Preanalysis Plan
Multidimensional Temptation: Field Evidence*

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Abstract

Most of the experimental work on temptation and menu choice remains limited to laboratory settings. To bring decision theory to the field, we design customized food ordering platforms on which we invite participants for a challenge – following a carb- and meat-controlled diet for 5 consecutive days. Our dataset allows us to take an agnostic and comprehensive approach to measuring temptation: we allow for any degree of commitment, from commitment to a single meal category to complete flexibility. Using information on the entire ordering over 7 menus, we develop behavioral measures to study the source, strength and structure of temptation. In particular, our design allows us to study the revealed preference implications of agents facing multiple temptations. We use detailed survey data on participants' lunch habits to test whether the elicited measures align with participants' assessments of what foods are hard to resist. We then assess the predictive power of these measures for subsequent behaviors, intentions and beliefs.

JEL Codes: C93, D01, D90, D91

Keywords: Temptation, commitment, flexibility, self-control, field experiment

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1 Introduction

A central implication of most economic theories of temptation is that decision-makers with self-control problems will want to restrict the choices of their future selves. This study offers a systematic analysis of the relationship between temptation and commitment behavior in a field setting. Study participants are students at the University of Oxford who will be invited for a meal challenge: limiting their consumption of animal products and/or refined carbohydrates for five days in a row, focusing instead on plant-based options. They will be offered 5 free lunch meals at their dining hall for a week and asked to order their meals on a food ordering platform designed specifically for this project. We study participants' preference ordering over 7 different versions of the platform, which vary in the number of meal categories displayed (i.e., the menu), allowing us to study (i) the trade-offs between commitment and flexibility (i.e., restricted vs. larger menus) and (ii) the nature of commitment choices. We collect data on participants' motives and beliefs to interpret these measures. Participants are then randomly assigned to one version of the platform based partly on their decisions and partly on chance. Subsequently, we study their meal orders on the assigned platform, their likelihood of picking up the meals, and their subjective experiences and attitudes after the challenge period is over. This preanalysis plan (PAP henceforth) details (i) the experimental design, (ii) the behavioral measures constructed from participants' menu preferences, (iii) the data used to interpret those measures, and (iv) the analyses proposed to assess their predictive power for future behavior, attitudes, subjective experiences, and beliefs.

2 Study Design

2.1 General Description

Recruitment and Incentives. Students from 6 University of Oxford colleges (Jesus, Queen's, Somerville, St Antony's, St Hugh's, and St Peter's) who have no dietary restrictions are recruited to participate in a study on food ordering. Participants must (i) be at least 18 years old, (ii) be a student at one of the six colleges, (iii) have no dietary restrictions (such as vegan, vegetarian, gluten-free, keto, no dairy/lactose, halal, kosher, or other restrictions due to food allergies or health conditions), and (iv) complete the surveys on a computer (not a phone and not a tablet/iPad). The study consists of 4 stages: (i) a 25-minute main survey from 3rd February to 7th February 2025, (ii) a food ordering stage on the morning of 10th February 2025, (iii) a meal pickup stage from 10th February to 14th February 2025, and (iii) a 15-minute follow-up survey on 14th February 2025. For the recruitment of participants, we shared a "registration of interest" survey in the 6 colleges the week prior to the main survey.[1] We selected the six colleges based on the number of students and the feasibility to cater to our specific needs. The main survey is presented in Section A.2.

Besides a £20 survey completion fee in the form of an Amazon gift card, all participants receive free lunches for 5 consecutive days (5 meals worth around £25) to be consumed at their college hall. The meals are served during regular opening hours and prepared by the usual kitchen staff, ruling out any uncertainty regarding the quality of the meals. All participants place a single order of 5 meals on Monday (10th February 2025) of the week in which they receive the meals. Specifically, they will receive the link

[1] The form was circulated via various channels including mailing lists, text messages, social media channels, and in-person recruitment through flyers (see Figure A.1 in Section A.1).

to the ordering platform at 8:00am on Monday and have to complete their orders for the entire week by 11:00am (10:00am in St Hugh's). The short time between placing the order and receiving the first meal is a key design feature intended to induce temptation.[2] Participants consume their lunches Monday to Friday during standard lunch opening hours at their college. Orders will be placed through one of 7 possible versions of a customized food ordering platform developed specifically for this study. The assigned version partly depends on the respondent's answers in the survey and partly on chance.

To incentivize hall attendance and choice of plant-based meals, participants also collect lottery tickets to enter in a prize draw across all colleges.[3] Each participant gets one lottery ticket upon completion of a checkout poll after submitting their order, one lottery ticket for each carb- or meat-based meal collected, three lottery tickets for each plant-based meal collected, and a challenge completion bonus of three tickets if they collect all 5 meals. Hence, each participant can obtain up to 19 lottery tickets.

Robustness Analyses and Exclusion Criteria. We set a target to recruit 400 participants across the 6 colleges (partly due to logistical constraints). We will exclude any respondents who do not meet all inclusion criteria listed above. We will base our analyses on the full sample of complete responses in the main survey. To examine sensitivity to outliers, we provide robustness analyses after removing all respondents who meet at least one of the following exclusion criteria: (i) finishing the survey in less than 5 minutes, (ii) expressing indifferences at all menu pairs in both decision tasks (iterative ranking and monetary valuations), and (iii) indicating a motivation for the challenge of less than 30 (out of 100). To account for potential attrition, we provide robustness analyses on the sample of respondents who fully completed all elements of the study as summarized in Table 3.

Structure of Main Survey. Participants will complete 4 survey sections as summarized in Table 1. In section 1, participants answer basic questions about themselves (including gender and program year) and provide information on their meal habits over the last 6 months (including percentage of lunch/dinner meals that contained vegetables, carbohydrates, and meat, average weekly attendance to college hall, and other lunch habits). The next three sections, described below, introduce participants to the food challenge and the food ordering platform they will use (Section 2.2), elicit their preferences for the meal options to be shown on the platform (Section 2.3), and collect follow-up data to better interpret the preferences they expressed (Section 2.4).

2.2 Food Challenge and Platform Presentation

Food Challenge and Meal Categories. Section 2 of the main survey introduces participants to a food challenge associated with the free meal orders. The goal of the challenge is to limit the consumption of animal products and/or refined carbs for 5 days in a row and instead focus on plant-based sources of

[2] This fundamental constraint ruled out many of our initial design ideas. For instance, relying on pre-packaged meals was infeasible because their delivery times typically exceeded 24 hours.

[3] We investigated which items were the most popular among potential participants in the registration of interest survey (see Section A.2), and selected one Apple Watch SE GPS (£219), one Kindle Paperwhite 16 GB (£169.99), and two Virgin Experience vouchers (£50 each). The exact list of prizes can be accessed by clicking on a button in the main survey.

Table 1. Structure of the main survey.

Section in survey	Description
Section 1	Collection of socio-demographic variables and current meal habits of respondents.
Section 2	Presentation of the food challenge and ordering platform with customizable menus.
Section 3	Elicitation of preferences over 7 possible menus via iterative ranking (Section 2.3.1) and monetary valuations (Section 2.3.2).
Section 4	Questions about motives and beliefs regarding future choices.

protein and vegetables.[4] Completing the challenge increases a participant's chances of winning in the prize draw. In addition, we implement a randomized information manipulation: a random subset of our sample is informed of the fact that, when asked to predict the performance of different groups of participants during the challenge, an AI model expressed uncertainty about their overall performance. The other group receives a control message. We perform block randomization of the treatment at the college level. We use this information intervention to assess the motivational power of an ego threat and evaluate the elasticity of our main outcomes of interest (commitment demand, meal category ordered and number of meals picked up) to subtle psychological manipulations. To structure the challenge, we divided the meals that might be available on the platform into three mutually exclusive categories: Daily Harvest (G), Carb Powerhouse (O), and Carnivore Corner (R).[5] Table 2 summarizes the general content of each meal category, and Table B.1 in Appendix B provides examples of typical meals available in each category at one of the colleges.

Design of the Food Ordering Platform and Menu. Meal categories are combined into a set of 7 possible menus $\mathscr{M} := \{\text{GOR}, \text{GO}, \text{GR}, \text{OR}, \text{G}, \text{O}, \text{R}\}$. Since different platform versions will only differ in the number of available meal categories, we will interchangeably use "menu" or "platform" to refer to a specific combination of meal categories.[6] Importantly, regardless of the number of meal categories available on the

Table 2. Overview of the meal categories.

Meal Category	Description
Daily Harvest (G)	Vegetarian-friendly meals rich in vegetables and plant-based sources of protein and carbs. *Carb-controlled. No meat or fish.*
Carb Powerhouse (O)	High-energy meals with a large portion of starchy carbs such as potatoes, pasta or rice, accompanying plant-based protein options. *No meat or fish.*
Carnivore Corner (R)	High-protein meals based on animal products, usually offering a meat or fish option such as chicken, beef, pork, salmon or cod, and complemented by a mix of vegetables and plant-based sources of carbs. *Carb-controlled.*

[4] The challenge was organically framed as part of a "Green Action Week" that takes place at Oxford during the time of the field study.

[5] We use the letters G, O and R for the green, orange and red colors often associated with vegetables, carbohydrates and meat but these letters are not used in the actual survey.

[6] A platform that represents the menu GOR can be accessed via https://foodivery-college-shop-1.myshopify.com.

platform, participants must order all 5 meals from the same meal category. Thus, while having access to a larger platform allows one to postpone the choice of which meal category to order from, it does not provide more variety in the combination of meals. To reduce any room for misunderstanding and ambiguity regarding the challenge, meal categories, or differences between platform versions, respondents have to answer multiple quiz questions throughout the survey, some of which require them to explicitly interact with the food ordering platform. More details about the food ordering process on the platform are available in Appendix B.

2.3 Elicitation of Preferences Over Platforms

Overall Structure and Notation. In section 3 of the survey, we elicit respondents' preferences over $\mathscr{M}$, the set of 7 possible menus on the platform. We interpret the choice to display a menu on the platform as the commitment to choose at a later (unmodeled) stage among its elements (Dekel et al., 2009, p.901). At the start of the section, respondents are informed that their assigned menu will depend partly on chance and partly on their responses in one randomly selected decision task in the section. We elicit respondents' preferences using two elicitation methods: iterative ranking (method R) and monetary valuations (method V).[7] Formally, we will use $\succsim_j$ to denote the binary relation that captures the respondent's expressed preference over two elements $M, M' \in \mathscr{M}$ under elicitation method j, where $j \in \mathscr{J} := \{R, V\}$. To minimize submission errors, each decision task ends with a summary page displayed for at least 5 seconds. Respondents are asked to inspect the consequences of their choices, and revise them if necessary. Once confirmed, choices can no longer be revised. Below we describe the two elicitation methods in detail.

2.3.1 Iterative Ranking (R)

We elicit an ordinal ranking from respondents in an iterative way. At the start of the procedure, the 7 menus are listed in a random order. Respondents first select the menu(s) they wish to designate as their rank #1 (i.e., top) option(s). After this first step, the list of menus is updated and respondents select their #2 option(s). The procedure continues until the list of remaining options is empty. Importantly, respondents can express as many indifferences as they wish by assigning the same rank to two or more menus. This procedure generates a weak order $\succsim_R$ on $\mathscr{M}$. For example, the respondent in Figure 1 assigned rank #1 to GO, OR, and R and rank #2 to G only, which we interpret as GO $\sim_R$ OR $\sim_R$ R $\succ_R$ G. At every iteration in the ranking, a table at the top of the page summarizes the current ranking of the menus (see panel B of Figure 1). To elicit a truthful report of the entire ordering while maximizing the chances of observing temptation situations, we rely on a probabilistic assignment procedure:

(i) With a 50% chance, a respondent receives GOR (the unrestricted menu) for sure;

[7] A previous project (Suchy and Toussaert, 2024) compared the robustness of three elicitation methods: iterative ranking, monetary valuations, and binary choices. The results suggested that the iterative ranking procedure was the method most trusted by participants, while monetary valuations provided complementary information to evaluate the strength and robustness of preferences. The project also investigated the stability of expressed preferences across rounds. As there was very high stability, we use only one round in this study.

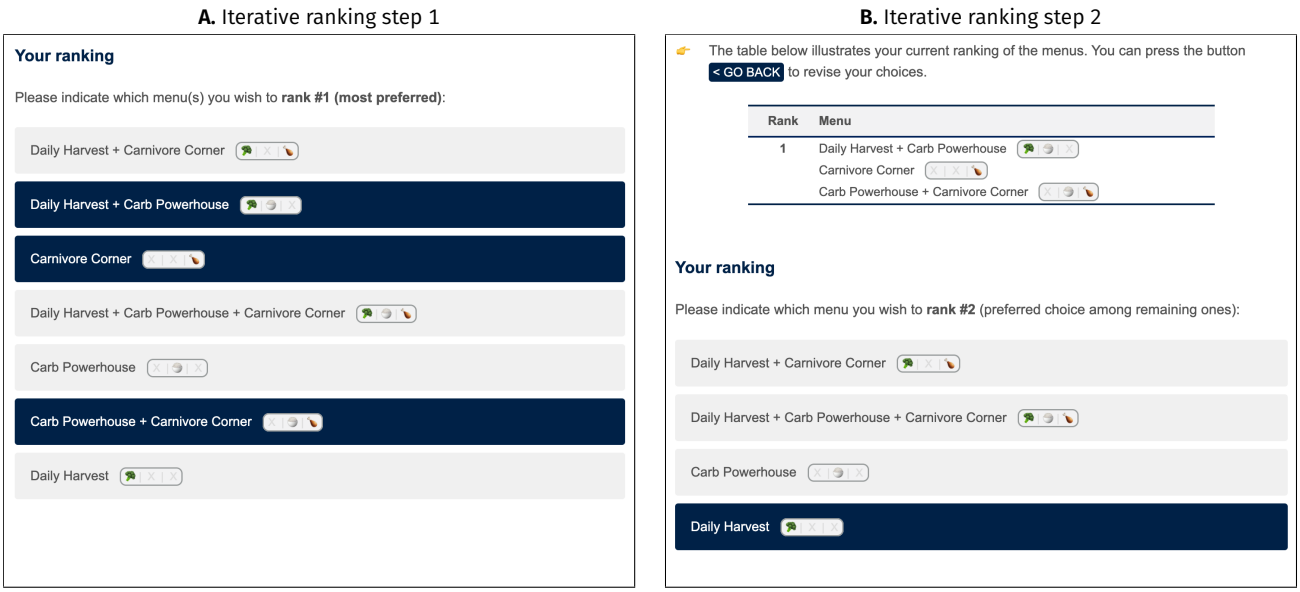


Figure 1. Illustration of the iterative ranking method. Panel A shows the first step in the ranking procedure where the respondent assigned rank #1 to the options GO, OR, and R. Panel B shows the second step of the procedure, where G was assigned rank #2. The table at the top summarizes the choices made in step 1.

(ii) With another 50% chance, they receive a menu based on a lottery assigning a higher probability of selection to a better-ranked menu (and an equal probability in expectation to equally-ranked menus).[8]

This procedure is incentive-compatible under the assumption that respondents' preferences respect independence and first-order stochastic dominance on the set of lotteries over $\mathscr{M}$, with the caveat that truth-telling is only weakly dominant for indifferences.[9] To provide a strict incentive to report indifferences, the iterative ranking procedure makes them easier to report. Indeed, while a respondent who wants to express a strict ranking of all 7 menus needs to take 7 steps to complete the procedure, someone who is indifferent between all menus can complete the procedure in a single step.

2.3.2 Monetary Valuations (V)

We elicit monetary valuations from respondents for each of the 7 menus using a WTA framing. Concretely, we ask participants for the minimum amount of money $v_M \in [0, 50]$ they would request (in £) to give up their spot in the challenge if offered menu M on the platform.[10] The 7 menus are listed in a fixed order, starting with the unrestricted menu GOR, and respondents are asked to enter their valuation below each menu (see panel A of Figure 2). Participants are reminded of their ranking before submitting their valuations.

[8] More precisely, the vector of implementation probabilities is $P = (0.35, 0.30, 0.20, 0.10, 0.03, 0.02, 0)$, where $0.30 = P(\text{best rank})$ and $0 = P(\text{worst rank})$, which is information that respondents can access by clicking on a button. For example, if GO, OR, and R are assigned rank #1, then each platform version is equally likely to be drawn with probability 0.35, 0.30 or 0.20 and the menu ranked #2, G in our example, is implemented with probability 0.10.

[9] Indeed, while a standard decision-maker who strictly prefers G to GOR has a strict incentive to rank G better than GOR, someone who is indifferent between G and GOR would be equally happy with any probability distribution over these options.

[10] We chose a lower bound of £0 rather than £1 to distinguish participants who wish to opt out from the challenge altogether from participants who have a very low valuation. Notably, we do not allow for negative values of WTA, that is, we cannot identify respondents who would request to be paid to consume certain meals (Krajbich et al., 2012). However, our prior is that only a negligible number of respondents would indicate £0. Furthermore, we are mostly interested in the ranking of the options.

We explain to respondents that they should request a higher amount of money for menus they like more and the same amount for menus they like equally. We then identify a strict preference for menu M over menu M' if $v_M - v_{M'} > 0$, and an indifference between the two menus if $v_M - v_{M'} = 0$. With this interpretation, the elicitation of monetary valuations $\{v_M\}_{M \in \mathscr{M}}$ induces a weak order $\succsim_V$ on $\mathscr{M}$. For instance, the respondent in Figure 2 requested £35 for GOR, GO and G, £28 for OR and GR, and £10 for O and R, implying GOR $\sim_V$ GO $\sim_V$ G $\succ_V$ OR $\sim_V$ GR $\succ_V$ O $\sim_V$ R. After making all their entries, participants proceed to a summary page that lists menus in a descending order by monetary valuation (updated whenever choices are revised). By ordering the menus, we hope to reduce the cognitive burden and minimize erroneous answers.

The truthful reporting of all valuations is incentivized via a two-stage procedure. In stage 1, one menu M is randomly selected for consideration. In stage 2, the Becker-DeGroot-Marschak (BDM) mechanism is applied for this selected menu i.e., a random number X is drawn from $U[0, 50]$ and compared to v_M: if $X \geq v_M$, the respondent receives £X without participating in the challenge; if $X < v_M$, she participates in the challenge with menu M. Note that given the two-stage procedure and randomness of the BDM mechanism, participants effectively face a compound lottery. This implementation was chosen for two reasons. First, we cannot require people to pay for the challenge participation, and so we have to measure WTA instead of WTP for logistical reasons. Second, we ask respondents to value each menu in absolute terms instead of relative to a reference menu, for example, GOR. While the latter approach would have been a more direct way of measuring preferences for commitment vs. flexibility, we wanted to keep the framing as similar as possible to the iterative ranking. Furthermore, we conjectured that our inferences would be sensitive to the choice of reference menu. That said, the fixed order of presentation by size of the menu might help with calibration.

2.4 Interpreting Expressed Preferences

In the last section of the survey, we ask respondents questions to better interpret their choices. Performance in the challenge has two dimensions: (i) choice of plant-based meals and (ii) hall attendance. Hence, we ask respondents to predict the probability that they will select meals from the categories G, O, and R if offered

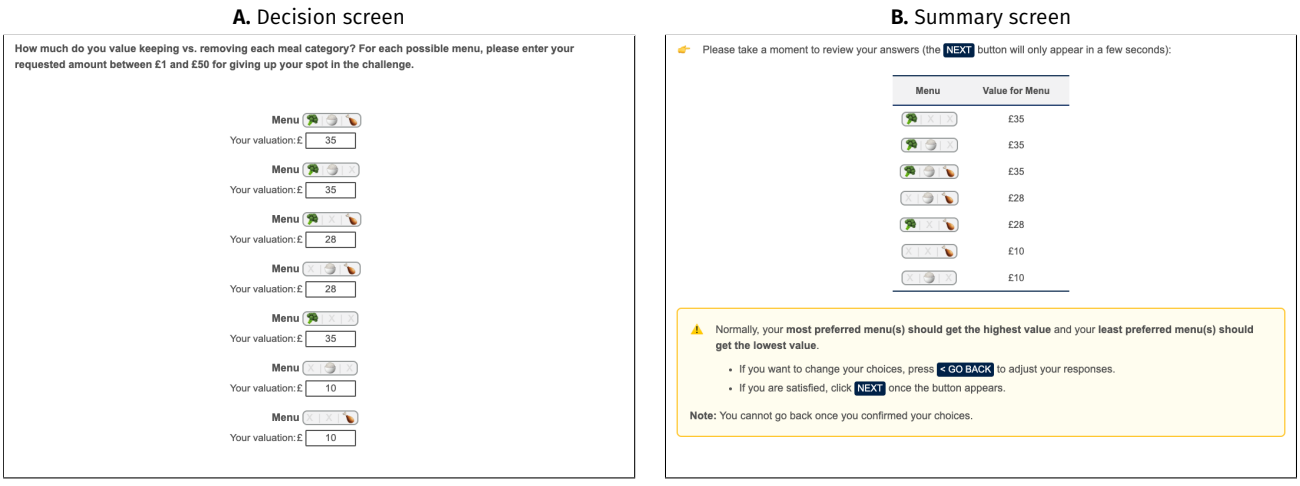


Figure 2. Illustration of the interface for the monetary valuations method. Panel A shows the decision screen, where the respondent entered £35 for GOR, GO and G, £28 for OR and GR, and £10 for O and R. Panel B shows the summary screen with the menus ordered in terms of their valuations.

the menu GOR, and to state their expected hall attendance. To rule out potential confounding factors in the hall attendance estimate, we investigate whether participants are aware of pre-existing commitments that might, or will, affect their ability to collect the meals.[11] We also remind participants about their submitted ranking and ask how much consideration they gave to the following dimensions: (i) the number of meal categories available and (ii) the specific meal categories. Furthermore, we are particularly interested in the rationales of respondents who did or did not rank the menu GOR at the top. To gain a better understanding about the underlying motives, we dedicate some questions to their challenge motivations, for example, whether participants are interested in reducing their consumption of meat, or making better choices for their health.

2.5 Food Ordering and Meal Collection Stages

Food Ordering. There are 7 possible versions of the food ordering platform for each college. All participants receive the link to one of them at 8:00am on Monday (10th February 2025) of the week in which they receive the meals, and have to place a single order of 5 meals by 11:00am (10:00am in St Hugh's). To maximize the chances of observing choices from GOR, there is a 50% probability that they are assigned to GOR. With the remaining probability, the platform they receive depends on the preferences expressed in the main survey, with higher probability assigned to more preferred menus, and zero probability attached to the least preferred platform. No upfront payment is required. The orders are sent no later than 11:30am (10:30am in St Hugh's) to the catering of the corresponding colleges.[12] Once the order has been placed, respondents are prompted to a checkout poll to rate their ordering experience, and to assess how many meals they expect to pick up (see Figure B.2 in Appendix B). An additional ticket for the final prize draw is assigned to every individual upon completion of the checkout poll.

Meal Collection. Participants will come to their college to have their meals on site between Monday, 10th February and Friday, 14th February during standard lunch hours.[13] They will be instructed to meet a research assistant from our team upon arrival at the dining hall, who will check their University ID, remind them of what they ordered for that day, and give them a meal coupon to reimburse their meals (see Figure B.3 in Appendix B). Participants will collect the meal themselves or assisted by college staff and proceed to the checkout as usual to show their coupon and pay for any extra food items they might have chosen. A second research assistant will collect the coupon back and check whether any changes were made to the initial order.

2.6 Follow-Up Survey

Participants will complete a follow-up survey sent shortly after the challenge (from Friday, 14th February 2025) and will be given up to 7 days to complete it. In this survey, they will be asked questions about (i)

[11] This includes tutorials, classes, lectures, official appointments, or extracurricular activities (see Table C.1 in Appendix C).

[12] To allow colleges to plan ahead, we give them an estimate of the average extra food demand they will face. The estimate is based on the number of sign-ups to the "registration of interest" form.

[13] For food safety reasons, we are not allowed to put the participants' orders aside. Therefore, we encourage them to arrive early to maximize chances that the full selection is available. If their chosen option is no longer available upon arrival, they may select an alternative meal at no extra cost.

Table 3. Overview of the study design.

Study element	Description
Main survey ($N = 400$, online)	Background information. Introduction to the food challenge and food ordering platform. Elicitation of preferences for the menu shown on the platform.
Meal ordering ($N = 400$)	Order of 5 meals on a randomly assigned version of the food ordering platform. Checkout poll after ordering.
Meal collection ($N = 400$)	Daily collection of meals over 5 days.
Follow-up survey ($N = 400$, online)	Debriefing questions on experience with the challenge, ordering process, and meals. Beliefs about the study. Views on various policies.

their overall experience in the challenge and what they learned, (ii) the ordering process and meals they ordered, (iii) their beliefs about the goals and findings of the study, and (iv) their views on various policies pertaining to college catering.[14]

Overview of Study Design. Table 3 summarizes the flow of the study.

3 Identification of Temptation Through Menu Preferences

Economic Framework. We start by describing the economic framework that serves as a foundation for our analyses. We consider a two-period expected utility model in which the individual first chooses from a set of menus, and then chooses an option from the selected menu at some later (unmodeled) stage (Dekel et al., 2009, p.901). The model primitive is a preference relation $\succsim$ defined over the set of menus $\mathscr{M} := \{\text{GOR}, \text{GO}, \text{GR}, \text{OR}, \text{G}, \text{O}, \text{R}\}$. Thus, a menu $M \in \mathscr{M}$ in our study corresponds to one version of the food ordering platform i.e., one combination of meal categories from the set $\{\text{G}, \text{O}, \text{R}\}$. For instance, we identify GR with the doubleton set $\{\text{G}, \text{R}\}$ and we let $m \in M$ refer to any generic element (meal category) of a menu M. We take this general framework to study the tensions between commitment and flexibility and the modeling of temptation as articulated in Dekel et al. (2001, 2009).

3.1 Uni-Dimensional Representation of Temptation

Model Primitives and the Set Betweenness Axiom. To capture the notion of temptation, Gul and Pesendorfer (2001) first proposed a relaxation of the standard framework via the *Set Betweenness* axiom (SB) on $\succsim$. This axiom states that for any two menus M and M',

$$M \succsim M' \implies M \succsim M \cup M' \succsim M'. \tag{1}$$

This axiom subsumes the case of a standard decision-maker (DM henceforth) but also accommodates temptation concerns in a simple way. For illustration, suppose that the DM has the preference $\text{G} \succ \text{R}$. A standard DM is free of temptation and unaffected by the presence of dominated options. As a result, they evaluate

[14] The follow-up survey will be posted on the day of distribution, Friday, 14th February 2025.

the menu GR only by its best element(s), expressing the preference G $\sim$ GR $\succ$ R. On the other hand, a DM who suffers from temptation, and is sophisticated enough to know about it, would like to exclude tempting options so that G $\succ$ GR.

Self-Control Typology. A tempted DM may either resist or succumb to temptation. The *Strict Set Betweenness* axiom (SSB) captures the idea that a DM may prefer to restrict their choice set even when they expect to resist temptation with positive probability

$$M \succ M' \Longrightarrow M \succ M \cup M' \succ M'. \tag{2}$$

In the Gul and Pesendorfer (2001) framework, a DM expects to resist temptation by exerting costly self-control, thus preferring $M \cup M'$ to M'. However, because exerting self-control is costly, M is preferred to $M \cup M'$. In such a case, we will say that M' is *revealed a resistible temptation*.[15]

The second case pertains to the situation were self-control costs are prohibitively high, and the DM expects to succumb with certainty when offered the temptation. Consequently, the DM will assign the same value to a set containing the tempting option as if they faced the tempting option alone $M \succ M \cup M' \sim M'$. In this case, M' is *revealed to be an overwhelming temptation*.

In summary, for any two menus (M, M'), we will say that the DM has (i) *self-control* if $M \succ M'$ implies $M \succ M \cup M' \succ M'$, and (ii) *no self-control* if $M \succ M'$ implies $M \succ M \cup M' \sim M'$.

Representation: Uni-Dimensional Temptation. If we impose the SB axiom on $\succsim$ (Gul and Pesendorfer, 2001), we obtain the uni-dimensional self-control representation

$$V(M) = \max_{m \in M} [u(m) + v(m)] - \max_{m' \in M} v(m'). \tag{3}$$

The difference $c(m, M) = \max_{m' \in M} v(m') - v(m)$ can be interpreted as the self-control cost of choosing m over the most tempting alternative in M. This representation showcases that the SB axiom reduces temptation to a one-dimensional object as only the most tempting option in M matters.

3.2 Multidimensional Representation of Temptation

Dekel et al. (2009) relax the SB axiom to acknowledge the multi-dimensionality of temptation. The *Positive Set Betweenness* axiom (PSB) leads to a representation of cumulative self-control costs (Section 3.2.1), and the *Weak Set Betweenness* axiom (WSB) leads to a representation of stochastic self-control costs (Section 3.2.2).

3.2.1 Cumulative Self-Control Cost

Motivation. One can imagine a situation in which resisting two temptations at the same time may be harder than resisting only one temptation at a time e.g., it may be harder to resist fries and beef instead of only beef. In this case, we say that the DM suffers from *cumulative temptation* effects.

[15] An alternative interpretation given by Dekel and Lipman (2012) is that a DM may suffer from "random indulgence", that is, the DM may expect to succumb to temptation with some positive probability $p > 0$, and to have no temptation otherwise. On the basis of menu choice alone, these two models cannot be distinguished in our setting, but we collect both belief and actual choice data to assess the importance of uncertainty.

Representation. To capture this idea, Dekel et al. (2009) impose only the first half of the SB axiom, called *Positive Set Betweenness*, which states that for any two menus M and M',

$$\text{if} \quad M \succsim M' \quad \text{then} \quad M \succsim M \cup M'. \tag{4}$$

Relaxing the SB axiom in such a way leads to the following multidimensional self-control representation

$$V(M) = \max_{m \in M} \left[u(m) + \sum_{j \in J} v_j(m) \right] - \sum_{j \in J} \max_{m' \in M} v_j(m'), \tag{5}$$

where J refers to the set of all dimensions that might simultaneously tempt the DM. The difference $c_j(m,M) = \max_{m' \in M} v_j(m') - v_j(m)$ can be now interpreted as the self-control cost along dimension j e.g., taste of meat. The total cost of choosing option m from menu M, the cumulative self-control cost $C(m,M)$, is now the sum of all dimension-specific self-control costs

$$C(m,M) = \sum_{j \in J} c_j(m,M). \tag{6}$$

The uni-dimensional case of Gul and Pesendorfer (2001) is obtained by setting $|J| = 1$.

3.2.2 Stochastic Self-Control Cost

Motivation. One can imagine that temptation may be context-specific and stochastic. For example, an individual may be more tempted by carbohydrates in the morning than in the evening, and vice versa for meat. In short, different temptations may differently affect the DM at various times. In this case we say that the decision maker suffers from *stochastic temptation* effects.

Representation. We obtain a stochastic representation if we relax the SB axiom to *Weak Set Betweenness* (Dekel and Lipman, 2012). This weakening of SB states that for any two menus M and M',

$$\text{if} \quad \{m\} \succsim \{m'\} \quad \text{for all} \quad m \in M, \; m' \in M' \quad \text{then} \quad M \succsim M \cup M' \succsim M'. \tag{7}$$

This leads to the following representation of stochastic cost of self-control

$$V(M) = \sum_{v \in V} p(v) \left[\max_{m \in M} [u(m) + v(m)] - \max_{m' \in M} v(m') \right], \tag{8}$$

where V denotes the set of all (stochastic) temptation utilities. When choosing m from M, the agent suffers from self-control cost $c_v(m,M) = \max_{m' \in M} v(m') - v(m)$ with probability $p(v)$. The uni-dimensional case of Gul and Pesendorfer (2001) is obtained by setting $|V| = 1$.

3.2.3 Relationship Between Models

While the uni-dimensional self-control representation is nested in both multidimensional representations, the two multidimensional representations are independent of each other in the sense that neither implies the other. Both classes of models capture different aspects of the multidimensional nature of temptation. Moreover, the two models cannot always be separated if only choices between, but not within, menus are observed (Lipman and Pesendorfer, 2013, Section 7.3). We will use our real-choice setting to attest how easily each of the two models can be separated based on menu choice data alone. To achieve better discrimination, we will also combine our menu choice data with expected and actual choice behavior from menus. Intuitively, if self-control costs have a stochastic nature, then the DM should assign a positive probability to choosing different options from GOR. Furthermore, if these expectations are correct, choice itself should be stochastic. We will classify study participants into types according to their propensity to satisfy the above axioms and study the mapping between their menu preferences, their expectations, and their actual choice behavior.

3.3 Trade-Off Between Commitment and Flexibility

The models described up to now assume that the normative preference $u(\cdot)$ (identified from singleton sets) is known and uni-dimensional. This implies that the DM can never exhibit a strict preference for flexibility $M \cup M' \succ M \succ M'$ at any two choice sets M and M'. As a result, none of the models can capture a DM who may feel uncertain about their future tastes as in Kreps (1979), which imposed the following *monotonicity* axiom (MON)

$$M \subseteq M' \implies M' \succsim M. \tag{9}$$

In reality, DMs often wish to balance a desire to restrict their access to temptation with the need to accommodate uncertainty, implying a trade-off between commitment and flexibility. In the context of our experiment, participants face uncertainty about the specific meals contained in each category and only learn about the exact options available when they order on the platform, thus creating an incentive to keep options open. This tension between commitment and flexibility might justify orderings of the form GO $\sim$ GR $\succ$ G $\succ$ GOR. In such a case, the DM reveals that they would rather not have both O and R available, but that G alone is too restrictive to accommodate unforeseen contingencies.

To incorporate flexibility motives, we generalize our analyses to consider the entire class of finitely additive expected utility representations, relying on results from Dekel et al. (2001) and Dekel et al. (2009)

$$W(M) := \sum_{i \in I} \max_{m \in M} U_i(m) - \sum_{j \in J} \max_{m \in M} V_j(m), \tag{10}$$

where I corresponds to the set of positive states in the DM's subjective state space, generating a desire for flexibility, while J corresponds to the set of negative states, generating a desire for commitment. For each participant, we will calculate the minimum size of the subjective state space that can rationalize the observed preference ordering.[16]

[16] Clearly, utility representations are non-unique since adding a subjective state $V_j(m) = v$ for all $m \in M$ in the representation $W(\cdot)$ would keep behavior unchanged. Thus, we focus on the minimum set of utilities that can generate a preference ordering.

To see how this works, note that a standard DM has only one evaluation criterion in mind i.e., which meal category they prefer. For such a DM, setting $|I| = 1$ and $|J| = 0$ with $U_i(\text{G}) > U_i(\text{O}) > U_i(\text{R})$ would generate the ordering $\text{G} \sim \text{GO} \sim \text{GR} \sim \text{GOR} \succ \text{O} \sim \text{OR} \succ \text{R}$. On the other hand, a DM with a demand for flexibility at all choice sets i.e., such that $M \cup M' \succ M \succeq M'$ for all $M, M' \in \mathscr{M}$, has preferences that can be rationalized by setting $|I| = 3$ and $|J| = 0$, and requiring that each meal category is the unique maximizer of some utility i.e., with $U_1(\text{G}) > \max\{U_1(\text{O}), U_1(\text{R})\}$, $U_2(\text{O}) > \max\{U_2(\text{G}), U_2(\text{R})\}$, and $U_3(\text{R}) > \max\{U_3(\text{G}), U_3(\text{O})\}$. In such a representation, the DM derives benefits from flexibility because they can condition their choice of meal category on the realized state (e.g., whether the G option is appealing or not). At the opposite extreme of the spectrum, a DM with a demand for commitment at all choice sets (i.e., with $M \succeq M' \succ M \cup M'$ for all $M, M' \in \mathscr{M}$) would be rationalized by setting $|I| = 0$ and $|J| = 3$ with e.g., $V_1(\text{G}) > \max\{V_1(\text{O}), V_1(\text{R})\}$, $V_2(\text{O}) > \max\{V_2(\text{G}), V_2(\text{R})\}$, and $V_3(\text{R}) > \max\{V_3(\text{G}), V_3(\text{O})\}$, such that more options unambiguously hurt the DM. In between, it is easy to see that Gul and Pesendorfer (2001) corresponds to the case $|I| = |J| = 1$, with $U_i = u + v$ and $V_j = v$. Applying this logic more broadly, we will search for the minimum number (between 0 and 3) of positive and negative states that can rationalize the preference ordering over $\mathscr{M}$ of each participant.

3.4 Mapping Between Temptation and Commitment

All the above models identify temptation via a preference for commitment. Clearly, the link between temptation and commitment behavior is far from being one-to-one.

Commitment Without Temptation. First, commitment decisions may reflect other motives than temptation and self-control, such as regret (Sarver, 2008), guilt (Kopylov, 2012), or choice aversion (Danan et al., 2012). In other words, commitment does not necessarily imply temptation. For instance, a DM may exhibit the ordering $M \succ M' \succ M \cup M'$ because choosing an option from M' while the menu M was also available may cause feelings of guilt.[17]

In addition, commitment decisions might not reflect a true preference e.g., commitment could be the fruit of decision-making noise or reflect social pressure due to experimenter demand. We will use our main survey data to assess the relationship between self-reported motives and commitment behavior (variable *reasons_restrictions* in Table C.1 in Appendix C). We will also measure noise by identifying inconsistencies in measurement between the iterative ranking and monetary valuation methods for eliciting menu preferences and test whether noise is higher among those who expressed commitment preferences (described in Section 4.2).

Temptation Without Commitment. Temptation itself does not necessarily imply commitment. First, a DM may lack the sophistication to understand their future desires. As a result, they may demand access to choice sets with limited to no restrictions but end up choosing options they did not expect to select. We will study the extent to which agents may misunderstand their future behavior by examining the relationship between their probabilistic beliefs about the option they would choose from GOR (variable *predicted_pickup* in Table C.1 in Appendix C) and their actual choice from GOR if offered this menu. Letting p_m denote a participant's beliefs that they will choose $m \in \text{GOR}$, we will assess sophistication in two ways: (i) by

[17] Of course, giving in to temptation itself could generate feelings of guilt; thus, the two feelings could be interconnected.

calculating the proportion of participants with *misspecified* beliefs in the sense that $p_m = 0$ but m was chosen from GOR (i.e., they assigned zero probability to the option they chose), and (ii) by testing whether beliefs are *well-calibrated* in the sense that $\hat{p}_m \approx \bar{p}_m$, where $\hat{p}_m$ is the actual proportion of participants who chose m from GOR and $\bar{p}_m$ is their average belief. We will study whether performance on these two criteria differs for those with commitment preferences relative to others.

Second, a sophisticated DM with temptation motives could still favor flexibility over commitment due to signaling and pride motives. In particular, a DM may prefer a flexible menu if they expect to resist temptation with sufficiently high probability. The main idea is that individuals may be proud of reaching the challenge goal although temptations were available i.e., they may want to signal to themselves or to others good virtues such as being disciplined. We will use our main survey data to assess the relationship between self-reported motives and demand for flexibility (variables *reasons_flexibility* and *motivation_factors* in Table C.1 in Appendix C). We will also test whether demand for flexibility is higher among those who received the challenge message (outlined in Section 6).

4 Data Analysis: Preferences over Menus

We start with an exposition of how we conduct our analysis of participants' preferences $\succsim$ over the set of all possible menus presented on the platform, $\mathscr{M} := \{\text{G}, \text{O}, \text{R}, \text{GO}, \text{GR}, \text{OR}, \text{GOR}\}$, using data from the iterative ranking and monetary valuation tasks only. The analysis proceeds in three parts. First, we study general properties of the elicited menu preferences, pertaining to the proportion of indifferences, inconsistencies between elicitation methods, and preferences over singletons. Using a subset of menu comparisons, we then lay out the construction of various preference indices to study the *source*, *strength* and *structure* of temptation as revealed from commitment choices. Finally, extracting information from the entire ordering, we propose falsification tests of the models presented in Section 3 and construct a typology of individuals, which encodes how they trade commitment and flexibility. By and large, the proposed analyses follow and extend Toussaert (2019). Before laying out the analyses fully, Section 4.1 introduces notations and two benchmarks against which we will assess the distribution of menu preferences.

4.1 Preliminaries

4.1.1 Notation

We denote by $\mathscr{M}_1 := \{\text{G}, \text{O}, \text{R}\}$ the set of singleton menus and by $\mathscr{M}_{\geq 2} := \{\text{GO}, \text{GR}, \text{OR}, \text{GOR}\}$ the set of menus with at least two elements. We index by $j \in \mathscr{J}$ the elicitation procedure, where $\mathscr{J} = \{R, V\}$. We use $\succsim_j$ to denote the binary relation representing a participant's weak preference ordering between any two menus $M, M' \in \mathscr{M}$ obtained via elicitation procedure j, where $\succ_j$ is a strict preference and $\sim_j$ denotes an indifference. Since we obtain two measurements of $\succsim$ for all respondents, we will report our findings for both types of methods to provide bounds on the statistics we present. Finally, let $\mathscr{P}_{\succsim}$ and $\mathscr{P}_{\succ}$ respectively denote the set of all possible weak and strict preference orderings on $\mathscr{M}$ that can be generated in theory.

4.1.2 Benchmark Data

We introduce two benchmarks against which we compare the distribution of menu preferences observed in the experiment: (i) a purely random DM (random benchmark) and (ii) a standard DM with noise (noise benchmark).

Random Benchmark. The first benchmark allows us to examine the extent to which our findings could be rationalized by idiosyncratic noise in decision-making, without assuming an underlying core preference. We generate this benchmark from purely random choice. For the iterative ranking and monetary valuations, we draw a $rank_M \sim U\{1,2,...,7\}$ and $valuation_M \sim U\{0,5,10,\ldots,50\}$ for each $M \in \mathscr{M}$, respectively.[18] We translate the resulting choice data into our main outcome measures as described in Section 4.3.

Noise Benchmark. The second benchmark simulates a standard DM that is affected by noise. To create this benchmark, we start from the ordering of G, O, and R induced by the monetary valuations. For example, if the DM entered $V(\text{G}) = 25$, $V(\text{O}) = 20$, and $V(\text{R}) = 10$, the ordering of the standard DM (STD), that is, a DM who does not care about the presence of other options in large choice sets, would be $\text{G} \sim \text{GR} \sim \text{GO} \sim \text{GOR} \succ \text{O} \sim \text{OR} \succ \text{R}$. Based on this ordering, we impute a monetary valuation for the larger sets: $V(\text{G}) = V(\text{GR}) = V(\text{GO}) = V(\text{GOR}) = 25$, $V(\text{O}) = V(\text{OR}) = 20$, and $V(\text{R}) = 10$.

Since indifferences tend to be fragile, we add mean-zero noise ε_M to the valuation of each menu to arrive at an implied ordering with noise. Our noise structure mimics the data from a prior study (Suchy and Toussaert, 2024), in which we elicited monetary valuations for each menu twice.[19] To illustrate the construction, assume $\varepsilon_{\text{G}} = 5$, $\varepsilon_{\text{GOR}} = -2$ and $\varepsilon_M = 0$ for all $M \in \mathscr{M} \setminus \{\text{G}, \text{GOR}\}$. The new valuations become $V(\text{G}) = 30$, $V(\text{GR}) = V(\text{GO}) = 25$, $V(\text{GOR}) = 23$, $V(\text{O}) = V(\text{OR}) = 20$, $V(\text{R}) = 10$, implying the perturbed ordering $\text{G} \succ \text{GR} \sim \text{GO} \succ \text{GOR} \succ \text{O} \sim \text{OR} \succ \text{R}$.

Relying on a noisy version of the standard framework as benchmark allows us to assess the prevalence of commitment and flexibility concerns against a strong null hypothesis, which accounts for the possibility of measurement error in our elicitation of preferences.

4.2 General Properties of Menu Preferences

Heterogeneity and Coarseness of the Orderings. With $|\mathscr{M}| = 7$, the set $\mathscr{P}_{\succsim}$ contains 47,293 unique weak orderings, and the subset $\mathscr{P}_{\succ}$ contains 5,040 (= 7!) unique strict orderings. We will first assess how many unique orderings $\succsim_R$ and $\succsim_V$ (vs. repeats) are present in our experimental dataset and, among them, how many are strict ones, $\succ_R$ and $\succ_V$. For the iterative ranking method, we will report the number of steps taken by respondents to complete their ordering. For each method and respondent, we will also calculate the share of indifferences across all 21 binary comparisons between any two distinct menus $M, M' \in \mathscr{M}$

[18] Assuming idiosyncratic noise that is drawn uniformly from each corresponding choice grid has implications for the mass of indifferences that can be generated. Based on evidence from Suchy and Toussaert (2024), where nearly 80% of valuations were multiples of 5, we draw valuations from a uniform distribution with support points in 5-unit increments rather than 1-unit increments. This benchmark will offer a better match to the data, making a rejection of the null of random choice a stronger test of our alternative hypothesis.

[19] We found that differences in monetary valuations between the two rounds were overall small, with 70% of participants reporting the exact same valuation and about 80% of deviations ranging between 1 and 5, with a peak at 5.

$$I_j = \frac{1}{21} \sum_{\substack{M,M' \in \mathscr{M} \\ M \neq M'}} \mathbf{1}\left[M \sim_j M'\right], \tag{11}$$

where $\mathbf{1}[x]$ is the indicator function evaluating to 1 if x is true and to 0 otherwise. We hypothesize that the number of indifferences generated by the monetary valuation exercise is larger than with the iterative ranking, $I_R < I_V$. We will test this conjecture via a two-sided paired t-test.

Knowledge of whether expressed preferences are weak or strict is very useful because strictness of an ordering rules out full compatibility with certain axioms. In fact, one can easily show the following observation.

Observation. *Let $\succsim$ be a weak ordering on $\mathscr{M} := 2^{|X|} \setminus \{\varnothing\}$ where $|X| = n > 2$. If $\succsim$ satisfies Set Betweenness everywhere on $\mathscr{M}$, then $\succsim$ cannot be strict: there must exist $M, M' \in \mathscr{M}$ such that $M \sim M'$ and $M \neq M'$.*[20]

Inconsistencies Between Methods. We define an inconsistency to be a strict reversal between the iterative ranking and monetary valuation methods: a respondent ranks a menu $M \succ_R M'$, but then indicates $M' \succ_V M$ when valuing the two options. Notably, this provides only a lower bound on the number of inconsistencies as we neglect indifferences. Hence, we will also consider inconsistencies from weak reversals: a respondent ranks a menu $M \succsim_R M'$ but then indicates $M' \succ_V M$, or vice versa. For each respondent, we will calculate the proportion of weak and strict reversals across all 21 binary comparisons. We will use these inconsistency measures to (i) assess the correlation with commitment preferences, and (ii) conduct robustness checks on our main findings by removing all participants who exhibit more than 20% of inconsistencies (at least 5 out of 21).[21]

Distribution of Ranks and Monetary Valuations. We will analyze the distribution of ranks and monetary valuations assigned to each of the 7 menus in $\mathscr{M}$. If choices are purely random, then ranks and valuations should not differ across menus. We will thus test for the equality of mean ranks and mean valuations via two-sided paired t-tests.

Distribution of Preference Relations Over Singleton Menus. Before analyzing commitment and flexibility, we will assess the distribution of participants' preferences over meal categories (singleton menus) as shown in Table 4. The challenge was designed to encourage meal choices from the category G, while

[20] To see this, suppose by contradiction that $\succsim$ is a strict ordering on $\mathscr{M}$ so that $\succsim = \succ$. Define $M_j := X \setminus \{x_j\}$ for all $x_j \in X = \{x_1, x_2, ..., x_n\}$ and assume WLOG that $M_1 \succ M_2 \succ ... \succ M_n$. Clearly, $M_j \cup M_{j+1} = X$ for any pair M_j, M_{j+1}. Since $M_j \succ M_{j+1}$, Set Betweenness together with $\succsim$ being strict implies $M_j \succ X \succ M_{j+1}$. Now consider the sets M_{j-1} and M_j such that $M_{j-1} \succ M_j$. By Set Betweeness and $\succsim$ being strict, $M_{j-1} \succ X \succ M_j$, contradicting $M_j \succ X$ (similarly, if M_{j+1} and M_{j+2} are such that $M_{j+1} \succ M_{j+2}$, Set Betweeness would imply $M_{j+1} \succ X \succ M_{j+2}$, contradicting $X \succ M_{j+1}$). In the present context with $X = \{\text{G}, \text{O}, \text{R}\}$, the SB axiom must be violated at least once if $\succsim$ is strict. For instance, the strict order G $\succ$ GO $\succ$ O $\succ$ GOR $\succ$ GR $\succ$ OR $\succ$ R violates SB at the pair (GR, OR), and replacing GOR $\succ$ GR with GOR $\sim$ GR ensures that the ordering fully passes SB. On the other hand, a strict order may still satisfy WSB and PSB. For instance, G $\succ$ GO $\succ$ O $\succ$ GOR $\succ$ OR $\succ$ GR $\succ$ R passes WSB everywhere because the conditional is not satisfied at (OR, GR), making the statement vacuously true. Similarly, PSB is satisfied G $\succ$ O $\succ$ R $\succ$ GO $\succ$ GR $\succ$ OR $\succ$ GOR, and flipping the order of the sets, one can see how the monotonicity axiom of Kreps (1979) can also be satisfied on strict orderings.

[21] We set the number based on insights from a previous study (Suchy and Toussaert, 2024). Averaging over participants, we found that 6.15% had at least 5 strict inconsistencies and 12.31% had at least 5 weak inconsistencies. However, in this study, we remind respondents about their ranking before entering their monetary valuations, which should reduce the number of inconsistencies.

Table 4. Possible orderings of singleton menus.

No.	Strict orderings	No.	Weak orderings
1	$\{G\} \succ \{O\} \succ \{R\}$	7	$\{G\} \sim \{O\} \succ \{R\}$
2	$\{G\} \succ \{R\} \succ \{O\}$	8	$\{G\} \sim \{R\} \succ \{O\}$
3	$\{O\} \succ \{G\} \succ \{R\}$	9	$\{O\} \sim \{R\} \succ \{G\}$
4	$\{O\} \succ \{R\} \succ \{G\}$	10	$\{G\} \succ \{O\} \sim \{R\}$
5	$\{R\} \succ \{G\} \succ \{O\}$	11	$\{R\} \succ \{G\} \sim \{O\}$
6	$\{R\} \succ \{O\} \succ \{G\}$	12	$\{O\} \succ \{G\} \sim \{R\}$
		13	$\{G\} \sim \{O\} \sim \{R\}$

treating the other two meal categories O and R symmetrically. Thus, we will test whether the proportion of orderings such that G $\succ$ O and G $\succ$ R is significantly higher than chance (3 out of 13) in a two-sided binomial test.

4.3 Anatomy of Temptation

Having studied general properties of the elicited preferences, we will turn next to an analysis of preferences for restricting menus (commitment) vs. expanding menus (flexibility). Our analyses allow us to ask three sets of interrelated questions.

(i) *Source*: When participants prefer a restricted menu, what meal categories tend to be excluded? We can ask this question about the source of temptation because the elicitation procedure imposes a priori no restrictions on when commitment demand should arise.

(ii) *Strength*: Which meal categories appear to be "robust temptations" in the sense of being systematically removed from participants' choice sets and at a non-trivial cost?

(iii) *Structure*: When commitment is strictly preferred, what form does it take? Are menu preferences compatible with Set Betweenness or extensions?

4.3.1 Source and Strength of Temptation

Top Menus. We will first assess the proportion of commitment choices and type of options removed by examining which menu(s) respondents put at the top of their preference ordering. We will present the distribution of top choices according to both elicitation methods, distinguishing a strict preference for GOR, a strict preference for any of its subsets, or an indifference. We will conduct two-sided proportion tests against the two benchmarks. Speaking to the source of temptation, we will test whether restricted menus including the challenge meal category G are more likely to appear above GOR than restricted menus containing the other meal categories.

Global Temptation Index. To speak to the strength of temptation, we introduce the *Global Temptation* index. We define a meal category $m \in \mathscr{M}_1$ to be a *temptation* in a non-singleton menu M if $M \backslash \{m\} \succ M$. We define a meal category $m \in \mathscr{M}_1$ to be a *global temptation* if $M \backslash \{m\} \succ M$ for all $M \in \mathscr{M}_{\geq 2}$ such that $m \in M$. For example, the meal category O is a global temptation if the respondent prefers to exclude O from any

menu. For each elicitation method j, we define the Global Temptation index as

$$GT_{j,m} = \sum_{\mathscr{M}_m} \mathbf{1}\left[M \backslash m \succ_j M\right], \tag{12}$$

where $\mathscr{M}_m := \{M \in \mathscr{M}_{\geq 2} : (m \in M) \wedge (M \neq m)\}$, with $GT_{j,m} \in \{0,1,2,3\}$. For example, consider $m = \mathrm{O}$, then $\mathscr{M}_{\mathrm{O}} = \{\mathrm{GO}, \mathrm{OR}, \mathrm{GOR}\}$, and GT_{O} measures the number of times a respondent strictly preferred to eliminate meal category O from a menu that includes it. In this sense, $GT_{j,m}$ measures the strength of a respondent's temptation for meal category m. A value of $GT_{j,m} = 3$ implies that m is globally tempting in $\mathscr{M}$ according to $\succsim_j$. We will show the distribution of the Global Temptation index for each of the meal categories $m \in \mathscr{M}_1$ split by the elicitation method. We will perform Kolmogorov-Smirnov tests of equality of distributions relative to the two benchmarks. To test whether one meal category is more tempting than another, we will stack the three indices (one for each meal category) for each individual and regress the value of the index on meal category dummies, clustering standard errors at the individual level

$$GT_{j,m} = \beta_0 + \beta_1 \mathbf{1}[m = \mathrm{O}] + \beta_2 \mathbf{1}[m = \mathrm{R}] + \varepsilon, \tag{13}$$

where $m = \mathrm{G}$ is the omitted category. We will test the hypotheses $\beta_1 = 0$, $\beta_2 = 0$ and $\beta_1 = \beta_2$. As a secondary analysis, we will perform similar regressions using $\mathbf{1}\left[GT_{j,m} = 3\right]$ as the outcome variable.

Strict Global Temptation Index. As outlined in Section 3.4, commitment preferences may capture other concerns than temptation. To better isolate this motivation, we will calculate a *Strict Global Temptation* index, which imposes additional conditions on the preferences over the meal categories. We say that $m \in \mathscr{M}_1$ is a temptation in menu M if (i) $M \backslash m \succ M$ and (ii) $\exists\, m' \in M \backslash m$ such that $m' \succ m$. That is, a meal category is a temptation if (i) the individual prefers to exclude m from a menu and (ii) there is another meal category in the menu that is, when compared in isolation, strictly preferred to it. For example, one might argue that $\mathrm{G} \succ \mathrm{GO}$ reveals O as tempting only if $\mathrm{G} \succ \mathrm{O}$ as well, while $\mathrm{O} \succ \mathrm{G} \succ \mathrm{GO}$ might better capture guilt, choice aversion or other motives. The Strict Global Temptation index is defined as

$$\widetilde{GT}_{j,m} = \sum_{\widetilde{\mathscr{M}_m}} \mathbf{1}\left[M \backslash m \succ_j M\right], \tag{14}$$

where $\widetilde{\mathscr{M}_m} := \{M \in \mathscr{M}_{\geq 2} : m \in M \wedge \exists\, m' \in M \backslash m \text{ such that } m' \succ m\}$. As for the Global Temptation index, we will examine the distribution of the Strict Global Temptation index for all meal categories $m \in \mathscr{M}_1$ and assess whether our inferences remain unchanged with this stricter definition.

Average Temptation Value. To further explore the strength of temptation, we will make use of the cardinal information contained in the monetary valuations. We will first show the distribution of valuations for each menu. Then, mirroring calculations for the Global Temptation index, we will compute how much, on average, a participant was willing to pay to remove a meal category m from any menu that contains it. More precisely, for each $M \in \mathscr{M}_m$ (the set of all supersets of m), we will calculate the temptation value of removing m from M as the difference in valuation between M and $M \setminus m$

$$\Delta^C_{M \backslash m, M} = \max\{v_{M \backslash m} - v_M, 0\}. \tag{15}$$

For example, $\Delta^C_{\text{GR,GOR}} = 5$ if $v_{\text{GR}} = 30$ and $v_{\text{GOR}} = 25$; and $\Delta^C_{\text{GR,GOR}} = 0$ if $v_{\text{GR}} = 25$ and $v_{\text{GOR}} = 30$. We will then calculate the average temptation value of each singleton option $m \in \{\text{G}, \text{O}, \text{R}\}$ via

$$\overline{TV}_m = \frac{1}{3} \sum_{M \in \mathscr{M}_m} \Delta^C_{M \setminus m, M}. \tag{16}$$

For example, if $(v_{\text{G}}, v_{\text{R}}, v_{\text{GO}}, v_{\text{OR}}, v_{\text{GR}}, v_{\text{GOR}}) = (30, 30, 20, 20, 20, 10)$, then we have that $\overline{TV}_{\text{O}} = \frac{1}{3}\left(\Delta^C_{\text{G,GO}} + \Delta^C_{\text{R,OR}} + \Delta^C_{\text{GR,GOR}}\right) = 10$. We will compare these measures to our noise benchmark in two-sided t-tests of equality of means. We also study the drivers of the commitment value $\Delta^C_{M \setminus m, M}$ by regressing $\Delta^C_{M \setminus m, M}$ on an indicator for the singleton option m and the size of the superset M, clustering standard errors at the individual level. In this way, we are able to identify which meal category generates the strongest temptation.

Other Valuation Measures. We will also assess how the temptation value of a menu changes depending on its size, focusing on the comparison between the doubletons GO and GR with the full menu GOR. If the DM is tempted by both O and R along different dimensions (i.e., temptation has a multidimensional nature), then

$$\Delta^C_{\text{G,GOR}} > \max\{\Delta^C_{\text{G,GO}}, \Delta^C_{\text{G,GR}}\}. \tag{17}$$

In other words, the DM's willingness to pay to remove O should be higher when R is also present in the menu and vice versa.[22] We will perform a t-test of equality of means between the left-hand side and the right-hand side of Equation 17. Finally, to measure positive valuations of larger choice sets, we also define the flexibility value of a set $M \in \mathscr{M}_{\geq 2}$ as

$$\Delta^F_M = \max\{v_M - \max_{m \in M} v_M, 0\}. \tag{18}$$

For example, we will check how much more value a respondent assigns to GO relative to the meal category with highest value between G and O. To investigate what determines the value of flexibility, we will regress Δ^F_M on dummies for the size of M and indicators for whether each of G,O,R is contained in M, clustering standard errors at the individual level.

4.3.2 Structure of Temptation

Having assessed the source and strength of commitment preferences, we next study the specific form they take. More specifically, we study the structure of temptation by assessing the consistency of commitment choice with the SB axiom and its relaxations. We will look at all comparisons between any two non-nested menus, yielding 9 pairwise comparisons in total.[23] We consider five categories of preferences depending on how respondents compare $M \cup M'$ to M and M' in binary comparisons as summarized in Table 5.

Referring to our economic framework (Section 3), only STD, NSC, and SC are consistent with SB, and only NSC, SC, and GC are consistent with temptation, while FLEX is consistent with neither. We will

[22] Such a finding could be rationalized by assuming that preferences admit a representation $W(M) = \max_{m \in M} U(m) - \max_{m \in M} V_1(m) - \max_{m \in M} V_2(m)$ with $U(\text{G}) > U(\text{O}) = U(\text{R})$, $V_1(\text{O}) > V_1(\text{R}) > V_1(\text{G})$ and $V_2(\text{R}) > V_2(\text{O}) > V_2(\text{G})$.

[23] The comparisons are (G ,O), (G ,R), (O ,R), (G ,OR), (O ,GR), (R ,GO), (GO ,GR), (GO ,OR), (GR ,OR). We exclude comparisons between one menu and a proper subset of it because implications of the SB axiom are trivial in that case.

Table 5. Typology of menu preferences.

Typology	Identification
Standard (STD)	$M \succ M' \Rightarrow M \sim M \cup M' \succ M'$
Flexibility (FLEX)	$M \succ M' \Rightarrow M \cup M' \succ M \succ M'$
Self-Control (SC)	$M \succ M' \Rightarrow M \succ M \cup M' \succ M'$
No Self-Control (NSC)	$M \succ M' \Rightarrow M \succ M \cup M' \sim M'$
Global Commitment (GC)	$M \succ M' \Rightarrow M \succ M' \succ M \cup M'$

analyze the distribution of these menu preferences for each of the 9 pairwise comparisons and for the two elicitation methods. We will compare the observed distributions to the distributions generated under the two benchmarks (Section 4.1.2).

Since we expect self-control considerations to manifest themselves differently depending on which menus are being compared, we will perform a regression analysis of the propensity to exhibit preferences of the type SC across the 9 binary comparisons (M, M') on indicators for whether a given meal category is contained in M or contained in M', clustering standard errors at the individual level. For instance, we can test whether O is more likely to be in M' and less likely to be in M when the SC condition is satisfied i.e., whether $\beta_1 < 0$ and $\beta_3 > 0$ in the following regression

$$\mathbf{1}[SC] = \beta_0 + \beta_1 \mathbf{1}[\mathrm{O} \in M] + \beta_2 \mathbf{1}[\mathrm{R} \in M] + \beta_3 \mathbf{1}[\mathrm{O} \in M'] + \beta_4 \mathbf{1}[\mathrm{R} \in M'] + \varepsilon. \tag{19}$$

Strict Set Betweenness Index. To measure how frequently the meal category $m \in \mathscr{M}_1$ is revealed a resistible temptation (i.e., respondents are SC types), we construct a *Strict Set Betweenness* index (SSB). For each meal category $m \in \mathscr{M}_1$, the SSB index is given by

$$SSB_m = \sum_{\mathscr{P}_m} \mathbf{1}\left[M \succ M \cup M' \succ M'\right], \tag{20}$$

where $SSB_m \in \{0, 1, \ldots, 7\}$, $\mathscr{P}_m := \{(M, M') \in \overline{\mathscr{M}}_{-m} \times \overline{\mathscr{M}}_m : M \nsubseteq M' \wedge M' \nsubseteq M\}$ with $\overline{\mathscr{M}}_{-m} := \{M \in \mathscr{M} \backslash \{\mathrm{GOR}\} : m \notin M\}$ and $\overline{\mathscr{M}}_m := \{M \in \mathscr{M} \backslash \{\mathrm{GOR}\} : m \in M\}$. For example, for $m = \mathrm{O}$ we have $\mathscr{P}_{\mathrm{O}} = \{(\mathrm{G}, \mathrm{O}), (\mathrm{R}, \mathrm{O}), (\mathrm{G}, \mathrm{OR}), (\mathrm{GR}, \mathrm{O}), (\mathrm{R}, \mathrm{GO}), (\mathrm{GR}, \mathrm{GO}), (\mathrm{GR}, \mathrm{OR})\}$. That is, SSB_{O} measures how often the meal category O is revealed to be a resistible temptation. We will present the distribution of SSB indices for all three meal categories G, O, and R, and analyze the empirical distribution against the benchmark data.

4.3.3 General Typology

While the previous sections focused on a subset of comparisons at a time, we now assess compatibility of each individual ordering with the axioms presented in Section 3 and proceed with the broadest categorization of menu preferences possible within the class of finitely additive representations to capture the trade-offs between commitment and flexibility.

Test of the Axioms. To test for violations of the axioms SB, PSB, and WSB, we compare any two non-nested menus, which yields 9 potential violations in total. To test for violation of MON, we compare any two nested menus, which yields 12 potential violations. For each axiom, we will calculate the number of violations exhibited by a given participant. Based on these falsification tests, we will classify participants into the types, under the assumption that they violate the corresponding axioms, WSB, PSB, and MON at most once. We will conduct robustness analyses of the classification by studying the sensitivity of the typology towards the threshold: (i) a stricter requirement that allows only to violate the axiom at most once, and (ii) a milder requirement that allows to violate the axiom at most twice. As some axioms are easier to violate than others, we will contextualize axiom violations by performing falsification tests within our benchmark samples.

To obtain a more continuous measure of proximity to each axiom, we will build a directed graph representation of a participant's preference ordering and calculate the minimum number of menu swaps required to achieve full consistency with the axiom.

Size of Subjective State Space. To conclude this section, we will study the tensions between commitment and flexibility by calculating, for each participant, the minimum number of positive and negative states (each between 0 and 3) in a finitely additive expected utility representation (Dekel et al., 2001, 2009) that would rationalize their preference ordering.

5 Data Analysis: Validation and Prediction

In this section, we will study the mapping from and to our menu preference measures.

(i) *Validation*: What are the drivers of preferences for restricting choice sets? Do these behavioral measures capture temptation or other motives?

(ii) *Prediction*: What is the predictive power of menu preferences for future behaviors and experiences?

As our main measures of menu preferences, we will make use of the following objects.

- Top choice: $\mathbf{1}\left[\text{GOR} \succ_j M \text{ for all } M \in \mathscr{M}\backslash\{\text{GOR}\}\right]$ and $\mathbf{1}\left[\text{G} \succ_j M \text{ for all } M \in \mathscr{M}\backslash\{\text{G}\}\right]$;
- Global Temptation indices: $GT_{j,m}$ for $m \in \{\text{G}, \text{O}, \text{R}\}$;
- Strict Set Betweenness indices: $SSB_{j,m}$ for $m \in \{\text{G}, \text{O}, \text{R}\}$.

We will focus our analyses in the main text on the ranking method ($j = R$), reporting any differences with valuations ($j = V$) in the appendix. Our regressions will control for college fixed effects γ_c and day-of-survey fixed effects δ_t (merging bins of less than 30 observations).[24]

5.1 Survey Validation of Menu Preferences

Do the menu preference measures described in Section 4 reflect temptation? What are the characteristics of those who prefer to restrict their choice sets? In this section, we investigate various predictors of commitment decisions pertaining to meal habits, motivation to take part in the challenge, noise and experimenter demand. We also investigate respondents' self-reported motives and expectations.

[24] If the main survey was started on one day and completed on another day, we will log the day of survey completion.

Lunch Habits and Challenge Motivation. We collect data on respondents' regular eating habits, their motivation to participate in the challenge, as well as their assessment of how hard to resist they find certain meal categories (see Table C.1 in Appendix C). We will regress our menu preference measures on the following variables.

- Frequency of eating meat, carbohydrates, and vegetables (variables *percentage_meat*, *percentage_carbs*, *percentage_veggies*);
- Perception of under- or overconsumption of meat, carbohydrates, vegetables (variables *current_cons_meat*, *current_cons_carbs*, *current_cons_veggies*);
- Hall attendance prior to the study (variable *num_visits_hall*);
- Self-reported motivation to participate in the challenge (variable *challenge_motivation*).

We conjecture that respondents who consume meat more frequently will be less likely to choose commitment to G (lower value of $GT_{j,\mathrm{R}}$ and lower likelihood of G being their top choice). Because respondents who regularly attend the college hall face less uncertainty regarding the meal options that could be available on the platform, we conjecture that they may have a weaker preference for flexibility (lower likelihood of GOR being their top choice). Finally, we conjecture that those who are more motivated to participate in the challenge might be more inclined to commit to G. In addition to these regressions, we will test whether those with $GT_{j,\mathrm{R}} > GT_{j,\mathrm{O}}$ are more likely to find meat (R) harder to resist than carbohydrates (O) and vice versa (variable *biggest_challenge*). We will perform chi-squared test of independence between the two variables.

Noise. We will report the correlation between our menu preference measures and our measure of inconsistency between the iterative ranking and monetary valuations (see Section 4.2 for a definition). We will test whether preference for commitment is positively correlated with the fraction of inconsistencies measured per respondent.

Self-Stated Motives. We will study participants' self-stated reasons for (not) putting GOR at the top of their ranking. We will assess descriptively how the distribution of motives differs depending on which categories participants chose to remove.

Expected Meal Order. We will regress a respondent's perceived probability p_{G} of choosing meal category G from GOR on $\mathbf{1}\left[\mathrm{GOR} \succ_j M \text{ for all } M \in \mathscr{M}\backslash\{\mathrm{GOR}\}\right]$ and $\mathbf{1}\left[\mathrm{G} \succ_j M \text{ for all } M \in \mathscr{M}\backslash\{\mathrm{G}\}\right]$, controlling for whether G was ranked above the other two meal categories, $\mathbf{1}\left[\mathrm{G} \succ_j \mathrm{O}\right]$ and $\mathbf{1}\left[\mathrm{G} \succ_j \mathrm{R}\right]$. We will also construct a measure of belief uncertainty by calculating the Shannon entropy of the distribution $(p_{\mathrm{G}}, p_{\mathrm{O}}, p_{\mathrm{R}})$, normalized to lie between 0 and 1. We will test whether belief uncertainty is positively correlated with preference for flexibility and negatively correlated with preference for commitment.

5.2 Predictive Power of Menu Preferences

We will use our menu preference measures as explanatory variables for the following outcomes.

(i) Primary outcomes

- Choice from meal platform: Indicator for choice of G if assigned the platform GOR;

- Number of meals picked up during the challenge week (from 0 to 5).

(ii) Secondary outcomes

- Placed an order: Indicator for whether the participant submitted an order on the platform;
- Picked up 5 meals: Indicator for whether the participant collected all 5 meals;
- Picked up at least one meal: Indicator for whether the participant collected all 5 meals.

All regressions will include college fixed effects γ_c and day-of-survey fixed effects δ_t. We selected these variables because they capture different dimensions of engagement with the challenge.

Choice Reversals. We will calculate the proportion of choice reversals defined as failing to choose from the meal category ranked first (alone) in the main survey (e.g., not choosing G from GOR despite G $\succ_j$ O $\succ_j$ R). We will test whether the fraction of reversals is higher for those who ranked GOR (vs. G) at the top of their ranking.

6 Data Analysis: Further Exploratory Analyses

This study contains two main sources of randomization. The first one is the randomization of a message treatment in the main survey (described in Section 2.2 and in more detail below). The second one is the randomization of the menu assigned on the platform (conditional on the preferences reported in the main survey), which will be performed in R after the main survey. We will conduct exploratory analyses of the impact of these two sources of randomization on a selected set of outcome variables, which we describe below.

Effect of Challenge Message. Early in the main survey, participants are randomized into receiving one of two messages. The control message ($T_i = 0$) reminds participants of the two dimensions of performance in the challenge (choice of plant-based options and hall attendance). The treatment message ($T_i = 1$) says that an AI model expressed uncertainty about their performance in the challenge (accounting for both dimensions). The treatment was randomized within each college using blocked randomization to ensure equal allocation. We chose to stratify the treatment at the college level due to heterogeneity in dining options across colleges and small participant samples, especially at certain colleges. We will assess the impact of the message on the following outcome variables.

(i) Primary outcomes

- Challenge motivation: Self-reported motivation to participate in the challenge, stated right after the message is displayed (variable *challenge_motivation*);
- Menu preferences: Indicators for top choice $\mathbf{1}\left[\text{GOR} \succ_j M \text{ for all } M \in \mathscr{M}\backslash\{\text{GOR}\}\right]$ and $\mathbf{1}\left[\text{G} \succ_j M \text{ for all } M \in \mathscr{M}\backslash\{\text{G}\}\right]$, $GT_{j,m}$ and $SSB_{j,m}$;
- Choice from meal platform: Indicator for choice of G if assigned the platform GOR;
- Number of meals picked up during the challenge week (from 0 to 5).

(ii) Secondary outcomes

- Beliefs about chosen meal category: Subjective probability p_G of choosing G if offered GOR (variable *predicted_pickup*);
- Expected number of meals picked up: Number of meals that the respondent expects to collect depending on the meal category, averaged across all three categories (average of three responses to main survey variable *predicted_attendance*);
- Picked up 5 meals: Indicator for whether the participant collected all 5 meals.

(iii) Ternary outcomes

- Placed an order: Indicator for whether the participant submitted an order on the platform;
- Order confidence: Uncertainty about chosen meal category if offered GOR measured as the entropy of the belief distribution (p_G, p_O, p_R) normalized to lie between 0 and 1 (constructed from variable *predicted_pickup*);
- Predicted number of meals at ordering stage: Answer to the checkout poll *"How many meals do you expect to have in hall this week"* (from 0 to 5, see Figure B.2 in Appendix B).

For each outcome Y_i measured for individual i in college c, we conduct the following regression

$$Y_i = \beta_0 + \beta_1 \mathbf{1}[T_i = 1] + \gamma_c + \delta_t + \varepsilon_i, \tag{21}$$

where γ_c are college fixed effects and δ_t are day-of-survey fixed effects. We will test the null hypothesis that $\beta_1 = 0$ against the alternative $\beta_1 \neq 0$ as we anticipate heterogeneity in treatment effects with a possible negative effect for some groups and positive effect for other groups. We will also study whether the variance in outcomes is larger in the treatment group than in the control group, with a focus on challenge motivation, belief p_G, and number of meals picked up.

Effect of Menu Assigned. Respondents to the main survey will be randomly assigned one version of the platform based partly on their answers and partly on chance. We will block randomize the assignment of the menu at the college level according to the following procedure:

- In each college, we will randomly select one participant whose menu will be determined based on monetary valuations ($j = V$). For each participant, we will select at random (uniformly) one of the 7 menus and implement the BDM mechanism described in Section 2.3.2 to determine whether they will proceed to the challenge given their reported valuation for the selected menu and the randomly drawn compensation for not taking part in the challenge.
- For all other participants, the menu assigned will be determined according to the iterative ranking procedure ($j = R$). The assignment will proceed in the following way:
  - Half of the participants in each college will receive the unrestricted platform GOR.
  - The other half will be assigned a menu according to their ranking using the assignment probabilities $(0.35, 0.30, 0.20, 0.10, 0.03, 0.02, 0)$ as described in Section 2.3.1. We will perform the assignment by taking an independent draw for each respondent from a discrete uniform $r_i \sim U\{1, 2, ..., 100\}$ such that respondent i will receive their menu ranked #1 if $r_i \leq 35$, #2 if $r_i \in [36, 65]$, and so on (see Table 6).[25]

[25] If two menus are assigned the same rank e.g., rank #1, then we will randomly split the chances such that each menu will be equally likely to be drawn with probability 0.35 or 0.30.

Table 6. Menu assignment procedure.

Menu rank	Chance (in %)	Draw r_i
#1	35	from 1 to 35
#2	30	from 36 to 65
#3	20	from 66 to 85
#4	10	from 86 to 95
#5	3	96, 97, 98
#6	2	99, 100
#7	0	none

Thus, the exogenous assignment of GOR (i.e., orthogonal to participants' ranking) will be stratified by college to ensure that exactly 50% (up to rounding) of participants receive GOR in each college regardless of their preferences (with an additional proportion receiving GOR based on their preferences).

We will investigate the impact of being assigned GOR on the following outcomes:

- Ordering experience on the platform (from 1 to 5, checkout poll);
- Number of meals picked up (from 0 to 5);
- Overall satisfaction with participation in the challenge (from 1 to 5, follow-up survey);
- Interest in participating in the challenge again in the future (from 1 to 5, follow-up survey);
- Behavior change index averaging agreement ratings for three statements: "*I tried foods I rarely or never consume*", "*I plan to come to hall more often in the future*", "*I plan to eat more plant-based in the future*" (from 1 to 5, follow-up survey);
- Support for lunch pre-ordering policy (from 1 to 5, follow-up survey);
- Support for Vegetarian Monday (from 1 to 5, follow-up survey).

For each outcome Y_i, we will run the following regression

$$Y_i = \beta_0 + \beta_1 \mathbf{1}[\text{assigned GOR}] + \beta_2 \mathbf{1}[\text{ordered favorite } m] + \sum_{M \in \mathcal{M}} \beta_M q_M + \gamma_c + \delta_t + \varepsilon_i, \tag{22}$$

where $\mathbf{1}[\text{assigned GOR}]$ is a dummy for whether the respondent was assigned to order from GOR, $\mathbf{1}[\text{ordered favorite } m]$ is a dummy for whether the respondent ordered their favorite meal category m, q_M is the probability of assignment of menu M given the respondent's ranking, γ_c are college fixed effects and δ_t are day-of-survey fixed effects.[26] We control for the assignment probabilities $\{q_M\}_{M \in \mathcal{M}}$ because assignment of GOR is fully random conditional on the respondent's preferences, which influences the overall probability of receiving GOR.

Minimum Detectable Effect Size. As a reference point, we provide power calculations for the probability of collecting all 5 meals. With 400 subjects (200 in each treatment arm), we will have 80% power to detect a 13 percentage point difference or higher in the probability of collecting all 5 meals, assuming a reference

[26] We will construct this indicator based on the ordering of the meal categories G, O, and R in the respondent's iterative ranking. The indicator will be set to 1 if the respondent ordered their meal bundle from the category ranked (weakly) highest.

value of 0.6 in the control group (assumption based on data from Suchy and Toussaert (2024)), in a two-sided test of proportions with $\alpha = 0.05$. For 300 subjects (150 in each arm), the corresponding minimum detectable effect size is 15 percentage points.

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Appendix A Register of Interest

A.1 Register of Interest: Flyer

We circulated a register of interest survey starting 27th January 2025 through mail channels and in-person in the six colleges. Figure A.1 shows the recruitment flyer that leads to the registration of interest survey Section A.2.

A.2 Register of Interest: Survey

Figure A.2 to Figure A.5 show the register of interest survey.



Figure A.1. Recruitment flyer for the register of interest survey.

WELCOME

Description

Thank you very much for your interest!

You have the opportunity to participate in a study conducted by researchers from the Department of Economics. Please read carefully the information about the study provided below.

⚠️ **Registering your interest today does not guarantee your participation in the study** as the number of participants is capped.

- If you are selected to participate, you will receive a confirmation email no later than Monday of HT Week 3 (the 3rd of February).
- Check your inbox (or spam folder) for messages from FoodChoiceStudy@economics.ox.ac.uk.
- **Since places are limited, only sign up if you really want to participate.**

What's in it for you?

👉 **Great study incentives**

1. If you complete two surveys (described below - 35 mins in total), you will receive a **guaranteed compensation of £20 as an Amazon gift card**.
2. In addition, you will receive **5 free lunches** (main + one side) **to be redeemed at your college hall in Week 4 of Hilary**, 10th to 14th of February.
3. Finally, if you collect at least one meal, you will be **entered in a lottery for the chance to win great prizes** (worth between £50 and £250). More about the prizes at the end of this survey.

👉 **Feedback opportunities**

- Provide feedback to the catering services at your college so they can improve your dining experience!
- Learn about yourself and what it's like to participate in a research study.

What do you need to do? Here are the study requirements:

✍️ **No later than Monday of HT Week 3 (3rd February), you will be asked to complete an introductory survey (about 25 mins)** to tell us about your meal habits and the meal choices you'd like to have available in Week 4.

🖥️ **On Monday of HT Week 4 (10th February), you will submit one order of 5 meals on a platform designed for this study.**

- Your free order must be submitted **between 8:00am and 11:00am (10:00am at St Hugh's)**.
- The available meals (main and side only) will be a **selection from the lunch hall menu at your college**.
- Your orders will be transmitted to your college so they can serve you what you requested.

🍽️ **Between Monday and Friday of HT Week 4 (10th to 14th February), you will come to your college hall to get your lunch on site during standard hall hours.**

- A research assistant will welcome you and remind you of your order for the day. All you need is to bring your student ID (Bod card) and the confirmation email with your orders.
- Note: we will not cover the meals of students who did not place an order within the time window.

✍️ **At the end of Week 4, you will complete a short follow-up survey (about 10 mins)** to give feedback on the meals offered to you and share your overall experience.

NEXT

Figure A.2. Register of interest survey (page 1).

Eligibility and Consent

Eligibility criteria: In order to participate, you must:

- Be at least 18 years old;
- Be a student at Oxford in one of the following colleges: **Jesus, Queen's, Somerville, St Antony's, St Hugh's, St Peter's**
- Have **no dietary restrictions** (such as vegan, vegetarian, gluten-free, keto, no dairy/lactose, halal, kosher, or other restrictions due to food allergies or health conditions);
- Complete the survey **on a computer** (not a phone and not a tablet/iPad);

Risks and benefits: There are no physical or emotional risks associated with this study that would go beyond the risks of daily life. Your participation in this study may benefit the scientific community.

Data protection and confidentiality: We will ask you for an email address to collect your survey responses and to send you information about the food ordering platform. If selected to make an order, you will need to create an account on the platform with your name and email; your IP address will be logged by the platform but not accessed by the researchers. All personal data recorded by us will be deleted at the end of the project. Other information (e.g., anonymised survey responses, time of the survey) will be kept by the researchers on a password-protected computer and may be used for future studies. A research assistant will be in personal contact with you at the college hall in order to verify your order; thus your participation in this study will not be anonymous to them. The anonymous data produced in this study may be published in a journal article and presented to various audiences. In no circumstances will your identity or personal involvement in this study be disclosed.

Your rights as a participant: Participation is entirely voluntary. You may leave the study at any time without any penalty or prejudice by simply closing your browser or opting out.

Ethics approval: This research has been reviewed according to the ethics procedures for research involving human subjects of the University of Oxford (approval #ECONCIA21-22-10). If you wish to raise any concerns about this study to the ethics committee, please email ethics@economics.ox.ac.uk. We suggest you save this email address right now for your records.

Contact: If you have any questions about the study, please feel free to contact FoodChoiceStudy@economics.ox.ac.uk. We will do our best to quickly respond to your questions.

Electronic Consent: Please answer the following questions to indicate whether you are eligible and willing to participate in this online study.

I am **at least 18** years old:

- Yes
- No

I am a **student at one of the Oxford colleges listed above and have a college email address**:

- Yes
- No

I am able and willing to **complete this study on a laptop or desktop computer**:

- Yes
- No

Figure A.3. Register of interest survey (page 2).

Please confirm that **you do not have any dietary restrictions** as outlined above. If you are unsure whether we can accommodate yours, please contact FoodChoiceStudy@economics.ox.ac.uk.

I confirm that I do not have any dietary restrictions (as outlined above)

I do have dietary restrictions

I am **willing to provide my college email** address on the platform:

Yes

No

I have read the above details and I am **willing to participate** in the study:

Yes

No

To complete your registration of interest, please **share your college email address** with us:

⚠ Please **do not close your browser just yet** as we have a few more questions for you before closing this survey. Press NEXT to proceed.

NEXT

Figure A.4. Register of interest survey (page 2 – continued).

Before closing this survey...

What is your **college**?

Jesus	Queen's	Somerville	St Antony's	St Peter's	St Hugh's

Are you a **JCR or MCR member**?

I am a JCR member	I am an MCR member

How **many days a week** do you go to college hall for **lunch on average** (your answer will not influence your participation eligibility)**?**

None	1	2	3	4	5

Finally, we mentioned that you will be entered in a **lottery for the chance to win great prizes** provided that you collected at least one of your meals.

Which of the following prizes would you be interested in winning? Please select all that apply:

- Apple Watch
- Kindle
- Ticket to concert or play
- Ashmolean Membership
- Virgin Experience (https://www.virginexperiencedays.co.uk)
- Other - please specify (should be at most £250)

If we put some of the prizes in the above list in the lottery draw, we could also not tell you what the precise prizes are and **keep it a surprise** until the end of the study.

Would you like that?

- No, I'd prefer to know what you put in the prize draw.
- Yes! Keep the prizes as a surprise.

Thank you! We will be in touch. **Press the button to validate your responses.**

⚠ We advise you to regularly **check your mailbox (including spam folder)** for communications from us and add the study email address FoodChoiceStudy@economics.ox.ac.uk to your contacts.

VALIDATE RESPONSES

Figure A.5. Register of interest survey (page 3).

Appendix B Food Ordering Platform

In the following, we describe the architecture of the food ordering platform.

Overview of Available Meals. Table B.1 presents an overview of the options available under a typical weekly menu at one of the colleges. The chosen composition of each category reflects the underlying principle of the challenge: meal category G is carb-controlled and contains no meat or fish, meal category O contains carbs but no meat or fish, and option R contains meat and fish but limited carbs.[27] The meals in each row are only available on a given day. Participants decide for one category and order all meals from this category.

Landing and Selection Pages. Figure B.1 shows the landing page of a platform representing the menu GOR. It shows the available meals and the categories they belong to. Participants can select all their meals from a single category and then proceed to the checkout. Since each meal is only available on specific days, we have indicated the corresponding availability directly on the platform's landing page.

Checkout Poll. Figure B.2 shows the checkout poll. After placing an order, respondents are prompted to answer two questions regarding their food ordering experience and their anticipated attendance at the dining hall. Since we could not enforce answers to these questions, participants were rewarded with one (out of 19) lottery ticket for answering these two questions (see Section 2.1).

Food Collection Coupons. Figure B.3 shows the coupon that our research assistants distribute among the study participants. Respondents show the coupons to college staff to redeem their free food.

Table B.1. Illustration of possible meals in each category (typical weekly menu at one of the colleges).

Day	Daily Harvest (G) (Vegetarian)	Carb Powerhouse (O) (Carbohydrates)	Carnivore Corner (R) (Protein)
Monday	Lentil & Root Vegetable Pie	Roasted Tomato Arrabbiata	Jerk Chicken with Peas
Tuesday	Jackfruit & Sweet Potato Curry	Butternut Squash Sage Lasagna	Fish Pie with Leek
Wednesday	Spicy Bean Burger	Roasted Vegetable Pasta Bake	Chicken Burger
Thursday	Sweet & Sour Tofu	Tomato Pasta Bake	Chicken Parmigiana
Friday	Moroccan Vegetable Filo Parcels	Cauliflower Penne Gratin	Battered Cod & Tartare Sauce

[27] There is only one exception to this set-up, and is represented by the Monday R option at St. Hugh's, which contains eggs, but no meat or fish. This is due to constraints faced by the catering service.

Select **one meal for each day of the week**. Each meal can only be ordered once.

Daily Harvest 🥦	Carb Powerhouse ⚪	Carnivore Corner 🍗
Vegetarian-friendly meals rich in vegetables and plant-based sources of protein and carbs. Choose a fresh and crisp vegetable option.	High-energy meals with a large portion of starchy carbs such as potatoes, pasta or rice, accompanying plant-based protein options.	High-protein meals with a meat or fish option such as chicken, beef, pork, salmon or cod, complemented by a mix of vegetables and plant-based sources of carbs.
Carb-controlled. No meat or fish.	**No meat or fish.**	**Carb-controlled.**

Remember that all your 5 meals **must be from the same category**: either 🥦 or ⚪ or 🍗.

Food allergies and intolerances: Please inform your server before ordering if you have a food allergy or intolerance. All food is prepared in an area where allergens are present.

Note: The meals on pictures are only illustrations. Presentations may vary in college. All meals subject to availability.

Featured collection


🍗 Monday: Hot and Sour Chicken Fillet & Roasted Vegetables


⚪ Monday: Ricotta Bake with Spinach & Creamed Potatoes


🥦 Monday: Sweet and Sour Tofu & Roasted Vegetables


🍗 Tuesday: Lamb Koftas & Roasted Carrots with Parsnips


⚪ Tuesday: Veggie Kebab, Rice & Roasted Potatoes


🥦 Tuesday: Butternut Squash Filo Roulade & Salad


🍗 Wednesday: Braised Chilli Beef & Steamed Broccoli


⚪ Wednesday: Bean Chilli & Potato Wedges


🥦 Wednesday: Bean Chilli & Steamed Broccoli


🍗 Thursday: Thai Green Chicken Curry & Stir Fried Greens


⚪ Thursday: Sweet Potato with Coconut Dal & Rice


🥦 Thursday: Thai Red Vegetable Curry & Stir Fried Greens


🍗 Friday: Deep Fried Fish & Mushy Peas


⚪ Friday: Deep Fried Halloumi & Chips


🥦 Friday: Deep Fried Fishless Goujons & Mushy Peas

Figure B.1. Landing page of a platform representing an example menu GOR.

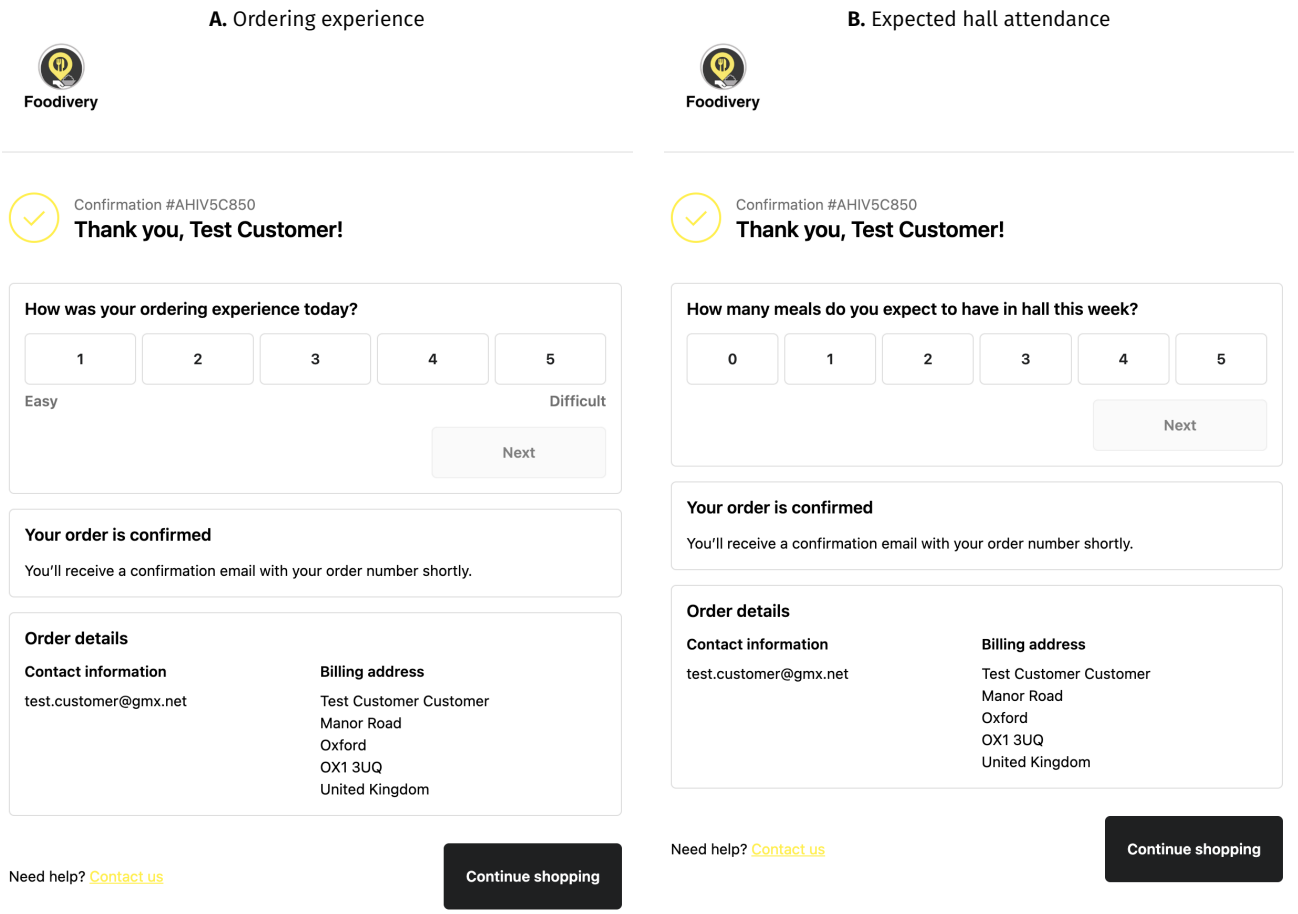


Figure B.2. Questions of the checkout poll.



Figure B.3. Coupon to redeem the free meals.

Appendix C Overview of Collected Variables

Table C.1 summarizes the variables collected in the main survey. Variables 1–14 represent demographic and background information. Variables 15–28 represent choice variables, and variables 29–40 provide information to interpret participants' choices. We do not report the attention checks in Table C.1. We further collect variables in the food ordering stage: (i) assigned menu, (ii) menu ordered on platform, (iii) number of meals picked up in college hall.

Table C.1. Collected variables in the participant survey.

No.	Variable name	Description	Values
1	*gender*	Demographics	female (1), male (0), other
2	*college*	College affiliation of participant	Jesus, Queen's, Somerville, St Antony's, St Hugh's, St Peter's
3	*jcr_mcr_member*	JCR or MCR member in college	JCR, MCR
4	*program_year*	Year in current study program	1, 2, 3, 4, 5+
5	*percentage_veggies*	Percentage of meals over the past 6 months that contained at least one portion of vegetables	0%, 10%, …, 100%
6	*percentage_carbs*	Percentage of meals over the past 6 months that contained at least one portion of starchy foods as the main carbohydrates source	0%, 10%, …, 100%
7	*percentage_meat*	Percentage of meals over the past 6 months that contained at least one portion of meat as the main protein source	0%, 10%, …, 100%
8	*current_cons_veggies*	Consumption of vegetables relative to desired	far too low, a bit too low, about right, a bit too high, far too high
9	*current_cons_carbs*	Consumption of carbs relative to desired	far too low, a bit too low, about right, a bit too high, far too high
10	*current_cons_meat*	Consumption of meat relative to desired	far too low, a bit too low, about right, a bit too high, far too high
11	*typical_lunch_options*	Typical lunch options during term time	college hall, university cafés, chain restaurant or fast food outlets, supermarket or convenience stores, delivered meals, packed lunch from home, vending machines, food trucks or market stalls, skip lunch
12	*num_visits_hall*	Number of weekdays respondent goes to college hall for lunch (in a typical week during term time)	1, 2, 3, 4, 5
13	*reasons_no_visits_hall*	Main reasons not going to college hall	food options do not suit dietary preferences, meals too expensive, food quality is not appealing, bored with the options, dining hall hours are too short, dislike of atmosphere in hall, prefer to eat elsewhere with non-college friends, too far or inconvenient to go to college hall, save time and eat something quickly, other (free text field)
14	*challenge_motivation*	Motivation to participate in the food challenge (randomized ego threat/challenge message)	0 (not motivated at all), 10, …, 100 (very motivated)
15–21	*rank_{menu}*	Assigned rank to {menu}	1, 2, …, 7
22–28	*valuation_{menu}*	Assigned monetary valuation to {menu}	£1, £2, …, £50
29	*predicted_pickup*	Percentage chance to order 5 meals from either G, O, and R if randomly assigned GOR	percentages for G, O, and R (must sum to 100)
30	*predicted_attendance*	Expected number of meal pick-ups if assigned bundle is G, O, or R	0, 1, 2, 3, 4, 5 for G, O, and R
31	*non_attendance*	Days unable to come to hall for meal pick-ups	Monday, 10th February; …, Friday, 14th February; none
32	*non_attendance_reason*	Reasons for not attending hall	tutorial, official appointment, extracurricular commitment, other (free text field)
33	*reasons_ranking*	Reasons for the submitted ranking	free text field
34	*reasons_restrictions*	Reason for not ranking GOR as top choice (restricted to respondents who did not rank GOR top)	avoid feeling overwhelmed, avoid getting tempted, not interested, avoid feeling guilty about meal choices, mistake in ranking, felt pressured to select the menu, avoid mistakenly ordering the wrong meals on platform, do not want to feel regret for meal choices, ordering process fast and easy
35	*reasons_flexibility*	Reason for ranking GOR as top choice (restricted to respondents who ranked GOR top)	do not like to be restricted in choices, prefer to decide after seeing exact meals, want to keep options open, want to see all available options, see whether can stick to goals if shown tempting foods, mistake in ranking, felt pressured to select the menu, no preference
36	*challenge_objectives*	Self-report about challenge objectives most interested in accomplishing	increasing consumption of vegetables, reducing consumption of meat/fish, reducing consumption of carbs, other (free text field)
37	*motivation_factors*	Importance of factors for the motivation to participate in the challenge	making better choices for health, making better choices for environment, personal challenge and opportunity to learn about oneself, possibility of winning a prize, fun of being put to the test by someone else, opportunity to give feedback to college about lunch options
38	*biggest_challenge*	Food category hardest to avoid	carbs, meat/fish, both, neither
39	*instructions_clarity*	Perceived difficulty of the instructions	{very easy, somewhat easy, neither, somewhat difficult, very difficult}
40	*study_feedback*	Any thoughts about the survey	free text field

Notes: {menu} ∈ {gor, go, gr, or, g, o, r}.