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The effects of social norms and observability on food choice

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ABSTRACT

People often adapt their behavior to the behavior of other people. We test with the help of an experiment whether this also applies to the choice of food and whether the sensitivity regarding others' behavior increases when the food choice is observable. Participants in the experiment are first-year students who are confronted with different statements about the diets of students already enrolled and studying at the university. Participants then choose between vouchers for vegan, vegetarian, or meat-based foods, with variation as to whether or not this choice is observable. The results show that the overall effects of social norms with and without observability are small and statistically insignificant. This is because women and men respond differently to the interventions; women are much more responsive to social norms than men, especially when their food choice can be observed by others. We discuss how our findings fit with dietary trends and what policy implications they have.

1. Introduction

What we choose to eat is receiving increasing attention in science and society because it has enormous implications for human health and the environment. The consumption of meat is particularly critical because of the negative consequences for global climate change, the local environment, human health, and animal welfare (Meier and Christen, 2013; Godfray et al., 2018; Springmann et al., 2018; Bonnet et al., 2020). Yet, meat consumption remains high in economically developed countries and is increasing in middle-income countries (Godfray et al., 2018). Due to high consumption and adverse consequences, the discussions revolve around the question of whether and which policy measures should be taken to steer consumption decisions towards a more sustainable and healthier diet (Meier and Christen, 2013; Springmann et al., 2018; Bonnet et al., 2020).

In this paper, we contribute to the literature on food choice by examining whether and to what extent social norms influence food choices, more specifically, choices between vegan, vegetarian, and meat-based foods. The first question we want to answer is whether people's food choices are influenced by the behavior of others, as has been observed for many other consumption decisions. Such peer effects have been measured in a wide range of contexts, such as the consumption of alcohol and cigarettes (Duncan et al., 2005; Powell et al., 2005), behavior at school (Sacerdote, 2001), the number of children (Munshi and Myaux, 2006), charitable giving (Frey and Meier, 2004; Shang and Croson, 2009), or environmentally friendly behavior (Farrow et al., 2017; Dannenberg et al., 2024). The tendency to orient one's own behavior to the behavior of others has various causes, ranging from social learning to herd behavior and imitation instincts to the desire to gain recognition and avoid disapproval (Zafar, 2011). When it comes to food choices, orientation to the behavior of others could be reinforced by uncertainties on the part of consumers due to conflicting information, food scandals, and the distance between consumption and production (Reisch et al., 2013). On the other hand, changing eating habits, especially giving up meat, is difficult for many people, so they may be reluctant to follow others' examples. Many people consider meat eating as natural and normal (Piazza et al., 2015) and for some people it is still associated with masculinity and status (Ruby and Heine, 2011; Chan and Zlatevska, 2019). The motivation behind the avoidance of meat is not clear as the reason may be health-related or the person may simply dislike meat (Brooks and Wilson, 2015; De Nardo et al., 2017). It is thus not clear whether information about the behavior of others can change personal attitudes toward meat consumption.

The second question we want to answer is whether people's sensitivity to social norms is enhanced when their choices are observed. The tendency to follow social norms may be greater if the behavior is observable because only then do image concerns, social approval, or disapproval matter (Zafar, 2011; Anderson and Dunning, 2014). Eating is an activity we often do in the presence of other people, sometimes people we don't know well or don't know well yet (think of dates or dinner after a job interview). Also, people's eating habits have changed significantly in recent decades; they cook less at home and eat out much

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more often in restaurants or public canteens (Reisch et al., 2013). Because of this high visibility, food choice could be a good way to signal to others that one is aware of the environment and animal welfare and willing to conform to social norms.

Although policymakers can hardly determine whether people's food choices are observable or not and what social norms people perceive in their social environment, a better understanding of how and under what circumstances social norms influence behavior is important for policy. Currently, the consumption of meat is not much regulated, in contrast to the production side. Existing measures are essentially limited to the provision of information and standardization and certification of labels (Reisch et al., 2013). To design appropriate policies, policymakers need reliable information on how the policy instruments, such as provision of information, taxes, subsidies, supply restrictions, or behavioral nudges, will change consumer behavior. The tendency of consumers to align their consumption decisions with those of others has important implications for the effects of those policy instruments (Kinzig et al., 2013; Frank, 2020; Reisch, 2021). For instance, the standard environmental economics recommendation of a Pigouvian tax is inappropriate or even counterproductive if consumption is strongly driven by social norms (Dasgupta et al., 2016; Ulph and Ulph, 2021).

Social norms also have important implications for the acceptability and feasibility of policy instruments. The main obstacle to the implementation of food policy measures is not technical but political, due to deep-rooted eating habits, pleasure, cultural status, and the resulting insufficient public acceptance of certain policy measures (Fesenfeld et al., 2020; Fesenfeld et al., 2023). Public resistance and political risks are greater when citizens perceive the measures as costly and as interfering with their personal consumption choices. Many empirical studies of the acceptability of food policy instruments show a trade-off between effectiveness and acceptability. Taxes on meat consumption are considered highly effective, but are unpopular in many countries (Roosen et al., 2022; Perino and Schwickert, 2023; Richter et al., 2023). For example, a representative survey in Norway shows that only 27 percent of respondents support a tax on red meat, even when they are educated about its climate protection effect (Grimsrud et al., 2020). Providing information about the negative consequences of meat consumption is usually supported by the public, but tends to have small effects on consumer behavior (Jalil et al., 2020; Jalil et al., 2023; Bazoche et al., 2023). Other indirect measures with moderate potential to change behavior, such as diet education, research investment, animal welfare standards, or ban of meat advertisements are also widely accepted (Richter et al., 2023). While strict regulation of meat consumption currently receives little support, this could change in the future with shifts of social norms. Gravert and Shreedhar (2022) argue that changes in social norms may pave the way for stricter regulation of meat consumption, similar to the evolution of smoking regulation. Initial reports of the health effects of cigarette smoking in the 1960s were followed by health warnings and advertising restrictions, and it was not until social norms changed that stricter measures such as taxes and bans in public places were introduced. The logic is that relatively soft policies change the behavior of some individuals who serve as role models for others, triggering social feedback effects that enable further policy action and perpetuate the process (Nyborg et al., 2016). In line with this logic, Fesenfeld et al. (2023) find that personal experience with plant-based meat-substitutes is positively associated with support for more stringent meat reduction policies. Social norms may also allow policy measures to be made more attractive by being used for a limited period of time. Converting a public canteen to vegetarian-only might be perceived as overly coercive, while a vegetarian week or month might be acceptable and, by changing social norms, still have long-term effects.

In general, there is not yet much evidence on the effects of social norms on food choices (the next section provides an overview), which is why scholars and organizations in the field are calling for more empirical research on the role of social norms and more broadly the human factor in food choices (SAPEA, 2020; Reisch, 2021; Enriquez and Archila-Godinez, 2022). We use an experiment to provide evidence on the effects of social descriptive norms and observability on food choices. The participants in our experiment are first-year students who just begin their studies at the university. In the experiment, they are presented with different statements about the dietary habits of students already enrolled and studying at the university, and then choose between vegan, vegetarian, and meat food vouchers. The advantage in this setting is that first-year students do not yet know students who are already enrolled, so the information has a high likelihood of influencing beliefs about the behavior of others. At the same time, the enrolled students are a relevant comparison group for the first-semester students. The desire to follow social norms should be particularly strong when entering a new social environment and having to establish new partnerships, friendships, and acquaintances.

The challenge in studying the effect of social norms is to isolate it from the multitude of other potential influencing factors. In our experiment, we took advantage of the fact that during the winter semester 2021/2022 many introductory events and lectures for first-year students took place online due to the Coronavirus pandemic. Participants in those events were invited to take part in an online survey and then randomly allocated into different treatment conditions. During the survey, they were informed that they could win a voucher for three sandwiches at a local restaurant as a thank-you gift and asked to choose either vegan, vegetarian, meat, or no voucher, which was our main variable of interest. Before choosing their voucher, subjects were given information about the university and the students already enrolled and studying there, such as gender distribution, use of the university sports program, or the proportion of students taking a semester abroad. This information section was used to communicate the social norms. In one treatment condition, first-year students were informed that, in a group of students already enrolled, a large percentage reported that they followed a vegan or vegetarian diet. In another treatment condition, they were informed that only a small minority reported to follow a vegan or vegetarian diet. No information about dietary habits was provided in the control treatment. As a second randomized treatment variable, we manipulated observability by informing half of the participants that they would have to publicly announce their voucher choice if they won, while the choice of the other half of participants remained private. In interaction with the social norms, this resulted in a 3x2 factorial design. The experiment contained several elements that were intended to somewhat obscure the purpose of the study for the participants (more on this in the design section). This makes it more of a field experiment (Harrison and List, 2004), even though our participants are students as in a classical lab experiment.

We conducted the experiment in Germany which is, due to its size, the largest meat consumer in the European Union. Per capita meat consumption in Germany has fallen slightly in recent years, from around 64 kg in 1991 to 55 kg in 2021.[1] According to recent surveys, the percentage of people who eat meat daily has dropped from 34 percent in 2015 to 25 percent in 2022. Men consume more meat than women; 31 percent of men report eating meat daily compared to 19 percent of women. The proportion of vegetarians is higher among women than men (9 vs. 5 percent) while the proportion of vegans is very low for both (1 percent). Women report more often that they pay attention to animal welfare and environmentally friendly food production when shopping. They are better informed about vegetarian or vegan meat-substitutes and more likely to buy them.[2] Sixty-five percent of women say they

[1] Source: https://de.statista.com/themen/1315/fleisch/#topicOverview (in German language, accessed 15 April 2023).

[2] The figures come from the Nutrition Report 2022 on the basis of representative surveys in Germany. The report is available at the following link: https://www.bmel.de/SharedDocs/Downloads/DE/_Ernaehrung/forsa-ernaehrungsreport-2022-tabellen.pdf?__blob=publicationFile&v=2 (in German language, accessed 15 April 2023).

Table 1
Overview of studies on the effects of social descriptive norms on food choice or intentions.

Study	Choice	Descriptive social norm	Randomization of descriptive norm treatment	Number and unit of observations	Choice observability	Significant reduction in meat consumption
Fesenfeld et al. (2023)	Intentions to reduce meat consumption and intentions to increase consumption of meat substitutes elicited in survey	The majority of Americans and many celebrities have started to limit meat consumption by eating plant-based meat alternatives.	Yes, at individual level	2,137 participants	No	No
Hammami et al. (2023)	Meal choices in experimental laboratory buffet	Presence of vegetarian confederate	Yes, at individual level within-subject (randomization of order)	74 meal choices of 37 participants	Yes	No
	Meal choices in a university restaurant	Prior order of the person ahead in line.	No	1,037 meal choices	Yes	Yes
Alblas et al. (2022)	Self-reported meat consumption frequency	On average, last week Dutch residents consumed meat 1.32 times per day. Based on your answers, you are above/ below the Dutch average.	Yes, at individual level	576 average daily meat consumption frequencies of 192 participants over three weeks	No	No
Çoker et al. (2022)	Meal orders in in-store restaurants	More and more customers are choosing veggie options	Yes, at store level within-subject (randomization of order)	Store-level percentage of plant-based meal sales from 22 stores over three time-periods (n = 66)	Yes	No
Reinholdsson et al. (2022)	Food purchases in a fast food restaurant	Many choose green.	Yes, across days	122,022 meal choices	Yes	No
Aldoh et al. (2021)	Intentions to reduce meat consumption elicited in survey	Static norm: 30 % of British people make an effort to limit their meat consumption. Dynamic norm: 30 % of British people have now started to make an effort to limit their meat consumption.	Yes, at individual level	846 participants	No	No
De Groot et al. (2021)	Intentions to reduce meat consumption elicited in survey	Perceived static and dynamic social descriptive norm elicited in a survey.	No	332 participants	No	Yes
		80 % / 20 % of Dutch population is making an effort to reduce meat consumption. Over half / less than a quarter of people like you have started to limit meat consumption.	Yes, at individual level	279 participants	No	Yes
Griesoph et al. (2021)	Meal orders in university dining halls	Vegetarian norm: 44 % of customers chose a vegan or vegetarian main dish. Meat norm: 56 % of customers chose a main dish containing meat or fish.	Yes, at individual level	661 meal choices	Yes	No
		Guessed descriptive norm: What do you think was the proportion of vegan or vegetarian (meat and fish) main dishes sold in our canteen last winter term?	No	513 meal choices	Yes	No
Sparkman et al. (2021)	Reported meat consumption elicited in survey	Reduction norm: Eating less meat is becoming more mainstream, many Americans have reduced their intake of meat. Elimination norm: Eliminating meat is becoming more mainstream, many Americans have eliminated meat from their diets.	Yes, at individual level	Average weekly meal choices of 2,473 and 4,603 participants (two samples)	No	Yes (for reduction norm)
Einhorn (2020)	Meal orders in university dining halls	2 out of 3 students eat a meat-free dish every day	No	2,405 meal choices	Yes	No
		Share of vegetarians at one's lunch table	No	1,021 meal choices	Yes	Yes

(continued on next page)

Table 1 (*continued*)

Study	Choice	Descriptive social norm	Randomization of descriptive norm treatment	Number and unit of observations	Choice observability	Significant reduction in meat consumption
Sparkman et al. (2020)	Meal orders in a college campus sports café	Our Meatless Burgers Are on the Rise. We've noticed customers are starting to choose more meatless dishes.	Yes, across days	86,788 meal choices of 23,103 customers	Yes	Yes
	Lunch orders in an online delivery service	We've noticed that customers are starting to eat less meat by choosing more meatless dishes.	Yes, at individual level (stratified)	7,460 meal choices of 1,231 customers	No	Yes
	Lunch orders in a dining restaurant	We've noticed that our customers are starting to order our meatless dishes for lunch more often.	Yes, across days (stratified)	12,636 meal choices of 3,645 dining parties	Yes	Yes
	Dinner orders in a dining restaurant	We've noticed that our customers are starting to order our meatless dishes for dinner more often.	Yes, across days (stratified)	7,914 meal choices of 1,985 dining parties	Yes	No
	Hypothetical food orders elicited in survey	Have you heard? Non-vegetarians / our community / our customers are choosing less meat and more plant-based dishes.	Yes, at individual level	3,751 participants	No	Yes (for non-vegetarian treatment)
Stea and Pickering (2019)	Intention to reduce meat consumption elicited in survey	People make food choices to indicate their sentiments regarding these impacts.	Yes, at individual level	396 self-reported intentions to reduce meat from ~ 198 participants	No	No
Amiot et al. (2018)	Self-reported meat consumption	Meat eating has reduced significantly in Canada since 1980.	Yes, at individual level	Self-reported meal choices of 32 participants over 4 weeks	No	Yes
Christie and Chen (2018)	Lunch orders in on-campus café	Prior order of the (unknown) person ahead in line	No	174 meal choices	Yes	Yes
Sparkman and Walton (2017)	Intentions to reduce meat consumption elicited in survey	Static norm: 30 % of Americans make an effort to limit their meat consumption. Dynamic norm: 30 % of Americans have now started to make an effort to limit their meat consumption.	Yes, at individual level	118 participants	No	Yes (for dynamic norm compared to static norm)
	Lunch orders in university café	Static norm: 30 % of Americans make an effort to limit their meat consumption. Dynamic norm: 30 % of Americans have started to make an effort to limit their meat consumption.	Yes, at individual level	304 participants	Yes	Yes (for dynamic norm) No (for static norm).

Note: Sample size and results refer to the comparison between the social descriptive norm treatment and the control treatment.

are willing to eat less meat or no meat at all in light of climate change compared to 48 percent of men.[3] In recent years, various measures to regulate meat consumption have been discussed in Germany, such as an animal welfare levy or an increase in the VAT rate on meat, but so far pricing instruments have found little support among the population (Roosen et al., 2022; Perino and Schwickert, 2023).

With a slight decline in meat consumption and a still skeptical attitude towards strict regulations, Germany offers an interesting and not untypical setting for our study. Although our sample is not representative of the German population, we can test whether we find differences between men and women as they exist in the population. The greatest advantage of our study certainly is the verifiable randomization into treatments at the level of individuals which allows us to identify causal effects of social norms and observability.

The remainder of the paper is structured as follows. Section 2 gives an overview of the relevant literature, Section 3 presents the design of the experiment and the sample, Section 4 provides hypotheses based on a simple model of social signaling, adapted from Bénabou and Tirole (2006), Section 5 presents the main experimental results (less important results are presented in the Appendix), and Section 6 discusses the results and concludes.

2. Related literature

It is a robust finding in the psychological and behavioral economics literature that people adapt their behavior to the behavior of others. The effect of social descriptive norms has been found in many different contexts, ranging from the consumption of alcohol and cigarettes to charitable donations to the consumption of energy or water (Duncan et al., 2005; Powell et al., 2005; Shang and Croson, 2009; Frank, 2020; Dannenberg et al., 2024). The effect of social norms has also been thoroughly studied in laboratory experiments, for example in dictator games or public goods games (Bicchieri and Xiao, 2009; Krupka and

[3] Source: https://www.infratest-dimap.de/umfragen-analysen/bundesweit/umfragen/aktuell/klimawandel-bereitschaft-zu-verhaltensaenderungen-in-ernaehrung-und-mobilitaet/ (in German language, accessed 15 April 2023).

Weber, 2009).

Our eating behavior is certainly guided by social norms, such as the distribution of meals throughout the day, the use of plates and cutlery, or the exclusion of certain animal species. Here, we are interested in whether people influence each other in their choice of food, particularly with regard to meat consumption. Studies based on cross-sectional data show that individuals' meat consumption or intentions to consume meat are positively correlated with meat consumption among their friends or acquaintances (Lea and Worsley, 2001; Einhorn, 2020; Schenk et al., 2018; Sharps et al., 2021), but it is unclear whether this is driven by social influence or selection. The main challenge in identifying a causal effect of social norms is to reliably manipulate subjects' knowledge or beliefs about other people's food choices. The studies that have attempted to do this provide mixed results.

Table 1 provides an overview of studies that investigate the effects of social descriptive norms on food choices or food choice intentions. We only included experimental studies that measure meat consumption or meat consumption intentions, either as a choice between meat and a meat-free alternative or the amount of meat consumed. Meat consumption is measured directly or estimated based on self-reports. Participants in these studies receive information about eating behavior of other people or, in three studies, they observe it themselves, and their food choice is then compared with a control group that did not receive any information or received information about different eating behavior. From the 24 comparisons presented, 11 show no significant reduction in meat consumption after receiving a social descriptive norm. In the other comparisons, meat consumption or intentions are reduced, although the effects are often moderate and statistically significant only for certain groups or certain meat types. The nature of the social norm plays an important role. For example, norms that relate to people's reduction of meat consumption rather than the complete renunciation have a stronger impact (Sparkman et al., 2021). Norms appear to be effective when decision makers have a connection to the people to whom the norm applies, and are much less effective otherwise. Some groups even respond negatively to the social norm by increasing their meat consumption, such as the wealthier customers of an expensive restaurant in the study by Sparkman et al. (2020). Dynamic norms that emphasize that many people are in the process of changing their eating behavior may have a stronger effect than static norms but the evidence so far is mixed (Sparkman and Walton, 2017; Sparkman et al., 2020; Aldoh et al., 2021).

Our contribution to this literature is to examine social norms that either indicate a high proportion of vegetarians and vegans in the reference group or indicate a low proportion. We also investigate whether the effects of social norms change depending on whether the food choice is observed or not. To our knowledge, the combination of social norms and observability of food choices has not been studied before. The choices in the studies in Table 1 are observable in some cases and unobservable in others. However, the comparison across studies does not allow any conclusions to be drawn about potentially different effects of social norms because the studies differ in too many factors. Most notably, in the cases of unobservable choices, these are mostly intentions, self-reports, or hypothetical choices, which are difficult to compare to the real food orders in other studies.

Observability of food choices alone has no significant effect in the study by Dannenberg and Weingärtner (2023). Observability together with an information nudge about the smaller climate damage of meat-free diets even produces reluctance, so that meat-free food is chosen less often. More generally, we know from many behavioral economics studies that decision observability favors prosocial behavior, which has been shown in a variety of contexts, such as blood donations (Lacetera and Macis, 2010), contributions to the maintenance of a national park (Alpizar et al., 2008; Alpízar and Martinsson, 2013), church offerings (Soetevent, 2005), energy consumption (Delmas and Lessem, 2014), driving a low emission car (Sexton and Sexton, 2014), fulfilling the civic duty of voting (Funk, 2010), paying for a fair-trade chocolate bar (Friedrichsen and Engelmann, 2018), or supporting the climate campaign of a movie theater (Dannenberg et al., 2022). It has also been shown in lab experiments (Andreoni and Petrie, 2004; Rege and Telle, 2004; Christens et al., 2019). In a meta-study, based on both field and lab experiments, Bradley et al. (2018) find a statistically significant, albeit moderate, effect of observability on prosocial behavior.

The combination of social norms and observability has been studied in other contexts. Vesely et al. (2022) find that donations to a renewable energy initiative increase significantly when decisions are observed and subjects receive information about relatively high donations in previous sessions. The combination of social norm and observability has the largest effect, but there is no interaction in which the social norm under observation has a stronger effect than without observation. Using an injunctive norm, Vesely and Klöckner (2018) find that the effect of the norm on donations to an environmental organization increases under observation. Bolton et al. (2021) examine a norm focus intervention by letting participants in a donation experiment guess how much previous participants have donated. They show that this intervention has a positive effect on prosocial behavior and that the effect is significantly stronger when the behavior is observed. Schram and Charness (2015) let subjects make allocation decisions in a modified dictator game and vary whether they receive an advice from an uninvolved jury and whether the decision is made public. They find that dictators often follow the advice, regardless of whether they are observed or not. Because juries recommend more generous allocations when they are made public, the allocations actually made are also more generous. Zafar (2011) shows in a donation experiment that the tendency to conform to others' behavior is driven by both learning about the social norm and image concerns.

Taken together, we can conclude that information about the behavior of others and observability of choices influence behavior in different contexts and that the effects of social norms may interact with observability. At the same time, we note that interventions to change eating behavior sometimes have no effect or unexpected effects, so that results from other contexts may not be transferable to eating behavior.

3. Experimental design and sample

We conducted the experiment at the University of Kassel in Germany in the fall of 2021 with first-year students who began their studies at that time.[4] Our goal was to reach as many first-year students as possible. To do this, we conducted the experiment during large introductory events and lectures for first-semester students, which were held online due to the Coronavirus pandemic. The restriction to online events was necessary to implement randomization into the experimental treatments. Large events were necessary because we assigned participants to a total of six treatments in each event. The first step of the recruitment process was to identify all large study programs at the university where a high number of first-year students were expected to attend the introductory event or lecture. Of these, all events that were held online were identified. The organizers of these events were asked whether it would be possible to conduct a survey as part of the introductory event, to which almost all of them agreed. Then, in the introductory events, the first-semester students were invited to take part in a survey that would elicit "opinions and habits" of first-semester students. The topic of the survey and terms such as food, environment, or social norms were not mentioned. Students were also informed that it would take about 15 min to complete the survey, that they would receive 5 euros for doing so, and that they could also win a prize. These incentives were used to get as many students as possible to participate, which was by and large

[4] We received an Institutional Review Board Certificate from the German Association for Experimental Economic Research prior to conducting the experiment which can be retrieved via the following link: https://gfew.de/ethik/pDDz1J6J. We also received approval from the University's data protection office.

successful. The experiment was conducted in a total of 35 online events, with the response rate in the various events ranging between 36 and 100 percent.[5] After having agreed to take part, participants were randomly divided into six different virtual rooms using the breakout-room function of Zoom. In each virtual room, participants were met by an instructor and given a treatment-specific link to answer the online survey.

The first part of the survey was the same in all treatments and collected personal information such as age, gender, native language, religion, housing situation, political preferences, social media use, employment, income, study program, level of study (bachelor or master), previous studies, and high school diploma. In addition, we asked whether the subjects knew people who were already enrolled and studying at the university, whether they had already met other first-year students from their program, and how much they identified with the university and looked forward to their studies. The questions in this first part gave no indication of the topics of food or environmental protection.

The first part was followed by an information section in which subjects were given some information about the university and its student body, including gender distribution, size of the faculties, use of university sports programs, and the percentage of students taking a year abroad. In the treatments with social norms, the subjects were additionally informed about the results of a non-representative survey of a group of enrolled students. In one treatment condition, it was reported that 60 % of students in that group reported eating a vegetarian or vegan diet. In the other treatment condition, this percentage was 10 %. These figures came from a survey conducted a year earlier with students from different study programs.[6] In the control treatments without a social norm, no information on dietary habits was provided. All the information in the information section was provided in interactive form, in that subjects first had to guess the correct answer before they learned it. In this way, we wanted to ensure that the subjects did not simply read over the information without really understanding it.

Subsequently, subjects learned that they could win a voucher for three high-quality sandwiches as a thank-you gift and that they could choose between vegan, vegetarian, and meat. The personalized voucher could be redeemed at a local restaurant, excluding the possibilities of giving the voucher to other people or changing the type of sandwich.[7] At the end of the survey, 20 % of the participants or at least one person in each virtual room were randomly selected and they received the voucher of their choice. It was possible to choose no voucher and still complete the survey. We allowed this so that participants would not drop out of the survey or choose a voucher they did not want.

In addition to social norms, we varied whether the choice of voucher was visible to other participants in the virtual room. In the private treatments, subjects were informed that the names of the winners would be announced aloud, but that the choice of vouchers would remain private. Subjects in the public treatments were informed that the winners' names would be announced aloud and that they would be asked for their voucher choice so that it could be communicated directly to the restaurant. This information was provided before subjects chose their voucher. Thus, there were a total of six treatments that differed in the social norms and the visibility of the decision. Table 2 provides an overview.

Table 2
Overview of treatments.

Treatment	Social descriptive norm	Observability
Private	–	No
Private LowVeg	Low share of vegans / vegetarians	No
Private HighVeg	High share of vegans / vegetarians	No
Public	–	Yes
Public LowVeg	Low share of vegans / vegetarians	Yes
Public HighVeg	High share of vegans / vegetarians	Yes

The second part of the survey was again identical in all treatments and included questions on subjects' diets, diets of their friends and acquaintances, volunteer activities, charitable donations, participation in environmental protests, and importance of environmental aspects in their daily consumption decisions. We also asked about subjects' views on people who refrain from eating meat and intentions for their future diet. To disguise the purpose of these questions, we asked the same questions regarding opinions and intentions about sports, studying abroad, and volunteering (the complete questionnaire is shown in the Appendix).

A total of 1,049 students participated in the survey. Out of these, 48 dropped out before the voucher choice, 30 were excluded because they were not first-semester students, and 15 were excluded because they only chose the voucher after the winners had been announced. This yields a final sample size of 956 participants, with around 150 participants in each treatment. On average, 6 subjects participated in each breakout room. Table 3 provides an overview of how the number of participants and their most important characteristics are distributed across treatments. Most characteristics are fairly evenly distributed across treatments, indicating successful randomization of participants. Diet is the only variable in the table that was elicited after treatment implementation, but the figures suggest that the responses were not distorted by the treatments.

4. Hypotheses

To derive hypotheses for the behavior in the different treatments, we follow Dannenberg and Weingärtner (2023) by using a simplified version of the social signaling model of Bénabou and Tirole (2006). Individuals choose an action $a \in \{0,1\}$, where $a = 0$ represents the environmentally friendly action (vegan or vegetarian voucher) and $a = 1$ represents the environmentally harmful action (meat voucher).[8] We assume that a significant proportion of individuals derive utility from consuming meat, $B(a)$, and thus suffer a utility loss if they forgo it. If a person is concerned about her health, then the utility loss of not eating meat is correspondingly lower. While eating meat provides benefits, an individual may feel guilty about consuming meat because it harms the environment and animal welfare, which we denote by $v_a \geq 0$. The feeling of guilt is mitigated by the proportion of people in the reference group who also consume meat $\overline{a}$ with $0 \leq \overline{a} \leq 1$. Both the taste for meat and the feeling of guilt are only known to the decision maker and not to the observers. With this, an individual's net benefit of choosing a is

$$B(a) - v_a a(1 - \overline{a}) \quad (1)$$

If the choice can be observed, the decision maker must additionally

[5] The introductory events and thus the participants in the experiment came from nine of the university's eleven faculties: human sciences; humanities; social sciences; architecture, urban planning, and landscape planning; economics and management; mathematics and natural sciences; ecological agricultural sciences; construction and environmental engineering; electrical engineering and computer science.

[6] Subjects were truthfully told that the figure came from a non-representative survey of a select group of students. Still, if the attempt to influence the participants' beliefs in different directions is regarded as deception, then this applies to our experiment as well as to other experiments with similar questions (e.g. Croson and Shang, 2008; Bicchieri and Xiao, 2009; and Goeschl et al., 2018).

[7] The sandwiches, including the vegetarian and vegan variants, are high quality sandwiches with various fillings. The value of a voucher was about 12 euros for all types of sandwiches.

[8] For simplicity, we group vegetarian and vegan together as environmentally friendly option, which is also consistent with how the social norms were provided in the experiment.

Table 3
Sample characteristics by treatment and in total.

Variable	Private	Private LowVeg	Private HighVeg	Public	Public LowVeg	Public HighVeg	All
Gender							
Male	0.41	0.40	0.42	0.42	0.44	0.50	0.43
Female	0.57	0.56	0.57	0.58	0.54	0.48	0.55
Diverse	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Not provided	0.01	0.02	0.01	0.01	0.02	0.01	0.01
Average age (in years)	22.5	22.2	22.4	22.2	21.8	22.5	22.2
Not provided	0.00	0.01	0.00	0.00	0.00	0.01	0.00
Religion							
None	0.49	0.53	0.47	0.56	0.48	0.59	0.52
Protestant	0.30	0.19	0.23	0.14	0.22	0.22	0.22
Catholic	0.05	0.09	0.11	0.07	0.07	0.05	0.07
Muslim	0.08	0.10	0.11	0.10	0.12	0.08	0.10
Other or not provided	0.08	0.10	0.08	0.12	0.11	0.05	0.09
Native language							
German	0.83	0.84	0.85	0.85	0.83	0.87	0.84
Other or not provided	0.17	0.16	0.15	0.15	0.17	0.13	0.16
Political party preference							
Die Grünen (green)	0.31	0.28	0.26	0.26	0.23	0.31	0.28
Die Linke (left)	0.07	0.12	0.11	0.16	0.11	0.12	0.12
SPD (social democrats)	0.11	0.18	0.16	0.12	0.16	0.13	0.15
FDP (liberal democrats)	0.15	0.17	0.20	0.15	0.19	0.20	0.18
CDU/CSU (christian democrats)	0.05	0.03	0.03	0.06	0.05	0.05	0.04
Other parties, non-voters, or not provided	0.31	0.21	0.24	0.25	0.26	0.19	0.24
Diet							
Vegetarian or vegan	0.15	0.18	0.14	0.20	0.21	0.12	0.17
Including meat	0.85	0.81	0.86	0.80	0.78	0.88	0.83
Not provided	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Number of observations	169	163	158	153	166	147	956

Note: Numbers show reported shares or means (in case of age) by treatment and overall. Kruskal-Wallis tests and Pearson's χ2-tests reveal no significant differences across treatments.

consider whether it would damage her reputation and how much she would suffer from that. The reputational damage $D(a)$ depends on whether observers believe the decision maker lacks awareness of the environment and animal welfare given the action she has chosen, on her sensitivity regarding others' opinions, and on the social norms prevailing in the community. We assume that meat consumption is particularly damaging for the reputation when the proportion of vegans and vegetarians in the reference group is high. An individual's reputational damage of choosing a is then given by

$$D(a) \equiv x\gamma_a E(v_a|a)(1-\overline{a}) \tag{2}$$

where $x \in \{0,1\}$ indicates whether choosing a is observable or not and $\gamma_a \geq 0$ represents the decision maker's concern about her reputation, that is having a low v_a. Meat-eaters are not judged if everyone in the reference group eats meat, just as meat-eaters do not feel guilty in this case.

An individual thus solves

$$\max_{a\in\{0,1\}} \left\{B(a) - v_a a(1-\overline{a}) - x\gamma_a E(v_a|a)(1-\overline{a})\right\} \tag{3}$$

and chooses $a = 1$ if

$$B^{'}(a) \geq v_a(1-\overline{a}) + x\gamma_a \frac{\partial E(v_a|a)}{\partial a}(1-\overline{a}) \tag{4}$$

Because $a \in \{0,1\}$, the discrete cost of choosing $a = 1$ can be defined as $B^{'}(1) \equiv B(1) - B(0)$. This discrete benefit is positive for subjects who like meat, negative for those who dislike meat, and zero for those who are indifferent. According to condition (4), individuals are more likely to choose the meat voucher if one (or more) of the following holds: they like meat, they do not feel guilty when eating meat, everyone in the reference group eats meat, they are not observed or do not care about their reputation.

We assume that $B^{'}(a)$, v_a, and γ_a are evenly distributed across treatments because subjects are randomly assigned to treatments. Observability in the public treatments changes $x = 0$ to $x = 1$. We assume that the provision of social norms directly increases or decreases the perception of $\overline{a}$, which may influence the choice of food with and without observation.

From this, the following hypotheses can be derived about the likelihood of choosing meat in the different treatments:

1. Private LowVeg $\geq$ Private $\geq$ Private HighVeg.
2. Public LowVeg $\geq$ Public $\geq$ Public HighVeg.
3. Private $\geq$ Public.
4. Private LowVeg $\geq$ Public LowVeg.
5. Private HighVeg $\geq$ Public HighVeg.

Hypotheses 1 and 2 capture the effects of the social norms. The implicit assumption is that the low social norm is below the value that subjects, consciously or unconsciously, hold in their minds without any information about it, and that the high social norm is above it. We will see in the results section that this assumption is justified. Hypotheses 3, 4, and 5 capture the effect of observability. According to the assumptions in our theoretical model, observability can only reduce the likelihood of choosing meat, while social norms may increase or decrease the likelihood. It is of course possible that the provision of social norms and observability will have no effect on food choice. Subjects may not feel guilty when consuming meat, $v_a = 0$, or they may not expect any judgment by observers, $\partial E(v_a|a)/\partial a = 0$, regardless of what others do, or they may not care about this kind of reputation, $\gamma_a = 0$.

The model also suggests that there is an interaction effect between social norms and observability in the sense that the provision of social norms has a stronger effect when decisions are observed. Observability has a smaller effect when a low social norm is provided and a stronger effect when a high social norm is provided, compared to no provision of norms. This is due to the fact that observability activates the second term in condition (4) and social norms additionally increase or decrease this term through $(1 - \overline{a})$.

5. Results

5.1. Descriptive statistics

Fig. 1 provides an overview of voucher choices in the various treatments. It is evident at first glance that the distribution of choices does not differ much across the treatments. Nonparametric tests comparing the distribution pairwise between treatments do not find any significant differences as long as we pool vegetarian and vegan choices (χ^2-tests, $p > 0.1$ each). If we consider vegetarian and vegan separately, we find that the probability of choosing vegan is significantly higher in *Public LowVeg* than in *Private* ($p = 0.060$), *Private HighVeg* ($p = 0.012$), and *Public* ($p = 0.017$). In turn, the likelihood of choosing vegetarian is significantly lower in *Public LowVeg* than in *Private HighVeg* ($p = 0.037$) and *Public* ($p = 0.052$), and lower in *Public HighVeg* than in *Private HighVeg* ($p = 0.082$). However, when we apply correction procedures for multiple hypothesis testing, we cannot reject the null hypothesis for any treatment comparison, supporting our initial statement that choices do not differ much.[9]

In the following, we examine the effects of the treatments in greater detail using multinomial logistic regression models. We first present the analyses in which vegetarian and vegan choices are analyzed separately and then the analyses in which these choices are pooled.

5.2. Regression results when vegetarian and vegan choices are analyzed separately

The multinomial logistic regression models differentiate between meat, vegetarian, vegan, and no-voucher choices. Apart from the treatment variables, we include gender, age, religion, native language, acquaintance with others in the same breakout room, gender of the session instructor, and political party preference as control variables in all regressions.[10] The results for these control variables are shown in Tables A2-A4 the Appendix, as our main interest lies in the treatment effects. (In short, males are more likely to choose meat and less likely to choose a vegetarian voucher compared to females. Individuals who are acquainted with someone in the same session have a higher probability of choosing a vegetarian voucher and a lower probability of choosing a vegan or no voucher compared to non-acquainted individuals. Protestants are more likely to choose meat and less likely to choose a vegan voucher in comparison to non-religious individuals. Muslims have a lower probability of choosing meat and a higher probability of choosing vegetarian compared to those without religion. Individuals of other religions or who did not provide any information about their religion are also less likely to choose a meat voucher than non-religious individuals. Native German speakers have a lower probability of choosing meat and a higher likelihood of choosing no voucher in comparison to non-native German speakers. Individuals who vote green or left are less likely to choose meat or no voucher and more likely to choose a vegetarian or vegan voucher.).

In the tables below, we report estimated average discrete probability effects of the treatment variables for the full sample (Table 4) and for subsamples consisting of male participants (Table 5) and female participants (Table 6).[11] Gender has been shown to be important in previous studies of food choices (Brough et al., 2016; McInnis and Hodson, 2017; Dannenberg and Weingärtner, 2023), which is why we also differentiate between the two gender groups as an exploratory analysis. Post-hoc power analyses show that we are able to detect small to medium effect sizes for the full sample and the female subsample, and medium effect sizes for the male subsample with 80 % power according to Cohen's classification (Cohen, 1988; see Table A1 in the Appendix for details). All models show treatment effects on the different levels of the nominal outcome variable voucher choice, namely meat choices, vegetarian choices, vegan choices, and no-voucher choices in the respective columns. The models shown in the first five columns in each table use the *Private* treatment as baseline while the models shown in the second five columns use the *Public* treatment as baseline.

When interpreting the results, we have to consider that we test multiple treatments on multiple levels of an outcome variable in multiple (sub)samples. We therefore report results from Wald tests which jointly test the hypothesis that all regressions coefficients of a treatment (comparing it to the baseline) are zero, i.e. that there is no effect of the treatment on voucher choice. We also report results from a Wald test jointly comparing all coefficients of *Private LowVeg* and *Private HighVeg* to *Private* and *Public LowVeg* and *Public HighVeg* to *Public*, testing the hypothesis that the social norm treatments have no effect on voucher choice when choices are private and when they are public, respectively. Finally, we report results from a Wald test jointly comparing all coefficients of all treatments against the baseline, testing the hypothesis that all treatment effects on voucher choice are zero. We also report q-values from multiple testing procedures conducted with the *qqvalue* package in Stata and applying the Holm method (Newson, 2010, based on Holm, 1979) for all treatment effects and Wald tests. The reported q-value represents the minimum familywise error rate at which the null hypothesis for the respective effect can still be rejected, defining as a family the three p-values relating to the same treatment effect or Wald test in the three (sub)samples.

The Wald tests show that we can reject the null hypothesis that none of the treatments has any effect on food choice in the full sample, both based on its p-value and when we control for multiple hypothesis testing. This appears to be driven mostly by the *Public LowVeg* treatment, in which vegan choices are significantly more likely than in *Public* and in *Private*, although the latter comparison requires accepting a familywise error rate slightly higher than 0.10. In turn, the likelihood of choosing a vegetarian voucher is lower in *Public LowVeg*, but the statistical evidence here is relatively weak. The lower likelihood of choosing vegetarian in *Public LowVeg* is in line with our hypotheses, while the increase in vegan choices when a low social norm is communicated is not consistent with the hypotheses. Overall, the results confirm the impression in Fig. 1 that the treatments do not significantly influence meat choices (Table 4).

This changes as soon as we look at men and women separately. The sign of the treatment effects on meat choice compared to *Private* is consistently positive for males and negative for females (Tables 5 and 6). Again, we can reject the null hypothesis that no treatment has any effect on voucher choice for each subsample, but the treatments for which we find significant effects partly differ between both gender groups. In contradiction to our hypotheses, the combination of observability and a high social norm *increases* males' likelihood of choosing meat by 16.7 percentage points and *reduces* their likelihood of choosing a vegetarian voucher by 11.1 percentage points. As the statistical power for the male

[9] We calculated frequentist q-values with the qqvalue-command in Stata (Newson, 2010), using the Holm method based on the familywise error rate (Holm, 1979) and the Yekutieli method based on the false discovery rate (Benjamini and Yekutieli, 2001). Both methods produce very high q-values, implying that we would have to accept a high likelihood of a false positive (Holm method) or a high share of false positives (Yekutieli) if we wanted to reject the null hypothesis for any of the pairwise nonparametric tests.

[10] We exclude diverse participants and participants who did not indicate their gender from the regression analyses to focus on the differences between males and females. The results remain almost unchanged if we include those participants.

[11] Originally, we also analyzed the results for a subsample of participants who usually consume meat, as we expected treatment effects mainly for them and not for vegetarians and vegans. However, the results are very similar to those of the overall sample with very few significant treatment effects and therefore do not provide any additional insights.

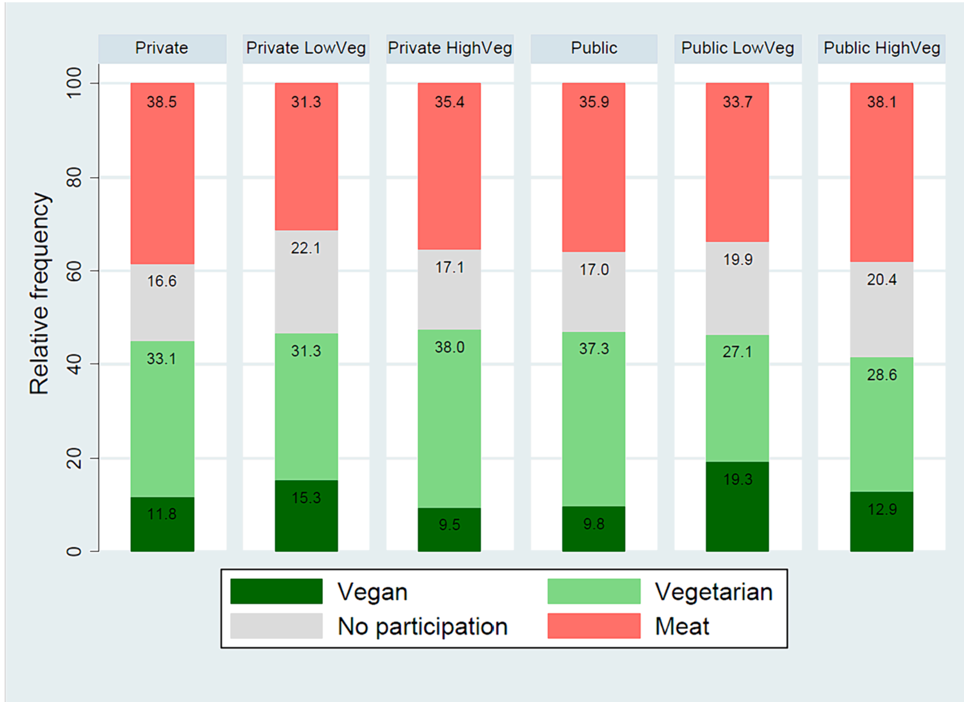

Fig. 1. Food choices by treatment

Note: Pairwise Pearson χ^2-tests reveal the following statistically significant differences: vegan choices between *Private* and *Public LowVeg* (p = 0.060); vegan choices between *Private HighVeg* and *Public LowVeg* (p = 0.012); vegan choices between *Public* and *Public LowVeg* (p = 0.017); vegetarian choices between *Private HighVeg* and *Public LowVeg* (p = 0.037); vegetarian choices between *Private HighVeg* and *Public HighVeg* (p = 0.082); vegetarian choices between *Public* and *Public LowVeg* (p = 0.052). For all comparisons, q-values are larger than 0.740 if we apply the Holm method or the Yekutieli method for multiple hypotheses testing (Newson, 2010, based on Holm, 1979; Benjamini and Yekutieli, 2001).

Table 4
Multinomial logistic regression results on voucher choices in the full sample.

Full sample	Baseline = Private					Baseline = Public				
	Meat	Vegetarian	Vegan	No voucher	Joint Wald test of coefficients	Meat	Vegetarian	Vegan	No voucher	Joint Wald test of coefficients
Private						−0.011	−0.010	0.023	−0.003	
						(0.867)	(0.807)	(0.497)	(0.956)	(0.912)
						[1.000]	[1.000]	[1.000]	[0.956]	[1.000]
Private LowVeg	−0.044	−0.035	0.029	0.050		−0.055	−0.045	0.053	0.047	
	(0.428)	(0.567)	(0.368)	(0.281)	(0.421)	(0.174)	(0.339)	(0.113)	(0.309)	(0.273)
	[0.842]	[1.000]	[0.736]	[0.562]	[0.963]	[0.522]	[0.678]	[0.312]	[0.618]	[0.546]
Private HighVeg	−0.019	0.035	−0.020	0.004		−0.030	0.025	0.004	0.001	
	(0.669)	(0.352)	(0.493)	(0.916)	(0.767)	(0.543)	(0.536)	(0.861)	(0.981)	(0.871)
	[0.669]	[0.398]	[0.986]	[1.000]	[0.862]	[1.000]	[0.609]	[1.000]	[1.000]	[1.000]
Public	0.011	0.010	−0.023	0.003						
	(0.867)	(0.807)	(0.497)	(0.956)	(0.912)					
	[1.000]	[1.000]	[1.000]	[0.956]	[1.000]					
Public LowVeg	−0.039	−0.074	**0.076****	0.038		−0.050	**−0.084***	**0.099*****	0.035	
	(0.369)	(0.207)	(0.045)	(0.425)	(0.191)	(0.366)	(0.052)	(0.000)	(0.359)	(0.001)
	[0.738]	[0.621]	[0.135]	[0.850]	[0.382]	[0.933]	[0.156]	[0.001]	[1.000]	[0.003]
Public HighVeg	0.001	−0.031	−0.004	0.033		−0.010	−0.040	0.020	0.030	
	(0.990)	(0.473)	(0.877)	(0.471)	(0.841)	(0.880)	(0.260)	(0.596)	(0.556)	(0.647)
	[0.990]	[0.946]	[1.000]	[0.942]	[0.841]	[0.880]	[0.520]	[1.000]	[1.000]	[1.000]
Joint test of Private LowVeg and HighVeg compared to Private or Public LowVeg and HighVeg compared to Public					(0.232)					(0.005)
					[0.464]					[0.015]
Joint test of all treatments compared to baseline					(0.001)					(0.001)
					[0.002]					[0.002]
N			931					931		

Note: Numbers show estimated average discrete probability effects of multinomial logit models of the categorical outcome variable voucher choice and results of joint Wald tests of regression coefficients of treatments. Standard errors are clustered at the session level. p-values are shown in brackets and q-values are shown in square brackets. q-values are estimated with the Holm method for multiple testing corrections (Newson, 2010, based on Holm, 1979). Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5
Multinomial logistic regression results on voucher choices in the male subsample.

Male subsample	Baseline = Private					Baseline = Public				
	Meat	Vegetarian	Vegan	No voucher	Joint Wald test of coefficients	Meat	Vegetarian	Vegan	No voucher	Joint Wald test of coefficients
Private						−0.089	−0.016	0.015	0.089	
						(0.328)	(0.837)	(0.765)	(0.235)	(0.532)
						[0.984]	[1.000]	[1.000]	[0.705]	[1.000]
Private LowVeg	0.054	**−0.096***	0.065	−0.023		−0.035	**−0.112****	0.081	0.066	
	(0.421)	(0.059)	(0.229)	(0.786)	(0.321)	(0.543)	(0.040)	(0.104)	(0.195)	(0.046)
	[0.842]	[0.177]	[0.687]	[0.786]	[0.963]	[0.732]	[0.120]	[0.312]	[0.585]	[0.138]
Private HighVeg	0.082	−0.070	0.019	−0.031		−0.007	−0.085	0.035	0.058	
	(0.189)	(0.199)	(0.669)	(0.717)	(0.431)	(0.933)	(0.204)	(0.467)	(0.454)	(0.509)
	[0.516]	[0.398]	[0.986]	[1.000]	[0.862]	[1.000]	[0.609]	[1.000]	[1.000]	[1.000]
Public	0.089	0.016	−0.015	−0.089						
	(0.328)	(0.837)	(0.765)	(0.235)	(0.532)					
	[0.984]	[1.000]	[1.000]	[0.705]	[1.000]					
Public LowVeg	0.057	−0.058	0.038	−0.037		−0.032	−0.074	0.053	0.052	
	(0.416)	(0.352)	(0.531)	(0.693)	(0.706)	(0.663)	(0.359)	(0.123)	(0.411)	(0.252)
	[0.738]	[0.621]	[0.531]	[0.850]	[0.706]	[0.933]	[0.359]	[0.123]	[1.000]	[0.252]
Public HighVeg	**0.167***	**−0.111****	0.001	−0.057		0.078	−0.127	0.016	0.032	
	(0.070)	(0.018)	(0.983)	(0.486)	(0.104)	(0.384)	(0.153)	(0.698)	(0.639)	(0.512)
	[0.140]	[0.054]	[1.000]	[0.942]	[0.243]	[0.768]	[0.459]	[1.000]	[1.000]	[1.000]
Joint test of Private LowVeg and HighVeg compared to Private or Public LowVeg and HighVeg compared to Public					(0.504)					(0.160)
					[0.504]					[0.160]
Joint test of all treatments compared to baseline					(0.031)					(0.031)
					[0.031]					[0.031]
N			410					410		

Note: Numbers show estimated average discrete probability effects of multinomial logit models of the categorical outcome variable voucher choice and results of joint Wald tests of regression coefficients of treatments. Standard errors are clustered at the session level. p-values are shown in brackets and q-values are shown in square brackets. q-values are estimated with the Holm method for multiple testing corrections (Newson, 2010, based on Holm, 1979). Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6
Multinomial logistic regression results on voucher choices in the female subsample.

Female subsample	Baseline = Private					Baseline = Public				
	Meat	Vegetarian	Vegan	No voucher	Joint Wald test of coefficients	Meat	Vegetarian	Vegan	No voucher	Joint Wald test of coefficients
Private						0.031	0.005	0.024	−0.061	
						(0.663)	(0.945)	(0.693)	(0.389)	(0.660)
						[1.000]	[1.000]	[1.000]	[0.778]	[1.000]
Private LowVeg	−0.095	0.008	−0.006	0.094		−0.065	0.013	0.018	0.033	
	(0.164)	(0.939)	(0.914)	(0.112)	(0.389)	(0.366)	(0.904)	(0.746)	(0.644)	(0.829)
	[0.492]	[1.000]	[0.914]	[0.336]	[0.963]	[0.732]	[0.904]	[0.746]	[0.644]	[0.829]
Private HighVeg	−0.077	0.100	−0.051	0.029		−0.046	0.105	−0.027	−0.032	
	(0.172)	(0.119)	(0.274)	(0.573)	(0.140)	(0.398)	(0.203)	(0.547)	(0.563)	(0.600)
	[0.516]	[0.357]	[0.822]	[1.000]	[0.420]	[1.000]	[0.609]	[1.000]	[1.000]	[1.000]
Public	−0.031	−0.005	−0.024	0.061						
	(0.663)	(0.945)	(0.693)	(0.389)	(0.660)					
	[1.000]	[1.000]	[1.000]	[0.778]	[1.000]					
Public LowVeg	**−0.090***	−0.092	0.083	**0.099***		−0.059	−0.087	**0.108*****	0.038	
	(0.063)	(0.241)	(0.126)	(0.051)	(0.071)	(0.311)	(0.122)	(0.004)	(0.549)	(0.085)
	[0.189]	[0.621]	[0.252]	[0.153]	[0.213]	[0.933]	[0.244]	[0.008]	[1.000]	[0.170]
Public HighVeg	**−0.145****	0.034	−0.010	**0.122***		−0.114	0.039	0.015	0.061	
	(0.021)	(0.597)	(0.812)	(0.063)	(0.081)	(0.151)	(0.545)	(0.820)	(0.399)	(0.562)
	[0.063]	[0.946]	[1.000]	[0.189]	[0.243]	[0.453]	[0.545]	[1.000]	[1.000]	[1.000]
Joint test of Private LowVeg and HighVeg compared to Private or Public LowVeg and HighVeg compared to Public					(0.098)					(0.060)
					[0.294]					[0.120]
Joint test of all treatments compared to baseline					(0.000)					(0.000)
					[0.000]					[0.000]
N			521					521		

Note: Numbers show estimated average discrete probability effects of multinomial logit models of the categorical outcome variable voucher choice and results of joint Wald tests of regression coefficients of treatments. Standard errors are clustered at the session level. p-values are shown in brackets and q-values are shown in square brackets. q-values are estimated with the Holm method for multiple testing corrections (Newson, 2010, based on Holm, 1979). Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

subsample is relatively low, the effect on meat choice is only weakly significant and implies a familywise error rate slightly larger than 0.10, which is why this result should be interpreted as suggestive. We also find suggestive evidence that males choose vegetarian vouchers less often in *Private LowVeg* compared to both the *Private* and the *Public* treatment.

For females, the combination of a high social norm and observability in *Public HighVeg* has the opposite effect than for males; in line with our hypotheses their likelihood of choosing a meat voucher is reduced by 14.5 percentage points and the likelihood of choosing no voucher increases by 12.2 percentage points. The decrease in meat choices remains statistically significant when we account for multiple hypothesis testing, while the effect on no-voucher choices implies a higher familywise error rate and should therefore again be interpreted as suggestive. We also find a significant increase in vegan choices of 10.8 percentage points in *Public LowVeg* compared to *Public*. Comparing *Public LowVeg* to *Private*, meat choices are slightly reduced and no-voucher choices are slightly increased, but the effects are only weakly significant and again imply a higher familywise error rate.

The results in Tables 4-6 show that observability alone has no significant impact on food choices, that is, choices in *Public* are not significantly different from the choices in *Private*. Additional regressions with other baseline treatments show weak evidence that, with a low social norm, observability leads females to choose vegan more often (9 pp., $p = 0.086$) and, with a high social norm, it leads females to forgo a voucher more often (9.3 pp., $p = 0.087$). A postestimation calculation of differences additionally reveals that for females and for the full sample, there is a weakly significant interaction effect between observability and norms; the *Public LowVeg* treatment increases vegan choice more compared to the *Public* treatment than *Private LowVeg* does compared to *Private* ($p = 0.056$ for full sample, $p = 0.098$ for females). There are no significant interaction effects for males. Taken together, we find that males and females respond differently to social norms and that the effects do not always go in the predicted direction, which we will discuss in more detail below.

5.3. Regression results when vegetarian and vegan choices are pooled

In Tables 7-9, we report the estimated average discrete probability effects of the treatment variables as well as joint Wald tests of coefficients for the full sample and the two subsamples when vegetarian and vegan choices are combined into meatless choices. The regressions include the same control variables as before and are shown in full in Tables A5-A7 in the Appendix.

In the pooled model, we can reject the null hypothesis that none of the treatments has an effect on food choice for the female subsample but not for the male subsample and the full sample. With pooled choices, there are no significant treatment effects for the full sample. For males, the joint Wald tests of coefficients are insignificant, but similar to the analysis above, the *Public HighVeg* treatment significantly *reduces* meatless choices by 10.6 percentage points (Table 8). The corresponding increase in meat choices is also significant, but requires accepting a higher familywise error rate and should therefore be interpreted as suggestive. For females, we again find suggestive evidence that both the *Public HighVeg* treatment and the *Public LowVeg* treatment reduce meat choices in favor of no-voucher choices, with larger effect sizes for the high social norm (Table 9). With pooled choices, we do not find significant interaction effects between observability and social norms for any sample or subsample.

5.4. Interaction effects between gender and treatments

The results presented thus far suggest that men and women respond differently to social norms. To further examine these differences, we ran multinomial regressions with the same explanatory variables as in Table 4 which additionally include interaction terms between subject gender and treatment as well as instructor gender and treatment. The results for the interaction between subject gender and social norm treatment are shown in Fig. 2. For the interaction analyses, we estimate treatment effects at the means of all other controls instead of average treatment effects to avoid that estimated differences in treatment effects between the genders are driven by differences in other (observable) controls.[12] The figure shows the effects of social norms on food choices within each gender group, the differences between males and females for a given norm condition, and the differences in the effects of social norms between males and females (second differences). All the differences are shown with and without observability.

The results for meat choices (the two top left panels) show that males in the baseline condition *Private* are only slightly more likely to choose meat than females (10.1 pp.). In all other conditions, males are significantly more likely to choose meat than females, with differences ranging from 24 percentage points in *Public* to a remarkable 47.1 percentage points in *Public HighVeg*. The analysis of second differences reveals that the reduction in meat choices between *Private* and *Private LowVeg* is weakly significantly larger for females than for males (panel a). The same is true for the meat reduction between *Private* and *Private HighVeg*. In other words, females show a stronger reduction in meat choice after receiving a low social norm or a high social norm than males. Similarly, females show a significantly larger reduction in meat choice in response to the high social norm in *Public HighVeg* than males; the decreases in meat choice compared to *Public* and to *Public LowVeg* are significantly higher for females than for males (panel b).

The results for vegetarian choice (the two top right panels) show that females are significantly more likely to choose vegetarian than males except in *Public*, with differences ranging from 15.4 percentage points in *Public LowVeg* to 35.5 percentage points in *Private HighVeg* and 40.9 percentage points in *Public HighVeg*. Second differences show that the increase in vegetarian choices in *Public HighVeg* compared to *Public* as well as compared to *Public LowVeg* is significantly larger for females than for males (panel d). This demonstrates that females under observation are significantly more likely than males to adjust their behavior in the predicted direction. We do not find any significant second differences between males and females for vegan choices (panels e and f) and no-voucher choices (panels g and h).

Overall, the results in Fig. 2 confirm the impression that females respond sensitively to social norms, especially to the high social norm under observation (*Public HighVeg*). Their likelihood of choosing the vegetarian voucher increases by 18.3 percentage points in *Public HighVeg* compared to *Public LowVeg*. Males, in contrast, respond only little to social norms when their choices are not observed, and they tend to choose more meat and less meat-free when confronted with a high social norm and observed at the same time.

5.5. Beliefs

While there are significant differences between women and men in how they respond to the norm interventions, the effects of the norm interventions within the gender groups are only small to moderate, and no significant effects of the norm interventions can be found for the full sample. This raises the question of whether the norm intervention was successful in influencing participants' beliefs about the proportion of vegetarians and vegans in the relevant peer group.

On average, participants in treatments with social norms estimate that about 30 percent of students eat a vegetarian or vegan diet. This is almost in the middle between the low and the high social norm that we

[12] We do this because in multinomial logit models, estimated marginal and discrete effects do not only vary with the value of the variable of interest, but also with the values of all other control variables in the model. Females and males in our sample differ in some control variables, such as religion, native language, and political preferences. We use the SPost13 package in Stata (Long and Freese, 2014) to estimate differences.

Table 7
Multinomial logistic regression results on voucher choices when vegetarian and vegan choices are pooled in the full sample.

Full sample	Baseline = Private				Baseline = Public			
	Meat	Meatless	No voucher	Joint Wald test of coefficients	Meat	Meatless	No voucher	Joint Wald test of coefficients
Private					−0.011	0.014	−0.003	
					(0.863)	(0.653)	(0.960)	(0.904) [1.000]
					[1.000]	[1.000]	[0.960]	
Private LowVeg	−0.044	−0.006	0.050		−0.055	0.007	0.047	
	(0.434)	(0.911)	(0.280)	(0.534) [1.000]	(0.174)	(0.894)	(0.308)	(0.303) [0.909]
	[0.868]	[1.000]	[0.560]		[0.522]	[1.000]	[0.616]	
Private HighVeg	−0.020	0.016	0.004		−0.030	0.030	0.001	
	(0.662)	(0.702)	(0.929)	(0.893) [1.000]	(0.536)	(0.457)	(0.987)	(0.497) [1.000]
	[0.662]	[1.000]	[1.000]		[1.000]	[0.696]	[1.000]	
Public	0.011	−0.014	0.003					
	(0.863)	(0.653)	(0.960)	(0.904) [1.000]				
	[1.000]	[1.000]	[0.960]					
Public LowVeg	−0.039	0.001	0.038		−0.050	0.014	0.035	
	(0.370)	(0.989)	(0.427)	(0.617) [1.000]	(0.375)	(0.781)	(0.353)	(0.585) [1.000]
	[0.740]	[1.000]	[0.854]		[0.987]	[1.000]	[1.000]	
Public HighVeg	0.001	−0.035	0.033		−0.010	−0.021	0.031	
	(0.985)	(0.507)	(0.470)	(0.664) [0.664]	(0.883)	(0.672)	(0.552)	(0.786) [0.810]
	[0.985]	[1.000]	[0.932]		[0.883]	[1.000]	[1.000]	
Joint test of Private LowVeg and HighVeg compared to Private or Public LowVeg and HighVeg compared to Public				(0.827) [1.000]				(0.817) [1.000]
Joint test of all treatments compared to baseline				(0.376) [0.510]				(0.376) [0.510]
N			931				931	

Note: Numbers show estimated average discrete probability effects of multinomial logit models of the categorical outcome variable voucher choice with vegan and vegetarian option pooled (meatless) and results of joint Wald tests of regression coefficients of treatments. Standard errors are clustered at the session level. p-values are shown in brackets and q-values are shown in square brackets. q-values are estimated with the Holm method for multiple testing corrections (Newson, 2010, based on Holm, 1979). Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 8
Multinomial logistic regression results on voucher choices when vegetarian and vegan choices are pooled in the male subsample.

Male subsample	Baseline = Private				Baseline = Public			
	Meat	Meatless	No voucher	Joint Wald test of coefficients	Meat	Meatless	No voucher	Joint Wald test of coefficients
Private					−0.083	−0.010	0.094	
					(0.368)	(0.881)	(0.212)	(0.398) [1.000]
					[1.000]	[1.000]	[0.636]	
Private LowVeg	0.051	−0.026	−0.026		−0.032	−0.036	0.068	
	(0.472)	(0.670)	(0.765)	(0.737) [1.000]	(0.563)	(0.530)	(0.169)	(0.391) [0.909]
	[0.868]	[1.000]	[0.765]		[0.738]	[1.000]	[0.507]	
Private HighVeg	0.081	−0.047	−0.034		−0.003	−0.057	0.060	
	(0.205)	(0.481)	(0.695)	(0.388) [1.000]	(0.975)	(0.235)	(0.436)	(0.415) [1.000]
	[0.501]	[1.000]	[1.000]		[1.000]	[0.696]	[1.000]	
Public	0.083	0.010	−0.094					
	(0.368)	(0.881)	(0.212)	(0.398) [1.000]				
	[1.000]	[1.000]	[0.636]					
Public LowVeg	0.053	−0.012	−0.041		−0.031	−0.022	0.053	
	(0.449)	(0.893)	(0.665)	(0.737) [1.000]	(0.682)	(0.817)	(0.408)	(0.666) [1.000]
	[0.740]	[1.000]	[0.854]		[0.987]	[1.000]	[1.000]	
Public HighVeg	**0.165***	**−0.106****	−0.059		0.082	−0.117	0.035	
	(0.081)	(0.017)	(0.466)	(0.069) [0.138]	(0.359)	(0.122)	(0.615)	(0.270) [0.810]
	[0.162]	[0.051]	[0.932]		[0.718]	[0.366]	[1.000]	
Joint test of Private LowVeg and HighVeg compared to Private or Public LowVeg and HighVeg compared to Public				(0.686) [1.000]				(0.188) [0.564]
Joint test of all treatments compared to baseline				(0.255) [0.510]				(0.255) [0.510]
N			410				410	

Note: Numbers show estimated average discrete probability effects of multinomial logit models of the categorical outcome variable voucher choice with vegan and vegetarian option pooled (meatless) and results of joint Wald tests of regression coefficients of treatments. Standard errors are clustered at the session level. p-values are shown in brackets and q-values are shown in square brackets. q-values are estimated with the Holm method for multiple testing corrections (Newson, 2010, based on Holm, 1979). Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

used in the experiment. Since the guesses were elicited before the treatment interventions, they do not significantly differ between treatments (all p-values from pairwise Wilcoxon rank-sum tests are greater than 0.25). Females estimate significantly higher values (31.7 percent on average) than males (27.9 percent; p-value = 0.0006 from a Wilcoxon rank-sum test). The distribution of norm estimates is shown in Figure A1 in the Appendix.

Since we only collected subjects' beliefs in the treatments with social norms and before the treatment texts were displayed, we are unable to determine whether and how the norm intervention influenced the

Table 9
Multinomial logistic regression results on voucher choices when vegetarian and vegan choices are pooled in the female subsample.

Female subsample	Baseline = Private				Baseline = Public			
	Meat	Meatless	No voucher	Joint Wald test of coefficients	Meat	Meatless	No voucher	Joint Wald test of coefficients
Private					0.032	0.028	−0.060	
					(0.656)	(0.651)	(0.391)	(0.696) [1.000]
					[1.000]	[1.000]	[0.782]	
Private LowVeg	−0.096	0.002	0.094		−0.064	0.031	0.033	
	(0.162)	(0.977)	(0.113)	(0.222) [0.666]	(0.369)	(0.742)	(0.640)	(0.645) [0.909]
	[0.486]	[1.000]	[0.339]		[0.738]	[1.000]	[0.640]	
Private HighVeg	−0.078	0.050	0.028		−0.046	0.078	−0.032	
	(0.167)	(0.446)	(0.580)	(0.377) [1.000]	(0.397)	(0.232)	(0.560)	(0.482) [1.000]
	[0.501]	[1.000]	[1.000]		[1.000]	[0.696]	[1.000]	
Public	−0.032	−0.028	0.060					
	(0.656)	(0.651)	(0.391)	(0.696) [1.000]				
	[1.000]	[1.000]	[0.782]					
Public LowVeg	**−0.089***	−0.011	**0.100***		−0.058	0.018	0.040	
	(0.067)	(0.860)	(0.050)	(0.052) [0.156]	(0.329)	(0.734)	(0.531)	(0.624) [1.000]
	[0.201]	[1.000]	[0.150]		[0.987]	[1.000]	[1.000]	
Public HighVeg	**−0.146****	0.024	**0.122***		−0.114	0.052	0.062	
	(0.021)	(0.761)	(0.064)	(0.039) [0.117]	(0.153)	(0.519)	(0.395)	(0.390) [0.810]
	[0.063]	[1.000]	[0.192]		[0.459]	[1.000]	[1.000]	
Joint test of Private LowVeg and HighVeg compared to Private or Public LowVeg and HighVeg compared to Public				(0.230) [0.690]				(0.735) [1.000]
Joint test of all treatments compared to baseline				(0.023) [0.069]				(0.023) [0.069]
N			521				521	

Note: Numbers show estimated average discrete probability effects of multinomial logit models of the categorical outcome variable voucher choice with vegan and vegetarian option pooled (meatless) and results of joint Wald tests of regression coefficients of treatments. Standard errors are clustered at the session level. p-values are shown in brackets and q-values are shown in square brackets. q-values are estimated with the Holm method for multiple testing corrections (Newson, 2010, based on Holm, 1979). Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

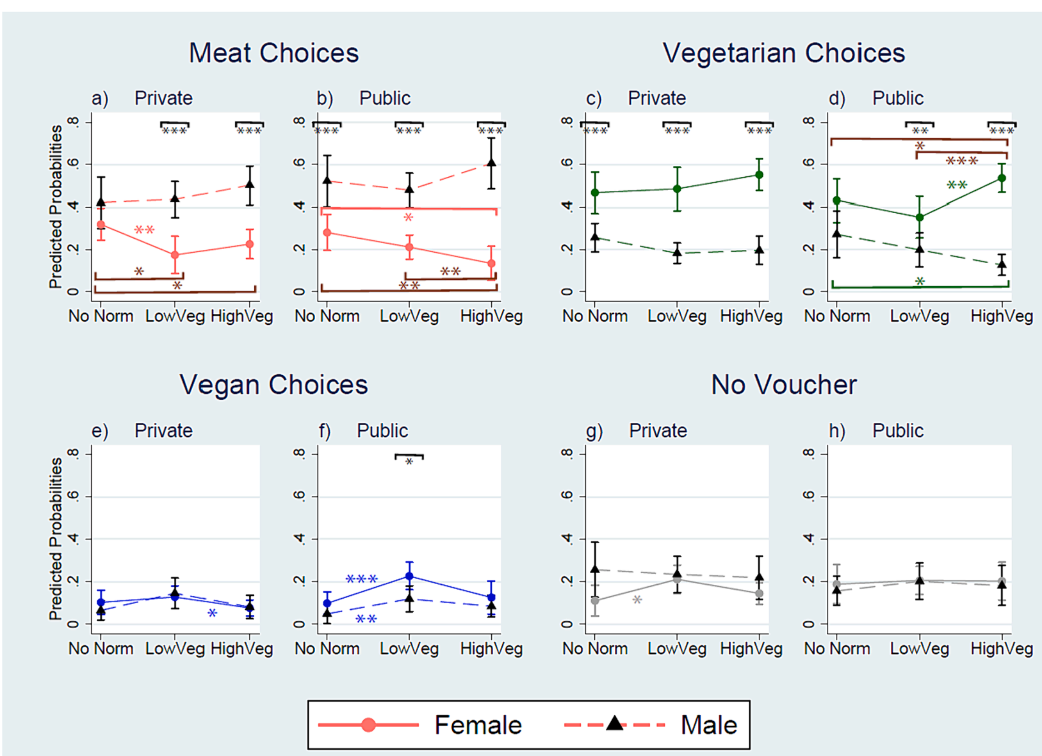

Fig. 2. Interaction effects between gender and social norm treatments
Note: Predicted probabilities of choosing meat (panels a, b), vegetarian (c, d), vegan (e, f), or no voucher (g, h) from a multinomial logit regression model with an interaction term between treatment and gender. Standard errors are clustered at the session level. Differences between males and females within a norm treatment in black; differences between treatments within gender group for meat in red, vegetarian in green, vegan in blue, no voucher in grey; second differences in treatment effects between males and females in brown; levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

beliefs with the original data. In order to still obtain evidence for this question, we collected additional data with a new sample of first-year students who started their studies two years after the first-year students in the original experiment. Table A8 in the Appendix shows that this new sample of first-year students is comparable to the original sample in terms of gender, age, native language, religion, and the share of meat-eaters. There are a few differences in the proportion of Master's students, study programs, and political preferences. The new sample of first-year students answered the same questions as the original sample in an online survey, with the difference that they could not choose and win vouchers (the complete post-experimental survey is shown in the Appendix). Importantly, they were presented with exactly the same norm interventions. To this end, participants were randomly assigned to one of three treatments and, depending on the treatment, received different information about the proportion of vegetarians and vegans in a non-representative group of students already enrolled at the university (No Norm: no information, LowVeg: 10 percent, HighVeg: 60 percent). Afterwards, participants were asked to estimate the proportion of vegetarians and vegans in their study program, with correct estimates being rewarded with 5 euros.[13] We use these estimates in the three treatments (No Norm, LowVeg, HighVeg) to test whether the norm intervention changed the participants' beliefs about the share of vegetarians and vegans in their study program in the desired direction.

A total of 394 students took part in the post-experimental survey. One person was dropped because he or she participated twice, 43 were dropped because they left the survey before the elicitation of beliefs, another 31 were dropped because they were not first-year students, resulting in a final sample size of 319 observations and approximately 100 observations per treatment.

The analyses of the new data show that subjects' beliefs about the share of vegans and vegetarians in their study program are strongly affected by the norm interventions. The differences in subjects' estimates between treatments are large, statistically significant, and in the expected direction (No Norm: 26.5 percent, LowVeg: 15.8 percent, HighVeg: 39.8 percent) which applies to the full sample and the male and female subsamples (all p-values from pairwise Wilcoxon rank-sum tests are smaller than 0.001). Table 10 shows the results of Tobit regression models with subjects' estimates of the share of vegetarians and vegans in their study program as dependent variable.

The regression results are in line with the non-parametric tests and show a strong and highly significant effect of the norm treatments on subjects' beliefs about the share of vegans and vegetarians in their study program. The estimates of participants in the *HighVeg* treatment compared to the *LowVeg* treatment differ by an estimated 24 percentage points in the full sample, implying that beliefs are adapted strongly in line with the communicated social norm.

Model (2) tests whether the treatments affect males' and females' beliefs differently. The respective interaction term is not significantly different from zero. Fig. 3 shows this relationship in more detail. All pairwise treatment comparisons are highly significant within each gender group. Within each treatment condition, females and males only differ significantly in their beliefs in the *No Norm* treatment. The gender difference is slightly smaller in absolute terms in *LowVeg*, but the second difference is not statistically significant, which shows that women do not adapt their beliefs significantly more than men.

[13] The own study program represents the relevant comparison group because the observers in the original experiment, who were in the same breakout room, all came from the same study program or took the same course. In the post-experimental survey of the new first-year students, we asked about their study program and eating habits, on the basis of which we were able to identify and reward the correct estimates.

Table 10
Tobit regression results of norm beliefs in post-experimental survey sample.

	(1)	(2)	(3)	(4)
	Full sample	Full sample	Male subsample	Female subsample
Treatment (baseline category: No Norm)				
LowVeg	**−9.422*****	**−11.937*****	**−6.104****	**−11.736*****
	(0.000)	(0.004)	(0.020)	(0.005)
HighVeg	**14.346*****	**13.194*****	**16.279*****	**13.064*****
	(0.000)	(0.000)	(0.000)	(0.000)
Male	**−7.294****	**−10.008*****		
	(0.011)	(0.006)		
LowVeg*Male		5.789		
		(0.212)		
HighVeg*Male		2.747		
		(0.596)		
Constant	9.505	11.022	−5.181	14.244
	(0.434)	(0.369)	(0.666)	(0.471)
N	309	309	126	183

Note: Numbers show estimated treatment and interaction effects of Tobit models of the continuous (censored) outcome variable *estimated share of vegans and vegetarians in one's study program*. Control variables for acquaintance, age, religion, native language, and political preferences are included but not shown. Standard errors are clustered at the study program level. p-values in parentheses. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

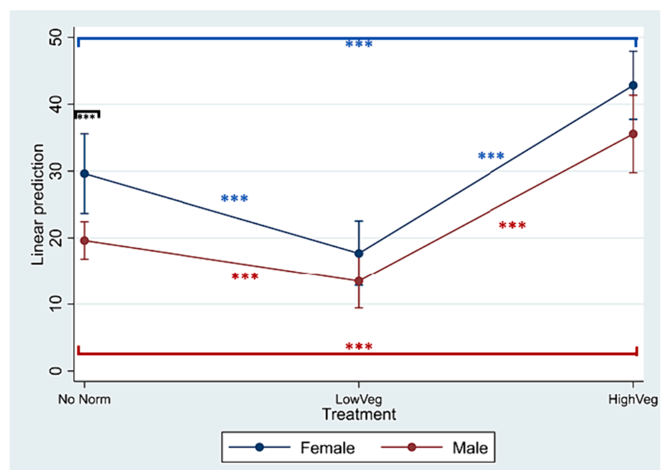

Fig. 3. Interaction effects between gender and treatment in post-experimental survey
Note: Lines show linear predictions of estimated share of vegans and vegetarians in one's study program from a Tobit regression model. Standard errors are clustered at the study program level. Differences between males and females within a norm treatment in black; differences between treatments within male subsample in blue, within female subsample in red; levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

6. Discussion and conclusion

Our experiment has shown whether individuals adjust their food choices when they receive information about the diets of others and are possibly observed. Our results show clear differences between women and men in how they respond to social norms. Men show little tendency to follow the social norm regardless of whether they are confronted with a high or low proportion of vegetarians and vegans, or whether they are observed or not. When faced with a high proportion of vegetarians and vegans and observed, they even show a slight tendency to choose more meat and less meat-free. Women, on the other hand, show a tendency to reduce their meat consumption when confronted with a social norm, especially when their decision can be observed. Interestingly, the tendency to choose less meat occurs not only with the high social norm indicating a high share of vegetarians and vegans, but also with the low social norm indicating a low share. This suggests that women do not blindly follow the norms, but rather take them as an opportunity to reflect on what is the better food choice. Our assumption in the theoretical model that a low proportion of vegetarians and vegans in the reference group would reduce feelings of guilt about meat consumption obviously does not hold. Instead, both the high and the low social norm seem to trigger a reluctance to choose meat among women. It would be interesting to study the effect of injunctive norms in this context and compare the results with the effects of descriptive social norms – a task we leave to future research.

The different tendencies of how men and women respond to social norms lead to large differences in their food choices once information about social norms is available. With a social norm message indicating a high proportion of vegetarians and vegans in the reference group and observability of food choices, the estimated probability of choosing meat at the means of all other control variables is 60.6 percent for men while it is only 13.5 percent for women. For comparison, in the baseline treatment with no social norm and no observation, the estimated probability of choosing meat is 42 percent for men and 32 percent for women.

According to our theoretical model, these differences may arise if the information provided changes women's beliefs about the proportion of vegetarians and vegans more than men's, if women are more likely to feel guilty about consuming meat, if they are more likely to believe that their voucher choice will affect their reputation, if they care more about their reputation than men, or a combination of those factors. The results from our post-experimental survey with a new sample of first-year students suggest that women do not adapt their beliefs about the proportion of vegetarians and vegans significantly more than men. This allows us to rule out different adjustment of beliefs about social norms as an explanation. There is some evidence in our data to support the other explanations that women are more likely to feel guilty about eating meat and that they are more concerned about their reputation. Females in our sample follow more sustainable diets and have more sustainable diet intentions than males, they state higher importance of eco-friendliness for everyday life decisions, they volunteer for the environment or animal protection more often, donate to environmental causes more often, and engage in environmental activism more often, and they are more likely to vote for the Green party than males. While guilt is not the only factor that may motivate these choices, a higher perceived responsibility for protecting the environment could explain why females seem to consistently engage in more pro-environmental behaviors than males. Females are also more likely to agree with positive statements concerning vegans and vegetarians and less likely to agree with negative statements in our survey. Given their own opinion, they may be more likely to expect a reputational gain from choosing a meat-free voucher in the public treatments. Also, females spend more time and post more content on social media than males, which could point towards a higher importance of reputation (see Table A9 in the Appendix for details on gender differences in the control variables).

The explanations that women tend to care more about their reputation and feel more guilty about meat consumption also align with recent studies showing that women are more likely to reduce their meat consumption when given information about climate change, health, or animal welfare impacts (Perino and Schwirplies, 2022; Dannenberg and Weingärtner, 2023). Schram and Charness (2015) find that women in a modified dictator game are much more sensitive to peer advice than males, both when their decision is observable and when it is not, suggesting that women may have a higher desire to follow others. Men's low tendency to follow social norms in our experiment, although we used two widely separated values (10 vs. 60 %), suggests that the numbers do not have a large impact. Nevertheless, it might be interesting for subsequent studies to look at higher values and test whether there are social tipping points at which also men's behavior tips in the predicted direction (Welsch, 2022).

Pure observability of food choices without additional nudge does not have a significant effect for either men or women in our experiment. In the experiment of Dannenberg and Weingärtner (2023), conducted at the same university, observability slightly reduces the probability of choosing meat among women. The difference may be explained by the fact that our experiment was conducted with first-year students, whereas the participants in Dannenberg and Weingärtner's (2023) experiment have already been studying for several semesters and thus exposed to eating behaviors and social norms at the university.

Like all studies, our study contains a number of limitations that must be considered when interpreting the results. First, we study people's short-term reactions when they receive one-time information about the behavior of others. It is plausible that social norms exert influence on food choice in the long term rather than short term which necessitates further research using panel data. Second, the data collection took place during a global pandemic in which many university events were conducted online and overall social life was very limited. The first-year students were given a wealth of new information to process in the introductory sessions, and the observation in the experiment was digital and not face to face. Third, the experiment was conducted with first-year students who are not representative of the general population and perhaps not even of the University where the experiment took place.

Together, these limitations raise the question of the external validity of the results and the transferability of the behavior measured in this context to other contexts, which can only be answered by further research. The advantage in our study is certainly the internal validity of the results, since it was precisely the special context that allowed us to randomly manipulate social norms and observability across individuals and thus identify causal effects. Such a trade-off between external validity and internal validity exists in many analyses as field studies with high external validity often suffer from a lack of control and controlled laboratory experiments with high internal validity suffer from an artificial decision context. In the analysis of food decisions, the trade-off is particularly acute because these decisions are made privately at home or in supermarkets and restaurants, which place tight constraints on analysts' ability to study food policy measures (see Just and Byrne (2020) for an excellent discussion). Because "no one methodology can claim to be the gold standard for building policy-actionable results" (Just and Byrne, 2020, p. 364) policies should not be based on individual studies, but on a research agenda that includes multiple complementary methodologies and deals transparently with existing limitations and trade-offs.

Pending further research, our context where first-year students receive unambiguous information about the group they are about to join was arguably favorable for detecting an effect. The fact that we did not find a significant effect overall suggests that choosing food is not one of those activities where many people spontaneously follow the lead of others. If the goal is to curb meat consumption on a large scale, policy should not rely solely on changing social norms and dynamic imitation processes, but explore and harness the potential of instruments explicitly designed to reduce meat consumption, such as pricing and information instruments. The low response to the behavior of others also suggests that public acceptance of interventions to reduce meat consumption will remain a political challenge. Some hope for decreasing meat consumption comes from women in our study, who respond particularly to the combination of social norm and observability. This finding suggests that information about other people's choices may be more effective in public canteens and restaurants, where people often go in company, than in supermarkets, where they are alone or with their immediate family. In the introduction above, we have discussed the fact that men and women in Germany have different habits and views regarding food, which we also found in the experiment. It might thus be useful for policymakers and other decision makers to think about target-group specific measures and information to influence meat consumption. While women in our experiment were willing to reduce their meat consumption, this was not the case for men. Perhaps men would be more willing to give up meat if the alternative was more similar to meat, such as lab-grown or plant-based meat. Here too, further research is needed to gain a better understanding of food choices and possible ways to achieve more sustainable diets.

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CRediT authorship contribution statement

Astrid Dannenberg: Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing. **Charlotte Klatt:** Conceptualization, Data curation, Formal analysis, Investigation, Validation, Visualization. **Eva Weingärtner:** Conceptualization, Data curation, Formal analysis, Investigation, Validation, Visualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodpol.2024.102621.

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