Empirical model

Consumer preferences were analyzed using the Random Utility Model (RUM) proposed by McFadden (2001), while parameters were estimated through a mixed logit model (Kershaw et al., 2019). Given a set of cracker alternatives C available to consumer i, the utility associated with each option c can be expressed as a linear function of product attributes and their levels.

$$U_c^i = h_{c'}\Omega + v_c^i$$

where $h_c$represents the vector of product attributes, Ωthe parameter vector, and $v_c^i$the stochastic error term. The model assumes that consumers choose the alternative that maximizes expected utility, such that $U_c^i \geq U_k^i$for all other alternatives in the choice set C.

Choice is interpreted probabilistically: the probability that consumer $i$selects alternative $c$depends on the likelihood that its utility exceeds that of the competing options. Therefore, the parameters in vector Ωcapture the effect of each attribute on choice probability and consumer decisions.

To estimate preferences, the study applied a mixed logit model (De Salvo et al., 2020), which extends the conditional logit model by including both fixed effects (average attribute impacts) and random effects, accounting for individual heterogeneity in preferences. This approach allows coefficients to vary across consumers, providing a more flexible representation of decision-making.

Two models were estimated: the first without interaction terms to evaluate average consumer preferences, and the second including interaction effects to examine preference heterogeneity and the influence of individual characteristics on choices.

In addition to sociodemographic variables (age, gender, income, and sport involvement), two psychometric scales were included: the Food Neophobia Scale (FNS) (Pliner and Hobden, 1992), measuring resistance to novel foods, and the Environmentally Conscious Consumer Behavior (ECCB) scale (Ghali-Zinoubi, 2022), assessing environmental awareness and sustainable consumption attitudes.

Both scales were subjected to factor analysis to identify their latent structure and generate representative factor scores. These scores were then included in the mixed logit model as interaction terms with cricket and Tenebrio flour to explain heterogeneity in consumer preferences.

After estimating the random parameter logit model, willingness to pay (WTP) was calculated. WTP represents the maximum amount consumers are willing to pay for a specific product attribute, holding other characteristics constant. Assuming that total utility derives from the linear combination of product attributes and price, WTP was estimated accordingly:

$$WTP_i = -\frac{\beta_i}{\beta_p}$$

where WTP_irepresents willingness to pay for attribute level i, $\beta_i$is the estimated coefficient of that attribute, and $\beta_p$is the price coefficient.

WTP was calculated as the ratio between the coefficient of each non-monetary attribute and the price coefficient, representing the amount consumers are willing to pay for a specific product characteristic. Statistical analyses were performed using Stata/SE version 18 (College Station, TX, USA).

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