The Impact of Information

Consumer Acceptance of Insect-Based Food

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The impact of information. Consumer acceptance of insect-based food

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Abstract

Edible insects are a promising low-impact protein source, requiring less land, water, and feed than conventional livestock, yet acceptance in Western countries remains low. This thesis investigates whether providing information can increase consumer acceptance of insect-based food, and which factors shape it. In a randomised survey experiment with around 500 respondents, predominantly Swedish university students, half watched a short informational video before reporting their willingness to try, willingness to pay, and product choice; the other half did not. The information treatment had no significant effect on any outcome. Instead, acceptance was driven by pre-existing attitudes toward insects and, most strongly, perceived social norms, while food neophobia acted as a barrier. These findings suggest that short-term information is insufficient to overcome resistance to insect-based food, and that lasting change depends more on shifting underlying attitudes and social norms.

Keywords: edible insects, willingness to pay, information provision, consumer acceptance

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Abbreviations

WTP	Willingness to pay
WTT	Willingness to Try

1. Introduction

The livestock sector is one of the largest contributors to climate change. It accounts for a substantial share of global greenhouse gas emissions, largely through methane from animals (Crippa et al., 2021). Within this sector, red meat is especially contributing. It is among the most resource-intensive protein sources in terms of land use, water consumption, and emissions, requiring far more of each per unit of protein than most alternatives (Vergé et al., 2008).

These pressures have intensified interest in alternative proteins that could partially replace conventional animal products (De Bakker and Dagevos, 2012). Edible insects are one notable candidate. Some studies suggest that insect farming can require less land, water, and feed than conventional livestock while supplying high-quality protein and essential micronutrients (Oonincx et al., 2010; Van Huis et al., 2013). These benefits are not guaranteed; indoor insect production can be energy-intensive, and its environmental advantage depends heavily on the system and energy source used. The sustainability case for insects is therefore promising but conditional. It is also worth noting that eating insects is already common across much of Asia, Africa, and Latin America (Van Huis et al., 2013).

Despite widespread global consumption, insect-based foods remain uncommon in Western diets. Disgust, neophobia, and unfamiliarity dominate the literature on resistance (Michel and Begho, 2023). This raises the question at the centre of the thesis: if reluctance stems partly from incomplete information and uncertainty about an unfamiliar food, can providing information shift acceptance? The answer in the existing literature is mixed. Some studies find that environmental and nutritional information improves attitudes and willingness to pay (Ardoin and Prinyawiwatkul, 2020), while others report weak, null, or even counterproductive effects (Hartmann et al., 2015; Caputo and Van Loo, 2023). As the following sections argue, this inconsistency is to be expected. The effect of information appears to depend on its framing and format, and on whether it reduces uncertainty without also activating the very resistance it aims to overcome.

Two features of this debate remain underexamined. Firstly, most existing studies deliver information through written formats, even though evidence suggests that other treatments may engage consumers more effectively (Hartmann et al., 2015); the comparative effectiveness of a dynamic, video-based treatment has rarely been tested directly. Secondly, evidence from Nordic countries is sparse relative to the larger literature from Southern and Central Europe, despite reasons to expect that acceptance and its determinants may differ across cultural contexts. This study addresses both gaps using a randomised survey experiment among predominantly Swedish university students, a group often regarded as more environmentally

aware and more open to sustainable food innovation, and therefore a relevant population for studying early adoption (Sogari et al., 2019).

The main objective of this study is to investigate the effect of information provision on willingness to try, willingness to pay, and purchase choice for insect-based food products. The secondary objective is to examine whether environmental attitudes and food neophobia are associated with the behavioural intentions described above. These two factors are singled out because they capture the opposing forces at the centre of the debate: environmental attitudes represent the main motivation that could draw consumers toward a more sustainable protein, while food neophobia is identified throughout the literature as the dominant barrier holding them back. Examining both alongside the information treatment makes it possible to see whether acceptance is shaped more by short-term information or by these deeper, pre-existing dispositions. The study further provides descriptive evidence on the current level of consumer acceptance, contributing to the limited empirical base on insect-based food attitudes in Nordic countries.

To identify the causal effect of information provision, a randomised experiment is used, embedded in a survey, where respondents are assigned either to a treatment group that watches a short informational video or to a control group that is not provided the video. The treatment is delivered as a short video rather than the written format common in earlier studies. This type of treatment might show larger effects since video showcases information more vividly and engagingly than text, holding attention more effectively and potentially making unfamiliar products feel more approachable. Testing a video treatment therefore addresses the format gap identified above, while the Nordic setting addresses the limited evidence from this context.

This thesis contributes to the existing literature in three ways. First, it provides experimental evidence on the causal effect of information provision on willingness to try and willingness to pay for insect-based foods. Second, instead of using text-based messages, this study uses an existing publicly available YouTube video as an information treatment, providing a more engaging communication format (TED-Ed, 2014). Third, it contributes evidence from a Nordic context, specifically among Swedish university students, where empirical research on insect-based food acceptance remains sparse. With these contributions, the study provides new insights into both the determinants of consumer acceptance and the extent to which targeted information can support more insect consumption.

2. Background

2.1 Regulatory constraints and market context

Edible insects are increasingly recognized as a potential source of sustainable protein, but their commercial adoption is shaped by regulatory frameworks and market development. In the European Union, insects are classified as "novel foods" under Regulation (EU) 2015/2283, requiring pre-market authorisation to ensure safety and traceability (Lotta, 2019). Only certain species, such as the yellow mealworm and the house cricket are currently approved for human consumption. This restrictive regulatory environment can slow market entry and increase compliance costs for producers, limiting both the range of products available to consumers and the overall width of the market.

Despite these constraints, the market for edible insects is gradually expanding in Europe. Early-stage commercial farms have primarily targeted niche segments, including specialty health foods, protein bars, and gourmet products. While the industry remains small relative to conventional livestock, there is potential for growth as production technology matures and public awareness increases. Profitability for producers depends on achieving economies of scale, efficient feed utilisation, and the ability to derive additional value from co-products such as insect oil and frass (Smetana et al., 2021).

2.2 Environmental trade-offs

The environmental appeal of insect farming rests on several well-documented advantages: high feed conversion efficiency, comparatively low greenhouse gas emissions, and substantially reduced land use relative to traditional livestock. Insects require less feed and water per unit of protein produced and generate lower emissions of CO_2, methane, and ammonia, making them a promising tool for reducing the climate impact of food systems (Oonincx et al., 2010; Van Huis et al., 2013).

However, trade-offs exist. Energy inputs for heating and maintaining climate-controlled production facilities can be substantial, particularly in a northern European context where ambient temperatures are unsuitable for most farmed insect species. Water use, while lower than that of conventional livestock, is not negligible when accounting for substrate preparation and facility hygiene. A full assessment of the net sustainability impact of insect farming therefore requires careful consideration of production conditions rather than relying solely on average figures. This restriction is worth bearing in mind when interpreting how consumers respond to messages that present insects as straightforwardly sustainable.

3. Previous research

The determinants of consumer acceptance of insect- based foods extend beyond standard price and taste considerations. Unlike most conventional food choices, acceptance is shaped by psychological, moral, and social factors, making preferences in this domain particularly context-dependent (Abro et al., 2025).

3.1 Information, familiarity and trust

Information provision is among the most frequently studied predictors of insect acceptance, but the evidence is challenged. On the positive side, Lombardi et al. (2019) find that providing information increases consumer valuation, and Abro et al. (2025) identify familiarity as a strong positive predictor of both WTT and WTP.

Several studies, however, report null or counterproductive effects. Gere et al. (2023) find that nutritional and sustainability information produced no significant change in attitudes among physically active consumers, though it did shift attention toward nutrition. Caputo and Van Loo (2023) show that information can reduce demand: interest in blended burgers fell once ingredients were disclosed, despite positive blind taste evaluations. Poortvliet et al. (2019) provide the key mechanism in that insect products were perceived as both healthier and more disgusting, with these opposing reactions cancelling out and leaving willingness to try unchanged. Together, these studies indicate that information does not straightforwardly increase acceptance and may instead activate competing responses.

Format and framing appear central to whether information influences behaviour. Informational messages uplifting insect-consumption due to positive environmental outcomes tend to be more persuasive than nutritional claims (Lombardi et al., 2019). At the same time, written information appears to engage consumers less effectively than simpler formats (Hartmann et al., 2015), which motivates the use of a video-based treatment.

Perceived safety and institutional trust reinforce these effects and Giotis and Drichoutis (2020) show that trust in certification and regulatory authorities significantly affects WTP.

3.2 Psychological barriers: disgust and neophobia

Disgust and food neophobia are the most consistently documented barriers to insect consumption. As noted above, Poortvliet et al. (2019) show that disgust can override recognised health benefits in determining willingness to try, and Abro et al. (2025) identify disgust as one of the most robust negative predictors across studies. Food neophobia operates through a similar mechanism. Modlinska et al.

(2021) demonstrate that it significantly reduces willingness to consume insect-based products, with earlier research indicating that this effect is consistent across cultural contexts (Fernández-Ruiz et al., 2013). Together these represent a fundamental barrier that informational and marketing strategies must contend with.

3.3 Factors that increase acceptance

Moral and environmental motivations can increase acceptance. Platta et al. (2024) find that individuals with higher environmental concern are more likely to accept insect-based foods, particularly among younger consumers, and Abro et al. (2025) report a consistent positive association.

Private benefits also shape acceptance, though rarely decisively. Perceived health benefits can increase WTP but are seldom sufficient alone to overcome negative emotional responses (Abro et al., 2025). Taste expectations appear more influential: Ribeiro et al. (2024) show that expected taste mediates the relationship between attitudes and WTT. Caputo and Van Loo (2023) finds that sensory expectations significantly affect both product choice and WTP. This suggests that improving taste perceptions may be as important as communicating environmental or health benefits.

Social influences also play an important role. Consumers are more willing to try insect-based products when they perceive the behaviour as socially accepted or increasingly common, and evidence from behavioural economics shows that both social and personal norms can influence environmentally relevant behaviour (Bašić and Verrina, 2024). Product characteristics also matter: Piha et al. (2018) find that insect flour generates higher acceptance than whole insects, and Giotis and Drichoutis (2020) show that visible insect content reduces willingness to pay, though Poortvliet et al. (2019) find that familiar formats do not always reduce disgust.

Hence, the literature points to a multi-layered set of determinants, psychological costs, moral motivations, private benefits, and informational and social factors that together shape WTT and WTP. These insights motivate the variables included in the empirical analysis and the choice of an information treatment as the central experimental feature of this study.

4. Theoretical framework

4.1 Demand theory

Demand theory provides the foundation for analysing consumption decisions, and for a market in insect-based products to emerge, there must be demand for them. The framework rests on utility maximisation: consumers choose the combination of goods that yields the highest utility given their preferences and budget constraints (Deaton and Muellbauer, 1980). Beyond the good's own price, demand is shaped by the prices of substitutes such as conventional meat, by complementary goods, and by individual preferences. For insect-based foods, additional determinants are likely to matter such as cultural norms, food-related disgust, taste perceptions, and social acceptance. These factors can all significantly influence preferences and thus demand.

The standard framework, however, assumes consumers possess the information needed to evaluate available goods, an assumption that does not hold for most Western consumers in the case of insects. Utility maximisation is therefore treated here not as a complete model but as a foundation to be extended for information constraints and social influence. Crucially, the model still assumes that consumers maximise utility, but they do so give their current information set, which may be incomplete. This distinction is central to the theoretical motivation for the information treatment in this study.

4.2 Utility maximization and the adoption decision

The standard framework assumes consumers choose continuous quantities, but many novel goods involve a discrete choice rather than a marginal adjustment (Deaton and Muellbauer, 1980). For insect-based foods, the relevant decision is typically binary: to adopt or not. Adapting Deaton and Muellbauer (1980), let consumption consist of a conventional protein good and a binary indicator S, where S = 1 if the individual consumes insect-based protein and S = 0 otherwise. The budget constraint is:

$$p_{\mathrm{m}} q_{\mathrm{m}} + p_{\mathrm{i}} S = x \qquad (4.2.1)$$

where p_m is the price of conventional protein, q_m is quantity, p_i the price of the insect product, and x total is expenditure. Utility is written as:

$$u = v(q_{\mathrm{m}}, S, \varepsilon) \qquad (4.2.2)$$

where ε captures individual-specific taste parameters such as disgust sensitivity, cultural norms, environmental preferences, and prior exposure. The individual compares the utility of non-adoption,

$$u^0 = v((x/p_m), 0, \varepsilon) \quad (4.2.3)$$

with the utility from adoption:

$$u^1 = v((x - p_i/p_m), 1, \varepsilon) \quad (4.2.4)$$

An individual adopts insect-based consumption if $u^1 > u^0$. This generates a threshold level of income or preferences at which adoption becomes optimal. At lower income levels, or for individuals with strong negative taste parameters such as high disgust sensitivity, non-adoption may dominate. As income increases, or as preferences shift toward sustainability, adoption becomes more likely.

Importantly, this framework does not assume that consumers have perfect knowledge of these utility values. The ε vector captures both stable preference parameters and the noise introduced by incomplete information, as consumers with no prior exposure to insect-based foods may hold inaccurate beliefs about taste, safety, or environmental impact that bias their perceived utility downward (Birchler & Bütler, 2007, p. 32). It is precisely this noise that an information treatment has the potential to reduce. The following section further this argument through the economics of information.

4.3 Information

In the context of insect consumption in Western countries, consumers typically face substantial uncertainty about product attributes, taste, nutritional value, and environmental impact that are rarely observable at the point of purchase. This is the central limitation of the standard utility model: consumers maximize utility given their information set, but if that information set is incomplete or distorted, observed choices may deviate significantly from what would be predicted under full information.

In information economics, insect-based foods can be characterised as experience goods, products whose quality cannot be evaluated prior to consumption and must instead be learned through direct experience (Nelson, 1970). This distinction is important because experience goods are particularly susceptible to under-consumption when consumers face high costs of acquiring information or limited opportunities for trial. This is the central limitation of the standard utility model: consumers maximize utility given their information set, but if that information set

is incomplete or distorted, observed choices may deviate significantly from what would be predicted under full information. This perspective builds on the economics of information as developed by Stigler (1961), who argues that the acquisition of information is costly, and that consumers will gather only as much information as long as the expected marginal benefit exceeds the expected marginal cost. Formally, search continues as long as:

$$E\ [\text{marginal benefit of additional information}] \geq \text{marginal cost of search} \quad (4.3.1)$$

Observed choices that may appear irrational such as a consumer refusing to try insect-based foods despite their environmental and nutritional benefits can often be explained by the high cost of acquiring relevant information. If firsthand experience with edible insects requires travelling to a country where insects are common, the cost of obtaining that information is high for most Western consumers. Stigler's framework emphasises that consumers make the best possible choice given available information, rather than the choice that would be optimal under perfect knowledge.

Providing information through a survey experiment effectively reduces the cost of acquiring knowledge about insect-based foods. By expanding the consumer's information set regarding environmental benefits, nutritional properties or taste, the intervention can shift perceived product attributes and thereby alter expected utility. In terms of the adoption model above, information provision can shift the ε vector updating beliefs and reducing the noise that suppresses perceived utility making adoption more likely for consumers who would otherwise remain at a corner solution of non-consumption.
A further implication of Stigler's framework is that differences in information across consumers generate heterogeneous preferences and purchasing behaviour even when prices and income are similar. This is particularly relevant for insect-based foods, where prior exposure and familiarity vary considerably across individuals and cultural contexts.

4.4 Social norms and nudging

Information alone may not fully explain adoption decisions for novel foods. Demand theory and information economics primarily focus on individual decision-making. Whereas behavioural economics highlights that consumption choices are also shaped by social context. Social norms refer to shared expectations regarding appropriate behaviour within a group and may influence decisions even in the absence of formal incentives or price changes (Thaler and Sunstein, 2008).

Individuals may also internalise these expectations as personal norms, creating an internal sense of moral obligation that affects behaviour. Empirical evidence suggests that all three types of norms can influence pro-environmental behaviour, with personal norms often acting as a mediating mechanism through which social norms affect individual actions (Helferich, Thøgersen and Bergquist, 2023). Further evidence shows that both social and personal norms can meaningfully influence environmentally relevant economic behaviour (Bašić and Verrina, 2024).

Such mechanisms are often incorporated into policy interventions through nudging. A nudge alters the decision environment in a predictable way without restricting the individual choice (Thaler and Sunstein, 2008). Norm-based nudges frequently operate by making certain behaviours appear more socially common or socially acceptable. However, empirical evidence suggests their effects can be modest and may weaken over time, particularly for one-off informational treatments (Allcott and Rogers, 2014). In the context of insect-based foods, where consumption remains relatively uncommon in Western societies, individuals may perceive insect consumption as socially unusual. Information signalling that insect consumption is widespread or increasingly accepted may therefore reduce these social barriers.

This perspective is relevant for the study since the video clip primarily functions as an information nudge that reduces uncertainty regarding environmental benefits, nutrition, taste, safety, and product characteristics. In addition, the video clip also contains a descriptive norm component, by communicating that two billion people consume insects as part of their regular diet, the video may simultaneously normalise insect consumption (TED-Ed, 2014).

Disentangling these two channels empirically is not straightforward, since both are activated by the same intervention. Nevertheless, the theoretical framework suggests that the observed treatment effect, if any, should be interpreted as the combined result of both information updating and norm-based nudging, rather than as a pure knowledge effect.

4.5 Implications for insect-based food demand

Together, these three perspectives form a layered framework. The demand model establishes that consumers maximize utility given prices and income; information economics adds that utility is evaluated under incomplete information, so observed non-adoption may reflect information constraints rather than fixed preferences; and social norm theory adds that perceived social context shapes the utility of adoption independently of private preferences. Information provision may therefore influence demand through both channels at once. Low observed demand does not need to indicate reservations towards insects alone; it

may also reflect incomplete information and social barriers that are potentially responsive to targeted intervention.

5. Method and Data

5.1 Data collection and sample

The dataset is based on an online survey administered to predominantly Swedish university students during the spring of 2026, implemented using Netigate. The survey was distributed through three channels: digitally via student networks and email lists at the Swedish University of Agricultural Sciences (SLU), and physically via printed info sheets with QR codes placed across university buildings in Uppsala (see Appendix II and III). Participation was voluntary and anonymous, and the questionnaire was designed to be completable within approximately ten to twelve minutes.

In total, 640 responses were recorded. After a structured cleaning process, the final analytical sample contains 499 respondents. Observations were excluded for three reasons: respondents who did not reach the treatment randomisation point, those who identified as vegan or vegetarian or respondents with missing diet responses. Vegans and vegetarians were screened out of the survey by design support in Gassler et al. (2024), who report that vegetarians and vegans hold stronger aversions to insect consumption than omnivores and flexitarians. Of the resulting 499 respondents, 476 completed the willingness to try questions and 443 provided a usable willingness to pay response.

5.2 Survey design, randomisation and covariate balance

The core feature of the survey is a randomised information treatment. Upon reaching the environmental behaviour section, respondents were randomly assigned to either a treatment or a control condition, yielding 249 respondents in the control group (49.9 percent) and 250 in the treatment group (50.1 percent). Respondents in the treatment group were shown a short video (4 minutes) covering taste, environmental impact, health, nutrition, and global consumption patterns of insect-based foods before answering questions about insects. Those in the control group proceeded directly to these questions. The design allows any systematic difference in outcomes between groups to be attributed to the information treatment, supporting a causal interpretation of the estimated effects. To verify randomisation integrity, a covariate balance check was conducted by regressing the treatment indicator on all individual-level covariates and testing their joint significance. The joint F-test yields $F(11, 424) = 1.29$ ($p = 0.23$), confirming that treatment assignment is orthogonal to observable characteristics

in aggregate. One exception is education, which shows a marginally significant imbalance (p = 0.004), meaning the treatment group's mean has a slightly higher education level than the control group. This is likely a result of random sampling variation. Education is nonetheless included as a control variable in the full model.
As a placebo check, the treatment indicator was regressed on the two pre-treatment variables food neophobia and environmental concern, measured before respondents reached the randomisation point. The treatment effect is insignificant in both cases (neophobia: β = 0.158, p = 0.236; environmental concern: β = 0.006, p = 0.971), confirming that the video did not affect variables measured before exposure.

5.3 Outcome variables and estimation methods

The analysis focuses on three outcome variables, each capturing a different behavioural dimension of consumer acceptance and each estimated with the method best suited to its data structure. Robustness checks for all three are reported in Appendix IV. Because treatment is randomly assigned, the treatment coefficient in each model is interpreted as the average causal effect of the information treatment, on the outcome in question.
Willingness to try (WTT) insect-based food products is measured on a 1–10 scale and modelled as continuous, estimated by OLS with heteroskedasticity-robust standard errors. Willingness to pay (WTP) is the stated amount in SEK respondents are willing to pay for the insect-based product, with 5.9 percent reporting zero; because these zeros represent a corner solution (willing to try but unwilling to pay a premium) rather than missing data, WTP is estimated by Tobit, since treating them as ordinary observations in OLS would bias the estimates (Greene, 2018). The estimable specifications are:

$$WTT_i = \beta_0 + \beta_1 Treatment_i + \beta_2 C_i + \gamma X_i + \varepsilon_i \qquad (5.3.1)$$

$$WTP_i = \beta_0 + \beta_1 Treatment_i + \beta_2 C_i + \gamma X_i + \varepsilon_i \qquad (5.3.2)$$

The treatment indicator is defined as:

$Treatment_i$ = 1 if respondent i was assigned to the video treatment; 0 otherwise,

where WTT_i and WTP_i denote the two continuous outcomes for respondent i, $Treatment_i$ is the treatment indicator, C_i is a vector of attitudinal and behavioural covariates, X_i is a vector of demographic controls, and ε_i is the error

term. The coefficient β_1 captures the causal effect of the information treatment. As robustness checks, an interval regression treats each whole number WTT response as a bracketed latent value (e.g., a response of 7 implies a latent WTT in [6.5, 7.5]), estimated by maximum likelihood under normality, while OLS on the continuous WTP serves as the corresponding check for WTP (Greene, 2018). Stated willingness to pay follows the contingent valuation tradition (Carson and Hanemann, 2005) and is subject to hypothetical bias (Lusk and Schroeder, 2004), so reported values should be read as upper-bound estimates; the treatment effect itself remains unbiased provided any bias affects both groups equally.

Purchase choice is a categorical variable taking three unordered values. To evoke this choice, respondents were shown two images, one of the conventional beef product (A) and one of the meat and insect-based product (B) and were asked which they would choose or whether they would purchase neither. Presenting the two products visually was intended to approximate a realistic point-of-sale comparison. For purchase choice, the specification is estimated using multinomial logit (McFadden, 1974). Letting $j \in \{0, 1, 2\}$ index the three alternatives (with j = 0, Neither, as the base outcome), the log-odds of choosing alternative j relative to the base are modelled as:

$$ln(\frac{P(Y_i=j)}{P(Y_i=0)} = B_{0j} + \beta_{1j}\, Treatment_i + \beta_{2j}\, C_i \qquad (5.3.3)$$

The multinomial logit excludes the demographic controls used in the other models. Because the model estimates separate coefficients for each non-base outcome, every added variable cost two parameters instead of one, and with 476 observations spread across three choice categories, adding the full set of demographics would reduce the precision of the estimates. Since demographics are controls rather than variables of interest, the model keeps only the theoretically central predictors. The IIA assumption is maintained given the small choice set and the exploratory aim of the analysis. Hence, it is treated as a reasonable simplification.

5.4 Variables and modelling

The treatment consisted of a short informational video (TED-Ed, 2014) describing the environmental benefits, nutritional value, global consumption patterns, and taste characteristics of edible insects. The video lasted approximately four minutes and was shown immediately before respondents answered the insect-related questions in Section 6 of the survey (see Appendix I and II). Respondents in the control group proceeded directly to these questions.

The control vector contains ten individual-level covariates motivated by the theoretical framework and previous literature, grouped into three categories: psychological barriers (food neophobia, prior insect experience, and insect familiarity), environmental attitudes (environmental concern and food-related environmental behaviour), and post-treatment attitudinal variables (attitude toward insects, trust in food safety, taste belief, social norm, and environmental belief). A set of demographic controls such as gender, age, education, income, student status, and continent of origin. Importantly, some variables were measured before treatment assignment (pre-treatment) and others after exposure to the treatment video (post-treatment); the latter may partly reflect the treatment effect itself and should therefore be interpreted with caution. Full variable names and definitions are reported in Table 1.

Table 1. Variable names and definitions (n = 499)

Variable name	Description
Dependent variables	
Willingness to try (WTT)	Willingness to try insect-based food products, measured on a 1–10 scale (continuous)
Willingness to pay (WTP)	Stated amount in SEK the respondent is willing to pay for the insect-based product (continuous; 5.9% report zero)
Purchase choice	Stated choice between two products shown as images (unordered categorical): 0 = Neither; 1 = Product A (100% beef); 2 = Product B (85% beef + 15% insect)
Treatment	
Treatment	= 1 if respondent was assigned to watch the short informational video (TED-Ed, 2014); = 0 otherwise (control)
Psychological barriers (pre-treatment)	
Food neophobia	Mean of two items — reluctance toward unfamiliar foods and willingness to try foods from different cultures (latter reverse-coded); higher values indicate greater neophobia (Cronbach's α = 0.60)
Prior insect experience	= 1 if the respondent has previously consumed insect-based food; = 0 otherwise
Insect familiarity	Self-reported familiarity with insect-based food products (1–10 scale)
Environmental attitudes (pre-treatment)	
Environmental concern	General personal concern about environmental issues (1–10 scale)
Food-related environmental behaviour	Extent to which environmental considerations influence food choices (1–10 scale)
Environmental concern index	Mean of the two items above; used in robustness checks (Cronbach's α = 0.70)
Attitudinal variables (post-treatment, 1–6 Likert scale)	
Attitude toward insects	Attitude toward the idea of eating insects

Variable name	Description
Trust in food safety	Belief that insect-based food products are safe for human consumption
Taste belief	Belief that insect-based food products taste good
Social norm	Whether the respondent would eat insect-based food if it became more common in Sweden
Environmental belief	Belief that replacing red meat with insect-based protein would reduce the environmental impact of meat production
Demographic controls (pre-treatment)	
Female	= 1 if female; = 0 otherwise
Age	Age in years
Education	Ordinal: 1 = upper secondary, 2 = bachelor's, 3 = one-year master's, 4 = two-year master's, 5 = PhD
Income	Ordinal: 1 = 0–9,999 SEK to 6 = 50,000+ SEK
Student	= 1 if currently enrolled as a student; = 0 otherwise
Continent of origin	Ordinal, 1 = Europe

Source: author's computation from survey data.

Each model is estimated over five specifications to assess the stability of the treatment coefficient as controls are introduced: M1 includes the treatment and psychological barriers; M2 adds the attitudinal variables; M3 adds environmental concern; and M4 is the full model including the demographic controls. Stability of $\beta 1$ across these specifications provides evidence that the estimated treatment effect is not confounded by observable individual characteristics.

5.5 Descriptive statistics

Table 2 presents descriptive statistics for the full analytical sample. Of the 499 respondents, 63 percent identify as female and 77 percent are currently enrolled as students, reflecting the target population. The mean age is 29.85 years, the sample is predominantly European in origin, education averages 2.39 (roughly bachelor's level), and income averages 2.51, reflecting the low-to-moderate income levels typical of students.

The mean WTT score is 6.74 on the ten-point scale, with the distribution skewed toward the upper end (Figure 1). Mean WTP is 43.58 SEK (sd = 24.34), indicating substantial variation in stated valuations (Figure 2). In the hypothetical purchase choice, most respondents selected the conventional beef product (A), a smaller share chose the insect-based product (B), and a minority rejected both options (Figure 3).

Attitudes toward eating insects are moderately positive with considerable variation. Social norm perceptions average 3.70, trust in food safety is comparatively high, and environmental belief is similarly elevated. Taste belief is

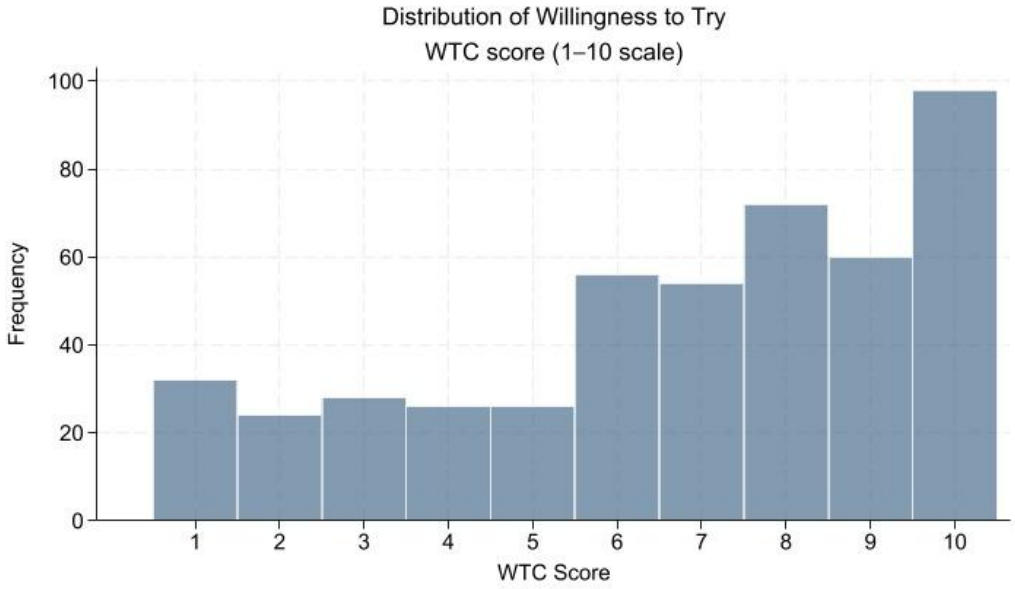
the only attitudinal item below the midpoint, indicating that scepticism about flavour persists even among otherwise open respondents. Environmental concern is high (mean 8.57), consistent with the environmentally oriented profile typically documented among university student samples (Platta et al., 2024). Food neophobia is correspondingly low. Prior experience with insect-based food is reported by 29 percent of respondents, and self-rated familiarity averages 3.72.

Table 2. Descriptive Statistics

Variable	N	Mean	SD	Min	Max
Outcome variables					
WTC score	476	6.74	2.81	1	10
WTP in SEK	443	43.58	24.34	0	175
Purchase choice	476	1.06	0.66	0	2
Treatment					
Treatment (video = 1)	499	0.50	0.50	0	1
Food habits and familiarity					
Food neophobia	499	2.22	1.02	1	6
Prior insect experience	499	0.29	0.45	0	1
Insect familiarity	499	3.72	2.59	1	10
Environmental attitudes					
Env. concern	499	8.57	1.68	1	10
Env. food behaviour	499	7.44	2.01	1	10
Attitudinal variables (post-treatment)					
Attitude toward insects	476	5.70	2.78	1	10
Trust in food safety	476	4.71	1.05	1	6
Taste belief	476	3.35	1.17	1	6
Social norm	476	3.70	1.36	1	6
Env. belief	476	4.47	1.41	1	6
Demographics					
Female	499	0.63	0.48	0	1
Age (years)	499	29.85	11.55	16	78
Education	483	2.39	1.24	1	5
Income bracket	451	2.51	1.47	1	6
Student (student = 1)	499	0.77	0.42	0	1
Continent	499	1.15	0.57	1	5

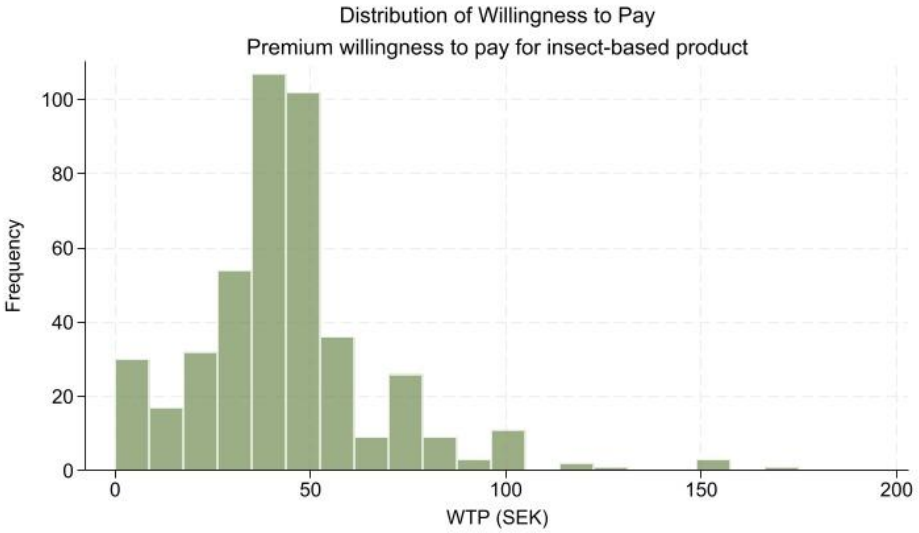
Notes: Sample sizes vary across variables due to item non-response and survey routing — the WTC and WTP outcome questions appeared toward the end of the survey, producing additional attrition (N = 476 for WTC, N = 443 for WTP). WTC score is the willingness-to-consume measure on a 1–10 scale; WTP is stated willingness to pay in SEK; purchase choice is coded 0 = neither, 1 = Product A (conventional beef), 2 = Product B (beef + insect). Food neophobia is the mean of the two food-openness items (with the positively worded item reverse-coded; Cronbach's α = 0.60). Environmental concern and food-related environmental behaviour are entered as separate items in the main models; their mean (the environmental concern index, α = 0.70) is used only in the appendix robustness checks. Education is coded 1 = upper secondary school, 2 = bachelor's degree, 3 = one-year master's, 4 = two-year master's, 5 = PhD. Income is coded 1 = 0–9,999 SEK to 6 = 50,000 SEK or more. Continent refers to continent of origin (1 = Europe). All binary variables (treatment, female, student, prior insect experience) are coded 0/1.

Figure 1: Histogram of WTT



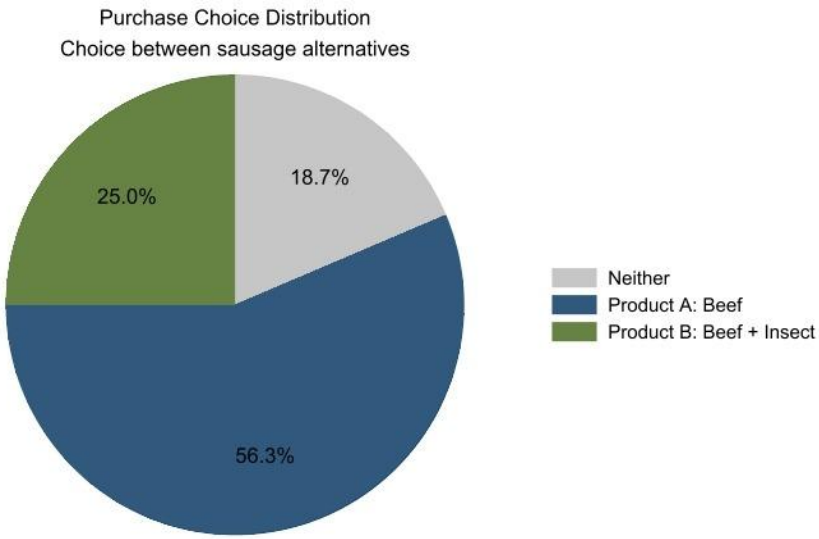
Note: Willingness to try was measured on a 1–10 scale, where 1 = not at all willing to try the insect product and 10 = very willing to try it.

Figure 2: Histogram of WTP (SEK)



Note: Willingness to pay was elicited as an open-ended question, with respondents stating the price they would pay for the insect-based product.

Figure 3. Pie chart of purchase of choice



Note: Product A is a 100% beef sausage. Product B is a beef and insect sausage consisting of 85% beef and 15% insect protein. Respondents were asked to assume equal taste, texture, and nutritional value between the two products. "Neither" reflects respondents who would not purchase either product.

5.6 Attrition analysis

Of the 499 respondents in the final sample, 476 completed the WTT outcome question and the post-treatment attitudinal items, while 443 provided a usable WTP response. The 23 respondents who did not complete the final section dropped out at the same point in the survey, immediately before the outcome block. WTP has additional missingness because some respondents skipped the open-text question or provided unreadable responses.

Attrition does not appear to be systematically related to treatment assignment. Completion rates are 90.4 percent in the control group and 87.2 percent in the treatment group, a difference that is not statistically significant ($p = 0.264$). A regression of a completion indicator on treatment and the full set of covariates yields an insignificant treatment coefficient, and a joint F-test of all covariates is similarly insignificant ($F(9, 426) = 0.73$, $p = 0.679$). The internal validity of the causal estimate is therefore preserved.

6. Results

6.1 Preliminary evidence

Before turning to the regression results, the unadjusted relationship between treatment and outcomes is informative. Among completers, mean WTT scores and stated WTP amounts are nearly identical across treatment and control groups, providing an initial signal that the information treatment did not produce a strong shift in stated preferences. This finding is confirmed and refined by the regression analysis below.

Table 3. Willingness to Try Insect-Based Food: OLS Results

Variable	M1	M2	M3	M4	M4 (Interval)
Treatment (video = 1)	-0.212	0.007	0.007	0.033	-0.075
	(.239)	(.144)	(.146)	(.148)	(.181)
Food neophobia	-0.460***	-0.124**	-0.121**	-0.104*	-0.151**
	(.088)	(.057)	(.057)	(.059)	(.065)
Prior insect experience	1.253***	0.078	0.097	0.115	0.316
	(.255)	(.166)	(.165)	(.174)	(.213)
Insect familiarity	0.189***	-0.032	-0.038	-0.039	-0.062
	(.052)	(.030)	(.031)	(.032)	(.039)
Attitude toward insects		0.428***	0.427***	0.409***	0.472***
		(.050)	(.050)	(.052)	(.055)
Trust in food safety		0.117	0.112	0.073	0.083
		(.095)	(.095)	(.098)	(.107)
Taste belief		0.118	0.118	0.152	0.220**
		(.092)	(.093)	(.097)	(.099)
Social norm		0.724***	0.713***	0.742***	0.878***
		(.102)	(.102)	(.103)	(.104)
Env. belief		0.176***	0.148**	0.146*	0.188**
		(.066)	(.073)	(.077)	(.078)
Env. concern			0.042	0.030	0.046

Variable	M1	M2	M3	M4	M4 (Interval)
			(.058)	(.065)	(.072)
Env. food behaviour			0.036	0.051	0.053
			(.042)	(.045)	(.056)
Female				-0.057	-0.110
				(.155)	(.196)
Age				-0.012	-0.018
				(.010)	(.011)
Education				-0.051	-0.049
				(.078)	(.085)
Income				-0.027	-0.023
				(.086)	(.102)
Student				-0.154	-0.359
				(.294)	(.346)
Continent				0.067	0.214
				(.151)	(.190)
Observations	476	476	476	436	436
R^2	0.158	0.700	0.702	0.706	
Log-likelihood					-695.59

*Notes: OLS estimates with heteroskedasticity-robust standard errors in parentheses. Dependent variable is willingness to try insect-based food (1–10 scale). M1 = treatment + psychological barriers; M2 = + attitudinal variables; M3 = + environmental concern; M4 = full model including demographics. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.*

Table 3 presents OLS estimates for willingness to try across five progressive specifications, with interval regression in the final column as a robustness check. The full OLS model is statistically significant, $F(17, 418) = 53.92$, $p < .001$, and accounts for 70.6% of the variance ($R^2 = .706$) in WTT. Variance inflation factors (VIF) are all below 1.76, indicating no concerns about multicollinearity. The Breusch–Pagan test rejects the null of constant error variance ($\chi^2(1) = 26.92$, $p < .001$), and heteroskedasticity-robust standard errors are used throughout.

The treatment coefficient is small and insignificant in every specification ($\beta = .033$, $p = .823$ in M5), and the interval regression produces estimates consistent with the OLS results ($\beta = -.075$, $p = .679$). The video-based information treatment did not significantly affect willingness to try.

Psychological variables remained robustly significant across specifications. Social norm perceptions were the strongest positive predictor ($B = .742$, $p < .001$), followed by attitude toward insects ($B = .409$, $p < .001$) and environmental belief ($B = .146$, $p < .10$). Food neophobia was a consistent negative predictor ($B = -.104$, $p < .10$). Trust in food safety, taste belief, prior insect experience, insect familiarity, environmental concern, and food-specific environmental behaviour did not reach significance in the full model. The inclusion of the attitudinal variables in M3 increased R^2 from .158 to .700, indicating that willingness to try is determined primarily by underlying attitudes rather than short-run information provision.

Table 4. Willingness to Pay for Insect-Based Food: Tobit Results (SEK)

Variable	**M1**	**M2**	**M3**	**M4**	**ME (M4)**
	Latent coef.	*Latent coef.*	*Latent coef.*	*Latent coef.*	*Uncond. ME*
Treatment (video = 1)	0.145	0.355	0.225	0.000	0.000
	(2.438)	(2.289)	(2.306)	(2.388)	(1.995)
Food neophobia	-0.936	0.611	0.631	0.637	0.532
	(.912)	(.878)	(.878)	(.899)	(.750)
Prior insect experience	3.414	-0.358	-0.267	0.160	0.134
	(2.782)	(2.709)	(2.716)	(2.769)	(2.312)
Insect familiarity	0.358	-0.504	-0.525	-0.870*	-0.727*
	(.484)	(.483)	(.485)	(.506)	(.422)
Attitude toward insects		2.001***	1.987***	2.246***	1.876***
		(.703)	(.703)	(.741)	(.617)
Trust in food safety		-1.712	-1.735	-1.852	-1.547
		(1.387)	(1.387)	(1.447)	(1.208)
Taste belief		-0.433	-0.426	-0.002	-0.001
		(1.264)	(1.264)	(1.294)	(1.081)
Social norm		2.146	2.118	1.750	1.461
		(1.376)	(1.381)	(1.413)	(1.180)
Env. belief		4.098***	3.861***	4.044***	3.377***
		(.955)	(1.027)	(1.057)	(.880)
Env. concern			0.565	0.208	0.174

Variable	M1	M2	M3	M4	ME (M4)
			(.901)	(.969)	(.809)
Env. food behaviour			-0.151	-0.106	-0.088
			(.701)	(.738)	(.616)
Female				8.056***	6.728***
				(2.568)	(2.138)
Age				-0.258*	-0.215*
				(.151)	(.126)
Education				0.220	0.183
				(1.124)	(.938)
Income				2.777**	2.319**
				(1.388)	(1.158)
Student				2.502	2.090
				(4.512)	(3.768)
Continent				6.081***	5.078***
				(2.137)	(1.781)
Observations	443	443	443	408	408
Log-likelihood	-1976.19	-1944.30	-1944.09	-1782.28	-1782.28
Pseudo R^2	0.0010	0.0172	0.0173	0.0225	

*Notes: Tobit model left-censored at zero (censored observations = 5.9% of the estimation sample). Columns M1–M4 report latent-variable coefficients; the ME column reports unconditional marginal effects from the full model (M4), computed as E[WTP | WTP > 0] using the delta method. M1 = treatment + psychological barriers; M2 = + attitudinal variables; M3 = + environmental concern; M4 = full model including demographic controls. Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.10.*

Table 4 presents Tobit estimates for willingness to pay, with 5.9% of observations left-censored at zero. The full model is statistically significant. The treatment coefficient is essentially zero in every specification, and the unconditional marginal effect in the full model is 0.00 SEK ($p > .10$).

Two attitudinal variables were highly significant across specifications. Environmental belief was the strongest predictor, with an unconditional marginal effect of 3.38 SEK per scale point ($p < .01$), while general environmental concern was insignificant throughout. Attitude toward insects was also significant (ME = 1.88 SEK per scale point, $p < .01$). Trust in food safety, taste belief, social norm, food neophobia, prior insect experience, and food-specific environmental behaviour did not reach significance in the full model.

Among the demographic covariates, female respondents stated a higher WTP than males (ME = 6.73 SEK, $p < .01$), each additional income bracket was associated with a 2.32 SEK increase in WTP ($p < .05$), and respondents of non-European origin stated a higher WTP than European-background respondents (ME = 5.08 SEK, $p < .01$). Age was marginally negatively associated with WTP (ME = −0.22 SEK per year, $p < .10$). While social norm dominated WTT, environmental belief dominated WTP, suggesting that perceived social acceptability lowers the psychological cost of trying insect-based food, whereas the belief that insect consumption produces tangible environmental benefits motivates respondents to pay a premium.

Table 5. Purchase Choice: Multinomial Logit Results

Base outcome: Neither. A = 100% Beef; B = 85% Beef and 15% insects.

Variable	**M1**		**M2**		**M3**		**M4**		**AME Pr(B)**
	A	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**M4**
Treatment (video = 1)	0.172	-0.186	0.159	-0.183	0.115	-0.143	0.135	-0.116	-0.042
	(.245)	(.282)	(.247)	(.283)	(.256)	(.298)	(.265)	(.303)	(.038)
Food neophobia			0.144	-0.048	0.058	0.093	0.027	0.090	0.008
			(.094)	(.112)	(.095)	(.118)	(.098)	(.121)	(.015)
Prior insect experience			-0.034	0.516*	0.180	0.191	0.124	0.167	0.004
			(.285)	(.311)	(.304)	(.341)	(.317)	(.344)	(.038)
Insect familiarity			-0.100**	0.044	-0.057	-0.027	-0.027	-0.026	-0.005
			(.049)	(.052)	(.056)	(.062)	(.055)	(.062)	(.008)
Attitude toward insects					-0.029	0.247***	-0.023	0.256***	0.038***
					(.075)	(.090)	(.079)	(.095)	(.011)
Trust in food safety					-0.304**	-0.246	-0.304**	-0.235	-0.005
					(.145)	(.207)	(.150)	(.208)	(.026)
Taste belief					-0.235	-0.243	-0.219	-0.266	-0.015
					(.146)	(.173)	(.156)	(.179)	(.021)
Social norm					0.110	0.605***	0.123	0.610***	0.077***
					(.154)	(.181)	(.167)	(.185)	(.019)
Env. belief					-0.346***	0.090	-0.193	0.104	0.035*
					(.105)	(.152)	(.117)	(.165)	(.020)
Env. concern							-0.355***	-0.072	0.018
							(.130)	(.154)	(.017)
Env. food behaviour							-0.142*	0.077	0.025**
							(.080)	(.101)	(.012)

Variable	M1		M2		M3		M4		AME Pr(B)
	A	B	A	B	A	B	A	B	M4
Observations	476	476	476	476	476	476	476	476	476
Log-likelihood	-466.80		-452.17		-388.10		-370.82		
Pseudo R^2	0.003		0.034		0.171		0.208		

*Notes: Multinomial logit estimates with heteroskedasticity-robust standard errors in parentheses. The dependent variable is the respondent's stated choice between Product A (100% beef), Product B (beef + 15% insect), and Neither. Columns labelled "A" report coefficients for Product A relative to Neither; columns labelled "B" report coefficients for Product B relative to Neither. The final column reports average marginal effects on Pr(Product B) from M4. M1 = treatment only; M2 = + psychological barriers; M3 = + attitudinal variables; M4 = + environmental concern. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.*

Table 5 presents multinomial logit estimates for the choice between Product A (100% beef), Product B (85% beef + 15% insect), and neither, which is the base outcome. The full model is statistically significant, Wald χ^2 (22) = 123.71, $p < .001$. The treatment effect is insignificant in every specification and across both outcome equations. The average marginal effect on the probability of choosing Product B is −0.042 ($p = .267$), and predicted probabilities of choosing Product B are 29.0% in the control group versus 24.8% in the treatment group, a difference well within sampling variation.

Three variables were significant predictors of choosing Product B over Neither. Social norm perceptions raised the probability of choosing Product B by 7.7 percentage points per scale point ($p < .001$), attitude toward insects raised it by 3.8 percentage points per scale point ($p < .01$), and food-specific environmental behaviour raised it by 2.5 percentage points per scale point ($p < .05$). Two asymmetries between the Product A and Product B equations were noted. Trust in food safety was negatively associated with choosing Product A relative to Neither (B = −.304, $p < .05$) but insignificant for Product B. Similarly, general environmental concern had a strong negative coefficient in the Product A equation (B = −.355, $p < .01$) but was insignificant for Product B, indicating that environmentally concerned respondents were pulled away from conventional beef without being correspondingly pushed toward the insect-based alternative.

Overall, the results show that the video-based information treatment did not significantly affect willingness to try, willingness to pay, or purchase choice; the point estimates were consistently small and, if anything, slightly negative. Acceptance of insect-based foods was instead explained primarily by psychological and attitudinal factors, most notably attitude toward insects, social norm perceptions, and environmental belief, which emerged as the strongest positive predictors, alongside food neophobia, which consistently and significantly reduced willingness to try. Environmental attitudes mattered only in part: product-specific environmental belief predicted acceptance, whereas general environmental concern did not, suggesting it is the targeted conviction that insect protein reduces environmental impact, rather than broad environmental orientation, that translates into willingness to consume. The following discussion interprets these findings in relation to previous literature and the theoretical framework.

7. Discussion

7.1 The effect of information provision

This study set out to examine whether a short video-based information treatment could causally shift attitudes, willingness to try (WTT), willingness to pay (WTP), and purchase choice regarding insect-based foods among Swedish university students. The main finding is that across all three behavioural outcomes, the treatment effect was statistically insignificant. The consistency of this null across OLS, Tobit, interval regression, and multinomial logit specifications, and its stability as controls were introduced, indicates that the result is robust.

These findings align with a growing body of work suggesting that information provision alone may be insufficient to overcome the psychological barriers associated with insect consumption like Bengtsson and Wendin's study (2023). They found that providing physically active consumers with nutritional and sustainability information left their attitudes toward insects as food unchanged. Earlier research often assumed that greater knowledge of environmental and nutritional benefits would translate into greater acceptance; more recent evidence is markedly more mixed. The results here are particularly consistent with Poortvliet et al. (2019), who found that insect-based foods were perceived as simultaneously healthier and more disgusting, with these opposing reactions offsetting one another and leaving willingness to try unchanged. Caputo and Van Loo (2023) also showed that ingredient information could reduce demand even when blind sensory evaluations were positive. The present study supports the interpretation that information can activate positive cognitive evaluations and negative emotional reactions at the same time.

One reading of the consistently negative point estimates is that the treatment may have inadvertently increased the salience of insects as food rather than reducing resistance to them. Although the video promoted sustainability, nutrition, and global consumption patterns, it may simultaneously have reminded respondents of the unfamiliarity, or perceived unnaturalness, of eating insects. Information exposure alone does not necessarily reduce disgust or neophobia and may in some cases intensify attention to precisely the characteristics consumers find aversive. This does not establish a harmful effect of the video, given the insignificance of the estimates, but it does caution against treating information as a straightforwardly acceptance-enhancing intervention.

7.2 Why did the video treatment not move behaviour?

A central methodological motivation for this study, and its second stated contribution, was the use of a dynamic video treatment rather than the static written formats that dominate much of the previous literature. This choice was grounded in evidence that written information may engage consumers less effectively than richer formats (Hartmann et al., 2015), and in the expectation that a more vivid format might better reduce uncertainty about an unfamiliar food. The finding that the video also produced no detectable effect is therefore informative.

Two interpretations follow, and the data do not allow them to be cleanly separated. The first is that the treatment was never the real obstacle: where acceptance rests on stable attitudes and dispositions, changing the information does little, because the message was never what held people back. The second, and more pointed, possibility is that visual presentation of insects is actively counterproductive in a way that text is not. Seeing insects, even within an informational and positively framed segment, may trigger disgust or unfamiliarity more strongly than a written description of the same facts. This interpretation is consistent with the competing-response mechanism documented by Poortvliet et al. (2019). Alternatively, the video may have raised perceived healthiness and disgust at the same time, so the two effects cancelled out and behaviour stayed the same. Either way, the results soften the optimism in parts of the literature about the power of how information is presented and motivates the alternative communication strategies discussed below.

7.3 What shapes acceptance: determinants across the decision process

While the treatment did not move behaviour, the analysis identifies a clear and theoretically coherent set of variables that do. The most interesting feature is not which variables matter, but that different variables dominate at different points in the decision process. Willingness to try, willingness to pay, and purchase choice capture related but distinct dimensions of acceptance.

Social norm perceptions emerged as one of the strongest predictors of both willingness to try and purchase choice. Respondents were considerably more open to insect-based foods when they perceived the behaviour as socially acceptable or potentially normalised in Sweden. This supports research highlighting the role of descriptive and personal norms in environmentally relevant consumption (Bašić and Verrina, 2024) and aligns with the theoretical framework, in which social acceptance lowers the psychological cost of adoption. Trying a novel food appears to depend heavily on whether the behaviour feels socially acceptable.

Environmental belief, by contrast, was the dominant attitudinal predictor of willingness to pay: respondents who believed that replacing red meat with insect protein would yield meaningful environmental benefits were willing to pay a higher premium. Paying a premium evidently requires a concrete, product-specific justification rather than mere openness. The contrast with social norms is theoretically meaningful: perceived social acceptability reduces the barrier to trying (Bašić and Verrina, 2024), whereas a belief in environmental impact is what motivates respondents to pay (Michel and Begho, 2023).

The pattern for general environmental concern is more revealing than a simple null result would suggest. Once product-specific attitudes were included, broad environmental concern was largely insignificant for the insect product, yet in the purchase-choice model it carried a strong negative coefficient in the Product A (only beef) while remaining insignificant for Product B. In other words, environmental concern pulled respondents away from conventional beef without correspondingly pushing them toward the insect alternative. This is a sharper finding than "concern does not predict acceptance": general environmental motivation operates primarily as avoidance of the high-impact option rather than as adoption of a specific novel substitute.

The weakness of general environmental concern likely reflects the structure of the sample itself. Respondents identifying as vegetarian or vegan were screened out of the survey, since they are abstaining from all animal products, yet these are precisely the individuals most likely to change their diet. Excluding them from the survey narrows the range of environmental concern among the remaining respondents, and its explanatory power. This clarifies who the relevant consumer is: a meat-eater whose adoption decision is tied more to social acceptability and product-specific environmental belief than to diffuse environmental concern.

Food neophobia remained a consistent negative predictor of willingness to try, in line with previous literature (Modlinska et al., 2021; Abro et al., 2025). This is consistent with the view that psychological barriers may be somewhat more stable, and less responsive to short informational interventions. Even when respondents acknowledge environmental or nutritional benefits, reluctance toward unfamiliar foods can still dominate the final consumption decision.

7.4 Why the treatment failed and the importance of norms

The theoretical framework anticipated that the treatment would operate through two channels: an information channel reducing uncertainty about taste, safety, nutrition, and environmental impact, and a descriptive-norm channel, since the video communicates that roughly two billion people consume insects as part of their regular diet. Given that measured social norm perceptions are the single strongest predictor of acceptance in this study, one might have expected the treatment which included a norm cue to shift behavior through that channel. Yet it produced no detectable effect. Because the video delivered the norm cue and the

other information together, the study cannot isolate the effect of the norm component on its own; the null therefore applies to the intervention, not to the norm cue specifically.

One reading of the combined null is that a single exposure is not enough to change how people see social norms, even when the link between norms and behavior is strong. Whether someone feels insect consumption is socially acceptable in Sweden is a settled belief, shaped by everyday experience, and a single statistic in a short video is unlikely to change it. This fits evidence that one-off norm-based interventions tend to have small effects that fade over time (Allcott and Rogers, 2014). It remains an interpretation rather than a proven effect, since the information and norm content were shown together. Social norms matter, the determinant analysis shows they are central but that a brief treatment cannot create them. Norm change, if it happens, is more likely to come from gradual normalization through repeated exposure and a growing market presence than from a single message.

7.5 The Nordic student sample in context

The third contribution of this study is evidence from a Nordic context, where empirical research on insect-based food acceptance remains sparse. The sample profile helps situate the findings. Average acceptance was relatively high, environmental concern was elevated, and food neophobia was correspondingly low, consistent with the environmentally aware, sustainability-open profile typically documented among university student populations (Platta et al., 2024). This profile also makes them a likely early consumer group for insect-based foods, which is part of why the sample is a relevant one to study: if acceptance is limited even among this receptive group, it points to barriers that are likely to be stronger in the wider population. This makes the null treatment effect more notable: if a short informational video fails to move behaviour even among a group predisposed to be receptive, it is unlikely to be more effective among the broader, less environmentally engaged public. The result should therefore be read as a reasonably conservative test of the information-provision hypothesis, while also recognising that the sample is not representative of the Swedish population.

At the same time, taste belief was the only attitudinal item to fall below the scale midpoint, showing that doubts about flavour persisted even among otherwise open respondents. The main obstacle for this group is not a lack of environmental or nutritional information which they largely already accept but uncertainty about what eating insects tastes like. Information campaigns that keep repeating environmental arguments may therefore be tackling a barrier that, for this group, is no longer the real one.

7.6 Policy Implications

The findings carry implications for how interested parties might approach the promotion of sustainable proteins. The most direct lesson is that one-off information provision, the instrument most readily available to policymakers, is unlikely to shift behaviour on its own. If the goal is to encourage a dietary transition toward lower-impact proteins, campaigns built around environmental and nutritional facts may have limited reach, since the present results suggest that for many consumers the relevant information is already accepted and is not the main factor holding them back.

A more promising direction follows from the central role of social norms. Because willingness to try depended heavily on whether insect consumption was perceived as socially acceptable, policy is likely to be more effective when it works to normalise the behaviour rather than simply to inform. This aligns with evidence that descriptive social norms, alongside cues from visible and trusted actors, shape public support for climate-related measures (Rinscheid, Pianta and Weber, 2020), and with the broader argument that overcoming Western reluctance toward insects requires reshaping the food environment and building familiarity rather than relying on persuasion alone (Deroy, Reade and Spence, 2015). In practice, this points less toward standalone awareness campaigns and more toward measures that increase the visibility and ordinariness of insect-based products: their presence in mainstream retail, in food service, and in settings where consumers can observe others choosing them.

A complementary lever is to target those most ready to adopt. Acceptance is far from uniform, and early demand is likely to come from identifiable consumer segments rather than the population (Verbeke, 2015); the meat-eating, environmentally engaged profile that emerged in this study is one such group. Concentrating early efforts on receptive segments may help establish the visible everyday consumption on which wider normalisation depends.

The role of environmental belief in driving willingness to pay suggests a further direction. Given that a price premium is motivated by the specific belief that insect protein delivers environmental benefits, rather than by general environmental concern. Demand may be more effectively supported by credible and verifiable impact information, such as trusted certification or labelling. At the same time, the persistence of taste scepticism and food neophobia indicates that informational and norm-based measures alone will not be sufficient; opportunities for direct trial and gradual familiarisation are likely to remain necessary complements.

Taken together, these implications point away from short, information-heavy interventions and toward a slower, multi-pronged strategy that combines

normalisation, credible environmental signalling, targeted early adoption, and direct sensory exposure.

8. Limitations and future research

Several limitations should be kept in mind when interpreting these findings, and each point toward a direction for future work.

The first concerns external validity. The sample was relatively small and consisted of mostly Swedish university students, a group that is environmentally aware and open to sustainable innovation but not representative of the broader population. This limitation is compounded by the survey's design: vegetarian and vegan respondents were routed out of the insect-food section, removing precisely those individuals for whom environmental concern most readily translates into dietary change and thereby compressing the variation in environmental concern among the meat-eating respondents who remained. The results should therefore be read as describing a specific consumer group rather than the population. Future work should therefore examine actual behaviour through field experiments, supermarket trials, or controlled tasting sessions in which consumers interact directly with insect-based products, allowing stated intentions to be validated against revealed choices.

A second set of limitations concerns the treatment as administered. The study relied on an existing informational video rather than one built for this purpose, so it may not have been optimally framed to reduce emotional resistance, and its visual presentation of insects may have activated disgust or unfamiliarity rather than diminishing it, particularly among neophobic respondents. The design also did not allow respondent engagement to be observed, so it could not be verified whether participants watched the video in full or disengaged from parts of it; actual treatment exposure is therefore uncertain. Given that the video treatment may not have been effective, future studies should test other approaches in which the insect component is less visually prominent such as product-focused advertising, cooking demonstrations or tasting experiences.

Finally, because acceptance appears to depend more on familiarity and social normalisation than on one-off information, longitudinal designs are needed to examine whether repeated exposure and a growing market presence gradually shift acceptance over time.

9. Conclusion

This study examined whether a short video-based information treatment could increase consumer acceptance of insect-based foods among Swedish university students, measured through willingness to try, willingness to pay, and hypothetical purchase choice. The result was a consistent null: across all three outcomes and all specifications, the treatment effect was small, statistically insignificant, and, if anything, slightly negative. The robustness of this finding across estimation methods strengthens the conclusion that brief informational exposure does not meaningfully shift behavioural intentions toward insect-based foods.

Acceptance was instead shaped by underlying psychological and social factors, and notably by different factors at different stages of the decision. Social norm perceptions most strongly predicted willingness to try and purchase choice, suggesting that perceived social acceptability lowers the threshold for engaging with insect-based foods, while environmental belief dominated willingness to pay, indicating that a tangible sense of environmental benefit is what motivates a price premium. Food neophobia operated as the clearest negative predictor throughout, reinforcing earlier evidence that emotional resistance and unfamiliarity can outweigh sustainability motivations even among environmentally aware consumers (Modlinska et al., 2021; Michel and Begho, 2023).

Taken together, the findings suggest that consumer acceptance of insect-based foods is governed more by social and psychological mechanisms than by short informational interventions. Increasing acceptance is therefore likely to depend on building familiarity, supporting social normalisation, and reducing emotional resistance, rather than on environmental information campaigns alone.

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Popular science summary

Producing the meat on our plates places enormous pressure on the planet. Beef in particular demands large amounts of land, water, and feed, and it generates significant greenhouse gas emissions. This has prompted a search for protein sources that are gentler on the environment. Edible insects are one promising candidate: they need far less land and feed than cattle, emit fewer greenhouse gases, and are rich in protein and nutrients. They are already a normal part of the diet in many parts of the world. In Europe, however, most people remain reluctant to put insects on their plate.

This thesis asked a simple question: if reluctance comes partly from not knowing much about insect-based food, can giving people information change their minds? To find out, around 500 people, mostly students in Uppsala Sweden took part in a survey experiment. Half of them watched a short informational video about the benefits of eating insects before answering questions about whether they would try such products, how much they would pay, and which product they would choose. The other half answered the same questions with no video.

The result was striking: the video made almost no difference. People who watched it were no more willing to try or buy insect-based food than those who did not. What did matter were people's existing attitudes and how they felt about insects to begin with, and especially whether they believed people around them would approve. A general fear of unfamiliar foods also held some people back.

The takeaway is that acceptance of insect-based food is unlikely to be won through quick information campaigns alone. Lasting change depends more on shifting attitudes and social norms, making insect-based food feel normal, familiar and socially accepted.

Appendix

I. Survey design

The full questionnaire as administered to respondents through Netigate is reproduced below. Response options are listed beneath each question. Sections were displayed sequentially; respondents could not return to previous sections after advancing.

Section 1 — Introduction and information

Hello! This survey is conducted as part of a master's thesis in Environmental Economics, with a focus on consumer behaviour. The purpose of the study is to better understand how individuals make choices related to food products. We are very grateful for your participation.

Please note:

- You will need about 5 to 10 minutes to complete the survey.
- The results of the study will primarily be presented in the master thesis and publications.
- All information provided by you will be treated anonymously and confidentially. The information you provide will not be linked to information about who you are.
- Only general statistics will appear in reports and/or publications. No individual respondents can be traced.
- The full survey responses are only handled by us, who work directly in the study.
- Your participation is voluntary but very important to us.

Section 2 — Background questions

Q1. What is your gender?

- Male
- Female
- I don't identify with any gender
- Do not want to specify

Q2. How old are you?

- Below 18 years old
- 18–25 years old
- 26–35 years old
- 36–45 years old
- 46–55 years old
- 56–65 years old
- 66–75 years old
- Above 75 years old

Q3. In what country were you brought up in?

[Open-ended text response]

Q4. What is your current employment status?

- Student
- Employed
- Unemployed
- Self-employed
- Retired
- Other

Q5. What is your highest level of education?

- Upper secondary school
- Bachelor's degree
- One-year master's degree
- Two-year master's degree
- PhD
- Other

Section 3 — Food and eating habits

Q6. Make statements for the following prompts.

Response scale: 1 = Strongly disagree, 2 = Disagree, 3 = Somewhat disagree, 4 = Somewhat agree, 5 = Agree, 6 = Strongly agree.

- I am hesitant to try new or unfamiliar foods.
- I enjoy trying foods from different cultures.

Q7. When choosing food products, how important is the overall health impact of the food to you? (e.g., long-term health effects, disease prevention, weight management, general wellbeing)

Response scale: 1 (not at all important) to 10 (extremely important).

Q8. How important is the nutritional composition (such as protein, vitamins, and fat content) when choosing food products?

Response scale: 1 (not at all important) to 10 (extremely important).

Q9. Have you ever tried food containing insects? (Both whole insects and insect-based ingredients.)

- Yes
- No
- Not sure

Q10. How familiar are you with insect-based food products? (e.g., insect protein powder, insect as a meat substitute, as topping on a salad)

Response scale: 1 (not at all familiar) to 10 (very familiar).

Section 4 — Environmental behaviour

Q11. To what extent are you personally concerned about environmental issues in general (e.g., climate change, biodiversity loss, pollution)?

Response scale: 1 (not at all concerned) to 10 (extremely concerned).

Q12. When choosing food products, how much do environmental considerations influence your choices (e.g., climate impact, production methods, sustainability labels)?
Response scale: 1 (not at all) to 10 (very strongly).
[Randomisation point: at the end of Section 4, respondents were assigned at random to either the treatment group (Section 5: video) or the control group (proceed directly to Section 6).]
Section 5 — Information treatment (Treatment group only)
Treatment-group respondents were shown a short informational video about insect-based food, covering global consumption patterns, environmental impact, nutritional value, taste, and sustainability. The full video transcript is reproduced in Appendix II.
Source: TED-Ed, "Should we eat bugs?" by Emma Bryce. After the video, respondents proceeded to Section 6.
Section 6 — Insect-based food consumption
Q13. How would you describe your current diet?
- Omnivore (I eat everything)
- Vegetarian (no meat products)
- Vegan (no meat or animal-related products)
- Pescetarian (no meat except for fish)
- Flexitarian (I eat mostly vegetarian)
- Other

[Routing: respondents identifying as vegetarian or vegan were routed out of the insect-food section and directed to Section 7.]
Q14. How do you feel about the idea of eating insects?
Response scale: 1 (very negative) to 10 (very positive).
Q15. Please answer the following statements.
Response scale: 1 = Strongly disagree, 2 = Disagree, 3 = Somewhat disagree, 4 = Somewhat agree, 5 = Agree, 6 = Strongly agree.
- I believe insect-based food products are safe for human consumption.
- I believe and/or know insect-based food products taste good.
- If insect-based food became more common in Sweden, I would most likely eat it.
- I believe replacing red meat with insect-based protein would reduce the environmental impact of meat production.

Q16. How willing are you to try food products that contain insect-based ingredients?
Response scale: 1 (not willing at all) to 10 (very willing).
Q17. For each of the following products, rate your willingness to try them.
Response scale: 1 (not likely at all) to 10 (very likely).
- Whole roasted insects

- Ground-up insects as meat substitute
- Insect flour used in baked goods
- Insect protein powder

Imagine you are shopping for sausages for a weekday dinner at your regular grocery store. The store has introduced a new meat product: minced beef mixed with 15 percent insect protein (crickets). Below are two pictures of products, A and B. Please take a moment to look carefully at the packaging and product information. You will be asked questions about them on the next page. Assume that the taste, texture, and nutritional value are the same for both products.

Product A: 100 percent beef sausages — labelled "100% BEEF SAUSAGES, High Quality Meat, Source of Protein, Gluten Free, Net Wt 12 oz (340 g)."

Product B: Beef-and-insect sausages — labelled "BEEF & INSECT SAUSAGES, 85% Beef – 15% Insect, Source of Protein, Gluten Free, Net Wt 12 oz (340 g)."

Q18. Which product would you choose if it were available in regular grocery stores?

- A (100% beef)
- B (beef + 15% insect)
- Neither A nor B

Q19. How willing are you to try (taste, sample) product B?

Response scale: 1 (not willing at all) to 10 (very willing).

Q20. How much would you be willing to pay for product B if you saw it in your regular grocery store? (Answer in SEK.)

[Open-ended numeric response]

Q21. What is your current income? (Before tax.)

- 0 – 9,999 SEK
- 10,000 – 19,999 SEK
- 20,000 – 29,999 SEK
- 30,000 – 39,999 SEK
- 40,000 – 49,999 SEK
- 50,000 SEK or more
- I prefer not to answer

Section 7 — End of survey

Q22. If you have any thoughts or concerns about the survey, please write them here.

[Open-ended text response]

Thank you for taking the time to complete this survey! Your responses are greatly appreciated and will contribute to ongoing research on consumer behaviour and sustainable food choices.

II. Video transcript (information treatment)

The following is a transcript of the video shown to respondents in the treatment group as part of the survey experiment.

Part 1: **Why don't we eat bugs?**
For centuries, people have consumed bugs, everything from beetles to caterpillars, locusts, grasshoppers, termites, and dragonflies. The practice even has a name: entomophagy. Early hunter-gatherers probably learned from animals that foraged for protein-rich insects and followed suit.
As we evolved and bugs became part of our dietary tradition, they fulfilled the role of both staple food and delicacy. In ancient Greece, cicadas were considered luxury snacks, and even the Romans found beetle larvae to be scrumptious.

Part 2: **Why have we lost our taste for bugs?**
The reason for our rejection is historical, and the story probably begins around 10,000 BC in the Fertile Crescent, a place in the Middle East that was a major birthplace of agriculture. Back then, our once-nomadic ancestors began to settle in the Crescent. As they learned to farm crops and domesticate animals, attitudes changed, rippling outwards towards Europe and the rest of the Western world. As farming took off, people might have spurned bugs as mere pests that destroyed their crops. Populations grew, and the West became urbanised, weakening connections with our foraging past. People simply forgot their bug-rich history. Today, for people not accustomed to entomophagy, bugs are just an irritant. They sting and bite and infest our food. We feel an "ick factor" associated with them and are disgusted by the prospect of cooking insects.

Part 3: **Global consumption**
Almost 2,000 insect species are turned into food, forming a big part of everyday diets for two billion people around the world. Countries in the tropics are the keenest consumers, because culturally it is acceptable. Species in those regions are also large, diverse, and tend to congregate in groups or swarms that make them easy to harvest. In Cambodia, huge tarantulas are gathered, fried, and sold in the marketplace. In southern Africa, the mopane worm is a dietary staple, simmered in a spicy sauce or eaten dried and salted. In Mexico, chopped jumiles are toasted with garlic, lemon, and salt.

Part 4: **Health benefits**
Bugs can be eaten whole to make up a meal, or ground into flour, powder, and paste to add to food. They are also nutritionally valuable. Scientists suggest that entomophagy could be a cost-effective solution for developing countries that are food insecure. Insects can contain up to 80% protein and are also high in energy-rich fat, fibre, and micronutrients such as vitamins and minerals. Most edible insects contain the same amount or more mineral iron than beef making them a significant untapped resource given that iron deficiency is currently the most common nutritional problem in the world.

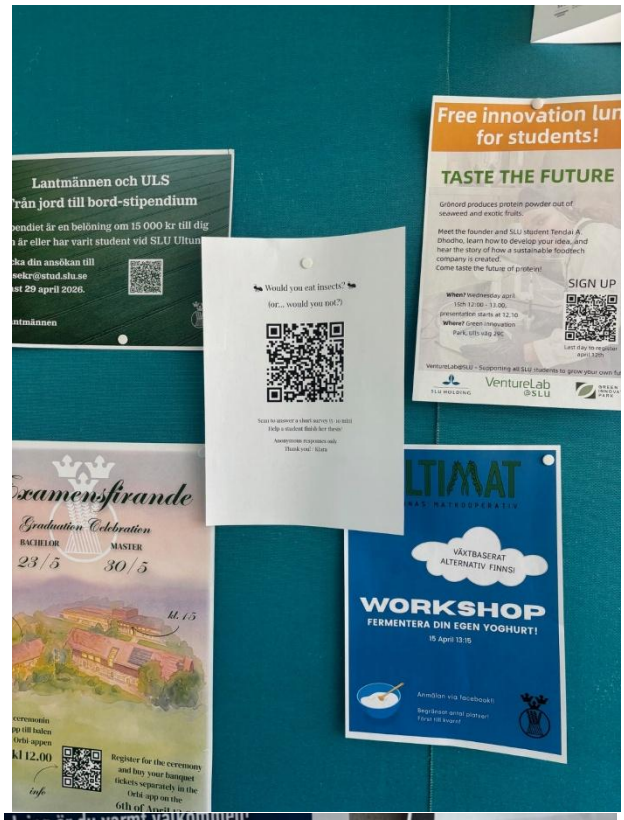
The yellow mealworm is a nutritious example. Native to America and easy to farm, mealworms have a high vitamin content, contain healthy minerals, and can contain up to 50% protein, almost as much as an equivalent amount of beef.

Part 5: **Nutrition, taste, and environmental impact**
Bugs can also be delicious. Mealworms taste like roasted nuts, locusts are similar to shrimp, and crickets are said to have an aroma of popcorn. Farming insects for food also has considerably less environmental impact than conventional livestock farming, as insects emit far less greenhouse gas and require less space, water, and feed. Insect production could furthermore support livelihoods in developing countries, since insect farms can be small-scale, highly productive, and relatively inexpensive to maintain. Insects can also serve as sustainable feed for livestock and can be reared on organic waste such as vegetable peelings that would otherwise end up in landfills.

Part 6: **Conclusion**
Faced with a plate of fried crickets, most people today would still recoil. But consider the lobster essentially a giant insect with legs and feelers, once regarded as inferior and repulsive food, now considered a delicacy. Could the same shift in perception happen for insects?

Source: TED-Ed. "Why Don't We Eat Bugs?" YouTube, [https://www.youtube.com/watch?v=rDqXwUS402I&t=97s]. Accessed [03/12/2026].

III. Survey distribution at the university



Picture 1 and 2: *The information was distributed across the university in five separate buildings, in total 15 different sheets were set up.*

IV. Robustness checks

Because the central finding of this study is a null treatment effect, the robustness checks below test whether the null is driven by specific modelling, measurement, or sample choices, or whether it reflects a genuine absence of effect. Four sets of checks are reported: heterogeneous treatment effects across four pre-treatment moderators (R1), an alternative WTC outcome based on a composite product index (R2), three alternative WTP specifications (R3), and a re-estimation on an education-balanced sample (R4). The focus throughout is the stability of the treatment coefficient β_1.

R1. Heterogeneous treatment effects

A null average treatment effect is consistent both with a uniform absence of effect and with offsetting effects across subgroups that cancel in the average. To distinguish these, the full M5 specification is re-estimated for each outcome with an interaction between treatment and four theoretically motivated moderators: food neophobia, prior insect experience, insect familiarity, and gender. Food neophobia is the most directly motivated by the experience-goods framework of Nelson (1970), under which information should reduce uncertainty most strongly for those facing the highest cost of trial; prior experience and familiarity capture different dimensions of baseline knowledge; gender is included given the baseline differences in WTP observed in the main results.

Table A1: *Treatment-by-moderator interaction coefficients*

Moderator / Outcome	Treatment β	Interaction β	Interaction p
Food neophobia			
WTC	−0.060 (0.324)	0.037 (0.110)	0.740
WTP	1.482 (4.992)	−0.584 (1.728)	0.736
Purchase B	0.253 (0.668)	−0.146 (0.254)	0.566
Prior insect experience			
WTC	−0.029 (0.179)	0.219 (0.316)	0.488
WTP	−1.390 (2.801)	4.935 (5.206)	0.344
Purchase B	−0.553 (0.419)	1.536 (0.718)**	0.032
Insect familiarity			
WTC	0.257 (0.286)	−0.060 (0.063)	0.343
WTP	3.078 (4.242)	−0.834 (0.950)	0.381
Purchase B	−0.001 (0.589)	−0.023 (0.119)	0.850
Female			
WTC	−0.078 (0.246)	0.178 (0.317)	0.574
WTP	0.599 (3.821)	−0.975 (4.854)	0.841
Purchase B	0.572 (0.611)	−0.902 (0.734)	0.219

Notes: *Coefficients with robust standard errors in parentheses. WTC estimated by OLS; WTP by Tobit (censored at zero); purchase choice by multinomial logit with Neither as base outcome*

*(Product B log-odds equation reported). Full M5 specifications with all controls included; table reports only treatment, interaction term, and interaction p-value. ** p<0.05.*

Across twelve interaction tests, only one is statistically significant: the treatment × prior experience interaction on the log-odds of choosing Product B (β = 1.536, p = 0.032). However, when translated to the probability scale via average marginal effects, the treatment effect on Pr(Choose B) is similar across experience groups and not statistically distinguishable from zero in either (no experience: ME = −0.077, p = 0.109; has experience: ME = −0.073, p = 0.091). The pattern in the Product A equation, where the same interaction is also positive and marginally significant (β = 1.191, p = 0.086), suggests the video activates decisiveness among experienced respondents, they become less likely to choose Neither and more likely to choose either alternative rather than shifting preferences toward the insect-based product specifically. The remaining eleven interactions are firmly null. Taken together, the heterogeneity tests do not support the alternative hypothesis that the null ATE masks offsetting subgroup effects.

R2. Alternative WTC outcome (Product index)

The main WTC outcome is a single 1–10 item. The survey additionally asked respondents to rate their willingness to try four specific product formats (whole roasted insects, ground insects as meat substitute, insect flour in baked goods, and insect protein powder); the mean of these four items forms a composite index with strong internal consistency (Cronbach's α = 0.86). Table A2 compares the full M5 specification across the two outcomes.

Table A2: *WTC across single-item and composite outcomes*

Specification	Treatment β	SE	p	R^2
Single item (main, M5)	0.033	0.148	0.821	0.706
Product index (4 items, α = 0.86)	−0.097	0.144	0.498	0.674

Notes: *OLS estimates with heteroskedasticity-robust standard errors. Both specifications include the full M5 controls. The product index was recoded so higher values indicate greater willingness, matching the single-item direction.*

The treatment coefficient remains close to zero (β = −0.097, p = 0.498). Predictor signs and significance patterns are essentially unchanged between specifications. Taste belief becomes significant in the index specification (β = 0.236, p = 0.009) where it is null in the single-item version intuitively consistent with the four product items asking about specific consumption scenarios where taste expectations are more directly relevant, but the substantive treatment-effect conclusion is unchanged.

R3. Alternative WTP specifications

Three alternatives test whether the null Tobit result on WTP is sensitive to the modelling of zero responses, the right-skewed distribution, or functional form: OLS on the full WTP variable, OLS on log(WTP+1), and OLS restricted to the positive-WTP subsample.

Table A3: *WTP across alternative specifications*

Specification	Treatment β	SE	p	N
Tobit on full WTP (main)	0.000	—	0.10	408
OLS on full WTP	−0.194	2.319	0.933	408
OLS on log(WTP+1)	0.013	0.092	0.890	408
OLS on WTP > 0 subsample	−0.106	2.311	0.963	384

Notes: *All OLS specifications use heteroskedasticity-robust standard errors. The Tobit row reports the unconditional marginal effect; the latent-variable coefficient is not directly comparable. The positive-subsample excludes the 24 respondents (5.9 percent) stating zero willingness to pay.*

The treatment coefficient is essentially zero across all four specifications, with p-values between 0.89 and 0.96. The predictor structure is broadly consistent: attitude toward insects, environmental belief, female, and continent of origin remain significant in all four. The null on WTP is not driven by the Tobit's treatment of zeros, the skewed upper tail, or the choice of functional form.

R4. Education-balanced sample

The covariate balance check in the data section flagged a marginally significant imbalance on education ($p = 0.004$), with the treatment group slightly more educated than the control group. The M5 specifications are re-estimated on a sample excluding respondents in the highest education bracket (PhD), reducing the sample by 25 observations. The joint F-test on the trimmed sample is insignificant ($F(11, 399) = 1.20$, $p = 0.282$), confirming balance is restored in aggregate.

Table A4: *Main results on education-balanced sample (PhD excluded)*

Outcome	Treatment β	SE	p	N
WTC (OLS)	0.023	0.155	0.882	411
WTP (Tobit)	−0.013	2.475	0.996	385
Purchase B (mlogit)	−0.147	0.345	0.670	411

Notes: *WTC estimated by OLS; WTP by Tobit; purchase choice by multinomial logit with Neither as base outcome (Product B log-odds reported). All specifications include the full M5 controls.*

The treatment coefficient barely moves from its main-specification value across all three outcomes. The null ATE cannot be attributed to the education imbalance.

In conclusion, across eleven alternative specifications and twelve heterogeneity tests, the treatment coefficient remains close to zero and statistically insignificant. The robustness checks provide consistent evidence that the null average treatment effect reflects a genuine absence of effect rather than an artefact of modelling, measurement, or sample composition.

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