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Nudging healthier food choices in a cafeteria setting:

A sequential multi-intervention field study

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Abstract: Creating more health-fostering environments is high on the agenda of public and private actors. The behavioral approach to nudge people towards healthier food choices is gaining popularity despite limited understanding about where, and for whom, which specific nudges work. This study contributes by reporting on three different nudging interventions in the same setting and presents effects on different sub-populations. We find overall small effects that are heterogeneous, ranging from robustly more to even less healthy choices. We discuss the importance of transparency and reactance to health interventions and the potential interplay of interventions with habitual behavior among different sub-populations.

Keywords: (5) health nudges, food choice, cafeteria, reactance, habits

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1. Introduction

Unhealthy diets are associated with obesity and non-communicable diseases (NCDs) such as diabetes II (WHO, 2018). These NCDs encumber individuals themselves, their families, the economy, and ultimately the public health system. Despite substantial efforts to educate the public about the risk of unhealthy eating (Just & Gabrielyan, 2016), obesity rates continued to rise over the last decades in most parts of the world (NCD Risk Factor Collaboration, 2017). The failure to increase healthier diets by appealing to individual responsibility and restraint has spawned some advocacy to shift focus away from a predominantly individually centered cognitive approach towards an emphasis on the importance of the food environment. Studying the influence of food environments is likely to be increasingly relevant given that the continuous rise in out-of-home eating contributes to an ever-larger share of people's regular diet (e.g., for Germany; BMEL, 2018). Earlier research associates this trend with less healthy food choices (Nielsen, 2016).

Looking beyond individual health benefits and taking an employer's perspective, researchers have found that overweight and obese employees are less productive, enjoy less work satisfaction, and have more sick days on average than normal-weight colleagues (e.g., Harvey et al., 2010; Goettler et al., 2017). In Germany, where our study was conducted, the working population spends 34.8 hours per week on average at work (Federal Statistical Office, 2020), and 36% eat in a worksite cafeteria or go to a bakery or restaurant during the work week (BMEL, 2018). It is therefore in both the public and private interest to ensure an environment that promotes healthy eating among the population in general, and employees specifically.

Multiple studies have tested different health interventions in various food settings to assess how an intentionally designed food environment or small healthy eating nudges affect peoples' choices. A recent meta-analysis focusing on healthy eating nudges in field experiments

suggests an overall positive effect finding an overall Cohen's d of 0.23 or -124 kcal per day (Cadario & Chandon, 2020). However, results varied substantially with study characteristics. These findings are generally in line with several other review papers in the field coming mostly to the conclusion that nudges "hold promise", but many narrative reviews also report mixed and null findings (Allan et al., 2017; Arno & Thomas, 2016; Bauer & Reisch, 2019a; Broers et al., 2017; Bucher et al., 2016; Nørnberg et al., 2016; Skov et al., 2013; Wilson et al. 2016). Despite this considerable body of research, clear evidence of what constitutes a robustly efficient nudging intervention to foster healthier food choices remains somewhat unclear or, at least, highly context dependent (Cadario & Chandon, 2020; Szaszi et al., 2018).

To date, there is still a limited understanding about when, how, and for whom which types of nudges work—and when they fail. This can be attributed to several limitations of the research field of nudging. First, there is not one widely accepted specific "nudge theory" beyond the theoretical approaches of behavioral economics and cognitive and social psychology on which "nudging" is based. The field is mostly driven by empirical identification and exploitation of specific behavioral biases. Being still in its infancy, with the expected conceptual debates ongoing, this current field of research was characterized as "empirically rich but (still) theoretically poor" (Marchiori et al., 2017).

Second, and closely linked to the first point, is an ongoing debate about a taxonomy of different nudging interventions that impairs comparability and cumulative evidence creation (Blumenthal-Barby & Burroughs, 2012; Cadario & Chandon, 2020; Hollands et al. 2013; Hollands et al., 2017; Ly et al., 2013; Michie et al., 2013; Münscher et al. 2015). This becomes particularly relevant when one tries to evaluate the existing evidence regarding the effectiveness of nudges in a specific field by means of meta-analysis or systematic reviews.

Third, the uncertainty about the effectiveness of nudging food choices stems largely from the heterogeneity of the existing studies, which often lack sufficient research quality and vary

widely in setting, population, and methodology (Szaszi et al., 2018; Wilson et al., 2016). Hence, even if trials follow best protocol, many factors can have a pronounced impact on the external validity of the results and are often hard to detect ex ante (Deaton & Cartwright, 2018). Additionally, but not limited to nudging research, the academic publication process increases the chance that only the most successful interventions get published (so-called "publication bias"), which might create a positively skewed picture of the effectiveness of nudging interventions (see Gelman & Carlin, 2014; Hummel & Maedche, 2019; Ioannidis, 2005; Simonsohn et al., 2014).

This paper reports on three different interventions that aim to nudge employees towards a healthier food choice in a real-world cafeteria setting. A number of recent studies had a similar aim but mostly focused on the main effect, asking whether the intervention worked or not (see dos Santos et al., 2018; Friis et al., 2017; Marcano-Olivier et al., 2019; Mazza et al., 2018; Montagni et al., 2020; Winkler et al., 2018). While most studies find positive results and enrich the literature with evidence of promising interventions, they often fail to obtain evidence for a universal effect, highlighting the importance of heterogeneity between different contexts, interventions, or study populations. This issue is highlighted by many reviews and is essential to understanding the distributive consequences of health nudges beyond the main effects (Cadario & Chandon, 2020). In this study, we address the increasing importance of effect conditionality of nudges and focus on their boundary conditions. By exploring the effects of different nudges in the same setting and with different populations, we can assess potential effect heterogeneity of these interventions, which has important practical and theoretical implications. Therefore, the contribution of the present paper to the literature is threefold: First, we provide empirical evidence from three field trials in one corporate cafeteria, enlarging our collective empirical knowledge about which food-choice nudges may work (or not) for different target groups. Beyond the results regarding effectiveness, there is a lot to learn from both successful and unsuccessful field trials in terms of the design process and we suggest that our results have

immediate relevance for companies and other institutions that aim to design health-supporting worksite cafeterias.

Second, the study contributes to the scientific understanding of important moderating factors for nudging interventions. The large variety of nudges relies on different behavioral mechanisms, and effects might be conditional on several individual factors such as the presence of health goals or the degree of habitual behavior in the specific study setting. Moreover, we learn about situational factors that serve as barriers or drivers for change in food choices.

Third, earlier work suggests that acceptance of regulatory health nudges differs in Germany among socio-demographic groups, with a slightly higher acceptability among women and younger age groups (Reisch et al., 2017). We expect the present study to shed light on the acceptability of corporate health nudges in different age groups as we learn how best to design health interventions in cafeterias (and what to avoid).

The remainder of the paper is structured as follows: We first describe the overall study setting before explaining in detail the design, methodology, and results of three sequential interventions. We then discuss the results of all three experiments and reflect on their limitations. We conclude with general implications and suggestions for future research and policy.

2. The Present Study

2.1. The Setting

The three studies took place sequentially in the same corporate cafeteria between May and September 2017. The cafeteria is the main place for lunch of a medium-sized family-owned enterprise located in the south of Germany, with about 9,000 employees worldwide. About 5,300 employees work in Germany and are potential customers of the test cafeteria. For lunch, the cafeteria is generally open from 11:30 to 13:30. Customers require a payment card that the company provides to its employees and (non-employed) external guests. Customers must make a

basic decision about what they want for lunch before selecting their food: At the entrance, there are three access terminals. Paying at the first two terminals provides access to the whole lunch buffet ("all inclusive"), including three warm dishes. This option costs 5.20 EUR for regular employees and 7.40 EUR for external guests, while company trainees and interns pay a reduced price of 2.60 EUR. The third terminal, called the "Green Line," is most distant to the canteen entrance and allows a restricted access to the salad bar, the soup of the day, and a bread roll—i.e., a light, low-calorie, mostly meat-free lunch. This is symbolized by the name "Green Line" as well as by green duct-tape lines on the floor that guide the customer after passing the terminal along the Green Line buffet. The regular price for the Green Line is 2.70 EUR, and the reduced price is 1.35 EUR. All customers can enter the buffet area to inspect the food before making their choice. They can also inform themselves online about the offer of the day.

2.2.Data and Sample

The data used in this paper are largely sales data from the three cafeteria terminals. We investigate the effects of three different interventions as described below. The treatment effect is measured by a change in the probability of choosing the Green Line for lunch. In addition to the data from 2017, we received the terminal data of the corresponding period from the year 2016, which is used as a control in Studies 1–3.

The Green Line can be reasonably assumed to be comparably healthier than the alternative choices since it provides full access to the salad bar of the cafeteria while limiting availability of calorie-dense main dishes, which are usually high in meat and carbohydrates. Even though the data did not allow for the identification of specific individuals nor for an exact presentation of the individual food choices or calories per meal, the terminal sales record did offer the opportunity to distinguish between different groups of canteen users' choice of type of lunch (Green Line or regular line). For our analysis, we focused on four groups, namely: regular employees, trainees,

interns, and guests. We excluded other customer groups that did not match our study population or could not be reasonably matched to one of the groups (e.g., due to cash payments, replacement cards, and owner family).

Even though we do not have detailed information about the different subgroups, the groups of trainees and interns on average differ from regular employees in their demographic characteristics, being younger and still in their educational phase. The group of *trainees* (in German: "Auszubildende") at the analyzed company consists of regular trainees that just finished secondary school as well as students from a special German type of school that connects vocational training and university courses ("Duale Hochschule"). On the national level, 27% of trainees in Germany had a lower secondary-school diploma ("Hauptschulabschluss") , 43% had a higher secondary-school diploma ("Realschulabschluss"), and 28% an high-school certificate qualifying for university admission ("Abitur") (BMBF, 2017). The average age in Germany for this group is 19.7 years (BIBB, 2017, p. 178). Company specific information about the group composition stems from personal interviews with staff, describing the typical trainee to be between 17 and 23 years, predominately male, and enrolled in a wide range of vocational career programs focusing on technical disciplines.

The group of *interns* ("Praktikanten") at the company was by far more diverse in terms of age and educational level; also, interns in this company tend to stay for a shorter duration at the company than regular trainees. Interns included high school students from secondary school (from 13 years on), but they were predominantly bachelor and master students as well as graduates. They covered a large number of different disciplines, ranging from technical courses of study such as mechanical engineering to economic courses of study or even sports or sociology. In the focal company, the share of highly qualified interns was comparatively high, probably since the company is an international high-tech champion and market leader, and the gender composition was reported to be more balanced.

Overall, it is safe to say that compared to trainees, company interns were on a higher educational career track, spanned a wider age range, and were older on average. While the group of trainees can be regarded as a cohort, the group of interns was much more diverse. Taken together, these two groups were significantly younger than the other customer groups (guests and regular employees).

Even though we have no information about individual characteristics of the group of *guests,* we assume that these customers frequent the lunch setting irregularly, with their food choices possibly less driven by habitual behavior compared to regular employees of the company (Gardner, 2015; Gardner et al., 2011). The *regular employees* are full- or part-time workers who might have joined the company after completing their training and typically work there until their retirement. A summary of the sales data per customer group and per weekday from 2016 and 2017 is provided in ***Table 1.*** While overall use of the Green Line is slightly below 20%, one can see systematically that lower values are observed for trainees and on Thursday. While we discuss the former deviation below in more detail, the latter can simply be explained by employees' preference for "Schnitzel," which is regularly served on Thursday in the all-inclusive line.

TABLE 1 ABOUT HERE

2.3. The Three Interventions

As reported by the corporate health-management team, the company had observed a deterioration of the health status of their employees in general and of their trainees in particular. For instance, the number of long-term illnesses had increased while the job expectations had increased. In 2014, the company's health management started to offer courses and initiatives targeted specifically to young employees on healthy food, relaxation and stress reduction, as well as physical activity. The goal was to create awareness of healthy lifestyles at work and beyond in

an entertaining and attractive way. During our intervention time, however, there was no specific health training and no specific campaign.

The overall aim of this study was to assess the effectiveness of three different nudging interventions on the four target groups. Table 2 provides an overview of the setting of the three studies, while Figure 1 outlines the sequential study schedule.

Study 1 included only the young subset of employees, namely trainees and interns, and assessed the effect of reminding messages (henceforth *reminders*) to activate different goals related to choosing the Green Line. Goal activation in the moment of decision-making, often tested in priming interventions, has received attention in the field. Even though a review finds the evidence to be mixed (Wilson et al., 2016), the use of health cues is found to improve self-regulation in food choice (Papies, 2016; Papies & Veling, 2013). Studies using eye-tracking (van der Laan et al., 2017) and fMRI (functional Magnetic Resonance Imaging) data (Hare et al., 2011) offer valuable insights into the underlying mechanisms. Following the theory of goal-framing that is based on evidence that human perception, thinking, and deciding are organized in a modular way and people may strive for several overarching goals (as the ones emphasized in the email messages). External cues activate which of these latent goals becomes focal (i.e., which is the goal-frame), and hence which goal has the greatest influence on cognition and motivation (Förster et al., 2007; Lindenberg & Steg, 2007). Hence, our interventions aimed to activate mental structures congruent with the choice of the Green Line and thereby increase the number of people (here: trainees and interns) choosing it for lunch. The messages, sent via the company's email system just before lunchtime, pointed out the benefits of the Green Line with four different goal frames: We included three pro-self frames (i.e., better health, better price, and better work performance) as well as one pro-social frame (better for the climate). Upon receiving the sales data, we discovered that the sample size of the relevant groups was smaller than expected. Given

the low statistical power we concluded that differences between these frames could not be analysed in a meaningful way.

In Study 2, we increased the attractiveness and relative *convenience* of the Green Line by adding a "hassle factor" to the less healthy options (de Vries et al, 2020). In this natural field experiment, we exploited the fact that one of the regular terminals for the "all inclusive" meals was out of order for five consecutive days, which increased queueing time for this option in periods of high demand. Hence, access to the Green Line was comparatively more convenient, which provided an incentive to change from "all inclusive" to the Green Line. This type of nudge ("increased convenience") has been studied in various forms by changing the proximity, position, and accessibility of different food options and thereby changing the "micro convenience" of options (Hollands et al., 2017). Bucher et al.'s (2016) review of positional changes of food items found a consistent positive effect on healthier food choice, and the study recommended to employers and cafeterias that healthy food "should be placed in easily accessible and prominent positions." Effectiveness was, however, hard to quantify, and the authors call for more studies to assess the importance of different individual factors (i.e., habits, preferences) on the effectiveness of these nudges.

Study 3 increased the *salience* of the healthier option, an intervention that can be considered as distinct from priming since it aims to attract attention to the nudged alternative or different aspects of the choice characteristics (Blumenthal-Barby & Burroughs, 2012). Due to the mixed evidence about salience nudges, more research is needed before making general recommendations for their use (Wilson et al., 2016). In our experiment, we applied green footstep stickers for several weeks on the floor leading to the Green Line to make it more salient and thereby motivate people to choose this line. The footsteps started directly from the entrance of the canteen and guided the customers to the terminal of the Green Line, which was the most

distant from the entrance. The stickers were designed and placed by the company itself to align with their corporate design.

All three interventions were designed in cooperation and agreement with the canteen personnel and were presented and agreed to by the management and the working council of the company for ethical review and adherence to data-protection regulations. Ethical approval was received following the guidelines at the [*institution removed from the masked review version*].

TABLE 2 ABOUT HERE

FIGURE 1 ABOUT HERE

3. Reminders (Study 1)

3.1. Design and Procedure

Using the company's email system, *reminders* were sent to young employees (trainees and interns) highlighting the benefits of choosing the Green Line for their next meal. They were sent by the occupational health and social management of the company on our behalf with four different reasons: health reasons (benefits of fruits and vegetables), economic reasons (saving money), environmental reasons (climate relevance of meat), and productivity reasons (not getting tired after lunch). *Figure 2* shows an example of an email full message and a reminder.

FIGURE 2 ABOUT HERE

Employees in the treatment group received two emails each week for four weeks, so eight in total. On Monday or Tuesday, we sent an email with the main message and followed up with a short reminder on Wednesday or Thursday, respectively. No email was sent on Fridays. Emails

were sent in the morning before the regular lunchtime that starts at 11:30 am. The four themes differed each week to avoid redundancy, and they tested different goal-frames aiming to activate different but common goals associated with a healthy and plant-based diet (see a detailed overview of email schedule and content in the supplemental material Tables A1 and A2).

3.2. Data and Analysis

To analyze the effect of our intervention, we primarily rely on a pretest-posttest non-equivalent group design using matched data from the previous year as a control (Price et al., 2019). Psychologists and economists frequently rely on field experiments using such non-random control methods when the importance of context prohibits the use of laboratory research, and the field setting is unsuitable for individual randomization. We selected this design for two reasons: First, individual randomization within certain subgroups would have increased the risk of spillovers, as people are expected to talk about the ongoing interventions (Sinclair et al., 2012). Second, corporate and public data-protection policy would have required a lengthy and uncertain approval process if we wanted to link intervention assignment with the individual outcome beyond group affiliation; this technically prevented randomization on the individual level.

The decisions related to study design always entail researchers' judgment about different sources of bias that might hamper the analysis of the effects (Madsen & Stenheim, 2015). The method applied in our study, often called difference-in-difference analysis, avoids within-group contamination and yields unbiased causal effect if the treatment and control groups would have followed the same consumption pattern over time in the absence of our interventions (Wing et al., 2018). The data from 2016 was matched to the 2017 data to minimize deviations in the seasonal calendar, such as holidays and new cohorts of incoming trainees, and differences between treatment and control period were two calendar days or less. While data from the previous year allowed for accounting for potential seasonal or time trends during the intervention

period, year-group specific events remain a threat for our design. We provide the additional estimation with varying controls and a simple pretest-posttest analysis to assess the robustness of our results.

In Study 1 (as in the two other studies), we use a linear probability model to estimate the probability of choosing the Green Line. Additionally, we control for day of the week fixed effects to capture differences in presence or menu composition. To account for the nested structure of our data, we cluster the standard errors on the day-group level. A re-estimation of all regressions using a logit model provided virtually identical results; the regressions are available from the authors upon request. In all three studies, we adjusted the baseline to the intervention period and compared the use of the Green Line. In Study 1, this time was 20 days and ranged from five weeks (due to a number of public holidays) before the first email to four weeks during the intervention.

3.3. Results

Because we exposed the two groups, i.e., trainees and interns, to the same treatment, we first pooled them together as one group to achieve the highest statistical power. Our estimates showed a reduced probability of choosing the Green Line during the time that trainees and interns received email reminders about potential benefits (see ***Figure 3***). This effect was small but statistically significant (beta = -0.04, p = 0.04, 95% CI [-0.08, -001]). Testing the groups individually, we observed that the negative effect was mainly driven by the group of interns, who showed a stronger and highly significant reduction in their healthy choices (beta = -0.09, $p <$ 0.001, 95% CI [-0.14, -0.04]). Significant effects on trainees were not observed.

This method relied on the assumption that in the absence of our intervention these groups would have followed a similar trend in food choice over the four weeks of intervention compared to the previous year. Hence, an inspection of the baseline trend between the treatment and control

groups helped us assess the validity of this assumption and the interpretation of the results. In the baseline weeks, food choices showed a remarkably similar trend between 2017 and the 2016 matched control (see Figure A1 in the Appendix for non-parametric predictions of the trend controlling for day-of-the-week fixed effects). To our surprise, during the first week of our intervention, healthy choices declined in 2017, while they slightly increased in the 2016 control, which might have contributed to the significant difference of our analysis. Hence, we conducted additional statistical tests on the 2017 data alone.

In an alternative model, we matched our intervention groups with untargeted regular employees over the same period. The joint analysis also showed negative effects on food choices in the younger group, which were similar in magnitude and only significant on a 10% level (beta = -0.03, $p = 0.09$, 95% CI [-0.07, 0.004]). Again, the negative effects were driven by interns (beta = -0.04, $p = 0.03$, 95% CI [-0.09, -0.004]). The simple pre-post analysis echoed the results from the two other models for interns, but effects were weaker and not significant on the 5% level (beta = -0.03, $p = 0.096$, 95% CI [-0.07, 0.006]).

FIGURE 3 ABOUT HERE

4. Convenience (Study 2)

4.1. Design and Procedure

Study 2 evaluated a natural experiment, which occurred coincidentally during the time of data collection. For five working days at the end of July and the beginning of August 2017, one of the two "all inclusive" terminals was out of service due to technical problems. On usual days, more than two thirds of the customers used these two lines; hence, this technical malfunction made access to the "all inclusive" area more cumbersome and created longer lines during high demand times. This, in turn, made the Green Line comparably more attractive, and we

hypothesize that this caused customers to change their lunch choice for the sake of *convenience*. One of the robust results of prior studies in choice architecture of micro-environments and their impact on behavior indeed indicates that increasing "micro-convenience" can have marked results (Hollands et al., 2017).

4.2. Data and Analysis

As all customers were equally affected by this natural experiment, we included all four customer groups in the analysis (as in Study 3). Also, we used a pretest-posttest non-equivalent group design as in Study 1 to estimate the effect of the increased inconvenience of the "all inclusive" line on Green Line use. Choices were compared to the corresponding data from the previous year, same period and length (five working days), as a control. Noteworthy, we excluded one day during the baseline period, as the data for this day suggested major irregularities with the later malfunctioning terminal. Five days before the actual failure, the terminal indicates that sales were less than one fifth of the average sales within this week. The reason for this difference could not be reconstructed. We hence disregarded the day and extended the baseline period by one day.

4.3. Results

The results for the group of regular employees (this excludes trainees, interns, and guests) indicated a comparably large and significant increase in the probability of choosing the Green Line (beta = 0.08, $p < 0.001$, 95% CI [0.05, 0.12]) (see Figure 4). No significant difference was observed for trainees and interns treated as one group (beta = 0.01, $p = 0.761$, 95% CI [-0.06, 0.09]), nor when analyzed separately. Customers identified as guests showed an increase in Green Line use, which was, however, not statistically significant (beta = 0.05, $p = 0.214$, 95% CI [-0.03,

0.13]). The temporal trends are illustrated in Figure A2 and reflect the volatility of choice, particularly among the small groups.

The lack of difference for the subgroups might be partly attributed to the rather small sample size providing weak power for our subgroup analysis (trainees: n = 1,083, interns: n = 470, guests: n = 673). Given the short time of only ten working days, potential time trends might be of less concern (see Figure A2). The simple pre-post comparison supports the positive findings for the group of regular employees, even though differences are smaller in magnitude (beta = 0.05, $p < 0.001$, 95% CI [0.03, 0.07]). Guests showed a slightly stronger increase that reached statistical significance (beta = 0.06, $p = 0.02$, 95% CI [0.01, 0.12]). No effect was found for the other customer subgroups. Hence, the comparable increase of convenience for the Green Line, resulting from the additional hassle with the only alternative, positively affected the largest subgroup of regular employees and guests, who are observed to make the healthier choice.

FIGURE 4 ABOUT HERE

5. Salience (Study 3)

5.1. Design and Procedure

In Study 3, we aimed to increase the *salience* of the Green Line. The terminal for the lighter, healthier lunch was located further from the entrance than the all-inclusive terminals, which could be a disadvantage in terms of choice architecture and natural customer default. To make the Green Line option more salient, we used green footstep stickers intended to guide customers directly from the entrance to the Green Line. These stickers were put in place on a Friday afternoon (end of the final baseline week) and stayed there until the end of data collection (see Figure 5).

5.2. Data and Analysis

To estimate the effect of the footsteps on sales, we employed the same method as in Study 2. The data are based on a four-week baseline comparison during the four weeks after the footsteps were put in place.

FIGURE 5 ABOUT HERE

5.3. Results

Increasing salience through our footsteps intervention showed no effect on the group of regular employees, according to our main method of analysis (beta = -0.01, $p = 0.46$, 95% CI [-0.03, 0.01]), nor was there an effect on the pooled sample of trainees and interns (beta = -0.02, $p = 0.268$, 95% CI [-0.06, 0.16]) (see Figure 6). When we analyzed the groups of young employees separately, trainees showed a small positive but insignificant effect on Green Line choice after the implementation of the footsteps (beta = 0.03, $p = 0.10$, 95% CI [-0.01, 0.08]). Similar to Study 1, we find a negative effect on interns, which is comparably strong and statistically significant (beta = -0.15, $p < 0.001$, 95% CI [-0.21, -0.08]). A small positive but insignificant increase was observed for guests (beta = 0.04, $p = 0.204$, 95% CI [-0.02, 0.11]).

The comparable pre-post analysis without 2016 data as a control did support the small positive effect for the trainees, which was statistically significant (beta = 0.04, $p = 0.006$, 95% CI [0.01, 0.07]). A significant effect was also observed for guests (beta = 0.04, $p = 0.049$, 95% CI [0.00, 0.07]). For interns, we obtained a negative but much smaller effect, which failed to reach statistical significance at the conventional level (beta = -0.04, $p = 0.125$, 95% CI [-0.08, 0.01]). This finding is in line with the observation of a strong increase in the 2016 control, which contributed to the large negative effect in the analysis using this data as control (see *Figure A3*).

FIGURE 6 ABOUT HERE

6. General Discussion

Overall, the aim of the three studies was to examine how small "nudging" interventions in a company cafeteria can influence different employee and customer group choices towards a comparably healthier lunch option. Our results suggest that the overall effects of these different nudges were small, and results differed substantially among subgroups. Unexpectedly, our interventions even led to a reduction of healthy choices among the interns.

For Study 1, we did not observe any clear increases, which could be explained by several factors: Using email reminders that activate goal structures might be too far from the moment of decision-making to be effective, or the messages themselves did not tap into the right goals (Papies, 2016). The recipients of the messages might also actively engage in information avoidance to avoid a hedonic loss of the meal experience through the considerations of health, monetary costs or the environment (Sharot & Sunstein, 2020). This might be especially true for the groups of interns and trainees that are quite young. Moreover, most trainees are male, and the group of interns has a balanced gender ratio. For comparison, Thorndike et al. (2020) find increased healthy purchases for their treatment group in a similar experiment with email reminders in hospital cafeterias. However, their sample consisted of 79 % women, and the mean age was 43.6 years.

The messages in Study 1 exclusively focused on the instrumental benefits of chosing the Green Line. Even though such cognitive approaches have successfully changed food choices in multiple studies, effects were on average smaller than those focusing on affect or behavioral elements (Cadario & Chandon, 2020). The concept of epicurean eating could provide an alternative approach by shifting focus on the pleasure of food (Cornil & Chandon, 2016). Such reframing of healthy choices as something hedonically beneficial rather than a sacrifice for another instrumental benefit might not only foster healthier choices on a wide scale (Vaillancourt

et al., 2019), but could also reduce potential side effects. Also, the association between taste and health has been shown to differ between samples in prior studies (Werle et al., 2013). While it might be a relevant moderator in the present study, this could not be investigated given its design.

As this intervention did not yield robust positive results, this echoes the uncertainty about the effectiveness of reminders or related priming nudges outlined by previous reviews (Cadario & Chandon, 2020; Wilson et al., 2016). However, our data suggest that the intervention reduced the use of the Green Line during lunch for younger and less educated customers.

Study 2 was not a planned intervention, which we therefore characterize as a natural experiment. Even though we did not observe differences for trainees and interns, reducing the convenience of the "all inclusive" buffet choice provided the strongest and most robust effect among the largest customer group of regular employees. This "nudge" differed from the other two interventions by its transparency and mechanism. While Studies 1 and 3 both relied on an underlying goal associated with the use of the Green Line that we aimed to activate or make salient in different ways, Study 2's effect builds on adding time costs to Green Line alternatives. The longer waiting time associated with the malfunction of one "all inclusive" terminal seemed to be enough to alter people's choices towards the now comparably more attractive Green Line. These results are in accord with previous studies that effectively increased the micro-convenience of healthier choices (Bucher et al., 2016; Cadario & Chandon, 2020) or added a "hassle factor" to less healthy ones.

In Study 3, we placed footsteps on the floor to increase salience and provide a guide—an intervention that has been applied in earlier studies (e.g., Hansen & Jespersen, 2012). However, our results indicate virtually no effect on the large group of regular employees. Although results were small, interns again showed a negative reaction to the intervention, while trainees and guests, however, seemed to respond most positively.

Taking the results at face value, we observed a negative effect in Studies 1 and 3 for interns. Pooling the data from both experiments for interns, our model predicted a reduction in Green Line use by 5.7% (pre-post; $p = 0.001$, 95% CI [-0.09, -0.02]) to 13.9% (previous year as control; $p < 0.001$, 95% CI [-0.18, -0.10]). However, no negative effects were observed in Study 2. Despite the comparably smaller sample size available for this study, this absence of a negative relation could be explained by the different level of transparency of the respective studies. Given the evidence that interns showed adverse effects to the interventions that aimed to alter their food choices, Studies 1 and 3 could be clearly identified as such. Personal emails highlighting the benefits of the Green Line as well as green footsteps guiding customers were salient interventions that were clearly visible and easily discernible as attempts (of the company) to influence employees' food choices, something that might be regarded as being too intrusive to be acceptable. Such a negative effect resulting from our efforts, which was primarily observed among interns, could have been caused by a reactance of employees (Just & Hanks, 2015; Kavvouris et al., 2020; Kivetz, 2005). Reactance is a motivational state characterized by a strong need for autonomy and freedom of choice (Miron & Brehm, 2006). It is a reactive concept, i.e., it is only activated if a person feels loss of freedom. While policies based on libertarian paternalism (nudges) are intended to be freedom-preserving by design (Thaler & Sunstein, 2008), some nudges might be perceived as intrusive and not offering the option to opt out to a satisfactory degree (Schmidt, 2017). Nudges that are viewed as infringement of autonomy are less accepted and might lead to reactance. While such counter-reaction has been observed in some previous studies (Faith et al., 2004; Witte & Allen, 2000), empirical support for the concern of reactance to transparent nudging intervention remains limited (Just & Gabrielyan, 2016; Loewenstein et al., 2014; Mols et al., 2015). In this context, we highlighted sustainable and health attributes of the Green Line which might be perceived as "uncool" among interns, thereby amplifying peer pressure against the selection of the Green Line by the two transparent

interventions (Stead et al., 2011). This theoretical explanation of reactance is backed by some feedback we received from the employees during the intervention period. One intern complained particularly about the "paternalistic" email reminders and announced a purposeful avoidance of the Green Line in response. We can only speculate that interns might be less embedded in the corporate culture and have less trust and loyalty to the company and are therefore more critical towards the message's source (Wilson & Sherrell, 1993) and perceive them as more intrusive.

The broken terminal in Study 2 was, however, not a transparent intervention as such, which might have prevented reactance by interns as a response to this change in the choice architecture. In earlier studies, making the nudge transparent did not impair its effectiveness (Bruns et al., 2016; Loewenstein et al., 2014). However, both of these studies were not focused on healthy food but on reducing carbon emissions and on end-of-life decisions.

As opposed to interns, external *guests* showed a general positive response to both interventions that affected them (Studies 2 and 3). Overall, our interventions increased external guests' Green Line use by 4.5% (pre-post; $p = 0.008$, 95% CI [0.012, 0.078]) and 4.8% (previous year as control; $p = 0.106$, 95% CI [-0.01, 0.11]). While results were similar to that of regular employees in Study 2, guests showed a more positive response to the footsteps in Study 3. We hypothesize that guests and irregular visitors are less likely to be guided by habitualized behavior as regular employees are through their daily eating routine. Hence, our footsteps could have provided this customer group with useful guidance in a new food environment as a contribution to the observed effects. Strong prior habits are a known barrier to behavioral change (Kwasnicka et al., 2016), which might impair the ability of the salience nudge to affect choices.

However, the positive effect of Study 2 on guests and irregular visitors is expected to be temporary and to vanish as soon as the broken "all inclusive" terminal was fixed as five days were too short to establish new habits or food routines. We tested this by comparing the five days after the intervention to the five days during and five days before the terminal malfunctioned.

The results show that already in the five days follow-up, no effects could be detected, and dietary behavior went back to baseline (see Table A9). Food behavior is a very complex topic that is driven by many factors, and developing of new food routines will in all likelihood take more time (Köster, 2009). The importance of strength of prior unhealthy habits has received little attention in the nudging literature and is mostly discussed as an argument against mere information provision (Gardner et al., 2012), but it could also moderate the effectiveness of specific nudging interventions. Alternatively, guests might also be under less time pressure than regular employees and, hence, be more attentive to cues in the environment.

The habit explanation was, however, supported by our positive findings of the salience intervention on the trainees. Following the German education system, new trainees often start in their traineeship between August and September, which is when the intervention took place. In line with the so-called habit discontinuity hypothesis (Verplanken & Roy, 2015), positive effects from our third intervention might be partly attributed to the fact that trainees had not yet formed strong habits in the new cafeteria environment, and salience of the Green Line was able to alter their choices.

The results from this field experiment based on three separate interventions should be interpreted with several limitations in mind. Fostering healthier food choices within a real company setting was associated with some restrictions that impaired a more thorough intervention design and more rigorous evaluation method. In Study 1, we were able to target only the specific subgroup of trainees and interns for our email reminder. Such restrictions made it impossible to implement a fully randomized design. Additionally, the sample size of the targeted individuals was rather small, which is problematic, as we had no information about the share of people who actually opened the email and saw our message before their eating decision was made. Yet these limitations cannot fully explain the observed effects. Both aspects, however, limit

the power to detect any true effect, while increasing the possibility of obtaining false positive or exaggerated results (Gelman & Carlin, 2014; Simmons et al., 2011).

As Study 2 was not a designed experiment, we used data to evaluate the effects ex-post. The malfunctioning terminal occurred between the two scheduled interventions, for which we had limited washout periods between the interventions. The analytical baseline period for Study 3 started less than a week after the terminal was repaired. We find little evidence for potential carry-over effects between Study 2 and 3, as dietary behavior quickly returned to baseline levels (see Table A9). We assume that the risk of Study 2 being effected by Study 1 to be small, given the small and subgroup-specific effects of Study 1. However, the treatment period was only five days, and a longer period would have been desirable.

We initially planned to pair the green footsteps in Study 3 with health- and dieting-related priming words. However, because of the negative feedback received in Study 1, a more salient—and potentially more effective—intervention design was rejected by our corporate partners. Given that at least some employees expressed behavior in line with reactance to the first intervention, we cannot say with certainty whether the estimated effects to the more subtle intervention in Study 3 would have been observed without the prior interventions. While we did not observe any long-term behavioral difference, we cannot rule out that the actual responses to the intervention in Study 3 were altered by the prior exposure to Study 1, which however only targeted trainees and students. This drawback is naturally intertwined with the sequential design of the studies presented here.

Overall, the payment setting allowed for a clear and easy-to-collect outcome measure of food choice, which is a strength of this study. However, this design and existing data privacy regulation prevented us from gathering detailed socio-demographic information on the individual level. The group affiliation was determined by the system and it would have been desirable to obtain more detailed information about the individual group members and their attitudes.

Furthermore, we have no assessment of potential effects of our intervention on the quantity of consumption and the amount of food waste that was created. Even though choice is a strong predictor of consumption (Robinson et al., 2015), we cannot directly assess whether nudging customers towards the Green Line affected the amount of food consumed and ultimately changed the calories consumed.

Given the field setting, we had to rely on non-random experimental approaches that do not allow for a clear identification of the treatment effect. We therefore present the estimates of different methods, which sometimes gave inconclusive results. Whether a simple pre-post design or the use of matched controls provides a better estimate of the real treatment effects cannot be determined with certainty. Seasonal differences in the sample composition, such as the entry of new trainees between August and September, have potential implications for effect size estimates of our interventions. The matched data from the previous year should account for these variations, as long as the turnover of employees remained comparable. We have no indication for any structural change between the two years of data collection. Varying sample sizes and overall small effects might additionally impair a clear comparison between different groups and interventions. We attempt to address this issue by trying different modelling techniques and pooling data to access overall effectiveness. As we did not make any hypothesis about the effect heterogeneity ex-ante, the group differences and their interpretations must be considered exploratory. Field trials generally have a high potential to deliver external validity; in practice, however, they also often require compromises on methodological, which is the root cause for most of the above-mentioned limitations (Eden, 2017).

7. Implications and Future Directions

While the literature is growing steadily, little is known to date about the interplay of food choice setting, individual differences, and the efficiency of nudges. This study provided a

comparative analysis of different nudging interventions and subgroups within the same setting and revealed a marked heterogeneity among different subgroups and interventions.

While Study 2 indicated positive effects for regular employees and guests, interns seemed to have reduced their healthy choices in response to our interventions in Studies 1 and 3. Regarding the reminder study, qualitative evidence (email responses to our interventions) showed that reactance to the interventions might be the reason for this observed negative effect. We therefore conclude that choice architecture and other nudges are clear determinants of food choice, and our study provides further evidence supporting the fundamental attribution error when it comes to individual responsibility for food choice. However, due to a complex interplay with psychological factors, even benevolent nudges can be counterproductive, and a one-size-fits-all choice architecture might not be equally beneficial to all sub-populations. These dynamics might be the central reason why cognitive interventions frequently yield less reliable results compared to those targeting behavioral aspects (Cadario & Chandon, 2020). In some cases, an intervention might not only be ineffective, it can create the opposite of the intended effect and reduce healthy food choices. This underlines the importance of the often-stated advice to develop target-group-specific interventions and messages (Sousa Lourenço et al., 2016), and to test them empirically for their effectiveness and unintended side effects (Bauer & Reisch, 2019b).

The current study also highlights the difficulty of obtaining clear results from experimental studies with non-random assignment, particularly when effect sizes are likely to be small. To provide more reliable results in the future, researchers would benefit greatly from unrestricted access to the setting and data to implement better study designs and exploit the full potential of modern payment technology. Even within our study setting, the available technology would have allowed us to follow individuals over time and roll out a fully randomized design for our email intervention. This was, however, not possible for reasons of data protection and the concern of interference with the regular work process (sending too many emails).

Our field trial has several strengths and contributes to the emerging topic of nudging healthy food choices in cafeteria settings. Overall, our study suggests that direct change in the convenience of food availability provided a robust effect among a large consumer group. Guests who were less likely to be guided by a habitual routine showed comparably stronger results, which implies that salience nudges might be less effective if behavior is strongly driven by habits. We therefore show that some types of nudges are promising tools to enhance healthier choices in such settings. This has practical implications for health-focused corporations as well as for public policy, such as application in public canteens that increasingly work with similar health nudges as those tested in the present study. The more and the better the evidence on what works—including unintended side effects such as reactance that undermine nudging efforts—the more straightforward the suggestions for healthy canteen design and choice architecture can be. Much more empirical field research is needed, including the replication of these findings to assess their robustness and reliability outside the specific context of this study.

To avoid reactance effect, it might be a good strategy to invite the employees (the young employees in particular) to participate systematically and actively in the design of a corporate health program. Transparency, participation, and co-design will likely help corporate health management to develop acceptable, supported, and potentially effective health nudges (John, 2018; Sunstein & Reisch, 2019). We also suggest that emphasizing the "epicurean pleasure" of healthy meals might be a fruitful mechanism for future interventions that could potentially avoid reactance (Cornil & Chandon, 2016). We therefore hope that future research enriches the literature in this direction.

Overall, the three field trials add to the growing empirical knowledge about which nudges and choice architecture may work (or not) to move different target groups towards healthier food-choices. While the results regarding effectiveness are modest, we add to the evidence of successful and less successful design process in worksite field trials, and shed light on individual

barriers such as reactance effects; of institutional barriers such as sceptic management; and of setting barriers such as the build environment. Knowing more about "what works", but also about pitfalls of interventions is of immediate relevance for companies and other institutions that aim to design health-supporting worksite cafeterias. Moving towards healthier diets – for people and planet – has become a high-priority political goal that needs the active support of all actors in the food system: from farmers to industry, retail to restaurants, and school to worksite cafeterias. The latter constitute choice environments where consumers (or citizens, employees, students) face a curated choice of assortments of meals to decide upon individually but embedded in social situations, often under peer- and time-pressure. Curating such an interface – or designing such a choice environment – means both a powerful lever to change and a social responsibility.

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Tables

Table 1. Summary of sales data.

	2016		2017	
	Green Line	N	Green Line	N
Regular employees	0.17	70,225	0.18	77,018
Trainees	0.12	4,799	0.09	3,777
Interns	0.17	2,390	0.14	2,295
Guests	0.21	2,617	0.21	2,617
Monday	0.2	15,838	0.21	17,305
Tuesday	0.19	17,170	0.2	18,683
Wednesday	0.17	16,849	0.19	18,628
Thursday	0.11	16,895	0.13	18,422
Friday	0.17	13,279	0.17	14,159

Notes: Column "Green Line" indicates the share of users choosing the Green Line in the group.
N = total number of meals sold between 17.05.2016 and 29.09.2016, and between 15.05.2017 and 29.09.2017

Table 2. Overview of the three interventions

Nudge type	*Reminders*	*Convenience*	*Salience*
Details	Different goal-related email messages associated with the GL just before lunchtime	Limiting easy access to the GL alternative by reducing the number of "all inclusive" payment terminals	Increasing salience of the GL by sticking guiding green footprints on the floor from cafeteria entrance to GL terminal
Target group	Trainees, interns	Regular employees, trainees, interns, guests	Regular employees, trainees, interns, guests
Analytical method	Past year control & regular employees as control. Pre-post method.	Past year control as control. Pre-post method.	Past year control as control. Pre-post method.
Beginning & end of the field time	15th of May – 14th of July 2017	18th of July – 1st of August 2017	7th of August – 29th of September 2017
Length of baseline/ intervention in work days	20/20	5/5	20/20

Note: GL = Green Line

Figures

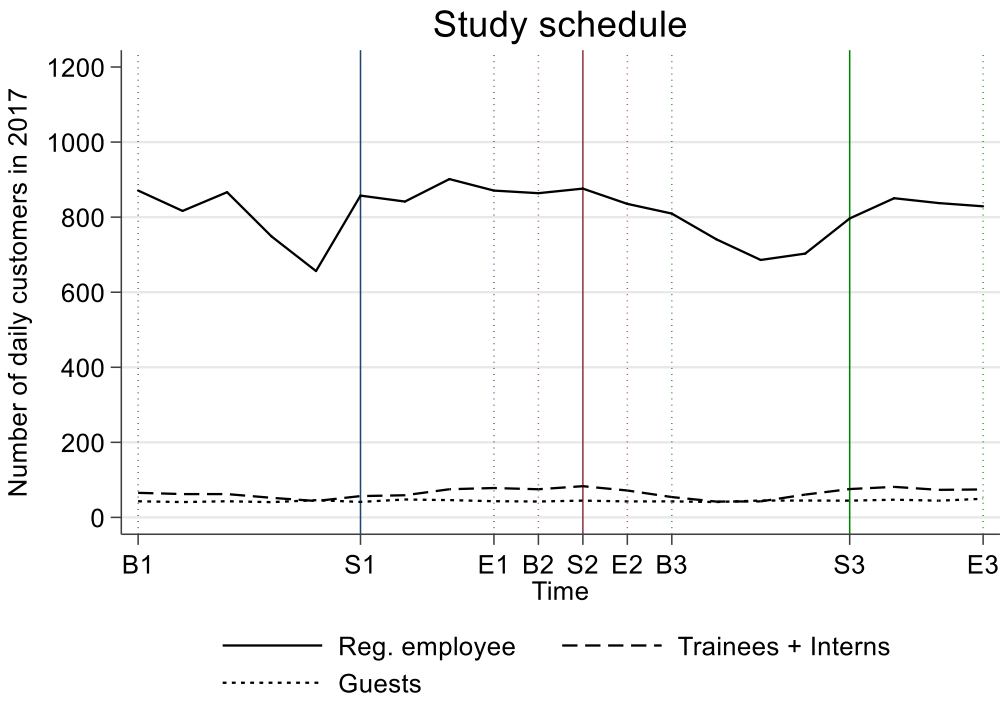

Figure 1. Study schedule and number of customers with baseline (B), intervention start (S), and end (E) of the field time for each of the 3 studies indicated in the graph at the beginning of the respective weeks. Details of the schedule provided in Table 2. Total number of customers for the groups indicated as daily averages on the y-axis.

Main message: "Dear employee,
We care about you being healthy and staying healthy. Your eating habits play an important role. That's why we want to provide you with a few simple tips over the next four weeks and point out the many benefits of a conscious diet.
Our tip at the beginning of the week: Nutrition experts recommend per day 5 servings (à 100g) of fruit and vegetables that provide your body with enough vitamins and minerals.
Choosing a large, crispy salad from our Green Line for lunch, you have almost reached this goal and protected yourself against many widespread diseases.
More information can be found here [hyperlink to a public website supporting the claims made].
We look forward to welcoming you to our cafeteria for lunch!"

Reminder: "Dear employee,
Did you have your 5 portions of fruits and vegetables today? You can find all information on the topic here [same hyperlink as above]. Like every day, a fresh offer awaits you in the Green Line."

Figure 2. Example of an email message with a health frame and corresponding reminder (original in German).

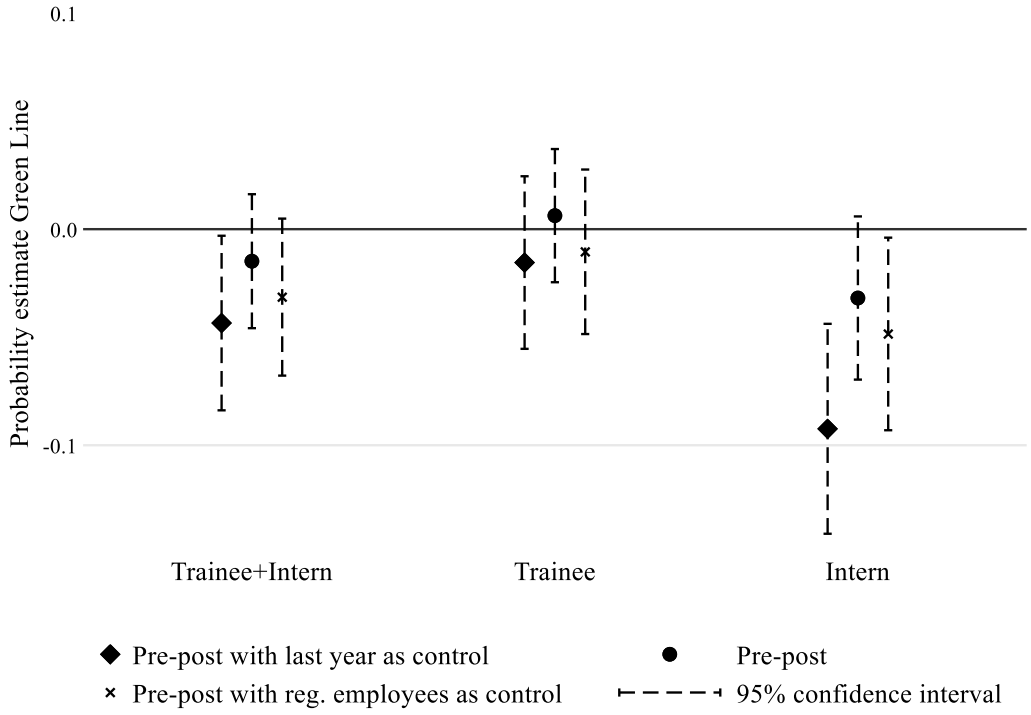

Figure 3. Effect estimates of the reminder intervention. Corresponding regression tables see Appendix Table A3-A4.

Figure 4. Effect estimates of convenience intervention. Corresponding regression tables see Appendix Table A5-A6.

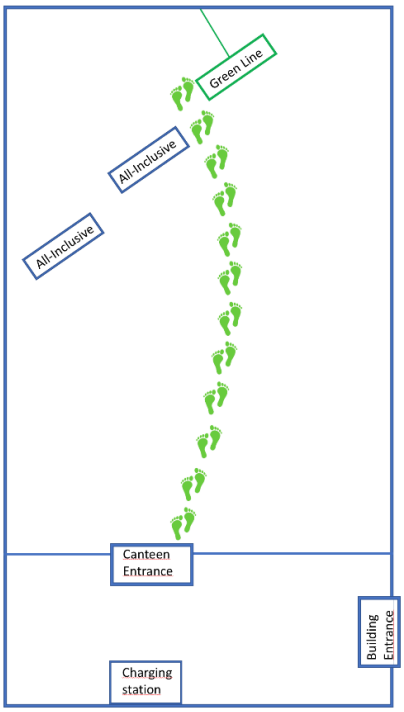

Figure 5. Sketch of the salience intervention. Footsteps lead from the entrance to the most distant terminal, where customers pay for the Green Line. Two of the three terminals displayed in the top left area of the figure are used to pay for the all-inclusive buffet starting directly after passing the terminals.

Figure 6. Effect estimates of the salience intervention. Corresponding regression tables see Appendix Table A7-A8.

APPENDIX

Table A1. Overview of email schedule and used frame / content

Email recipients	**Date**	**Email content**
Trainees	20.06.2017	"5 a day" – main
Interns	20.06.2017	"5 a day" – main
Trainees	23.06.2017	"5 a day" – reminder
Interns	23.06.2017	"5 a day" – reminder
Trainees	26.06.2017	"Save money" – main
Interns	27.06.2017	"Save money" – main
Trainees	28.06.2017	"Save money" – reminder
Interns	29.06.2017	"Save money" – reminder
Trainees	03.07.2017	"not tired" – main
Interns	04.07.2017	"not tired" – main
Trainees	05.07.2017	"not tired" – reminder
Interns	06.07.2017	"not tired" – reminder
Trainees	11.07.2017	"CO2" – main
Interns	11.07.2017	"CO2" – main
Trainees	12.07.2017	"CO2" – reminder
Interns	13.07.2017	"CO2" – reminder

Table A2. Email content translated to English from the German original version

Emails with four frames	Reminders with four frames
"5 a day" – health reason	
Dear employee, We care about being healthy and staying healthy. Your eating habits play an important role. That's why we want to provide you with a few simple tips over the next four weeks and point out the many benefits of a conscious diet. Our tip at the beginning of the week: Nutrition experts recommend 5 servings per day (~100g) of fruit and vegetables that provide your body with enough vitamins and minerals. With a large crisp salad from our Green Line for lunch, you have almost reached this goal and helped protect yourself against typical diseases of civilization. More information can be found here. We look forward to welcoming you to our company restaurant this afternoon!	Dear employee, Did you have your 5 portions of fruits and vegetables today? Here again is more information on the topic. Like every day, a fresh offer for a small price awaits you today in the Green Line. Best regards and enjoy your meal
"save money" – economic reason	
Dear employee, Often the healthier alternatives are unfortunately also the more expensive at lunch. Not in our company. With our Green Line you get daily fresh and healthy food and can save almost 50% compared to the all-inclusive offer at every lunch! We look forward to welcoming you to lunch in the company restaurant today! Best regards and enjoy your meal.	Dear employee, Remember that visiting the Green Line can not only do something good for your health, but also for your wallet. We look forward to welcoming you to lunch in the company restaurant today! Best regards and enjoy your meal.
"not tired" – productivity reason	
Dear employee, Who does not know it after a rich lunch: the noon tiredness? On the other hand, fresh air and exercise and a light lunch that is low in meat and carbohydrates will help. A selection of fresh and light food is available daily in the Green Line. We look forward to welcoming you to lunch in the company restaurant today! Best regards and enjoy your meal	Dear employee, Are there still big tasks ahead of you this afternoon? With the Green Line you stay ahead of the fight against noon weariness. We look forward to welcoming you to lunch in the company restaurant today! Best regards and enjoy your meal.
"CO2" – environmental reason	
Dear employee, Did you know that one kilo of meat causes up to 80 times more CO2 emissions than vegetables? With our Green Line you do good twice: You help your health and at the same time protect the environment. We look forward to welcoming you to lunch in the company restaurant today! Best regards and enjoy your meal.	Dear employee, Considering lunch in the Green Line? That would be a good act for you and your environment. We hope our tips in the last four weeks have been helpful to you. Thank you for your patience and we look forward to welcoming you in the company restaurant in the future! Best regards and enjoy your meal.

Table A3. Reminder analysis with different controls

	(1)	(2)	(3)	(4)	(5)	(6)
Control group	Previous year			Regular employees		
	Trainees + interns	Trainees	Interns	Trainees + interns	Trainees	Interns
Baseline	ref.	ref.	ref.	ref.	ref.	ref.
Treatment period	0.03**	0.02	0.06***	0.02**	0.02**	0.02**
	[0.00,0.05]	[-0.00,0.05]	[0.03,0.09]	[0.00,0.04]	[0.00,0.04]	[0.00,0.04]
Treatment group	0.03**	0.01	0.06***	-0.04***	-0.09***	0.02
	[0.00,0.06]	[-0.02,0.05]	[0.03,0.09]	[-0.07,-0.02]	[-0.12,-0.06]	[-0.01,0.05]
Treatment period * treatment group	-0.04**	-0.02	-0.09***	-0.03*	-0.01	-0.05**
	[-0.08,-0.00]	[-0.06,0.02]	[-0.14,-0.04]	[-0.07,0.00]	[-0.05,0.03]	[-0.09,-0.00]
Monday	ref.	ref.	ref.	ref.	ref.	ref.
Tuesday	0.00	-0.00	0.01	-0.02	-0.02	-0.02
	[-0.03,0.03]	[-0.04,0.03]	[-0.03,0.04]	[-0.05,0.01]	[-0.05,0.01]	[-0.05,0.01]
Wednesday	-0.00	0.00	-0.02	-0.03**	-0.03**	-0.04**
	[-0.03,0.02]	[-0.02,0.03]	[-0.06,0.01]	[-0.06,-0.00]	[-0.06,-0.00]	[-0.07,-0.01]
Thursday	-0.02	-0.03***	-0.01	-0.10***	-0.10***	-0.10***
	[-0.05,0.01]	[-0.06,-0.01]	[-0.04,0.02]	[-0.12,-0.07]	[-0.13,-0.07]	[-0.13,-0.07]
Friday	0.01	0.04**	-0.03	-0.04***	-0.04**	-0.05***
	[-0.02,0.04]	[0.00,0.07]	[-0.08,0.01]	[-0.08,-0.01]	[-0.08,-0.01]	[-0.08,-0.01]
Intercept	0.11***	0.08***	0.15***	0.21***	0.21***	0.22***
	[0.09,0.13]	[0.05,0.10]	[0.12,0.17]	[0.19,0.24]	[0.19,0.24]	[0.19,0.24]
N	5202	3075	2127	35751	34802	34214

Notes: Results based on a linear probability model. 95% confidence intervals in brackets. Standard errors clustered on the day-group level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A4. Reminder analysis pre-post

	(1)	(2)	(3)
	Trainees + interns	Trainees	Interns
Baseline	ref.	ref.	ref.
Treatment period	-0.01	0.01	-0.03*
	[-0.05,0.02]	[-0.02,0.04]	[-0.07,0.01]
Monday	ref.	ref.	ref.
Tuesday	-0.01	0.01	-0.04*
	[-0.05,0.04]	[-0.04,0.06]	[-0.08,0.00]
Wednesday	-0.01	0.00	-0.04
	[-0.06,0.03]	[-0.04,0.04]	[-0.10,0.01]
Thursday	-0.05*	-0.05***	-0.04
	[-0.10,0.01]	[-0.09,-0.02]	[-0.09,0.01]
Friday	0.01	0.04	-0.02
	[-0.04,0.06]	[-0.01,0.08]	[-0.10,0.06]
Intercept	0.15***	0.09***	0.23***
	[0.11,0.19]	[0.05,0.12]	[0.19,0.27]
N	2486	1537	949

Notes: Results based on a linear probability model. 95% confidence intervals in brackets. Standard errors clustered on the day-group level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A5. Convenience analysis, previous year as control

	(1) Reg. employees	(2) Trainees + interns	(3) Trainees	(4) Interns	(5) Guests
Baseline	ref.	ref.	ref.	ref.	ref.
Treatment period	-0.04**	-0.02	-0.03*	-0.00	0.01
	[-0.06,-0.01]	[-0.05,0.01]	[-0.06,0.00]	[-0.07,0.06]	[-0.05,0.07]
Treatment group	-0.03*	-0.06**	-0.08***	-0.02	0.01
	[-0.06,0.00]	[-0.12,-0.01]	[-0.12,-0.03]	[-0.11,0.06]	[-0.05,0.08]
Treatment period * treatment group	0.08***	0.01	0.01	0.02	0.05
	[0.05,0.12]	[-0.06,0.09]	[-0.06,0.07]	[-0.09,0.13]	[-0.03,0.13]
Monday	ref.	ref.	ref.	ref.	ref.
Tuesday	0.02	0.03	0.03	0.02	0.03
	[-0.01,0.04]	[-0.04,0.10]	[-0.03,0.10]	[-0.07,0.12]	[-0.02,0.07]
Wednesday	-0.01	-0.02	-0.01	-0.04	0.08**
	[-0.03,0.02]	[-0.06,0.03]	[-0.06,0.03]	[-0.10,0.03]	[0.01,0.14]
Thursday	-0.06***	-0.05**	-0.05**	-0.04	-0.01
	[-0.08,-0.03]	[-0.10,-0.00]	[-0.10,-0.01]	[-0.11,0.03]	[-0.06,0.03]
Friday	-0.02	-0.01	0.00	-0.04	0.08*
	[-0.06,0.01]	[-0.05,0.04]	[-0.04,0.05]	[-0.14,0.06]	[-0.00,0.15]
Intercept	0.22***	0.20***	0.19***	0.22***	0.19***
	[0.19,0.26]	[0.17,0.23]	[0.16,0.23]	[0.16,0.27]	[0.13,0.25]
N	16362	1553	1083	470	673

Notes: Results based on a linear probability model. 95% confidence intervals in brackets. Standard errors clustered on the day-group level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A6. Convenience analysis pre-post

	(1) Reg. employees	(2) Trainees + interns	(3) Trainees	(4) Interns	(5) Guests
Baseline	ref.	ref.	ref.	ref.	ref.
Treatment period	0.05***	-0.02	-0.03	-0.00	0.06**
	[0.03,0.07]	[-0.09,0.04]	[-0.08,0.02]	[-0.12,0.11]	[0.01,0.12]
Monday	ref.	ref.	ref.	ref.	ref.
Tuesday	0.02**	0.05	0.07*	-0.02	0.04
	[0.00,0.04]	[-0.05,0.14]	[-0.01,0.15]	[-0.14,0.10]	[-0.02,0.10]
Wednesday	-0.01	0.04	0.06*	-0.01	0.06**
	[-0.02,0.00]	[-0.05,0.14]	[-0.00,0.12]	[-0.08,0.07]	[0.01,0.12]
Thursday	-0.03***	-0.03	-0.01	-0.06	0.01
	[-0.04,-0.02]	[-0.11,0.05]	[-0.07,0.04]	[-0.16,0.04]	[-0.04,0.05]
Friday	0.01	0.03	0.05*	-0.01	0.10
	[-0.03,0.04]	[-0.05,0.12]	[-0.00,0.11]	[-0.17,0.15]	[-0.03,0.22]
Intercept	0.18***	0.12***	0.08***	0.21***	0.19***
	[0.17,0.19]	[0.04,0.20]	[0.02,0.14]	[0.15,0.28]	[0.14,0.24]
N	8619	780	550	230	431

Notes: Results based on a linear probability model. 95% confidence intervals in brackets. Standard errors clustered on the day-group level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A7. Salience analysis previous year as control

	(1) Reg. employees	(2) Trainees + interns	(3) Trainees	(4) Interns	(5) Guests
Baseline	ref.	ref.	ref.	ref.	ref.
Treatment period	0.00	0.03**	0.01	0.11***	-0.01
	[-0.01,0.02]	[0.00,0.06]	[-0.02,0.04]	[0.06,0.16]	[-0.06,0.05]
Treatment group	0.01	-0.03***	-0.04***	-0.00	0.00
	[-0.01,0.02]	[-0.05,-0.01]	[-0.06,-0.02]	[-0.06,0.05]	[-0.04,0.05]
Treatment period * treatment group	-0.01	-0.02	0.03	-0.15***	0.04
	[-0.03,0.01]	[-0.06,0.02]	[-0.01,0.08]	[-0.21,-0.08]	[-0.02,0.11]
Monday	ref.	ref.	ref.	ref.	ref.
Tuesday	-0.02**	-0.00	0.00	-0.00	-0.02
	[-0.03,-0.00]	[-0.04,0.04]	[-0.03,0.04]	[-0.05,0.04]	[-0.06,0.03]
Wednesday	-0.04***	-0.03	-0.01	-0.05**	-0.04
	[-0.05,-0.02]	[-0.06,0.01]	[-0.05,0.02]	[-0.10,-0.00]	[-0.09,0.01]
Thursday	-0.10***	-0.08***	-0.09***	-0.06**	-0.05**
	[-0.11,-0.08]	[-0.11,-0.05]	[-0.11,-0.07]	[-0.11,-0.01]	[-0.10,-0.01]
Friday	-0.05***	-0.01	0.00	-0.03	-0.03
	[-0.07,-0.04]	[-0.04,0.03]	[-0.04,0.05]	[-0.08,0.02]	[-0.08,0.01]
Intercept	0.20***	0.14***	0.13***	0.14***	0.23***
	[0.19,0.22]	[0.11,0.16]	[0.11,0.16]	[0.09,0.19]	[0.18,0.27]
N	59208	5727	3884	1843	2781

Notes: Results based on a linear probability model. 95% confidence intervals in brackets. Standard errors clustered on the day-group level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A8. Salience analysis pre-post

	(1) Reg. employees	(2) Trainees + interns	(3) Trainees	(4) Interns	(5) Guests
Baseline	ref.	ref.	ref.	ref.	ref.
Treatment period	-0.00	0.01	0.04***	-0.04	0.04**
	[-0.02,0.01]	[-0.01,0.03]	[0.01,0.07]	[-0.09,0.01]	[0.00,0.07]
Monday	ref.	ref.	ref.	ref.	ref.
Tuesday	-0.02*	-0.02	-0.03	0.00	-0.03
	[-0.04,0.00]	[-0.07,0.03]	[-0.09,0.03]	[-0.06,0.06]	[-0.09,0.02]
Wednesday	-0.04***	-0.03*	-0.02	-0.03	-0.07**
	[-0.06,-0.01]	[-0.07,0.01]	[-0.06,0.02]	[-0.08,0.01]	[-0.14,-0.01]
Thursday	-0.09***	-0.08***	-0.10***	-0.04	-0.08***
	[-0.11,-0.07]	[-0.11,-0.05]	[-0.13,-0.07]	[-0.10,0.01]	[-0.13,-0.02]
Friday	-0.07***	-0.03*	-0.05**	-0.01	-0.06*
	[-0.09,-0.04]	[-0.07,0.00]	[-0.08,-0.01]	[-0.08,0.06]	[-0.13,0.01]
Intercept	0.21***	0.12***	0.11***	0.13***	0.25***
	[0.20,0.23]	[0.09,0.14]	[0.09,0.14]	[0.07,0.18]	[0.20,0.30]
N	30983	2455	1448	1007	1756

Notes: Results based on a linear probability model. 95% confidence intervals in brackets. Standard errors clustered on the day-group level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A9. Carry-over test for convenience

	(1) Reg. employees	(2) Trainees + interns	(3) Trainees	(4) Interns	(5) Guests
Baseline	-0.04***	0.03	0.04*	0.01	-0.06**
	[-0.06,-0.02]	[-0.03,0.09]	[-0.01,0.09]	[-0.09,0.11]	[-0.12,-0.01]
Treatment period	ref.	ref.	ref.	ref.	ref.
Carry-over period	-0.04***	-0.00	-0.00	0.00	-0.06*
	[-0.07,-0.02]	[-0.05,0.05]	[-0.04,0.04]	[-0.08,0.09]	[-0.13,0.00]
Monday	ref.	ref.	ref.	ref.	ref.
Tuesday	0.02*	0.05	0.05	0.02	0.07**
	[-0.00,0.03]	[-0.03,0.12]	[-0.01,0.12]	[-0.08,0.13]	[0.01,0.14]
Wednesday	0.01	0.09**	0.09**	0.07	0.11***
	[-0.02,0.04]	[0.01,0.17]	[0.02,0.16]	[-0.04,0.17]	[0.04,0.19]
Thursday	-0.05***	-0.03	-0.02	-0.05	0.04
	[-0.07,-0.02]	[-0.09,0.03]	[-0.07,0.03]	[-0.14,0.03]	[-0.02,0.10]
Friday	-0.00	0.02	0.03	-0.01	0.08
	[-0.02,0.02]	[-0.05,0.09]	[-0.02,0.09]	[-0.14,0.12]	[-0.03,0.19]
Intercept	0.23***	0.09***	0.05**	0.18***	0.23***
	[0.22,0.25]	[0.03,0.15]	[0.00,0.11]	[0.10,0.27]	[0.17,0.30]
N	12679	1098	780	318	627

Notes: Results based on a linear probability model. 95% confidence intervals in brackets. Standard errors clustered on the day-group level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

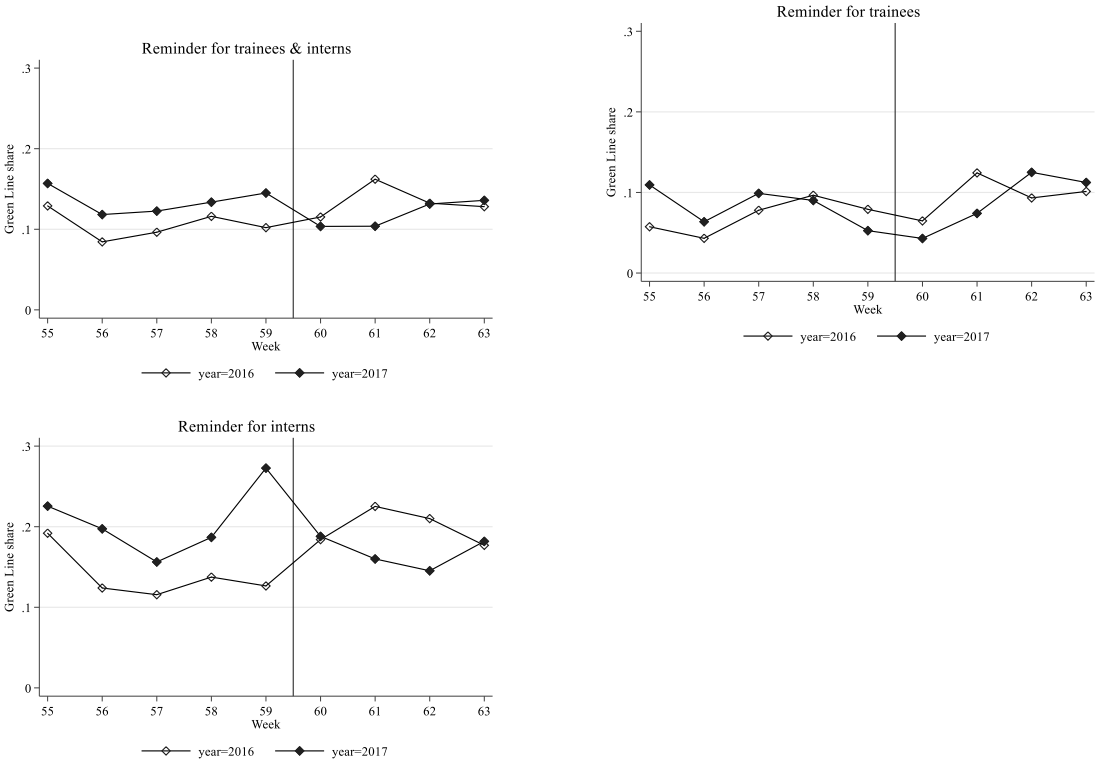

Figure A1. Trend analysis for reminders

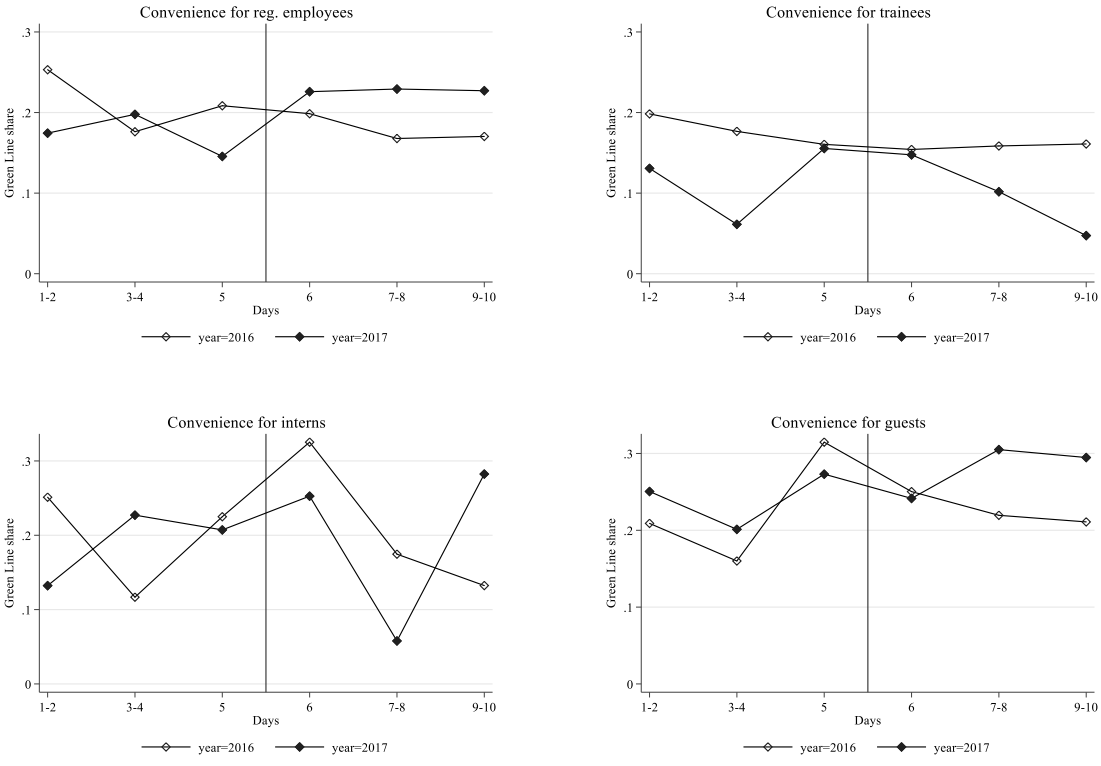

Figure A2. Trend analysis for convenience

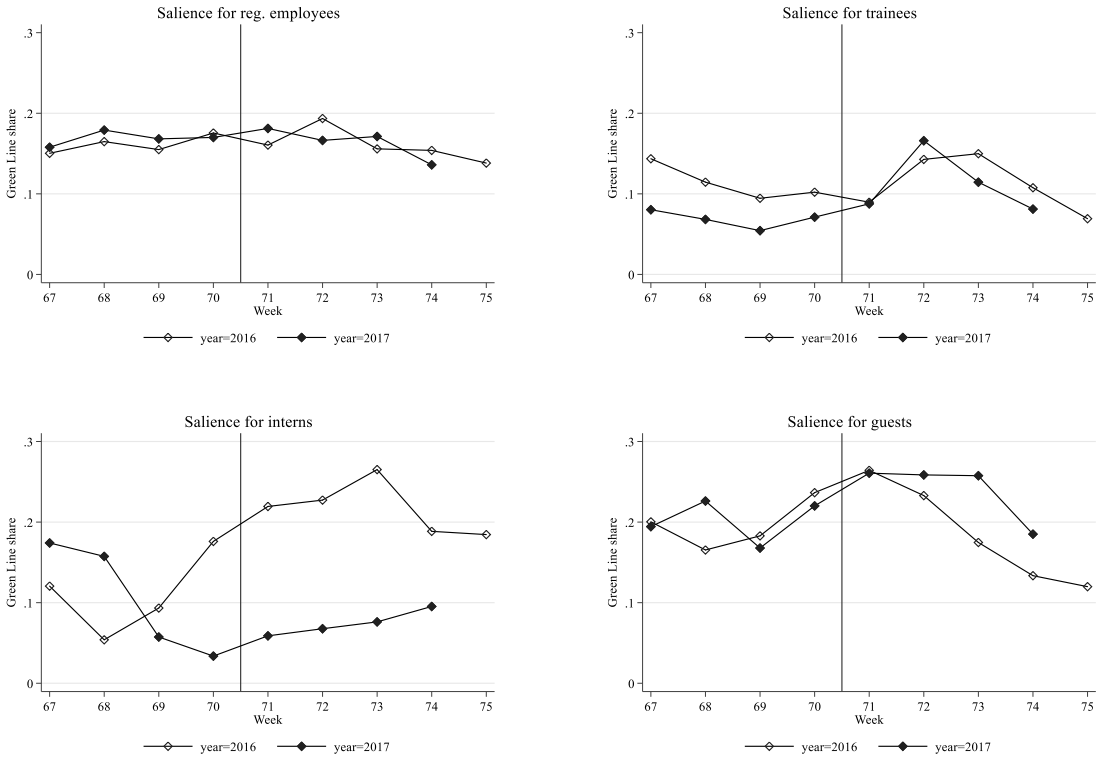

Figure A3. Trend analysis for salience