of digital nudging (Collier and Johnson, 2021; Henkel et al., 2019), which is defined as "*any aspect of the choice environment that alters behaviour in a predictable way*" (Thaler and Sunstein, 2009, p. 6). Digital Nudges (DN) can improve decision making in the digital hemisphere towards the individual or public welfare (Sunstein, 2014; Weinmann et al., 2016). When implemented with a specific goal (Mirsch et al., 2017), various digital nudging concepts (DNC) each exploiting human heuristics to be effective have worked well in commercial areas (Dennis et al., 2020; Lehner et al., 2016), and especially in the context of online grocery shopping (Auf der Landwehr et al., 2021; Gottschewski et al., 2022). From a theoretical perspective, the concept of social norms (SN) may prove to be a promising approach in e-grocery to encourage more pro-social choices. SN have a decisive advantage over other concepts to alter behavior towards societal welfare, namely they can change collective attitudes, bring awareness about urgent societal issues (i.e., supporting social projects) and thus, increase social pressure to act socially acceptable or desirable (Andrighetto and Vriens, 2022). Hence, SN can create peer effects, influencing the behavior of individuals within a group (Ajilore et al., 2014; Burke, 2008). SN also might counter the diminishing effect of DN over time as it changes attitudes rather than short term behavior (Babar et al., 2023; e.g., Sunstein, 2016). Also, Engler et al. (2019) argue that behavior is primarily related to in-group favoritism, a concept involving social comparison to distinguish between the preferred in-group towards the not preferred out-group. Thus, in-group favoritism could lead to positive reinforcement of the SN effect (i.e., injunctive norms). Though, in contrast to other DNCs, the efficacy of digital SN nudges has been found to be inconclusive and may be attributed to variations in the implementation of the SN nudge concept across studies. SN interventions were either unsuccessful (Auf der Landwehr et al., 2021; Katner and Jianu, 2019) or partially successful (Stuber et al., 2022) indicating a socially accepted product via a claim (e.g., "*Bestseller*"). Yet, if used as a social comparison nudge, SN interventions were successfully implemented and changed buying behavior (DiCosola III and Neff, 2020). Thus, we seek to investigate on the effect of peer group specific digital SN nudges on consumer behavior.

More recently, it has been recognized that "*warm glow*" is also a theory worth exploring to foster behavior related to social concerns (Iweala et al., 2019). Warm Glow (WG) is defined as positive emotional experience after the act of helping (Hörisch and Tenner, 2020). In recent studies, WG was also investigated on in the e-grocery context, using pro-social and pro-environmental claims successfully (Iweala et al., 2019) or fostering recurring organic grocery purchases (Cahyasita et al., 2021). WG works because humans *"derive psychological benefits from […] altruistic actions"* (Cahyasita et al., 2021, p. 904) in feeling a "*warm glow*". Since it has been shown in various contexts

that enriching DN interventions with other concepts has been found to have decent impacts on nudge effectivity (Jesse and Jannach, 2021; Zimmermann and Renaud, 2021), we seek to enrich the concept of peer group specific digital SN nudges with the theory of WG in one intervention to examine the effects on consumer decisions. Consequently, investigating on (a) peer group specific SN nudges in e-grocery (b) in combination with the theory of WG (c) to enhance effectivity of fostering consumer decisions that support social projects deserves examination and constitutes a research gap this study seeks to fill. Therefore, and following the calls for further research in IS on both social concerns (Schoormann and Kutzner, 2020) and combinatorial nudges (Gottschewski et al., 2022) we opt to investigate on the following research questions (RQ):

RQ1: *Does the implementation of digital social norm nudges, modeled on typical consumer testimonials, influence purchasing decisions in the context of e-grocery?*

RQ2: *How does incorporating the warm glow concept affect the effectiveness of digital social norm nudges on pro-social grocery selection decisions?*

To answer our RQ, we conducted a randomized between subject experiment with the help of a questionnaire using a mock-up mobile grocery store testing SN interventions through peer group relevant testimonials (Friedman et al., 1976) and the influence of the WG theory on these interventions to foster pro-social behavior comparing against a control group without any intervention. Conducting online experiments in IS is an underused, yet, in the context of behavioral research particularly fruitful methodology and thus, we follow the call of Fink (2022) to expand the body of research in this area. This paper proceeds as follows: firstly, we shed light on the theoretical background of DN, the concept of SN and its relation to WG theory. Secondly, we outline our hypotheses and explain our research model. Then, we describe our experimental design. Afterwards we are testing our hypotheses. Subsequently, we present and discuss our results and highlight certain limitations of this study. Finally, we provide conclusions and ideas for future research to expand upon the findings of this paper.

2 Theoretical Background

2.1 Digital Social Norms Nudges in E-Grocery

IS can support to counter social concerns via a multitude of tools, concepts and methods (Vassilakopoulou and Hustad, 2021), including digital nudges, which can refer to several concepts, such as the concept of social norms. Evolution has shown that humans adapt to the behavior of their social environment. People imitate behavioral patterns and want to do what is social and ethical, i.e., in accordance with good manners (van Vugt et al., 2014). Moreover, individuals exhibit a tendency to affirm socially desirable actions and behaviors while denying socially undesirable ones (Chung and Monroe, 2003). Thus, SN can influence behavior by either demonstrating or suggesting that it is generally accepted to behave according to a target state (Lehner et al., 2016). As a means of persuasion in decision-making, SN are effective because people memorize that others have acted specifically in the same situation (Sunstein, 2014).

Recent studies have explored DN in various application fields following the concept of SN. For example, Loschelder et al. (2019) proved the effectiveness of SN nudges in promoting the adoption of sustainable coffee to-go cups or Bauer et al. (2019) used SN to support suicide prevention. However, whilst research has identified several use-cases in which digital SN nudges are effective, only few studies have been conducted successfully within the area of e-grocery. Demarque et al. (2015) have used social influence in a virtual grocery shop and found these as effective to foster pro-environmental shopping behavior. Despite these findings, Auf der Landwehr et al. (2021) have found SN to be inappropriate to foster more eco-sustainable delivery slot selections. Richter et al. (2018) investigated on behavior when buying seafood online using descriptive SN and found sales dropping in a multitude of studies. Berger et al. (2020) also could not find any influence of digital SN nudges in their e-grocery experiment. Further studies also used textual claims indicating a peer group to follow (e.g. "*other customers also bought*") but failed in altering product choices (Bunten et al., 2021; Jansen et al., 2021).

However, there are also studies which have been successfully implemented SN interventions, such as DiCosola III and Neff (2020), investigating on SN to foster more healthy e-grocery choices. Studies using personalized SN in e-grocery following the concept of DN are scarce. For example, Bauw et al. (2022) showed positive effects using descriptive norms and personalized feedback. In summary, one could conclude it depends on how SN nudges are used in e-grocery to alter decisions for the good of society successfully. For our study, we use personalized typical consumer testimonials (TCT) as a special form of SN theory, that indicates social approval of product choices. Testimonials are peripherical cues and work best when a source–receiver similarity is given (Martin et al., 2008). Moreover, consumers feel the social presence of the testimonial which can reinforce the effect of the TCT (Elgaaied-Gambier et al., 2018), as it *"increases the accessibility of words that are applicable to social desirability"* (He et al., 2012, p. 303). Friedman et al. (1976) identified three types of endorsers, including the typical consumer who is described as an ordinary person with no special knowledge about the product beyond what can be gained through normal use. Typical consumer endorsers *"are most effective for products ranking low in risk"* (Dean and Biswas, 2001, p. 43), such as grocery products. Also, TCTs are used to indicate positive transformative effects of the use of the product recommended (Schimmelpfennig, 2019). Studies suggest that testimonials are more effective when the testimonial appears to be within the same in-group (e.g., age group or gender, cf. Gupta and George, 2013) which can impact behavior as it is based on group identity (White et al., 2019).

2.2 Warm Glow Theory to Foster Pro-social Consumer Behavior

Warm glow theory is an emerging topic of interest for promoting sustainable consumption and behavior (Mahasuweerachai and Suttikun, 2022). The theory describes a positive emotional experience after engaging in actions that promote positive societal or environmental outcomes (Hartmann et al., 2017; Hörisch and Tenner, 2020), perceived as a personal benefit and a feeling of a "warm glow" (Andreoni, 1989; Taufik et al., 2015). The feeling itself arises from an activation of neurons which are similar to receiving a payment (i.e., activation of the mesolimbic pathway, cf. Harbaugh et al.,

2007). Thus, consumers can be nudged into more pro-social behavior patterns if a WG reward is possible.

The application areas of the WG theory to promote socially beneficial outcomes are manifold. Halvorsen (2008) investigated on the willingness to recycle and found both, SN and WG, as inseparable factors that both increase recycling activities of households. Hartmann et al. (2017) were able to find WG as a decisive factor for pro-environmental behavior within the area of green electricity. Several studies utilized WG theory to enhance the effectivity of activities of charitable donations (e.g., Hörisch and Tenner, 2020; Scharf, 2014). Allison et al. (2013) examined how WG influences microloan funding of investors to support developing countries. Pro-social spending was found to have a positive effect on the mood, making a person even happier than spending the money for oneself (Dunn et al., 2014). In the context of e-grocery shopping, Iweala et al. (2019) were investigating on the effect of WG on food choices, finding pro-social (ethical) claims to be more effective as pro-environmental claims. Cahyasita et al. (2021) found a positive correlation between WG and the attitude to consume organic food repeatedly. Finally, Jia and Linden (2020) were investigating on green warm-glow within the context of food retailing and were able to predict pro-environmental decisions. Thus, we consider using WG theory to be a promising theory for behavioral change and seek to expand the existing body of knowledge in this regard. However, within the research area of DN, research including the theory of WG to promote socially beneficial outcomes is scarce. Reinholdsson et al. (2022) investigated on more eco-sustainable hamburger choices, but no effect of an informational nudge intervention using WG theory was found. Hence, investigating on the interplay between SN and WG theory to alter consumer decisions towards more pro-social behavior patterns is a subject worth exploring on, since SN offer serious advantages over other concepts of digital nudging to overcome the challenge of the need to act more digital and social responsible (Herden et al., 2021). Thus, we seek to shed light on the efficacy of a combination of SN and WG theory in one intervention using TCTs enriched with the theory of WG.

3 Hypotheses

SN can alter attitudes, raise awareness of societal issues, and increase social pressure for desirable behavior (Andrighetto and Vriens, 2022). Moreover, the impact of SN on one person has the ability to impact the attitudes of numerous others (Ajilore et al., 2014; Burke, 2008). In this study, we examine on a special form of SN, the TCT. According to Dean and Biswas (2001), TCT is suited best for products which are associated with a low risk. Grocery goods usually do not have a high price, nor do they have any associated risk when buying. Thus, interventions feature higher likeliness to be effective in this context. Also, the social presence of a testimonial should impact the efficacy of the message transported with the TCT (He et al., 2012). Also, we opt to use different testimonial messages, such as positive product reviews, transformative effects of buying the related product or a direct product recommendation. While positive product reviews and product recommendations are known for their effects on buying behavior (e.g., Wang et al., 2019), they also suggest a socially accepted product (Cialdini and

Goldstein, 2004) that directly addresses consumers. Suggesting transformative effects of products are used in marketing successfully (e.g., pharmaceuticals, cf. Schimmelpfennig, 2019). Also, in-group favoritism could lead to a reinforcement of the SN effect (Engler et al., 2019), which is triggered by the peer group relevant testimonial in our study. Hence, we expect a high effectivity of the intervention and hypothesize:

H1: *The presence of peer group relevant TCT interventions indicating a positive product review increases sales compared to the absence of an intervention*

H2: *The presence of peer group relevant TCT interventions indicating a transformative effect of the purchase increases sales compared to the absence of an intervention*

H3: *The presence of peer group relevant TCT interventions indicating a product recommendation increases sales compared to the absence of an intervention*

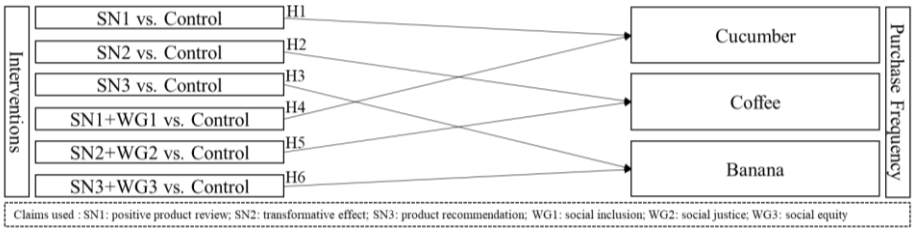


Figure 1: Research model

Enriching DN following the concept of SN with the theory of WG to foster purchase decisions which supports pro-social projects can enhance effectivity of DN interventions. Providing the opportunity to receive a WG reward from deciding for low-risk grocery goods can effectively nudge consumers towards adopting more pro-social behavior patterns (Liao et al., 2020). Communicating the intention behind an action that contributes to positive societal or environmental outcomes may enhance individuals' perception of attaining a WG (Bronnmann et al., 2021). In line with Schoormann and Kutzner (2020), we chose three social purposes (social inclusion, social justice, social equity) to be included in the message of the TCT. Additionally, combining or enriching DN interventions with other theories and concepts have shown better effectivity than single interventions in various other studies (Jesse and Jannach, 2021; Zimmermann and Renaud, 2021). Furthermore, providing the possibility to support projects related to social purposes triggers the need to act socially desirable (Chung and Monroe, 2003), which is reinforced by the presence of the in-group testimonial (He et al., 2012).

H4: *The presence of peer group relevant TCT interventions indicating a positive product review and supporting social inclusion projects increases sales compared to the absence of an intervention*

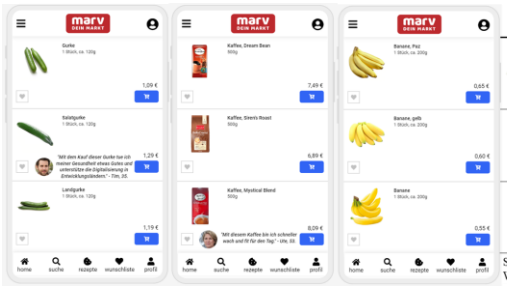
H5: *The presence of peer group relevant TCT interventions indicating a transformative effect of the purchase and supporting social justice projects increases sales compared to the absence of an intervention*

H6: *The presence of peer group relevant TCT interventions indicating product recommendation and supporting social equity projects increases sales compared to the absence of an intervention*

To test above hypotheses, we will conduct an online experiment, which we will present in the next chapter. Our research model is depicted in Figure 1.

4 Method

To answer our research questions and to conduct our experiment we developed a mobile grocery store mock-up using the platform Uizard. We opt for a design similar to the mobile webpage of a German grocery retail chain, in which three choice options per screen and product category were shown. The environment was designed including typical optical features of popular mobile webpages, such as a wish list, profile page and alike (cf. Figure 2). Three common grocery categories were to be bought (coffee, bananas, cucumbers). We deliberately choose bananas and cucumbers as rather low involvement products and coffee as a high involvement product (Kuenzel and Musters, 2007) to mix between cheaper and more expensive products. Within the product category, we opt for a price tolerance of ±8% (92% / 100% / 108%) of the respective market price in January 2023 and decided to choose the most expensive products per category to be nudged to circumvent any price-induced effects on the decision (Hartmann-Boyce et al., 2018). To avoid brand affinity of the participants, we only chose generic no name products (cucumber, banana) or manipulated existing brand designs within one color spectrum (i.e., rust-brown for coffee). Furthermore, to avoid effects by sorting the products we mixed the nudge position between the products so that neither the nudged nor the cheapest product was at the same position within the three screens every participant had to go through. We created customer testimonials in a two-step approach. First, we designed our nudge interventions by following the DN design guidelines by Mirsch et al. (2018), namely by defining the nudge context and goal, the respective theory behind, specifically the digital nudge concept SN including the enrichment factor WG, TCT theory and social concern aspects to be covered within the interventions. Afterwards we created different textual claims as well as designs and aligned on the final selection within the research group in a common workshop. The TCT was then designed in the following manner: we randomly selected AI-generated pictures of average looking people per peer group to avoid any similarity with celebrities created by generative adversarial networks from the webpage thispersondoesnotexist.com. Generative adversarial networks are AI algorithms which generate infinite streams of photorealistic human faces, each of which is unique and never existed before (Karras et al., 2019). To cover all peer groups in our experiment, we chose to structure the interventions by age (18-29, 30-39, 40-49, 50-64, 65-99) and gender (male, female) and selected one picture per age group and gender to be the testimonial. Every age group was nudged by the same claim per intervention group (IG) (independent variables, cf. Figure 1), independent of gender. Hence, we applied two IGs (SN, SN+WG) and one control group without an intervention. Both IGs used the same SN claim, the SN+WG IGs was enriched with the corresponding WG claim (cf. Figure 2).



Product	Picture	SNx	SNxWGx	x
		"By buying this cucumber, I am doing something good for my health." - Eve, 19	*"By buying this cucumber, I am doing something good for my health and supporting digitalisation in developing countries." - Eve, 19*	1
		"This coffee makes me wake up faster and fit for the day." - Pia, 23	*"This coffee makes me wake up faster, fit for the day and 10% goes to projects against poverty in the country of production. Great!" - Pia, 23*	2
		"As an energy supplier, the perfect choice for a successful day!" - Kim, 26	*"As an energy supplier, the perfect choice for a successful day! Buying guarantees fair payment to the producer, great!" - Kim, 26*	3

SN1: positive product review; SN2: transformative effect; SN3: product recommendation; WG1: social inclusion; WG2: social justice; WG3: social equity; x=number of claim

Figure 2: Choice environment (from left to right: SN1+WG1 male 30-39, SN2 female 50-64, control) and TCT claims per intervention (translated to English, female 18-29 TCT)

The experiment took place in the academic version of LimeSurvey. We conducted a pre-test with 5 participants using a cognitive-pretesting method (cf. Koskey, 2016) to validate the survey and ensure participants understanding. Comments were incorporated into the survey as applicable. The final survey was done via a crowdsourcing platform (i.e., *Clickworker*) and participants were paid a small participation reward. Thoughtful use of crowdsourcing platforms expands participant diversity, capturing a wider range of demographics (education level, income, etc.) compared to traditional pools of university students, relatives, and friends (Mason and Suri, 2012). When starting the experiment, participants were confronted with an initial screen which was explaining the reason and the topic of the experiment including a disclaimer for data protection. After entering the survey, a number between 1 and 3 was created not visible to the participants to allocate the user randomly to the IG (1 SN, 2 SN+WG, 3 Control). Then, the survey was divided in three sections. To ensure a high quality of the answers provided by the crowd workers, we first asked for the user identification number of the participants (to identify abusive users), age and gender. In the second section the participants were first informed about the shopping task and confronted with the mobile environment in which they ought to choose their product of choice per product category in three different screens. Selections were saved per participant to be able to evaluate the purchase frequency (dependent variable) later on. Afterwards, a manipulation check question (*"Did you recognize a product recommendation?"*) to ensure participants recognized the manipulation of the independent variable as intended and an attention check question were asked, along with a question for the reasons for the selection (multiple choice) as well as the general attitude towards social equity on a 5-point Likert-scale. After collecting data on the participant's online purchase frequency per time period, the experiment ended with a concluding message.

5 Results

5.1 Descriptive Statistics

Out of a total of 556 participants we had to exclude 137 due to either failed attention checks (25), failed manipulation checks (97) or not finishing the study (15). Although

especially high for the manipulation checks (17,4%), exclusion rates are in line with other (digital nudging) experiments (e.g., Mager and Kranz, 2021; Schär, 2021; Schär et al., 2022; Terres et al., 2019). Within the remaining 419 participants, the distribution of the independent variables *Age* and *Gender* did only slightly differ compared to the German population, with a higher share of female participants and within the age group of 30-39 years as well as a relatively low number of participants older than 65 years (cf. further statistics in Table 1).

Table 1: Selective descriptive statistics and Welch ANOVA

Selective Descriptive Statistics

Controls	Mean	StD	Min	Max	N
Age Group*	2.42	1,098	1	5	419
Gender**	0.42	0.499	0	2	419
Dependant Variables - Purchase Frequencies					
SPF Cucumber	0.17	0.378	0	1	419
SPF Coffee	0.11	0.319	0	1	419
SPF Banana	0.17	0.378	0	1	419
Independant Variables - Intervention Groups					
SN	0.23	0.526	0	3	120
SN WG	0.80	1,021	0	3	135
Control	0.35	0.613	0	3	164

*Gender was dummy coded (0 male, 1 female, 2 diverse)
**Age Group was coded 1=18-29; 2=30-39; 3=40-49;4=50-64; 5=65-99

Welch ANOVA

Dependant Variables - Purchase Frequencies	Statistic***	df1	df2	p
SPF Cucumber	6.656	2	271.7	0.002
SPF Coffee	6.814	2	261.7	0.001
SPF Banana	19.946	2	252.5	< 0.001

*** Asymptotically F-distributed

To evaluate our experiment, we conducted several statistical analyses in IBM SPSS Statistics 28.0.0.0 (190) to examine the relationships between variables and test for significant differences. Firstly, we checked whether our data was normally distributed using Kolmogorov-Smirnova (using Lilliefors significance correction) and Shapiro-Wilk tests, with the result that the data was not normally distributed. The homogeneity of the variances was further checked with Levene's test, which showed that no equality of variances could be assumed ($p < 0.05$). To correct for variance heterogeneity we performed a Welch ANOVA, which showed that the purchase frequency of the single items (SPF) differed statistically significant for the different interventions (cf. Table 1). Thus, we were able to continue with our statistical analysis.

5.2 Planned Contrast Analysis and Regression Analysis

To test our hypotheses, we performed a planned contrast analysis for not equal variances to investigate on the specific differences between the three IGs (cf. Table 2). Contrast 1 compared SN1-3 against control (H1-3), while contrast 2 compared SN+WG1-3 against control (H4-6). Results showed that contrast 1 has a significant effect for the intervention SN1 on the product cucumber. Contrast value reveals a negative impact. Thus, the intervention was backfiring and SPF was worse than control (contrast value (CV)=-0.106; p=0,008), so we reject H1. We further have to reject H2 and H3, showing no significant effect against control for the interventions on coffee

(SN2: CV=-0.021; p=0.488) and banana (SN3: CV=0.004; p=0.902). Contrast 2 was found to be non-significant for the product cucumber and intervention SN1+WG1 (CV=0.040; p=0.394), but significant for both of the other interventions SN2+WG2 on coffee (CV=0.128; p=0.002) and SN3+WG3 on banana (CV=0.284; p> 0.001), thus accepting H5 and H6 (cf. Table 2). To control for influences of the product type on the effect of the SN interventions we additionally tested rather unfamiliar organic products in a follow up study, with no significant differences (p > 0.05) against non-organic products.

Table 2: Planned contrast analysis

SPF	Contrast	Contrast Name	Contrast Value	Std.-error	T	df	*p*
Cucumber	**1**	**SN1 - Control**	-0.106	0.040	-2.657	281.7	0.008 **
Cucumber	**2**	**SN1+WG1 - Control**	0.041	0.048	0.854	277.3	0.394
Coffee	**1**	**SN2 - Control**	-0.021	0.030	-0.694	273.8	0.488
Coffee	**2**	**SN2+WG2 - Control**	0.128	0.041	3.131	225.0	0.002 **
Banana	**1**	**SN3 - Control**	0.004	0.033	0.123	253.0	0.902
Banana	**2**	**SN3+WG3 - Control**	0.284	0.047	6.085	201.4	<0.001 ***

*indicates significance at 95%, ** at 99% , *** at 99.9% level

Table 3: Results of Binary Logistic Regression

Dependant Variable	**SPF Cucumber**				**SPF Coffee**				**SPF Banana**			
Control Variables	**B**	***p***		**Exp(B)**	**B**	***p***		**Exp(B)**	**B**	***p***		**Exp(B)**
Gender(1)	-0.683	*0.039*	*	0.505	0.080	*0.841*		1.084	-0.578	*0.135*		0.560
Gut Feeling(1)	0.371	*0.251*		1.450	0.439	*0.275*		1.551	1.321	*<0.001*	***	3.750
Appealing Product(1)	0.566	*0.096*		1.761	0.480	*0.249*		1.616	0.791	*0.048*	*	2.207
Price(1)	-1.487	*<0.001*	***	0.226	-1.919	*<0.001*	***	0.147	-1.046	*0.006*	**	0.351
Product Recommendation(1)	2.429	*<0.001*	***	11.348	2.634	*<0.001*	***	13.925	3.137	*<0.001*	***	23.031

* indicates significance at 95%, ** at 99% , *** at 99.9% level; sig. variables only

Additionally, we performed three binomial logistic regression analyses per each product to examine the relationships between the different variables and to identify significant predictors and their effect on the related SPF. With N=419 and a maximum of 11 predictors in our study the minimal sample size was exceeded to perform the analysis (Burmeister and Aitken, 2012) We used the Box-Tidwell procedure to test linearity (Box and Tidwell, 1962) and determined that all variables exhibited a linear correlation using Bonferroni correction (α =0.004). Multicollinearity did not have a confounding effect in the analysis, since the correlations between predictor variables were below r < .60. We removed outliers (cucumber: 0, coffee 1, banana 4) from the analysis because lever values were above the cut-off value of 0.2 according to Huber (1981) and their corresponding Cook distances were excessively high (Cook 1977). Overall models were statistically significant for all three products (cucumber $\chi^2(22) = 92.839$ p < .001; coffee $\chi^2(22) = 102.304$, p < .001; banana $\chi^2(22) = 152.254$, p < .001). Variance explanation was acceptable (cucumber $R^2 = .331$) or good (coffee $R^2 = .430$) or even very good (banana R^2=.520) using Nagelkerkes R^2 (Backhaus et al., 2021). Goodness-of-fit using Hosmer-Lemeshow-test indicated a good model fit for all three analyses (cucumber $\chi^2(8) = 5.768$, p > .05; coffee $\chi^2(8) = 8.914$; p > .05; banana $\chi^2(8) = 3.738$, p > .05). Decision reason *price* contributed significantly negatively in predicting all of the three SPFs (cucumber and coffee at 99.9%, banana at 99% level) and *product recommendation* significantly positively at 99.9% for all three products. SPF of banana was also

significant at 99.9% level for the purchase reason *gut feeling* and at 95% significant for decision reason *appealing product. SPF for cucumber was* as well found as negatively significant at 95% for *gender (female).* A detailed overview about the model coefficients and odds ratios is depicted in Table 3.

6 Implications, Limitations and Conclusion

The aim of this study was to investigate on peer group specific SN nudges using TCTs in the context of e-grocery. We further enriched the intervention with the theory of WG and measured its effects on consumer decisions. Our research model argued that the usage of these interventions will significantly increase purchase frequency against the control group. We found that especially the SN interventions were not successful, with SN1 (and SN2, though not significantly) even resulting in a backfire effect (Bicchieri and Dimant, 2022), so the intervention decreased the SPF compared to control. SN interventions indicating a positive product review seem to provoke counter reactions by the participants, leading to a lower purchase rate than in the control group without an intervention. We believe that the intervention was not able to overcome the moderate price difference of 8%, especially for the higher price product coffee, since price was shown as a negative factor (B=-1.905). We estimate that a higher price sensitivity due to the current high inflation rate and the ongoing energy crisis in Europe might have led to a more price sensitive choice behavior within the IG for SN. Although we opt to select equally looking product pictures, we cannot rule out a difference in *product appeal* between the choice options for the product banana, as found by the regression analyses. Also, altruistic actions, such as the act of supporting a purpose with the reward of a WG, work in the fast, intuitive cognitive system (Karlan and Wood, 2017), similar to digital SN nudges (Vlaev et al., 2016), thus we believe *gut feeling* had an influence on the SPF for banana. Unexpectedly, we could not find any significant effect on the SPF of the product cucumber, which tried to trigger support for the digitization of emerging countries (SN1+WG1). Since the single SN intervention was backfiring, we assume that the SN intervention was decreasing the overall effectiveness. Another possibility could be either that the understanding of the necessity of digitalization in emerging countries is low (Sunstein, 2016), since it is not directly supporting people (i.e., digital participation, access to information, improved quality of life, cf. Schoormann and Kutzner, 2020) or that participants may not perceive the project as a valuable contribution, as other priorities take precedence. Also, the relationship between effort (spending 8-16% more on a product) and benefit (reward in form of a WG) could be a possible reason for the participants not to choose the product (apart from the general reason *price* as found by regression analyses). Both other interventions related to social justice (SN2+WG2) and social equity (SN3+WG3) significantly increased consumers purchase frequency of the related products compared to the control group. Additionally, decision reason *product recommendation* had a highly significant statistical impact on the SPF of all products, which underlines the effectiveness of the interventions. Thus, the key contribution of this work is the finding that hybrid or enriched nudging concepts lead to a higher effectivity in terms of altering purchase behavior supporting societal

beneficial outcomes. The enriched interventions have used the same testimonials as well as claims and were only enriched by additional information about a purposeful contribution towards projects supporting social projects triggered by the WG reward. This shows a certain willingness to spend more money for more value (i.e., contributing to societal good to receive a WG reward). A possible WG reward seemed to be a valuable reason for our participants to choose the most expensive product in the choice environment. Also, our results provide empirical support for the efficacy of WG theory to foster support for social projects and are congruent with the finding of other studies (e.g., Iweala et al., 2019; Mahasuweerachai and Suttikun, 2022). Our research finds the usage of SN DNs in the context of e-grocery shopping as non-effective or even counterproductive, confirming results of other studies (e.g., Auf der Landwehr et al., 2021; Berger et al., 2020). Also, consistent with other studies (Jesse and Jannach, 2021; Zimmermann and Renaud, 2021), we showed that enriched DN can make a valuable contribution to more effective DN interventions.

However, our study was subject to several limitations. First, our participants were influenced by the prices used in the choice environment. Accordingly, we assume that income could be a variable for further studies to consider. Moreover, we suppose that the necessity to work as a crowd worker could indicate a lower than average household income, thus, controlling for the influence of available income could bring valuable insights of price effects on the support of pro-social purposes. Second, as we applied distinct product claims and choice options for each intervention group, we cannot entirely isolate the influence of the WG theory on the intervention's efficacy. Variations in buying behavior may not solely arise due to the nudge but also due to differences in the product features or appeal. Third, since we used a research panel in German-speaking countries only, we opt to choose mainly white, European looking people as testimonials. To investigate further in this context, testimonials could be tested which are more diverse in regards to outer appearance or gender, indicating belonging to a group which should be socially supported. Fourth, our experiment was conducted through a questionnaire that presented a mock-up mobile grocery store, and participants did not engage in actual grocery shopping. Conducting a field study in a real grocery store would likely yield more valid results. Therefore, research should involve companies to investigate on such initiatives that aim to elucidate the efficacy of enriched DN in real-world settings.

This study makes several contributions to the existing body of research. Firstly, we confirmed the non-effectiveness of SN interventions in e-grocery although personalized and using the concept of social presence in our intervention, consistent with other results in this context. Secondly, we examined a previously unexplored SN variant (typical consumer testimonial) in the context of digital nudges. Thirdly, we successfully enriched digital nudges following the concept of SN with the theory of WG with the goal to support projects related to pro-social purposes and hope, that our findings can help scholars as well as policy makers to foster more pro-social behavior. Yet, more research is needed to extend the knowledge in the area of DN fostering pro-social behavior, as the social aspect of sustainability still remains under researched but the imperative to enhance social equality on this planet remains an essential concern.

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