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Does the climate crisis reshape meat and vegetarian preferences? Climate-change appraisals moderate the association between value orientations and meat and dietary preferences

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Abstract

Dietary choices are increasingly recognised as an important component of climate-change mitigation, yet less is known about the conditions under which individuals' value orientations translate into preferences for meat- or plant-based diets. This study examined whether climate-change appraisals are associated with meat and vegetarian preferences and whether they moderate the associations between value orientations and dietary preferences. Data were obtained from a nationally representative online survey of 1,970 respondents aged 16 years and older in South Korea. Parallel ordinary least squares regression models assessed pro-vegetarian and pro-meat preferences, with five value orientations (ecocentric, altruistic, egoistic, hedonic, and religious) and six climate-change factors (perceived severity, vulnerability, psychological distance, anxiety, personal norm, and guilt) as predictors. Moderation effects were examined using value × climate-appraisal interactions and simple-slope analyses, with false-discovery-rate correction applied across the interaction tests. The full models explained 32.4% of the variance in pro-vegetarian preference and 27.7% of the variance in pro-meat preference. Personal norm, age, ecocentric and religious values, perceived severity, vulnerability, and guilt were positively associated with pro-vegetarian preference. Pro-meat preference was positively associated with psychological distance, egoistic values, vulnerability, income, and perceived severity, and negatively associated with climate anxiety and age. Significant interactions indicated that several associations between value orientations and food preferences varied across levels of climate-change appraisal, although individual interaction effects were small. The patterns differed between vegetarian and meat preferences, supporting their treatment as related but distinct outcomes. These findings suggest that climate-change appraisals may function not only as direct correlates of dietary preference but also as conditions under which value orientations are expressed in food preferences.

Keywords: climate change, food preference, vegetarian, meat, value orientations, moderation, simple slopes

1. Introduction

Food choice links individual behaviour directly to climate outcomes. Livestock production contributes substantially to agricultural greenhouse-gas emissions, and shifting towards plant-based diets is among the highest-leverage individual mitigation options. However, food preference also reflects taste, identity, culture, and habit; therefore, climate concern alone cannot explain shifts towards vegetarian or meat-centred consumption habits.

Livestock supply chains account for approximately 14.5% of anthropogenic greenhouse-gas emissions [1], while the global food system contributes roughly one-quarter to more than one-third [2], [3]. Animal-based foods generate about twice the emissions of plant-based foods [4], making dietary change a consequential

domain of individual mitigation.

The Korean case is particularly relevant. Per-capita meat consumption rose from approximately 11 kg in 1980 to 60.6 kg in 2023 and first exceeded rice consumption in 2022 [5], [6]. This continuing rise makes the psychological determinants of meat versus vegetarian preference, and the conditions under which climate concern affects these preferences, particularly salient.

Prior research has more often treated value and climate-appraisal variables as parallel predictors than examined how they operate in combination. This study addresses that gap by testing whether climate appraisals constitute boundary conditions for the expression of values in food preference.

Two explanatory traditions guide the model. Value-basis accounts emphasise stable orientations towards nature, others, self-interest, and pleasure, whereas climate-appraisal accounts emphasise perceived severity, vulnerability, psychological distance, anxiety, obligation, and guilt. Rather than treating these constructs solely as parallel predictors, this study distinguishes values as dispositions from climate appraisals as conditions under which those dispositions are expressed.

Accordingly, the study investigates whether value orientations and climate-change factors predict pro-vegetarian and pro-meat preferences and whether the six climate-change factors moderate the effects of the five value orientations. Figure 1 represents this structure: demographic controls, values, and climate factors predict both outcomes, whereas climate factors also moderate the value-to-preference pathway.

Using a nationally representative survey of 1,970 Korean adults, we estimate parallel regressions for the two preferences and examine significant value × climate interactions using simple-slope analyses. The aim is not to claim that moderation accounts for a large amount of incremental variance, but rather to determine whether interactions occur in theoretically interpretable and outcome-specific patterns.

2. Theoretical Background

2.1 Philosophical and ethical foundations of meat consumption and vegetarianism

Before we turn to psychological determinants, it is useful to situate meat consumption and vegetarianism within the normative traditions that frame them because these traditions provide the moral content that value orientations subsequently bring to dietary choice. Three broad streams are particularly relevant: environmental philosophy, concerned with the relationship between humans and nature; animal ethics, concerned with the moral status of animals; and critical cultural approaches, concerned with the ideologies that render meat consumption unquestionable.

Within environmental philosophy, a decisive development was the expansion of the moral community beyond humans. Leopold's [7] land ethic already extended that community to 'soils, waters, plants, and animals', while deep ecology [8] radicalised this step by arguing that all living beings possess intrinsic worth independent of their usefulness to humans. From this perspective, the ecological self is realised through identification with nature rather than through mastery over it. From this biocentric-holistic standpoint, the confinement and slaughter involved in industrial meat production constitute a violation of nature's intrinsic value, while plant-based eating becomes a practice of ecological self-realisation. Social ecology [9], by contrast, argues that this diagnosis locates the problem incorrectly. The ecological crisis originates not primarily in individual consciousness but in hierarchical social structures, insofar as the domination of nature mirrors forms of domination among humans. Meat consumption is therefore less a matter of private moral failing than a practice embedded in the power relations, inequalities and industrial organisation of the food system. The two positions are complementary rather than mutually exclusive. Deep ecology calls for a transformation of values and consciousness, whereas social ecology calls for a transformation of institutions; both, however, converge in their critique of the industrial meat system.

Within animal ethics, the **animal-liberation** tradition grounds vegetarianism in the moral status of animals themselves, drawing on two distinct lines of reasoning. Singer's [10] utilitarian argument treats the capacity to suffer as the sole basis of moral consideration and condemns the discounting of animal interests on the grounds of species membership as *speciesism*. On this account, the aggregate suffering caused by industrial animal farming cannot be outweighed by the pleasure derived from eating meat. Regan's [11] rights-based argument reaches a similar practical conclusion on deontological grounds: animals are subjects-of-a-life who possess inherent value and therefore may not be treated merely as means to human ends. On either account, refraining from meat is a matter of obligation rather than personal taste. **Veganism** extends this ethical position beyond diet into a way of life that rejects the use of animals in food, clothing, and other domains. It has also increasingly brought together animal-ethical, ecological, and health rationales within a broader contemporary movement.

A third, critical-cultural stream approaches the issue from the opposite direction: not why one should stop eating meat, but why eating meat so rarely requires justification. Ecofeminist analysis [12] interprets meat as both a symbol and an instrument of patriarchal domination, in which the slaughtered animal becomes an 'absent referent', linguistically and culturally erased from the meal. Joy's [13] account of carnism identifies the invisible ideology that classifies a few species as edible and normalises their consumption, making meat consumption appear natural rather than chosen. In everyday reasoning, this ideology is reflected in the '4N' rationalisations, through which meat consumption is defended as natural, normal, necessary, and nice [14]. This lay framework legitimates the status quo and weakens the moral pressure towards dietary change.

Together, these traditions approach meat consumption and vegetarianism through several distinct normative routes: the intrinsic value of nature, obligations towards other humans and animals, and critiques of the ideologies that normalise meat consumption. Everyday meat eating, meanwhile, is defended through appeals to nature, normality, necessity, and pleasure. This plurality of justificatory frameworks maps onto the psychological constructs examined below. Ecocentric values reflect the intrinsic-value argument; altruistic values and personal norms reflect other-regarding obligations; egoistic and hedonic values reflect the perceived necessity and pleasure associated with meat consumption; and guilt captures recognition of one's own complicity. The philosophical debate is, in this sense, reproduced within the individual as a competition among value-laden considerations. This competition is what the psychological analysis models.

2.2 Determinants of meat and vegetarian preference: theory and evidence

Empirical research on why individuals consume, avoid, or reduce meat has developed into a substantial field of inquiry [15]. Its sociodemographic findings are consistent: women are more likely than men to endorse vegetarian eating and report weaker attachment to meat; younger cohorts express more permissive attitudes towards pleasure-oriented consumption, while meat preference declines with age in some societies and increases in others; and education and income show mixed, context-dependent associations. These patterns are typically interpreted through socialisation and social-position accounts, including gendered norms that associate meat with masculinity, cohort differences in value climates, and differences in the material accessibility of alternative diets.

Psychological determinants constitute a second and broader family of explanations. Attitudinal motives (health, environmental concern, and animal welfare) distinguish vegetarians and meat reducers from committed meat eaters [15]. On the meat-consumption side, research identifies a distinct motivational infrastructure: meat attachment, an affective bond with meat that predicts unwillingness to reduce consumption beyond the effects of attitudes [16], together with the 4N rationalisations that justify continued consumption [14]. On the moral side, meta-analytic research identifies a central mediating role for personal norms in pro-environmental behaviour [17], while the value tradition traces these more proximal factors back to stable value orientations [18], [19]. Two observations are particularly relevant to the present study. First, the determinants of meat or vegetarian preference overlap only partly, suggesting that the two preferences warrant separate models. Second, associations between values and dietary preferences are typically modest, which suggests that values operate under particular conditions rather than exerting uniform effects. This provides the rationale for examining moderation.

A final theoretical issue concerns the outcomes themselves and must be established before presenting the model because it determines how the results should be interpreted. Pro-vegetarian and pro-meat preferences are treated here as two related but distinct constructs rather than as opposite ends of a single continuum.

Conceptually, endorsing plant-based eating and endorsing meat-centred eating draw on partly different considerations: the former on ecological and moral considerations, and the latter on taste, habit, identity, and perceived personal benefit. An individual can therefore score either high or low on both dimensions. Empirically, the two preferences are only weakly negatively correlated in this sample, which is consistent with a two-construct rather than bipolar conceptualisation and supports the estimation of parallel models. This distinction allows the study to address a more specific question than simply asking what moves people away from meat. It asks whether the same value orientations are conditioned by the same or different climate appraisals across the two dietary preferences. If the moderators differ by outcome, that difference would itself provide evidence that climate appraisal functions as a boundary condition on the expression of values rather than as a uniform normative force towards one dietary option.

2.3 Value orientations and climate-change appraisals

Among the determinants reviewed above, this study focuses on two families of constructs: stable value orientations and situational climate-change appraisals. They are selected because they occupy distinct logical roles within the moderation framework. The value orientations are introduced first, followed by the appraisal family; the comparison table at the end of the section summarises the distinction between them.

Value-basis theories of environmental concern distinguish orientations according to the entity whose welfare an individual considers important. Ecocentric (biospheric) values place intrinsic worth on nature itself; altruistic values emphasise the welfare of other people; egoistic values emphasise costs and benefits to the self; and hedonic values emphasise immediate pleasure and comfort. A robust finding is that self-transcendent orientations (ecocentric and altruistic) tend to support pro-environmental behaviour, whereas self-enhancement and hedonic orientations tend to discourage costly or effortful environmental action. Religiosity is included here as a fifth orientation because it carries moral and stewardship dimensions that can operate in different directions depending on tradition and framing. Food choice provides a natural context in which these orientations may be expressed: reducing meat consumption is simultaneously an ecological act, an other-regarding act, a self-regarding decision involving considerations such as health and cost, and a hedonic sacrifice.

Two theoretical commitments follow from this taxonomy and organise the present study. First, the four value types are not merely a set of independent categories but form a structured space: self-transcendence (ecocentric and altruistic) and self-enhancement (egoistic and hedonic) occupy opposite positions within a motivational continuum [19], [20]. A single behaviour, such as reducing meat consumption, may therefore be evaluated simultaneously in relation to both poles, with its adoption depending on which considerations are given greater weight. Second, the value–behaviour relationship is probabilistic rather than deterministic: values establish dispositions, but whether those dispositions are expressed depends on the salience of the

considerations that make a given value relevant to the choice at hand [18], [21]. This helps explain why the main effects of values on food preferences are typically modest and provides the rationale for examining the conditions under which value orientations are expressed. If the behavioural expression of a value is conditional, then those conditions become an important object of study.

The psychological mechanism by this account concerns the weighting of considerations. An ecocentric or altruistic value increases the subjective importance of the ecological and other-regarding consequences of eating, whereas an egoistic or hedonic value increases the importance of personal costs, health considerations, and the pleasure associated with a meal. Food preference can therefore be understood as the outcome of balance among these competing considerations. This helps explain why the same value orientation may be associated with either greater or lesser support for vegetarian eating depending on which considerations are salient at the time of judgement.

Whereas value orientations describe what a person stably cares about, the six climate-change appraisals describe how the person construes the climate threat itself—its seriousness, personal relevance, psychological proximity, and the affective and normative responses it evokes.

The climate-appraisal constructs examined here draw on the threat-appraisal component of protective-action models as well as affective and norm-based accounts. Severity captures how serious the threat is perceived to be; vulnerability captures perceived personal exposure to the threat; psychological distance captures how near or far the threat seems in spatial, temporal, and social terms; anxiety captures the negative affect evoked by climate change; personal norm captures a felt moral obligation to act; and guilt captures self-directed negative emotion concerning one's own contribution. As main effects, these appraisals are expected to increase pro-vegetarian preference and reduce pro-meat preference, although empirical findings are mixed and depend on the outcome.

These six constructs are commonly examined within protection-motivation and risk-perception frameworks, in which threat appraisal (severity and vulnerability) initiates a coping process, while affective and normative factors (anxiety, personal norm, and guilt) provide motivational force [22], [23], [24]. Two distinctions are particularly important here. First, psychological distance is not a measure of threat intensity but of construal: it concerns whether the threat is represented as sufficiently concrete to influence a specific choice, such as what to eat that evening. A distant threat can leave even a strongly held value dormant. Second, guilt and personal norm are self-directed and obligation-directed constructs rather than assessments of the hazard itself. They therefore introduce a moral dimension into decision-making that severity and vulnerability do not [17], [25].

The psychological pathways are therefore twofold. Threat and construal appraisals affect the perceived

relevance of the climate consequences of eating, while affective and normative appraisals affect the extent to which moral pressure attaches to acting on them. Both pathways converge on the central proposition underlying this study: climate-change appraisals alter the importance a person attaches to the very considerations that a value orientation makes salient. In this way, an appraisal may strengthen or weaken a value's behavioural expression.

Table 1. Conceptual Comparison of Value Orientations and Climate-Change Factors

Dimension	Value orientations	Climate-change factors
Role	Source of disposition (what one cares about)	Condition of expression (when it is expressed)
Theoretical base	Value theory; VBN [18], [20]	Protection motivation and risk perception [22]
Constructs	Ecocentric, altruistic, egoistic, hedonic values; religiosity	Severity, vulnerability, distance, anxiety, personal norm, and guilt
Character	Stable, trait-like	Situational, appraisal-based
Mechanism	Weighting of the considerations a value makes salient	Increases the weight attached to those considerations
Analytic status	Independent variable	Moderator
Expected effect	Main effect on the two preferences	Amplify / reverse / attenuate the value → preference slope

Note. The two families are treated not as competing predictors but as occupying different logical roles: values provide the disposition, whereas climate-change appraisals supply the conditions under which it is expressed.

3. Research Model and Hypotheses

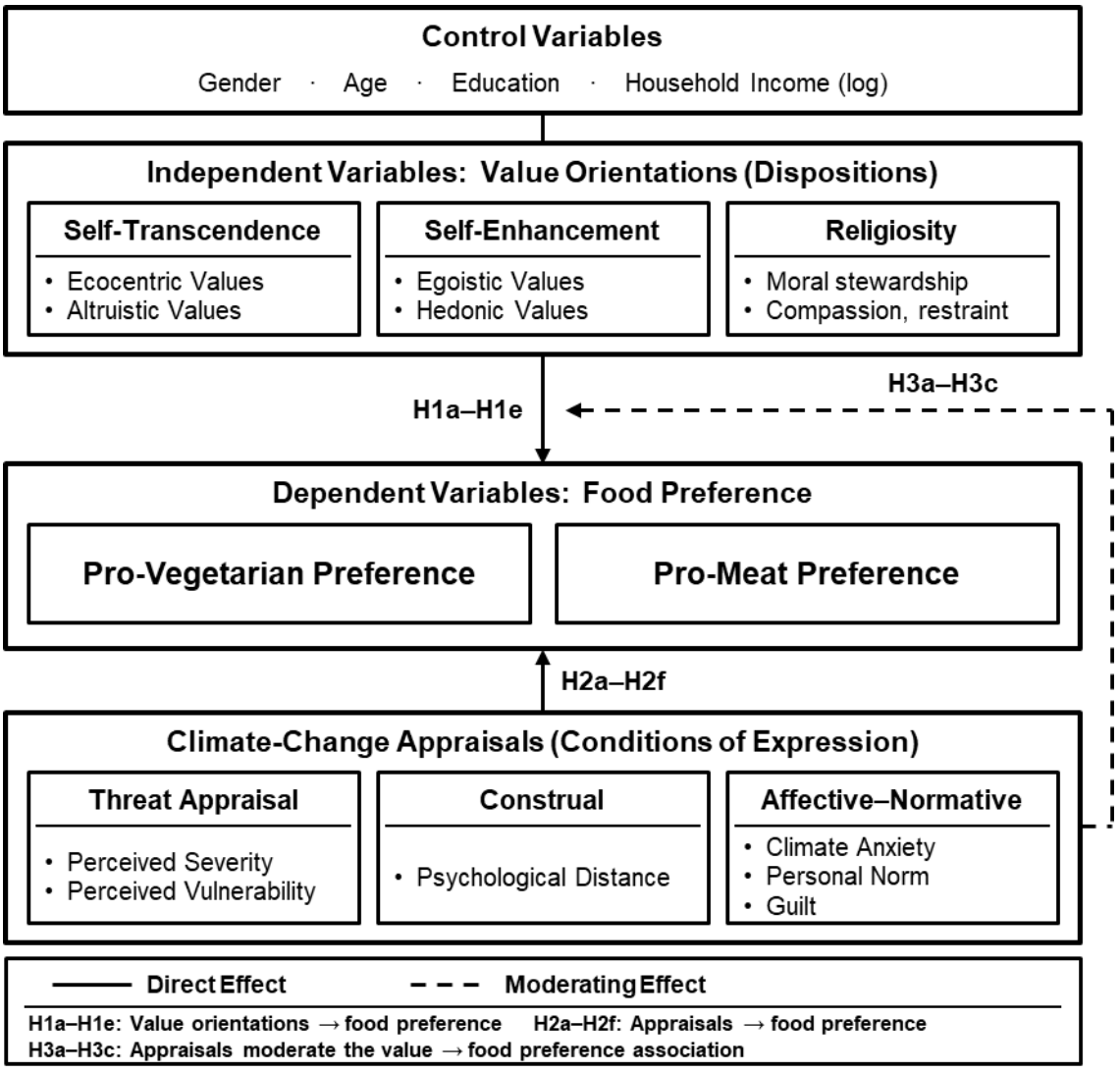
3.1 Research model

Figure 1 presents the base model. Two food-preference outcomes—pro-vegetarian and pro-meat preferences—are predicted by three blocks of independent variables: demographic controls (gender, age, education, and household income), five value orientations (ecocentric, altruistic, egoistic and hedonic values, and religiosity), and six climate-change factors (severity, vulnerability, psychological distance, anxiety, personal norm, and guilt). The dashed path represents the moderation hypothesis, whereby the climate-change factors condition the effects of the value orientations on the two preferences.

The model assigns different roles to the two substantive blocks: values are relatively stable dispositions, whereas climate appraisals are conditions of expression. Values therefore enter the model as direct predictors, while climate factors enter both as predictors and as moderators of the value → preference pathway.

The five values encompass self-transcendence (ecocentric and altruistic), self-enhancement (egoistic and hedonic), and religiosity; the six climate factors encompass threat (severity and vulnerability), construal (psychological distance), and affective-normative appraisals (anxiety, personal norm, and guilt). Both food preferences are modelled separately with gender, age, education, and log household income included as controls.

Figure 1. Research Model



Note. Solid arrows denote direct effects of the three predictor blocks on the two food-preference outcomes. The dashed arrow denotes the moderating (value × climate-change factor) effect that is the focus of this study.

3.2 Hypotheses

The hypotheses follow the weighting logic developed above. H1 predicts value effects on the preference whose justification is most closely aligned with each value; H2 predicts appraisal effects based on protection-motivation, construal-level, and norm-activation reasoning; and H3 tests whether climate appraisals amplify, reverse, or otherwise condition the expression of values.

Ecocentric values. Biospheric or ecocentric valuation assigns intrinsic worth to nature independently of its usefulness to human beings, and it constitutes the psychological counterpart of the deep-ecological position

reviewed in Section 2.1 [8]. Within the value-belief-norm tradition, this orientation is among the most reliable distal predictors of environmentally significant behaviour because it makes ecological consequences the relevant basis for evaluation [18], [19]. Food choice is an unusually direct context in which this orientation can be expressed: animal-based foods generate roughly twice the emissions of plant-based foods, and dietary change is among the highest-leverage individual actions available [2], [4]. For a person who places substantial weight on the welfare of natural systems, therefore, plant-based eating represents a direct behavioural expression of the value rather than an incidental preference. Because the ecological justification attaches specifically to the vegetarian option rather than to the rejection of meat as such, the expectation is stated for pro-vegetarian preference.

H1a. Ecocentric values are positively related to pro-vegetarian preference.

Altruistic values. Altruistic valuation places greater weight on the welfare of other people, including distant others and future generations, than on the actor's own convenience [20]. Climate change is precisely a domain in which the costs of one's own consumption are externalised onto others, so an other-regarding orientation can transform an abstract environmental problem into an interpersonal moral one. The value-belief-norm chain formalises this process: awareness that valued others are harmed activates ascribed responsibility and, in turn, a personal norm to act [18]. Since the human costs of a high-emission diet are borne by individuals who did not choose it, altruistic valuations should favour the diet whose justification is other-regarding rather than the one justified by personal health and pleasure. The expected association is therefore with the vegetarian option, and it should be positive but modest because the causal distance between one meal and harm to another person is considerable.

H1b. Altruistic values are positively related to pro-vegetarian preference.

Egoistic values. Egoistic valuation places greater weight on personal costs, benefits, and status, and it is the orientation most often found to be unrelated or negatively related to pro-environmental behaviour when such behaviour is costly [19]. In the food domain, however, its implication is not simply inaction but a positive attachment to meat, because meat is culturally construed as a personal good: the measurement items themselves capture beliefs that meat sustains health and stamina and that it is an essential component of a good meal. This is the everyday reasoning that the 4N account labels *necessary* and *nice* [14], and it is reinforced by the affective bond documented in research on meat attachment [16]. A self-interested calculation therefore weighs a concrete personal benefit against a diffuse collective one and should favour the meat-centred diet.

H1c. Egoistic values are positively related to pro-meat preference.

Hedonic values. Hedonic valuation places greater weight on immediate pleasure, comfort, and effort avoidance, and it has been shown to operate as a distinct orientation from egoistic valuation in

environmentally relevant choice [21]. Its relevance to diet is unusually direct, since eating is one of the few everyday behaviours whose primary reward is sensory. Meat is a prototypically hedonic food, while vegetarian eating is often represented as involving a sacrifice of taste, variety, and convenience—the *nice* rationalisation again, this time on the affective rather than the cognitive side. Unlike the other value orientations, hedonic valuation therefore has implications for *both* outcomes rather than one: it should raise the appeal of the meat-centred diet and, symmetrically, decrease the appeal of the plant-based one. This double signature is theoretically informative in itself, since it is the clearest case in which a single orientation opposes the two food preferences.

H1d. Hedonic values are positively related to pro-meat preference and negatively related to pro-vegetarian preference.

Religiosity. Religiosity is included not as a demographic marker but as a moral-stewardship orientation. Most major traditions transmit three resources relevant to diet: an ethic of stewardship over creation, an ethic of compassion towards sentient beings, and disciplines of self-restraint that frequently take dietary form, from fasting to abstention. Each supplies the kind of consideration by which the vegetarian option can be justified—responsibility for the natural world, regard for animals, and the legitimacy of restraining appetite for a higher end. The content of these teachings varies across traditions, and in some contexts religiosity accompanies socially conservative dietary conventions rather than reformist ones, so the expected association is directional but not large. On balance, the moral resources should support the restrained, other-regarding diet.

H1e. Religiosity is positively related to pro-vegetarian preference.

Perceived severity. Protection-motivation theory holds that protective behaviour begins with threat appraisal, of which perceived severity is the first component: a danger judged grave enough to matter mobilises coping, while a danger judged trivial does not [22]. When protection-motivation theory is applied to climate change, a person who regards the problem as exceptionally serious and harmful to their own family has reason to reconsider behaviours that contribute to it. Diet becomes relevant once the emissions intensity of animal-based foods is recognised, with plant-based eating representing one available protective response. The prediction is therefore stated for pro-vegetarian preference. Both maladaptive and adaptive responses to threat are addressed in the revised protection-motivation framework [26], a distinction considered again in the interpretation of the results.

H2a. Perceived severity is positively related to pro-vegetarian preference.

Perceived vulnerability. Vulnerability is the second component of threat appraisal and concerns personal susceptibility rather than the magnitude of the hazard [22]. It matters independently of severity because a threat can be judged catastrophic in general yet unlikely to affect oneself, in which case the motivation to

act is weak. As measured here, vulnerability is partly experiential, encompassing direct exposure to disasters and extreme weather. Experience renders risk concrete in a way that statistical information does not. An individual who has experienced the effects of climate-driven weather is therefore more likely to treat climate considerations as personally relevant in everyday choices, including choices involving food; a positive association with the protective dietary option is expected.

H2b. Perceived vulnerability is positively related to pro-vegetarian preference.

Psychological distance. Construal-level theory proposes that temporally, spatially, or socially remote events are represented more abstractly than psychologically near events [27]. Climate change is often perceived along these dimensions of distance, and greater psychological distance has been associated with lower concern and weaker willingness to act [28]. In the food domain, distance does not provide a positive argument for meat; rather, it may reduce the salience of climate considerations, leading to taste, habit, health beliefs, and cultural convention being assigned greater weight in meal choice. Psychological distance is therefore expected to function as a permissive condition for pro-meat preference, while the principal prediction is stated for the meat outcome.

H2c. Psychological distance is positively related to pro-meat preference.

Climate anxiety. Climate anxiety can direct attention and motivate climate-relevant responses independently of cognitive risk judgments [23]. By making climate considerations more accessible across decisions, anxiety should increase pro-vegetarian preference and decrease pro-meat preference.

H2d. Climate anxiety is positively related to pro-vegetarian preference and negatively related to pro-meat preference.

Personal norm. Personal norm is an internalised moral obligation to act [29] and a proximal predictor of pro-environmental intention [17]. The items here capture a sense of duty towards future generations and ethical obligation, so personal norm should positively predict vegetarian preference.

H2e. Personal norm is positively related to pro-vegetarian preference.

Guilt. Guilt is a self-conscious moral emotion directed at one's own conduct. Bamberg and Möser [17] place guilt among the antecedents of moral norm, while affective accounts identify such emotions as motivational [23]. Because the items concern consumption and failure to act, guilt should support vegetarian preference.

H2f. Guilt is positively related to pro-vegetarian preference.

Moderation. Moderation follows from the distinction between disposition and condition of expression. Values make particular considerations salient, while climate appraisals can increase their relevance or moral weight. The most common expectation is amplification: the effect of a value should become stronger as the

relevant appraisal increases, including cases in which a null association becomes significant at higher levels of the appraisal.

H3a. Amplification: The effect of a value orientation on food preference is stronger at higher levels of the relevant climate-change appraisal.

A stronger possibility is crossover moderation. When self-enhancement values are accompanied by high levels of guilt, vulnerability, or perceived proximity, the self-relevant calculation may be reoriented such that continuing current consumption becomes costly. Egoistic or hedonic values may then reverse direction rather than merely weaken.

H3b. Crossover: where a self-enhancement value (egoistic, hedonic) interacts with a moral or threat appraisal, the direction of the value's effect reverses between low and high levels of the appraisal.

Two boundary conditions are expected. First, when a value already supports an outcome on moral grounds, an additional appraisal may be redundant and may attenuate rather than amplify its effect. Second, because vegetarian and meat preferences are distinct constructs, the same appraisal need not moderate both outcomes symmetrically.

H3c. Differential moderation: the moderating appraisals differ across the two food preferences, and a value that is already aligned with an outcome on moral grounds is attenuated rather than amplified.

Table 2. Summary of Hypotheses

H	Prediction (direction)	Theoretical basis	Test
H1a	Ecocentric values → pro-veg (+)	Biospheric intrinsic value [8], [19]	Table 6
H1b	Altruistic values → pro-veg (+)	Other-regarding weighting [18], [20]	Table 6
H1c	Egoistic values → pro-meat (+)	Self-interest; meat as personal good	Table 6
H1d	Hedonic values → pro-meat (+), pro-veg (−)	Pleasure weighting [21]	Table 6
H1e	Religiosity → pro-veg (+)	Stewardship, restraint, compassion	Table 6
H2a	Severity → pro-veg (+)	Threat appraisal [22]	Table 6
H2b	Vulnerability → pro-veg (+)	Threat appraisal [22]	Table 6
H2c	Psych. distance → pro-meat (+)	Construal; licensed inaction [24]	Table 6
H2d	Anxiety → pro-veg (+), pro-meat (−)	Motivational affect [23]	Table 6
H2e	Personal norm → pro-veg (+)	Norm activation [25]	Table 6
H2f	Guilt → pro-veg (+)	Moral emotion [17]	Table 6
H3a	Value × appraisal: amplification (common)	Boundary-condition logic (Sec. 3.2)	Table 7; Figs 3–4; A1–A2
H3b	Self-enhancement × moral appraisal: crossover	Reorientation of self-relevant calculation	Table 7; Figs 3–4; A1–A2
H3c	Moderators differ by diet; moral value → attenuation	Two-construct outcome view (Sec. 2.2)	Table 7; Figs 3–4; A1–A2

Note. Each hypothesis maps onto a path in the research model (Figure 1) and the corresponding analysis. Pro-veg = pro-vegetarian preference; pro-meat = pro-meat preference; A1–A2 = Appendix Tables A1 and A2.

4. Method

4.1 Data and participants

Data come from the 2025 National Survey on Public Opinion about Energy, conducted by the Social

Science Research Institute at Ajou University. The target population comprised the general public aged 16 and older, and the survey was administered as an online panel survey to a nationally proportionate quota sample of 1,970 respondents across all 17 provinces and metropolitan cities of South Korea. Quotas were set to match the population distribution by sex, age, and region. Fieldwork was conducted from June 19 to July 1, 2025.

The sample is 49.4% male (n = 973) and 50.6% female (n = 997). By age, respondents comprised those aged 16–29 years (15.7%), in their 30s (15.0%), in their 40s (17.1%), in their 50s (19.3%), and aged 60 and older (32.9%). By education, 22.1% had completed high school or less, while 77.9% had attended college or beyond (62.3% were college graduates). Household income was log-transformed for the regression analyses; because 12 cases reported zero income, these cases were treated as missing, resulting in N = 1,895 for the regression models (N = 1,958 for the moderated models). For the group-difference analyses below, age was collapsed into three bands, education into two groups, and income into three terciles.

Ethics approval and informed consent. All methods were performed in accordance with the relevant guidelines and regulations, including the ethical principles of the Declaration of Helsinki and the Bioethics and Safety Act of the Republic of Korea (Act No. 13467). Ethical approval was not required for this study, and the study was exempt from institutional review board (IRB) review under the Act. Article 2, Paragraph 1 of the Bioethics and Safety Act defines research on human subjects as research prescribed by Presidential Decree that is conducted on human beings through physical intervention, through interaction or interpersonal contact such as communication or observation, or through the use of information by which individuals can be identified. Article 15, Paragraph 2 of the same Act, read together with Article 13 of its Enforcement Rule, further provides that research posing no more than insignificant risk to research subjects and to the general public may be exempted from deliberation by an institutional bioethics committee where it uses information already disclosed to the general public, or where it neither collects nor records personally identifiable information and does not identify individual research subjects. The present study satisfies these conditions. It involved no physical intervention, no biological sampling, and no experimental manipulation; it was administered entirely as a self-completed web-based questionnaire through an established research panel, so that no face-to-face interview or other interpersonal contact with respondents took place; and the dataset delivered to the research team contained no names, contact details, resident registration numbers, IP addresses, or any other identifiers, so that no response could be traced to an identifiable individual. The questionnaire measured general values, climate-change appraisals, and dietary preferences, and posed no more than the minimal risk associated with answering an ordinary attitudinal survey. Because the study fell outside the scope of mandatory IRB review under the Act and its implementing regulations, no written IRB exemption determination was issued.

Informed consent. Informed consent was obtained from all participants prior to their participation. Before any survey item was displayed, every respondent was presented with an information page that identified the sponsoring institution and the principal investigator together with contact details, described the purpose of the survey as the collection of basic data for academic research and for the development of government policy, stated that responses would be used only in aggregate statistical form and would be kept strictly confidential, and made clear that participation was voluntary, that respondents could decline to answer any question, and that they could discontinue at any time without penalty. Respondents recorded their consent electronically and were able to enter the questionnaire only after doing so. [AUTHORS TO CONFIRM WITH THE PANEL PROVIDER BEFORE SUBMISSION: For the small number of respondents aged 16 or 17 years, informed consent was additionally obtained from a parent or legal guardian in accordance with the panel provider standing procedures for minor panel members; alternatively, delete this sentence and restrict the analytic sample to respondents aged 18 years and older.] No personally identifiable information was collected at any stage, and all analyses were conducted on anonymised data.

4.2 Measures

All multi-item constructs were measured on five-point Likert scales, except climate anxiety, which was measured on a seven-point scale, and items were averaged to form composite scores. Table 3 lists each construct, its sub-dimensions, the corresponding survey items, and its internal-consistency reliability. Reliabilities ranged from .662 (altruistic values, a two-item scale) to .885 (climate anxiety), indicating acceptable to good internal consistency. The two dependent variables are pro-vegetarian preference (four items; $\alpha = .847$) and pro-meat preference (four items; $\alpha = .758$).

Table 3. Measurement Items, Sub-dimensions, and Reliability

Category	Construct	Items (no.)	Measurement items	α	Scale
DV: Food preference	Pro-vegetarian preference	Q43-1,2; Q6-10,11	I try to choose or practise a vegetarian diet in my everyday meals. / I prefer vegetarian food when preparing or choosing meals. / I try to choose vegetarian meals more often. / I intend to practise a vegetarian diet.	.847	5-pt
	Pro-meat preference	Q43-3,4; Q6-8,9	I generally prefer meals that include meat. / I believe eating meat helps maintain health and stamina. / I will maintain a meat-centred diet for healthy eating. / I will continue to regard meat as an essential food.	.758	5-pt
Value factor	Ecocentric values	Q1-41,42	My life is closely connected to the natural environment. / Maintaining a good relationship with nature is very important to me.	.729	5-pt
	Altruistic values	Q1-39,40	I tend to care for others more than for myself. / Promoting others' interests rather than my own is important to me.	.662	5-pt
	Egoistic values	Q1-88,89	In pursuing my goals, my own needs come before consideration of others' feelings. / My success matters more to me even if it requires others' sacrifice.	.759	5-pt
	Hedonic values	Q1-37,38	I pursue immediate pleasure rather than a restrained life. / I pursue a life of self-gratification, indulgence, and enjoyment rather than a frugal, restrained one.	.818	5-pt
	Religiosity	Q1-11,12	I am deeply religious. / I am certain of the existence of God.	.877	5-pt
Climate-change factor	Severity	Q6-70,71	Climate change is a very serious problem beyond comparison with any other risk. / Climate change will bring much harm to me and my family.	.764	5-pt
	Vulnerability	Q6-77,78	I have often directly experienced damage from natural disasters. / Compared with others, I am strongly affected by climate-driven extreme weather (heat waves, typhoons, etc.).	.798	5-pt
	Psychological distance	Q6-97,98	Damage from climate change happens in places far away from me. / My region is unlikely to be affected by climate change.	.767	5-pt

Category	Construct	Items (no.)	Measurement items	α	Scale
	Anxiety	Q7-(4),(5)	Emotions felt when thinking about climate change: anxiety / fear (1 = not at all to 7 = very strongly).	.885	7-pt
	Personal norm	Q6-46,47	I feel a strong moral obligation to solve the climate problem for future generations. / Solving climate change is a very important ethical duty for me.	.811	5-pt
	Guilt	Q6-81,82, 112,113	I feel much guilt about behaving in ways that worsen climate change. / I feel great guilt that my consumption pattern deepens the climate crisis. / I feel much guilt about not acting to solve climate change. / I feel great guilt about not taking part in the climate response.	.872	5-pt
Controls	Gender / Age / Education / Income	SQ1, SQ2, SQ5, BQ8	SQ1 gender; SQ2 age in years; SQ5 final education (≤high school vs. ≥college); BQ8 average monthly household income (log-transformed in the regressions).	—	nom./ratio

Note. Item numbers refer to the questionnaire of the 2025 National Survey on Public Opinion about Energy; item wording is translated from the Korean original (attached source table). α = Cronbach's alpha. Climate anxiety was measured on a 7-point scale; all other multi-item constructs on 5-point Likert scales; multi-item constructs were averaged to form composites.

4.3 Analytic strategy

Two ordinary least squares regressions were estimated, one for each food-preference outcome, with the four demographic controls entered in Model 1, the five value orientations in Model 2, and the six climate-change factors in Model 3 as hierarchical blocks. To test moderation, all predictors and moderators were mean-centred, and a single product term was added to the fully controlled model for each value × climate-change pair. Significant interactions ($p < .05$) were then probed using simple slopes at the 16th, 50th, and 84th percentiles of the moderator with PROCESS Model 1 [30], [31]. A sign change in the value slope across levels of the moderator indicates crossover (direction) moderation, whereas a change in magnitude without a change in sign indicates amplification (magnitude) moderation.

4.4 Analytic strategy and control of multiple testing

Because the moderation hypotheses concern a family of effects rather than a single focal interaction, the analysis requires an explicit multiplicity policy, and reporting this policy is a precondition for interpreting the results. Following common practice for probing moderation, each product term was entered individually into the fully controlled model, resulting in **5 value orientations × 6 climate-change appraisals × 2 dependent variables = 60 interaction tests**. Under a nominal criterion of $p < .05$, and if a true null is assumed for every term, three significant results would be expected by chance alone. A raw count of significant interactions therefore cannot, by itself, establish the presence of moderation, and interpreting each coefficient at its nominal p-value would capitalise on chance.

All 60 interaction tests were treated as one family. The Benjamini–Hochberg procedure was used to control the false discovery rate (FDR) at $q = .05$ [32], with Bonferroni $\alpha = .05/60 = .00083$ reported as a conservative benchmark. For each term, $\Delta R^2 \approx t^2(1 - R^2)/df$ was well below .01, so interpretation emphasised the theoretically predicted pattern rather than individual effect sizes. Table 7 reports both uncorrected and FDR-corrected results, and the discussion relies on the corrected set.

5. Results

5.1 Response distributions

Figure 2 shows the response distributions for the eight dependent-variable items after recoding the five-point scale into disagree (1–2), neutral (3), and agree (4–5). Agreement with the pro-vegetarian items ranges from approximately 40% to 54%, while agreement with the pro-meat items ranges from approximately 36% to 55%, indicating that both orientations are well represented in the sample rather than one clearly dominating.

Because the ranges of agreement overlap substantially (approximately 40–54% for the vegetarian items and 36–55% for the meat items), neither preference is marginal. This distribution is consistent with treating the two orientations as distinct rather than assuming a simple vegetarian-minority/meat-majority divide.

Figure 2. Response Distribution of the Eight Dependent-Variable Items (%)

Block	Item	Measurement item	Disagree (1–2) ■ Neutral (3) ■ Agree (4–5) ■
Pro-vegetarian preference (α = .847)	Q43-1	I try to choose or practise a vegetarian diet in my everyday meals.	**16.9 37.0 46.1**
	Q43-2	I prefer vegetarian food when preparing or choosing meals.	**22.1 38.0 39.9**
	Q6-10	I try to choose vegetarian meals more often.	**12.2 34.3 53.5**
	Q6-11	I intend to practise a vegetarian diet.	**16.2 38.9 44.9**
Pro-meat preference (α = .758)	Q43-3	I generally prefer meals that include meat.	**19.8 38.5 41.7**
	Q43-4	I believe eating meat helps maintain health and stamina.	**9.2 35.7 55.1**
	Q6-8	I will maintain a meat-centred diet for healthy eating.	**25.6 38.7 35.6**
	Q6-9	I will continue to regard meat as an essential food.	**24.6 36.2 39.2**

Note. N = 1,970. Five-point Likert responses were recoded as disagree (1–2), neutral (3), and agree (4–5); bar segments are valid percentages summing to 100% within each item and are drawn to scale. Blue = disagree, grey = neutral, gold = agree. The figure is presented as a table so that item wording, values, and bar widths can be edited directly in the manuscript.

5.2 Sample characteristics and group differences

Mean comparisons (t-tests and one-way analysis of variance [ANOVA] with Scheffe post-hoc tests) were used to assess demographic differences relevant to the regression controls and to describe how values and appraisals vary across social groups (Table 4).

Demographic contrasts (ANOVA and t-tests, reported in Table 4) show a coherent pattern. Women scored higher on pro-vegetarian preference ($M = 3.45$ vs. 3.23; $t = -6.32$, $p < .001$), while men scored higher on pro-meat preference ($M = 3.36$ vs. 3.19; $t = 5.33$, $p < .001$). Both preferences varied systematically with

age: pro-vegetarian preference increased across the three age groups (3.12 → 3.35 → 3.53; F = 44.71, p < .001), whereas pro-meat preference decreased (3.47 → 3.32 → 3.05; F = 61.05, p < .001). Scheffe post-hoc tests confirmed that all three age groups differed significantly from one another on both outcomes. Education distinguished the groups only for pro-meat preference (3.22 vs. 3.30; t = −2.07, p = .039), not for pro-vegetarian preference (t = 0.41, p = .684). Income was related to both preferences (pro-vegetarian F = 5.02, p = .007; pro-meat F = 8.85, p < .001), with the highest income tercile scoring highest on both. For pro-meat preference, the Scheffe test showed that the highest tercile scored significantly higher than the lower terciles. Levene's test indicated unequal variances for pro-vegetarian preference across age groups (p < .001), so these contrasts should be interpreted with some caution, whereas the variances for pro-meat preference were homogeneous (p = .173).

Table 4. Group Differences by Demographic Characteristics (ANOVA / t-test)

	M	F	F	16–29	30s	40s	50s	60+	F	≤HS	≥Coll.	F	Low	Mid	High	F
Ecocentric values	3.47	3.51	1.72	3.38	3.42	3.47	3.47	3.60	6.54***	3.48	3.50	0.20	3.43	3.44	3.54	5.31**
Altruistic values	3.14	3.04	7.72**	3.10	3.12	3.05	3.08	3.10	0.32	3.08	3.09	0.12	3.09	3.06	3.10	0.57
Egoistic values	3.01	2.89	10.37**	3.26	3.13	3.02	2.90	2.73	28.65***	2.94	2.96	0.08	2.99	2.86	2.98	3.96*
Hedonic values	2.80	2.59	25.01***	3.15	2.99	2.74	2.68	2.33	60.48***	2.72	2.69	0.37	2.84	2.68	2.63	7.81***
Religiosity	2.65	2.69	0.59	2.53	2.58	2.60	2.73	2.78	3.77**	2.71	2.66	0.52	2.69	2.62	2.68	0.53
Severity	3.58	3.68	9.97**	3.49	3.54	3.61	3.68	3.73	7.29***	3.63	3.63	0.03	3.57	3.62	3.66	2.14
Vulnerability	3.12	2.97	13.34***	3.09	3.09	3.10	3.16	2.90	6.34***	3.04	3.05	0.04	2.96	2.99	3.09	3.99*
Psychological distance	3.00	2.90	5.96*	3.02	3.13	3.04	2.95	2.79	10.14***	2.97	2.95	0.29	2.94	2.85	2.99	4.39*
Anxiety (7-pt)	4.65	4.93	23.59***	4.59	4.62	4.81	4.94	4.87	5.29***	4.84	4.78	0.73	4.80	4.78	4.80	0.06
Personal norm	3.47	3.58	9.75**	3.40	3.42	3.47	3.59	3.63	8.01***	3.47	3.54	2.86	3.41	3.45	3.61	13.42***
Guilt	3.06	3.10	1.28	3.17	3.08	3.17	3.15	2.95	7.42***	3.11	3.07	0.74	3.03	3.02	3.12	3.51*
Pro-meat preference	3.36	3.19	28.48***	3.48	3.46	3.35	3.29	3.05	30.86***	3.22	3.29	4.27*	3.19	3.22	3.34	8.85***

*Note. ***p < .001, **p < .01, *p < .05. Cell entries are group means; the F/t statistic tests the group difference. Group sizes: gender (M 973, F 997); age (16–29: 310; 30s: 295; 40s: 336; 50s: 381; 60+: 648); education (≤high school 435, ≥college 1,535); income (low 409, mid 531, high 1,018). N = 1,970 (income N = 1,958). Anxiety was measured on a 7-point scale. Group differences for pro-vegetarian preference are reported in the text (Section 5.2).*

Table 4 shows that younger respondents scored higher on egoistic and hedonic values and pro-meat preference, whereas severity, personal norm, and pro-vegetarian preference generally increased with age. Men scored higher on self-enhancement values, vulnerability, and psychological distance, while women scored higher on severity, anxiety, and personal norm, broadly consistent with previous demographic findings [15]. Education differentiated the groups little, whereas income differences emerged for several moral constructs and for meat preference.

5.3 Correlations among the study variables

Table 5 reports the bivariate relationships among the study variables before multivariate analysis. The strongest correlation among the predictors was .623, below conventional levels of concern for multicollinearity.

Pro-vegetarian preference correlated most strongly with personal norm (.459), severity (.395), ecocentric

values (.348), guilt (.337), and altruistic values (.284). Pro-meat preference correlated most strongly with psychological distance (.396), egoistic values (.358), vulnerability (.344), and hedonic values (.312), indicating that perceiving the climate threat as more distant and placing greater weight on self-interest and pleasure were associated with stronger meat preference. Pro-vegetarian and pro-meat preferences were themselves modestly negatively correlated (−.107). Within the climate block, severity and personal norm (.623) and vulnerability and guilt (.559) showed the strongest associations.

Table 5. Correlations Among the Study Variables

Block	Variable	1	2	3	4	5	6	7	8	9	10	11	12
Value	1. Ecocentric values	1											
	2. Altruistic values	.393**	1										
	3. Egoistic values	.046*	.111**	1									
	4. Hedonic values	.023	.252**	.490**	1								
	5. Religiosity	.245**	.382**	.094**	.111**	1							
Climate	6. Severity	.442**	.245**	−.009	−.024	.172**	1						
	7. Vulnerability	.261**	.339**	.259**	.275**	.240**	.335**	1					
	8. Psychological distance	.084**	.296**	.375**	.353**	.212**	.092**	.425**	1				
	9. Anxiety	.224**	.102**	−.082**	−.059**	.079**	.447**	.195**	−.046*	1			
	10. Personal norm	.461**	.325**	−.018	−.015	.220**	.623**	.380**	.158**	.393**	1		
	11. Guilt	.300**	.371**	.242**	.297**	.242**	.399**	.559**	.439**	.325**	.486**	1	
DV	12. Pro-meat preference	.057*	.164**	.358**	.312**	.076**	.112**	.344**	.396**	−.042	.120**	.284**	1

*Note. **p < .01, *p < .05. Pearson correlations; N = 1,970. Blocks: Value = value orientations, Climate = climate-change factors, DV = dependent variable. Zero-order correlations of pro-vegetarian preference (personal norm .459, severity .395, ecocentric .348, guilt .337, altruistic .284) and its weak negative correlation with pro-meat preference (−.107) are reported in the text.*

The correlation matrix broadly separates a moral-threat cluster associated with vegetarian preference from a self-enhancement/construal cluster associated with meat preference. The weak correlation between the two outcomes (−.107) further supports treating them as distinct constructs.

5.4 Regression: main effects on the two food preferences

Table 6 tests the predicted contrast: self-transcendent and moral factors should be more closely associated with vegetarian preference, whereas self-enhancement values and psychological distance should be more closely associated with meat preference.

Table 6 reports the final (Model 3) regressions for both outcomes side by side. Both models are significant: the full set of predictors explains 32.4% of the variance in pro-vegetarian preference ($R^2 = .324$, adjusted $R^2 = .319$; $F(15, 1879) = 60.03$, $p < .001$) and 27.7% in pro-meat preference ($R^2 = .277$, adjusted $R^2 = .272$; $F(15, 1879) = 48.11$, $p < .001$).

Pro-vegetarian preference is driven above all by personal norm (β = .184, p < .001) and age (β = .173, p < .001), with gender (women higher; β = .121), religiosity (β = .115), severity (β = .093), vulnerability (β = .091), ecocentric values (β = .086), guilt (β = .082), altruistic values (β = .059), and anxiety (β = .048) all showing positive and significant associations. Hedonic values are the only significant negative predictor (β = −.065). Egoistic values, income, education, and psychological distance do not reach significance once the full set of predictors is controlled.

Pro-meat preference shows a largely complementary profile. Psychological distance is the strongest predictor (β = .206, p < .001): the more distant the climate threat is perceived to be, the stronger the meat preference. It is followed by egoistic values (β = .164), vulnerability (β = .155), income (β = .080), severity (β = .079), and hedonic values (β = .059), all of which are positively associated with pro-meat preference. Age (β = −.152), anxiety (β = −.073), and gender (men higher; β = −.074) are significant negative predictors. The moral and self-transcendent constructs that carry pro-vegetarian preference—ecocentric and altruistic values, religiosity, personal norm, and guilt—have no independent effect on meat preference.

Table 6. OLS Regression (Model 3): Pro-Vegetarian and Pro-Meat Preference

		Pro-Vegetarian Preference			Pro-Meat Preference		
Block	**Predictor**	**B**	**β**	**t**	**B**	**β**	**t**
	(Constant)	.355		1.970	1.770		10.530
Control	Gender (female)	.187	.121	6.176	−.103	−.074	−3.660
	Age	.009	.173	8.277	−.007	−.152	−7.029
	Education	.051	.027	1.362	−.006	−.004	−.187
	Log income	.011	.010	.489	.080	.080	3.942
Value	Ecocentric values	.090	.086	3.727	−.034	−.036	−1.510
	Altruistic values	.062	.059	2.557	.001	.001	.040
	Egoistic values	.038	.040	1.767	.140	.164	6.972
	Hedonic values	−.055	−.065	−2.725	.046	.059	2.417
	Religiosity	.078	.115	5.466	−.015	−.025	−1.158
Climate	Severity	.099	.093	3.615	.076	.079	2.942
	Vulnerability	.078	.091	3.753	.120	.155	6.157
	Anxiety	.029	.048	2.144	−.040	−.073	−3.176
	Psychological distance	.006	.007	.300	.163	.206	8.533
	Personal norm	.187	.184	6.791	.018	.019	.689
	Guilt	.081	.082	3.069	.021	.023	.835
	R^2 / adj. R^2	**.324 / .319**			**.277 / .272**		
	F (15, 1879)	**60.03, p < .001**			**48.11, p < .001**		

Note. N = 1,895 (listwise). Model 3 enters demographic controls, five value orientations, and six climate-change factors simultaneously. Blocks: Control = demographic covariates, Value = value orientations, Climate = climate-change factors. B = unstandardised coefficient, β = standardised coefficient. $|t| \geq 1.96$ corresponds to $p < .05$, $|t| \geq 2.58$ to $p < .01$, $|t| \geq 3.29$ to p

< .001.

Read together, the two columns confirm the mirror-image prediction, although they qualify it in a theoretically informative way. Pro-vegetarian preference rests on the moral-normative and self-transcendent constructs: personal norm (β = .184), religiosity (.115), ecocentric values (.086), guilt (.082), and altruistic values (.059). These are the considerations that the value-weighting account assigns to the ecological-and-other-regarding pole, with felt severity and vulnerability adding the threat-appraisal contribution predicted by protection-motivation theory. Pro-meat preference rests on a partly distinct set: psychological distance (.206), egoistic values (.164), vulnerability (.155), and hedonic values (.059), representing a construal-and-self-interest cluster. The moral constructs that drive vegetarian preference have no independent effect on meat preference, and the reverse is also largely true. That asymmetry matters. The two diets are not simply the two ends of a single evaluative dimension but have partly separate determinants, which provides empirical support for the parallel-model design of Section 2.2 and for probing the interactions separately by outcome. Anxiety is the one appraisal that crosses the divide, increasing vegetarian preference and decreasing meat preference, consistent with its status as a diffuse motivational affect rather than a diet-specific consideration [23].

Two further observations sharpen the interpretation of the table. In relative magnitude, the strongest psychological predictor of each diet is not a value but an appraisal: personal norm (β = .184) for vegetarian preference and psychological distance (β = .206) for meat preference. The strongest value effects, religiosity at .115 and egoistic values at .164, are of the same order as the demographic effects of age and gender. Values are important, then, but their unconditional effects are modest, as the theory of Section 2.3 anticipates; the moral-normative and construal appraisals that make climate considerations relevant to food choice carry more direct weight. This accords with norm-activation and value-belief-norm reasoning, in which values stand at the distal end of a causal chain whose more proximal links are norms and appraisals [17], [18].

Two coefficients depart from the simple protective pattern and deserve theoretical attention. Severity and vulnerability are positive not only for vegetarian but also for meat preference (β = .079 and .155). Perceived threat, in other words, is associated with both dietary orientations rather than uniformly promoting the protective one. Such a pattern is more consistent with threat as a general arouser of engagement with food choice, or with a defensive reassertion of habitual diet under threat, than with a single protective pathway (cf. [26], on maladaptive coping). Anxiety is the only appraisal that behaves fully bidirectionally, increasing vegetarian preference and decreasing meat preference, which supports interpreting it as a diffuse motivational affect rather than a diet-specific belief [23]. A main-effects-only reading therefore obscures these nuances. The moderation analysis below examines them further.

5.5 Moderated regression: significant interactions

The interaction results provide the direct test of H3, and the boundary-condition logic of Section 3.2 specifies in advance what should appear. Because an appraisal makes the considerations associated with a value more important in a given decision, the expected default is amplification—a positive product term that steepens an already-aligned slope. Two departures from that default were predicted on theoretical grounds and are the more diagnostic cases: crossover, where a self-enhancement value meets a moral appraisal and its slope reverses sign, and attenuation, where a value that already carries the outcome on moral grounds meets a redundant appraisal and its slope flattens. Table A1 should therefore be read not simply for the number of significant interactions, but for whether the significant terms fall where the theory predicts; the simple-slope decomposition in Section 5.6 then shows which of the three patterns each significant interaction actually takes.

Across the two outcomes, eighteen value × climate-change interactions reached significance (Table A1). Nine predict pro-vegetarian preference and nine predict pro-meat preference. The great majority are positive, meaning that a higher climate appraisal strengthens the positive effect of the value on the outcome. Two are negative—ecocentric × psychological distance and religiosity × anxiety on pro-vegetarian preference—indicating that, for these pairs, a higher appraisal weakens the value's positive slope.

This count must be read against the multiplicity policy set out in Section 4.4. Of the 60 interaction tests, 18 reach the uncorrected .05 criterion; **13 survive Benjamini–Hochberg control of the false discovery rate at q = .05, and seven survive the conservative Bonferroni criterion**. Five effects that are nominally significant do not survive FDR correction (egoistic × anxiety and egoistic × distance on pro-vegetarian preference; ecocentric × distance on pro-vegetarian preference; altruistic × vulnerability and altruistic × distance on pro-meat preference), and they are treated below as provisional rather than established. The claims that follow are based on the 13 surviving effects; the full corrected status of every term is presented in Table 7.

The location of these 18 interactions is itself theoretically informative, even before their decomposition. On the vegetarian side, the moderated values are predominantly the self-enhancement orientations, egoistic and hedonic, whose default pull runs against the diet; their effects are conditioned by guilt, distance, vulnerability, and anxiety. The two negative interactions involve moral or self-transcendent values, ecocentric and religiosity, which are the attenuation cases anticipated by H3c. On the meat side, the moderated values are altruistic and egoistic orientations, whose effects are conditioned by severity, anxiety, norm, and guilt. Values that drive vegetarian preference as main effects show relatively little moderation, since their expression is unconditional. Values whose expression is contested are more strongly conditioned by the appraisals. Full coefficients for all 18 product terms appear in Appendix Table A1.

5.6 Simple slopes

Figures 3 and 4 plot the conditional slope of each value orientation at low (−1 SD) and high (+1 SD) levels of the moderating climate-change factor; the full conditional estimates at the 16th, 50th, and 84th percentiles of the moderator, together with their standard errors, t-values, and confidence intervals, are reported in Appendix Table A2. When the panels are read together with the table, three patterns recur: amplification, in which a value's slope retains its sign but becomes steeper as the appraisal rises; crossover, in which the slope reverses sign between low and high appraisal; and emergence, in which a slope that is non-significant at low appraisal becomes significant and positive at high appraisal.

Pro-vegetarian preference (Figure 3, panels 3-1 to 3-9). The dominant pattern is emergence through amplification. For altruistic, egoistic, and hedonic values under high psychological distance (panels 3-3, 3-4, and 3-5), the value's slope is flat or negative when the threat feels close but becomes clearly positive when it is perceived as distant: at high psychological distance, the conditional effect of altruistic values reaches .225 (SE = .033, $p < .001$) and that of egoistic values .131 (SE = .030, $p < .001$), whereas at low distance neither differs from zero (Table A2). The two guilt panels (3-8, 3-9) are the clearest crossovers. Hedonic values, which carry a negative main effect on vegetarian preference, slope downward at low guilt (−.187, $p < .001$) but flatten and become slightly positive at high guilt (.047, n.s.); egoistic values move from −.103 ($p < .001$) at low guilt to +.149 ($p < .001$) at high guilt. Guilt thus re-anchors self-interested and pleasure-seeking reasoning so that it no longer opposes vegetarian preference. Panel 3-1 (hedonic × vulnerability) shows the same reversal as vulnerability rises, while panel 3-6 (egoistic × anxiety) shows the same emergence. Two panels run in the opposite direction. Ecocentric × psychological distance (3-2) and religiosity × anxiety (3-7) are attenuation effects: the positive slope of these self-transcendent and moral values is strongest when the appraisal is low and weakens as it rises—for religiosity, from .123 at low anxiety to .064 at high anxiety (both $p < .001$). Where a value already supports vegetarian preference on moral grounds, a heightened appraisal adds little and may even substitute for it.

Pro-meat preference (Figure 4, panels 4-1 to 4-9). Here every significant interaction is a positive amplification, and the moderated values are the self-enhancement and other-regarding orientations rather than the moral ones. Egoistic values predict meat preference most strongly when the threat is perceived as severe, psychologically near, anxiety-arousing, or obligation-laden. The egoistic slope rises from .125 to .295 across low-to-high severity (panel 4-2), from .177 to .257 across anxiety (4-6), and from .163 to .243 across personal norm (4-8), remaining significant at every level (Table A2). The altruistic panels (4-1, 4-3, 4-4, 4-5, 4-7, 4-9) are emergence effects: altruistic values have no reliable association with meat preference when the appraisal is low, but a clear positive association when it is high. For altruistic × guilt, the slope moves from −.044 (n.s.) at low guilt to .164 ($p < .001$) at high guilt (panel 4-9); for altruistic × severity,

from .007 (n.s.) to .169 ($p < .001$) (panel 4-1). The direction is counter-intuitive at first, since stronger climate appraisals coincide with stronger, rather than weaker, meat preference among people high on these values. It nonetheless follows the boundary-condition reading: the appraisal sharpens whatever the value already implies for this sample, and it does so symmetrically across the two outcomes rather than uniformly suppressing meat.

Two things stand out across the panels. First, the same appraisal can play opposite roles for different values on the same outcome; compare the guilt crossover for hedonic and egoistic values in panels 3-8 and 3-9 with the absence of guilt attenuation among the moral predictors. Second, the location of moderation differs systematically between the two diets. Guilt, vulnerability, and psychological distance condition value expression for vegetarian preference, whereas severity, anxiety, and personal norm condition it for meat preference. This division of labour among the appraisals, rather than the modest variance explained by the interactions, is the substantive result. Conditional estimates underlying every panel appear in Appendix Table A2.

Figure 3. Simple-Slope Plots of the Significant Value × Climate Interactions on Pro-Vegetarian Preference (Panels 3-1 to 3-9)

Note. N = 1,958. In each panel, the value orientation (independent variable, IV) is plotted on the horizontal axis, and the climate-change factor (moderating variable, MV) defines the two lines: the solid navy line represents the IV's slope at high (+1 SD) levels of the MV, and the dashed grey line represents the slope at low (−1 SD) levels. All predictors and moderators were mean-centred, and each product term was added after the four demographic covariates, the five centred value orientations, and the centred moderator (PROCESS Model 1 [31]). Conditional (simple-slope) estimates for every panel are reported in Appendix Table A2.

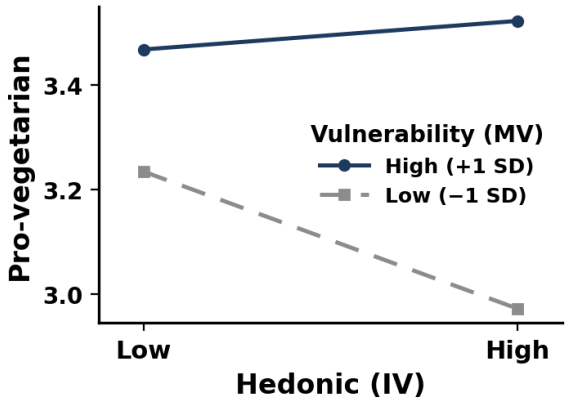


Figure 3-1. Hedonic × Vulnerability

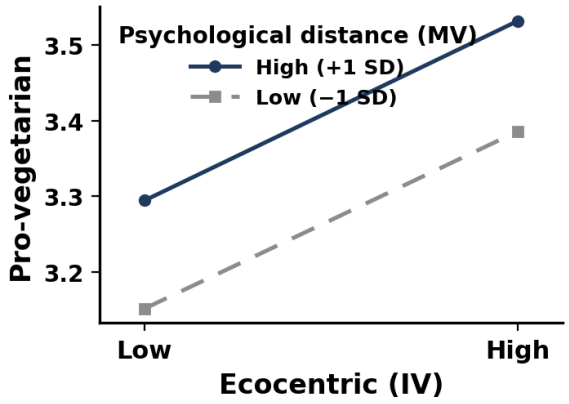


Figure 3-2. Ecocentric × Psychological Distance

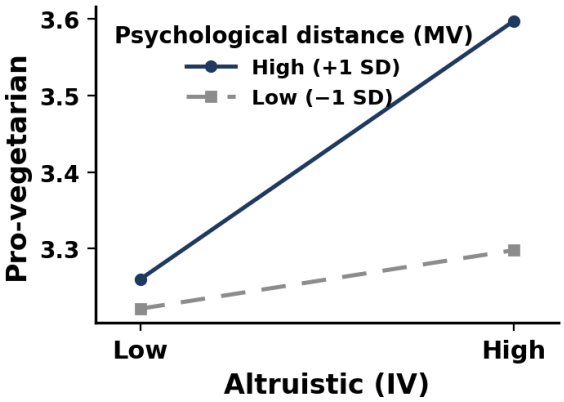


Figure 3-3. Altruistic × Psychological Distance

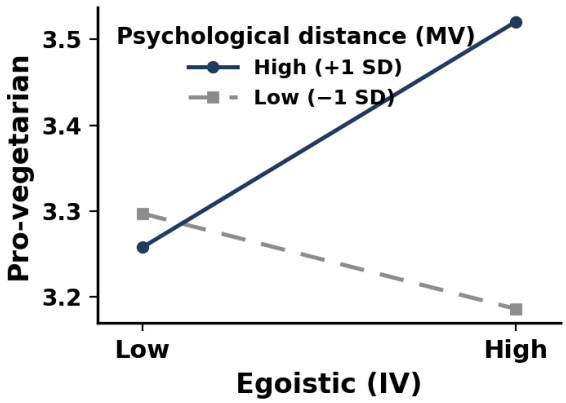


Figure 3-4. Egoistic × Psychological Distance

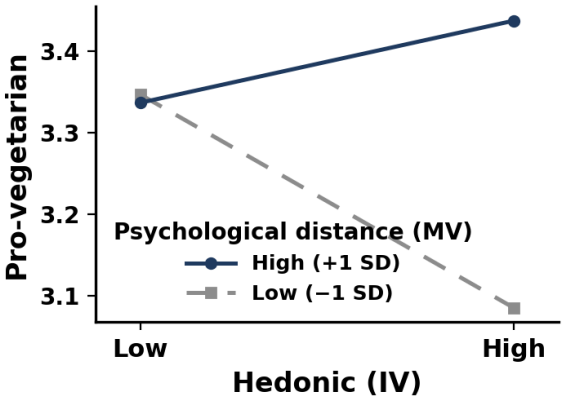


Figure 3-5. Hedonic × Psychological Distance

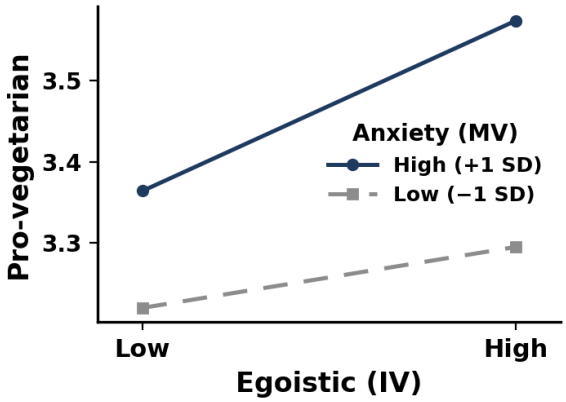


Figure 3-6. Egoistic × Anxiety

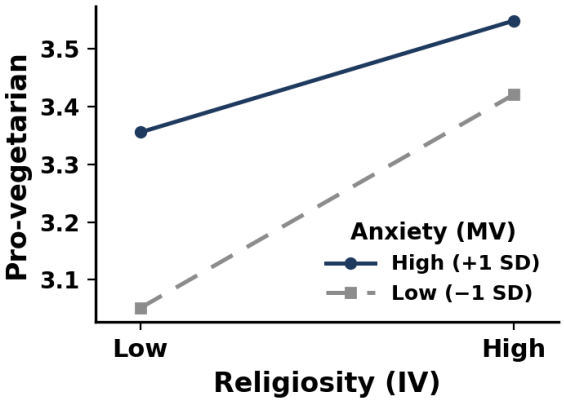


Figure 3-7. Religiosity × Anxiety

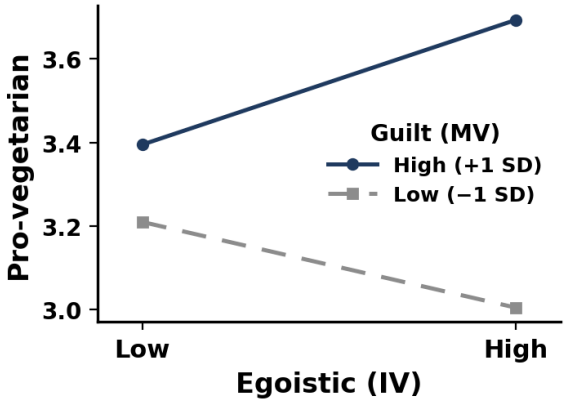


Figure 3-8. Egoistic × Guilt

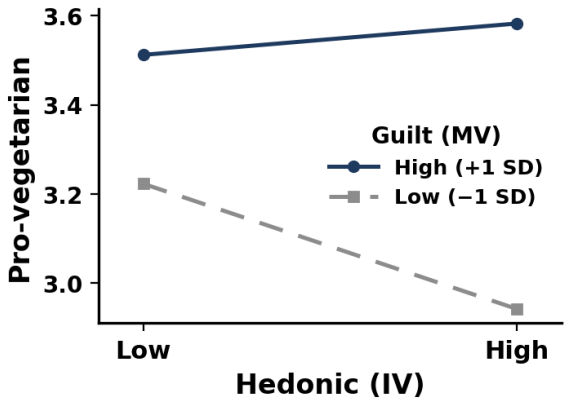


Figure 3-9. Hedonic × Guilt

Figure 4. Simple-slope plots of the significant value × climate interactions on pro-meat preference (panels 4-1 to 4-9)

Note. N = 1,958. In each panel, the value orientation (independent variable, IV) is plotted on the horizontal axis, and the climate-change factor (moderating variable, MV) defines the two lines: the solid navy line represents the IV's slope at high (+1 SD) levels of the MV, and the dashed grey line represents the slope at low (−1 SD) levels of the MV. All predictors and moderators were mean-centred, and each product term was added after the four demographic covariates, the five centred value orientations, and the centred moderator (PROCESS Model 1 [31]). Conditional (simple-slope) estimates for every panel are reported in Appendix Table A2.

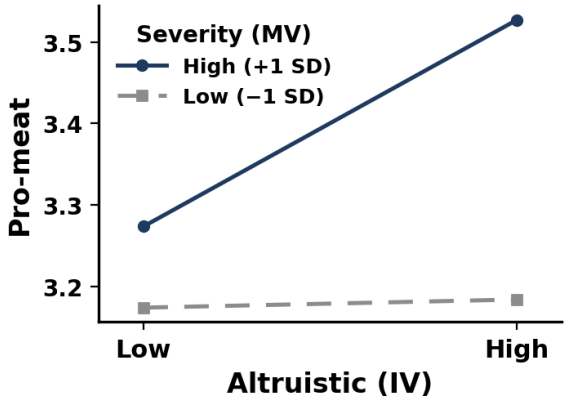


Figure 4-1. Altruistic × Severity

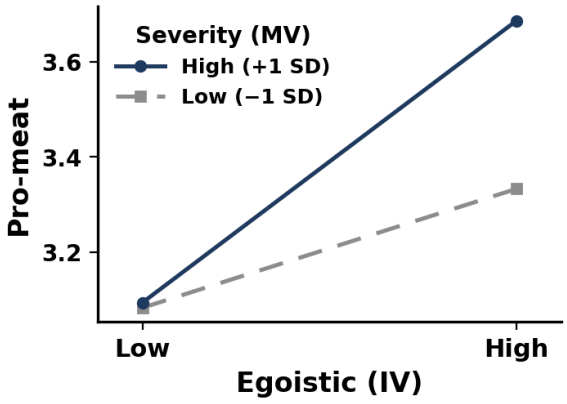


Figure 4-2. Egoistic × Severity

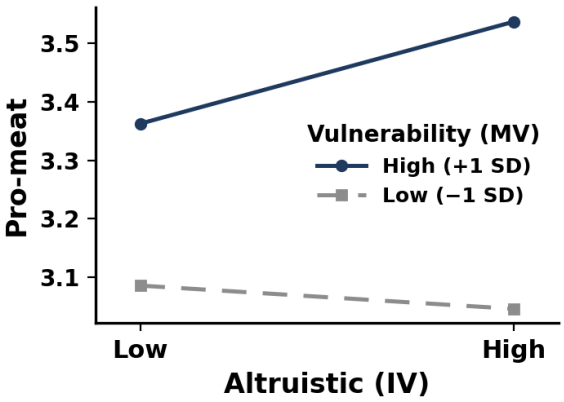


Figure 4-3. Altruistic × Vulnerability

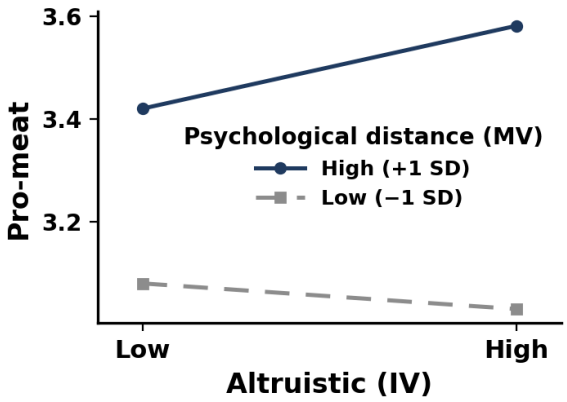


Figure 4-4. Altruistic × Psychological Distance

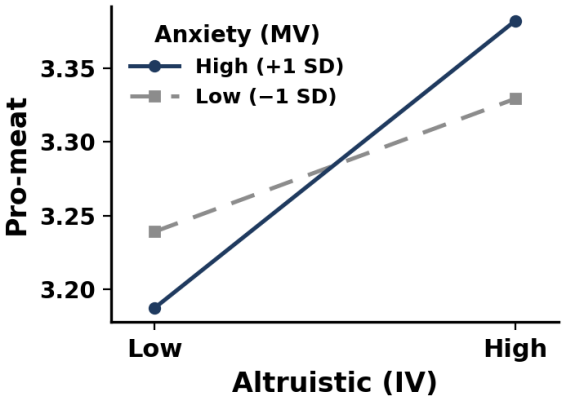


Figure 4-5. Altruistic × Anxiety

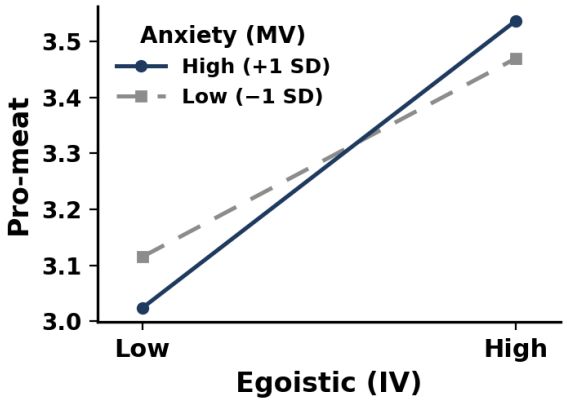


Figure 4-6. Egoistic × Anxiety

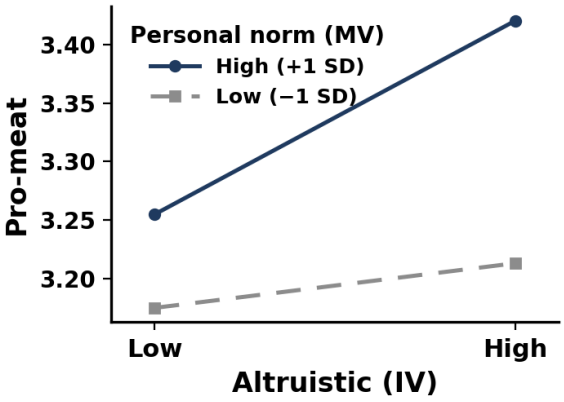


Figure 4-7. Altruistic × Personal Norm

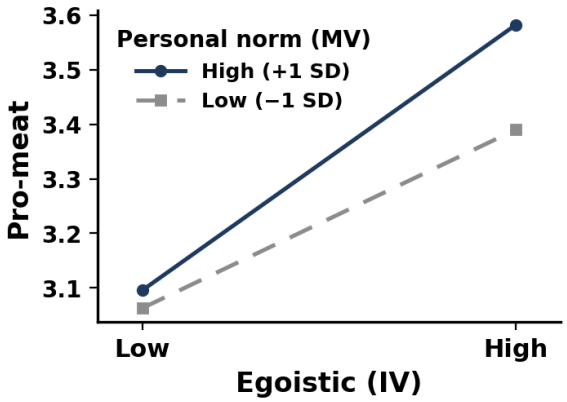


Figure 4-8. Egoistic × Personal Norm

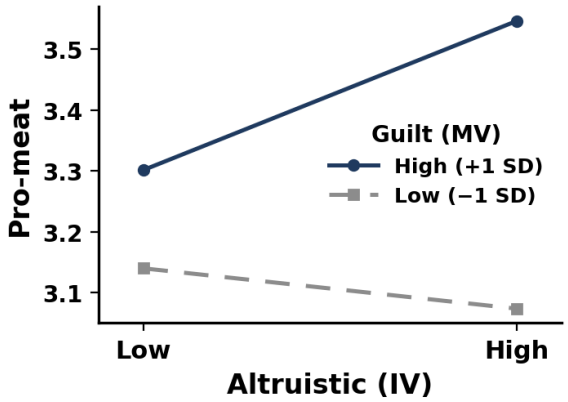


Figure 4-9. Altruistic × Guilt

5.7 Synthesis of the moderation effects

The preceding subsections examined the interaction terms and their simple slopes one family at a time. Table 7 now brings all 18 effects together, combining the product-term coefficients (Appendix Table A1) with the conditional slopes at low and high levels of the moderator (Appendix Table A2) and classifying each effect by the pattern it displays. Three patterns exhaust the data. *Amplification* is present when an already significant slope becomes steeper as the appraisal rises; *emergence* is its limiting case, in which a slope that is non-significant at low appraisal becomes significant and positive at high appraisal; *crossover* is present when the slope reverses sign. The two negative product terms are *attenuation* cases, in which a moral value's positive slope weakens as the appraisal rises.

Table 7. Synthesis of the Eighteen Moderation Effects: Direction, Conditional Slopes, Pattern, and Corrected Inferential Status

DV	Value (IV)	Moderator (MV)	β int.	Slope: low → high MV	Pattern	H3	p	FDR	Bonf.
Pro-veg	Hedonic	Vulnerability	.114	−.175*** → .036 n.s.	Crossover	H3b	<.001	Yes	Yes
Pro-veg	Ecocentric	Psych. distance	−.049	(not probed)	Attenuation	H3c	.037	No	No
Pro-veg	Altruistic	Psych. distance	.068	.051 n.s. → .225***	Emergence	H3a	.008	Yes	No
Pro-veg	Egoistic	Psych. distance	.048	−.056 n.s. → .131***	Emergence	H3a	.044	No	No
Pro-veg	Hedonic	Psych. distance	.106	−.174*** → .067*	Crossover	H3b	<.001	Yes	Yes
Pro-veg	Egoistic	Anxiety	.056	.038 n.s. → .105***	Emergence	H3a	.013	No	No
Pro-veg	Religiosity	Anxiety	−.057	.123*** → .064***	Attenuation	H3c	.007	Yes	No
Pro-veg	Egoistic	Guilt	.098	−.103*** → .149***	Crossover	H3b	<.001	Yes	Yes
Pro-veg	Hedonic	Guilt	.103	−.187*** → .047 n.s.	Crossover	H3b	<.001	Yes	Yes
Pro-meat	Altruistic	Severity	.089	.007 n.s. → .169***	Emergence	H3a	<.001	Yes	Yes
Pro-meat	Egoistic	Severity	.081	.125*** → .295***	Amplification	H3a	<.001	Yes	Yes
Pro-meat	Altruistic	Vulnerability	.052	−.027 n.s. → .116***	Emergence	H3a	.043	No	No
Pro-meat	Altruistic	Psych. distance	.061	−.033 n.s. → .107***	Emergence	H3a	.016	No	No
Pro-meat	Altruistic	Anxiety	.064	.060* → .130***	Amplification	H3a	.009	Yes	No
Pro-meat	Egoistic	Anxiety	.062	.177*** → .257***	Amplification	H3a	.009	Yes	No
Pro-meat	Altruistic	Personal norm	.084	.026 n.s. → .111***	Emergence	H3a	.002	Yes	No

DV	Value (IV)	Moderator (MV)	β int.	Slope: low → high MV	Pattern	H3	p	FDR	Bonf.
Pro-meat	Egoistic	Personal norm	.066	.163*** → .243***	Amplification	H3a	.005	Yes	No
Pro-meat	Altruistic	Guilt	.115	−.044 n.s. → .164***	Emergence	H3a	<.001	Yes	Yes

*Note. β int. = standardised coefficient of the product term (Appendix Table A1). Conditional slopes are the effects of the value at the 16th and 84th percentiles of the moderator (Appendix Table A2); ***p < .001, **p < .01, *p < .05, n.s. = not significant.*

Added in revision: p = exact two-tailed p of the product term; FDR = survives Benjamini–Hochberg control at q = .05 across all 60 interaction tests; Bonf. = survives the familywise criterion α = .05/60 = .00083. Thirteen of the 18 effects survive FDR control and seven survive Bonferroni; shaded cells mark effects that do not survive and are reported as provisional. All four crossover effects survive both criteria.

Together, the synthesis supports all three moderation hypotheses and specifies what each of them means substantively. H3a is supported by the modal pattern: 13 of the 18 effects are amplification or emergence, which is what the salience-weighting mechanism predicts, since an appraisal increases the weight of the considerations a value already makes salient. The emergence cases are theoretically the most striking. In them, a value orientation that appears inert in the main-effect model, such as altruistic values on meat preference or egoistic values on vegetarian preference, is in fact not inert at all but conditionally active. A null main effect, on this evidence, can conceal a value whose association with the outcome emerges under an appraisal that makes it more relevant. This provides a direct reinterpretation of the value–behaviour gap.

H3b is supported by the four crossover effects, and their composition is systematic rather than incidental: every one pairs a self-enhancement value (hedonic or egoistic) with a moral or threat appraisal (guilt, vulnerability, or psychological distance) on the vegetarian outcome. In each case, the value's slope is significantly negative at low appraisal and non-negative or significantly positive at high appraisal: hedonic values move from −.187 to a null slope under guilt, egoistic values from −.103 to .149. This is the clearest evidence in the study that appraisals do not merely add motivation but can alter the direction of the association between a value and dietary preference: the same self-referential reasoning that opposes the plant-based diet when the climate threat feels remote comes to support it when the person's own conduct is implicated.

H3c is supported in both of its parts. The two attenuation effects involve ecocentric values and religiosity, the orientations that carry vegetarian preference on moral grounds in the main-effect model; where morality is already expressed, an additional appraisal may add little and can partly substitute for it. The moderators also divide by diet, with guilt, vulnerability and psychological distance conditioning value expression for vegetarian preference and severity, anxiety, and personal norm conditioning it for meat preference. That the same appraisals do not govern both outcomes argues against treating food preference as a bipolar construct and favours the two-construct view adopted in Section 2.2. The three patterns thus describe a division of labour: values determine the direction of dietary disposition, and appraisals determine whether, and in which direction, that disposition is expressed in food preference.

Robustness of the three patterns under correction. The corrected results strengthen rather than weaken

the theoretical argument, because the effects that survive are concentrated among the patterns the theory treats as diagnostic. All four crossover effects survive not only FDR control but also the Bonferroni criterion: hedonic × vulnerability, hedonic × guilt, hedonic × distance, and egoistic × guilt on pro-vegetarian preference. H3b therefore rests on the most robust subset of the evidence rather than on marginal effects. Nine of the 13 amplification and emergence effects also survive FDR correction, so H3a remains supported, although two emergence cases on the vegetarian side (egoistic values under anxiety and under distance) fall below the corrected threshold and are reported as provisional.

H3c requires the most qualification, and stating this plainly is preferable to overclaiming. Its differential component is unaffected: the diet-specific division of moderators, with guilt, vulnerability, and psychological distance conditioning vegetarian preference and severity, anxiety, and personal norm conditioning meat preference, holds within the corrected set. The attenuation component is weaker. It rests on two effects, of which only religiosity × anxiety survives correction; the ecocentric × psychological distance effect does not. Redundancy of moral appraisal where a value already carries the outcome is therefore best described here as suggested by one robust and one provisional effect, and should be treated as a hypothesis for replication rather than as an established regularity.

5.8 Summary of hypothesis tests

The value hypotheses are supported. Ecocentric values (H1a), altruistic values (H1b), and religiosity (H1e) predict pro-vegetarian preference; egoistic values (H1c) predict pro-meat preference; and hedonic values (H1d) show the predicted double signature, positive for meat and negative for vegetarian preference. Among the appraisals, severity (H2a), vulnerability (H2b), personal norm (H2e), and guilt (H2f) predict vegetarian preference, psychological distance (H2c) is the strongest predictor of meat preference, and anxiety (H2d) is the only fully bidirectional appraisal. One qualification attaches to H2a and H2b: severity and vulnerability also carry unexpected positive associations with meat preference. The moderation hypotheses are supported in all three parts. Amplification and emergence dominate the interaction results (H3a), every crossover pairs a self-enhancement value with a moral appraisal (H3b), and the moderators divide by diet while the aligned moral values show attenuation (H3c). Table 8 at the head of the next section summarises these verdicts.

6. Discussion

Table 8. Summary of hypothesis test results

H	Prediction	Key result (β)	Verdict
H1a	Ecocentric → pro-veg (+)	.086***	Supported
H1b	Altruistic → pro-veg (+)	.059*	Supported
H1c	Egoistic → pro-meat (+)	.164***	Supported

H	Prediction	Key result (β)	Verdict
H1d	Hedonic → pro-meat (+), pro-veg (−)	.059* / −.065**	Supported
H1e	Religiosity → pro-veg (+)	.115***	Supported
H2a	Severity → pro-veg (+)	.093*** (also pro-meat +.079)	Supported (with caveat)
H2b	Vulnerability → pro-veg (+)	.091*** (also pro-meat +.155)	Supported (with caveat)
H2c	Distance → pro-meat (+)	.206*** (strongest predictor)	Supported
H2d	Anxiety → pro-veg (+), pro-meat (−)	.048* / −.073**	Supported
H2e	Personal norm → pro-veg (+)	.184*** (strongest pro-veg)	Supported
H2f	Guilt → pro-veg (+)	.082**	Supported
H3a	Amplification (common case)	13 of 18 effects amplify/emerge	Supported
H3b	Self-enhancement × moral appraisal: crossover	Egoistic/hedonic × guilt, distance, vulnerability reverse sign	Supported
H3c	Moderators differ by diet; moral values attenuate	Diet-specific gates; ecocentric/religiosity attenuated	Supported

Note. β are standardised coefficients from Table 6 (Model 3); moderation verdicts summarise Table 7 and Appendix Tables A1–A2. The caveat for H2a–H2b is that perceived severity and vulnerability also show positive paths to pro-meat preference, i.e., threat energises both diets rather than only the protective one.

6.1 Theoretical contribution: from the value–behaviour gap to conditional value expression

The central theoretical contribution is to reinterpret the value–behaviour gap as conditional value expression. Rather than assuming weak value effects, the model proposes that value slopes depend on climate appraisals. The FDR-corrected interactions identify the conditions under which this conditioning is sufficiently robust to warrant interpretation.

Three propositions summarise the framework. First, climate appraisals can activate or amplify value effects. Second, sufficiently strong appraisals can re-anchor self-enhancement values and produce crossover effects. Third, moderation is outcome-specific because vegetarian and meat preferences rest on partly different motivational structures.

This framework implies that value main effects are conditional averages, that climate appraisals can matter as moderators even when their main effects are weak, and that pro-vegetarian and pro-meat orientations should be modelled separately. These implications extend the value, risk-appraisal, and food-transition literatures without requiring large interaction effect sizes.

The framework therefore predicts where value effects emerge, reverse, or attenuate. Because the design is observational, however, it does not establish the causal direction of these conditioning relationships.

The clearest crossover illustrates this logic: the hedonic × guilt interaction reverses the hedonic slope on vegetarian preference at high guilt. Related egoistic interactions indicate that self-interest need not be uniformly opposed to environmental behaviour when the climate threat becomes sufficiently self-relevant.

Three contributions follow. First, values are modelled as dispositions and climate appraisals as conditions of expression rather than as rival predictor sets. Second, the distinct main-effect and moderation profiles of pro-vegetarian and pro-meat preference support the two-construct approach. Third, the findings connect the normative traditions reviewed in Section 2.1 to measurable value and appraisal processes without assuming that those traditions map onto separate groups of people.

The main-effect profiles are complementary: personal norm, ecocentric and religious values, guilt, severity, and vulnerability characterise vegetarian preference, whereas psychological distance, egoistic values, and hedonic values characterise meat preference; anxiety operates in opposite directions across the two outcomes. Moderation likewise varies by outcome, indicating that appraisals condition the intensity and direction of value expression rather than exerting a uniform push towards one diet.

The findings are consistent with the value–behaviour gap literature [18], meat-attachment and 4N accounts [14], [16], and demographic patterns reported in vegetarianism research [15]. The Korean results therefore reproduce several established patterns while extending them through the conditional-value framework.

Two central limitations are the cross-sectional design, which precludes causal inference, and the small incremental variance associated with individual interaction terms. The contribution lies in the patterned location of the effects rather than their magnitude.

Additional limitations are common-method variance from self-report, the use of stated preferences rather than observed diets and the associated intention–behaviour gap [33], the single-country online sample, and several short scales, including altruistic values (α = .662). Replication across food cultures and with behavioural outcomes is therefore needed.

7. Implications and Conclusion

For communication and policy, climate appraisal and value framing should be treated as complements. Messages that increase perceived severity, reduce psychological distance, or activate guilt may change how strongly existing values bear on food preference; pairing an appraisal with a relevant value frame may therefore be more effective than relying on either alone.

The moderation results also suggest segmentation. For self-enhancement orientations, guilt, vulnerability, and reduced psychological distance can reorient self-interest; for already ecocentric or religious audiences, additional moral-appraisal framing may be redundant. Because severity and vulnerability were associated with both dietary orientations, threat messaging should not be assumed to shift preference uniformly towards vegetarian eating.

Policy also extends beyond messaging. Structural measures such as plant-forward defaults, price or labelling policies that make climate costs concrete, and attractive plant-based options can complement value- and appraisal-based communication. Longitudinal, experimental, and behavioural studies are needed to test whether the observed boundary conditions cause sustained dietary change. The present evidence supports the narrower conclusion that climate appraisals condition when values are expressed in food preference.

Specifically, environmental-behaviour research should investigate not only how strongly a value predicts an outcome on average, but under which appraisal conditions its effect appears, reverses, or attenuates. Such tests require prespecified boundary conditions and appropriate control of multiple comparisons.

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Declaration of interests

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

☒ The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

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Data availability

Data will be made available upon reasonable request.

Ethics statement

All methods were performed in accordance with the relevant guidelines and regulations, including the ethical principles of the Declaration of Helsinki. Ethical approval was not required for this study, which was exempt from institutional ethical review in accordance with Article 2, Paragraph 1 of the Bioethics and Safety Act of the Republic of Korea (Act No. 13467)[1]. The exemption applies because the study involved no physical intervention or biological sampling, was administered exclusively as an anonymous self-completed web-based survey with no face-to-face or other interpersonal contact between researchers and respondents, and neither collected nor recorded personally identifiable information, so that no respondent could be identified from the data. On this basis the study meets the

criteria for exemption from deliberation by an institutional bioethics committee set out in Article 15, Paragraph 2 of the Act and Article 13 of its Enforcement Rule, and no written IRB exemption determination was issued because the study was not subject to mandatory review. Informed consent was obtained from all participants: before entering the questionnaire, every respondent was shown an information page describing the sponsoring institution, the principal investigator and contact details, the purpose of the survey, the exclusively statistical and confidential use of responses, and the voluntary nature of participation, and each respondent recorded consent electronically before proceeding. A full account of the ethical basis of the study is given in Section 4.1.

[1] https://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=33442&key=36&type=part

8. References

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