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RESEARCH ARTICLE

Behavioral Economics in Promoting Sustainable Consumer Choices

Murooj Mohammad Sattar[1], Hussein Ajlan Hasan[2], Salah Hassan Maleh Akla[3], Mujahed Mutlaq Abdul Rahman[4], Jassim Mohamed Brieg[5*]

[1] *Al-Turath University, Baghdad 10013, Iraq*

[2] *Al-Mansour University College, Baghdad 10067, Iraq*

[3] *Al-Mamoon University College, Baghdad 10012, Iraq*

[4] *Al-Rafidain University College, Baghdad 10064, Iraq*

[5] *Madenat Alelem University College, Baghdad 10006, Iraq*

*** Corresponding author:** Jassim Mohamed Brieg, jassim.mohamed@mauc.edu.iq

ABSTRACT

Consumer behavior plays a crucial role in the transition toward sustainability, yet traditional policy approaches often rely on financial incentives, which may not be the most cost-effective or scalable solution. This study examines the impact of behavioral economic interventions—specifically default options, social norms, and framing effects—on sustainable purchasing decisions. A randomized controlled experimental design was employed, assigning 500 participants to four groups, including a control group. In parallel, survey data from 1,000 consumers were analyzed to assess broader attitudes toward sustainable consumption. The experimental phase was conducted online between January–March 2024, ensuring methodological clarity regarding data collection procedures. In parallel, survey data from 1,000 consumers were analyzed to assess broader attitudes toward sustainable consumption. Results indicate that default options significantly increased sustainable purchases (78%), nearly matching the effectiveness of financial incentives (80%), without requiring direct subsidies. Social norms messaging also proved effective (74% adoption rate), reinforcing the influence of peer behavior. Framing interventions produced a moderate increase (70%), suggesting that message presentation shapes consumer decision-making. Generational patterns were also observed, with younger consumers responding more strongly to informational and norm-based cues, consistent with recent evidence on demographic variability in sustainable consumption. These results align with emerging research showing that perceived value, social identity, and anticipated emotions significantly shape sustainable purchasing decisions. However, perceived barriers such as cost concerns (65%), inconvenience (62%), and lack of information (58%) remain significant obstacles to adoption. These findings underscore the potential for non-monetary behavioral interventions to complement or replace traditional financial incentives in sustainability policy. Furthermore, the effectiveness of these interventions corresponds with recent systematic evaluations emphasizing the need for multi-component, evidence-based sustainability strategies. Future research should explore long-term habit formation and cross-cultural variations to refine behavioral strategies for maximum impact. By integrating insights from behavioral economics, policymakers and businesses can develop cost-effective, scalable interventions to promote sustainable consumer behavior.

Keywords: Behavioural economics; sustainable consumption; default options; social norms; framing effects; financial incentives; consumer behaviour

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1. Introduction

The choices consumers make in their everyday lives from the products they purchase to the services they use carry significant environmental, social, and economic implications. In an era marked by growing concerns over climate change, resource depletion, and pollution, understanding how to influence consumer behavior toward more sustainable patterns has become a priority for policymakers, businesses, and researchers. Given these patterns, the field of behavioral economics can be a useful lens through which to analyze these issues; people regularly state intending to engage in behavior that is environmentally- and socially-conscious, yet fail to follow through. Behavioral economics uses insights from psychology and economic science to analyze consumer choice and how relatively minor modifications can yield deep and persistent shifts in consumption patterns [1].

Rational choice as the dominant framework of economic theory, for it had long been presumed that individuals act as rational agents, always choosing the options that maximize their information-informed utility. In practice though, consumers are not always so rational, due to cognitive dissonance, limited attention potential and the effects of social norms. By integrating knowledge from psychology, sociology, and neuroscience, behavioral economics challenges the idea of the perfectly rational consumer, showing how the framing of choices, heuristics, and status quo bias often shape consumer decisions. But such inclinations can lead people to undervalue long-term benefits, overvalue short-term rewards, and stick with defaults even when better options exist. Consequently, understanding these behavioral tendencies is crucial for developing effective interventions that promote sustainable consumption [2].

Scholars and policymakers have sought to behavioral economic concepts to address urgent environmental problems. From energy conservation to waste reduction, there's now a sizable volume of evidence that relatively small changes for example, changing default settings on appliances, providing live feedback on energy use or re-framing green products more appealingly can significantly modify consumer behavior. These so-called "nudges" work not by forcing change or regulation but gently moving consumers toward solutions congruent with long-term sustainability goals. Nudges are attractive to both governments, corporations, and NGOs (non-governmental organizations) because they do not infringe upon consumer autonomy while redirecting them towards more favorable outcomes [3].

However, the behavioral economics notwithstanding, moving to widespread sustainable consumption is a tricky proposition. One of the main challenges the platform faces is the "intention-behavior gap": consumers might say they want to make environmentally conscious decisions, but often don't do so in real life. Reasons contributing to the gap include the perception that sustainable choices are inconvenient or more expensive, the lack of immediate satisfaction, and confusion about which goods or services are actually environmentally friendly. Furthermore, social dynamics can also contribute to the facilitation or inhibition of sustainable behaviors, highlighting the importance of understanding community influence on individual behavior. Identifying these obstacles is a crucial first step in crafting interventions that help steer consumers towards sustainable selection while ensuring the option is lasting and expandable [4].

However, what remains insufficiently examined is the comparative strength of behavioral nudges relative to structural or economic drivers, especially across different demographic groups and cultural contexts. Existing studies emphasize that sustainable purchasing is shaped not only by cognitive biases but also by generational differences, social identity, emotional responses, and perceived value structures [5-8]. This gap highlights the need for an integrated behavioral–psychological framework capable of explaining why similar interventions produce heterogeneous effects across consumer segments.

Another important aspect is the importance of financial (or material) incentives for sustainability. Recent research also demonstrates that digital and fintech-based incentive systems play a growing role in influencing sustainable decisions, particularly by embedding eco-friendly rewards into mobile payment platforms and smart consumption applications [9]. Additionally, technological innovation and macro-economic development trends significantly reshape consumer behavior in emerging markets, further complicating the behavioral landscape [10]. Although nudges tend to rely on more subtle psychological signals, pairing these approaches with concrete economic rewards can increase their reach. Some of this can be in the form of carrots: Give consumers discounts for using reusable bags, rebates for buying energy-efficient appliances, or tax credits for installing renewable energy. But these incentives must be carefully structured so that they don't lead to unintended consequences, for example rebound effects, where consumers cancel out environmental benefits by increasing overall consumption. It's essential to find the balance between behavioral and financial interventions to achieve sustainable results [11].

The article aims at contributing to the body of literature on sustainable consumption through the analysis of theoretical foundations, review of available evidence and identification of challenges and opportunities. In conclusion, this research seeks to establish a theoretical basis engage consumer behavior aimed at generating win-win outcomes for both environmental and societal goals while providing actionable guidance for leading global trends with a focus on behavioral insights.

2. Literature review

Consumer behavior research has been a longstanding area of interest in economics, psychology, and sociology. Researchers through the years have come up with different theoretical frameworks to help explain the decisions individuals make and why. Traditional economics focuses on the fact that we are rational beings, who make choices based on logical factors, while behavioral economics holds sufficient evidence that we are driven by cognitive biases, social norms, and heuristics that influence our decisions. In this way, different perspectives diverge, creating new ways of understanding and framing sustainable consumption [12].

As a sub-discipline, behavioral economics questions the assumption that consumers are always working in their own best financial or environmental interest. Instead, it reveals how concepts like default effect, framing and social proof can nudge people toward, or away from, sustainable behaviors. For example, consumers often default to energy settings that are weighted toward nonrenewable resources, even if greener options are available. This is because the research suggests that when they make the eco-friendly choice the default, people will tend to adopt it passively, without the sense that they're making a conscious effort to change their behavior. In the same vein, presenting products using the eco-friendly frame positively vs. cost savings frame, was associated with increased willingness to pay for a specific eco-friendly product [13].

One example would be the literature about social influence. Social norms and the behaviors of peers can strongly shape individual decision-making. Consumers are more likely to follow healthy behavior of their peers or members of their communities. This emphasizes the need for visible and relatable instances of sustainable consumption in social networks. Publicizing participation rates in recycling programs, for instance, or showing how many people in a neighborhood have switched to renewable energy sources have been proven to compel others to act similarly [14].

Moreover, research shows that sustainable decisions are frequently shaped by deeper psychological constructs, including perceived value, product familiarity, anticipated emotions, and social identity. For instance, perceived value and familiarity significantly influence the intention to purchase sustainable food

and consumer goods [15]. Social identity and collective belonging have been shown to drive eco-friendly purchasing among young consumers in several cultural contexts [7]. Studies also demonstrate that anticipated positive and negative emotions mediate the relationship between environmental concerns and sustainable consumption [8]. These findings suggest that behavioral interventions must be understood within a broader emotional and identity-based decision framework.

Financial incentives are also discussed often, but as noted in the literature, the reliance on monetary rewards should not be overestimated. Discounts and rebates can encourage consumers to choose products that are more sustainable, but the effects are often temporary unless they are paired with other measures." And in many cases, nudges, unlike the proverbial "big stick" — have proved particularly effective, with reminders, feedback, and goal-setting tools leaving longer-lasting impact on consumer behavior. These non-financial approaches can often be low-cost and implemented at scale [16], which makes them particularly appealing to policymakers and businesses alike. Importantly, generational differences have been documented in sustainable food choices, green purchasing, and responsiveness to social or informational cues, with younger populations frequently demonstrating stronger environmental attitudes and higher digital engagement [5, 17, 18]. Cross-national comparisons also indicate that consumers in developed and developing economies differ markedly in how they interpret and act on sustainability signals [19]. These variations highlight the need for generationally and culturally sensitive behavioral models.

The literature shows a rich spectrum of psychological and behavioral factors that guide sustainable consumption. Nevertheless, prior research also reveals important limitations. Studies on circular economy participation demonstrate that sustainable behavior is influenced by organizational and community-level dynamics rather than individual choice alone [20]. Furthermore, behavioral economic models applied to environmental conservation in human resource systems underscore that workplace norms and institutional structures strongly mediate sustainable actions [21]. Similarly, strategic development literature shows that sustainable behavior management within circular economy businesses requires integrating psychological, organizational, and market factors [22]. A comprehensive review of circularity indicators also highlights the role of psychological factors—such as trust, perceived responsibility, and personal norms—in shaping adoption of sustainable practices[23].

Learnings can potentially enable researchers and practitioners to design effective interventions aimed at increasing sustainable consumer choice [24].

3. Materials and methods

3.1. Experimental design and data collection

Using a randomized controlled experimental design, this study assessed the efficacy of behavioral economic interventions in promoting sustainable consumption. The experimental phase was conducted between January–March 2024 using an online recruitment platform. Participants were selected through stratified sampling to ensure representation across key age groups, consistent with generational sustainability studies [17, 18]. Randomization was automated within the survey system to minimize allocation bias. This sampling structure reflected demographic diversity known to influence sustainable purchasing behavior, including education, income, and environmental involvement [10, 19]. The selected indicators—purchase rate, switch rate, decision latency, and attitudinal indices—follow established behavioral decision-making frameworks widely used in recent sustainability research [15, 25, 26].

A randomized sample of 500 individuals into 4 groups: 1 control group and 3 intervention groups. These interventions were designed to examine behavioral mechanisms, for example default effects, framing and norms, that previous studies have demonstrated impact on decision-making [1, 2].

1.Default Options Group (n = 125): Participants were automatically enrolled in a green energy plan unless they opted out, leveraging the status quo bias to promote sustainable choices [27].

2.Framing Interventions Group (n = 125): Sustainable products were presented with positive environmental and cost-saving frames, emphasizing long-term benefits over immediate costs [28].

3.Social Norms Group (n = 125): Participants were exposed to peer-based messaging, which highlighted that a majority of consumers preferred eco-friendly choices, capitalizing on descriptive social norms [29].

4.Control Group (n = 125): This group received no intervention, serving as the baseline.

A simple model based on the extensive experimental data which allowed us to do a rigorous comparison of how different behavioral nudges influence sustainably relevant consumer choices, giving advice on the most effective tactics in order to overcome the intention-behavior gap for sustainable products [4, 12].

A large-scale survey (n = 1,000) was designed to test these findings in a wider context, where self-reported consumer behaviors, attitudes toward sustainability, and their barriers to participation in sustainable consumption behavior were asked through a 5-point Likert scale [30]. The choice of behavioral indicators—purchase rate, switch rate, decision latency, sustainability attitude index, and barrier index was informed by hybrid decision-making models that integrate psychological, attitudinal, and behavioral components [25, 26].

These measures align with established frameworks linking perceived value, emotional drivers, and informational clarity to sustainable purchasing behavior [6, 15].

Table 1. Assignment of Experimental Groups and Behavioral Framework

Group	Participants (n)	Purchase Rate (%)	Switch Rate (%)	Decision Latency (s)
Default Options	125	76	5	18
Framing Interventions	125	68	12	24
Social Norms	125	71	8	20
Control	125	55	20	27

This approach of triangulation used experimental data to supplement survey data to provide robust reliability and generalizability of results across a wide cross section of consumers per target demographic [11, 31].

Based on the literature, the study tested the following hypotheses:

H1: Default options significantly increase sustainable purchasing relative to the control group [32].

H2: Social norms interventions positively influence sustainable purchasing, mediated by social identity and perceived peer approval [7, 33].

H3: Framing effects increase sustainable purchasing but produce longer decision latency due to higher cognitive processing [15].

H4: Behavioral nudges perform comparably to low-intensity financial incentives, reflecting findings from recent systematic evaluations [34, 35].

Each hypothesis corresponds directly to the behavioral indicators: purchase rate (PR) tests adoption effects (H1–H4), switch rate (SR) evaluates resistance to change (H1–H2), decision latency (DL) reflects cognitive processing differences central to framing effects (H3), and the attitude and barrier indices (SAI, BI) contextualize variations in responsiveness to nudges (H1–H4).

3.2. Measurement and statistical methods

To quantify intervention effectiveness, several key metrics were assessed:

1. **Purchase Rate (PR)** – the percentage of participants choosing eco-friendly products, defined as:

$$PR = \frac{N_P}{N_t} \times 100\% \quad (1)$$

where N_P is the number of participants selecting sustainable options, and N_t is the total participants in the group.

2. Switch Rate (SR) – the proportion of participants who changed their initial decision, as a opting out of a default plan, calculated as:

$$SR = \frac{N_s}{N_t} \times 100\% \quad (2)$$

where NsN_sNs represents the number of participants who switched choices.

3. Decision Latency (DL) – the average time (in seconds) taken by each participant to finalize their purchasing decision.

4. Sustainability Attitude Index (SAI) – a weighted composite measure derived from Likert-scale responses, given by:

$$SAI = \sum_{i-1}^{n} w_i X_i \quad (3)$$

where X_i represents individual Likert scores, and w_i is the assigned weight based on factor loading analysis [13].

5. Barrier Index (BI) – measuring perceived barriers to sustainability, as a cost, inconvenience, lack of information, calculated as:

$$BI = \frac{C+I+L}{N} \quad (4)$$

where C, I, and L denote the number of participants citing cost, inconvenience, and lack of information, respectively, and NNN is the total number of respondents [3, 24].

Table 2. Comparative Analysis of Default and Control Group Metrics Under Experimental Conditions

Phase	Participants	Mean Likert Score (1-5)	Self-Reported Purchases (%)	Perceived Barriers (%)
Experimental Phase	500	N/A	76	N/A
Survey Phase	1,000	4.2	52	68
Combined Dataset	1,500	4.0	64	62

3.3. Statistical analysis

A combination of descriptive and inferential statistics was applied:

3.3.1. ANOVA test

To determine significant differences in purchase rates, switch rates, and decision latencies across groups.

$$F = \frac{\sum_{i-1}^{k} N_i(\bar{X}_i - \bar{X})^2/(k-1)}{\sum_{i-1}^{k}\sum_{j-1}^{n_i}(X_{i,j} - \bar{X}_i)^2/(N-k)} \quad (5)$$

Where k is the number of groups, N_i the sample size per group, $\bar{X}_i$ the group mean, $\bar{X}$ is the overall mean.

3.3.2. Logistic regression

Applied to survey data to identify predictors of sustainable purchasing behavior, considering income, education, and intervention exposure [16, 36].

$$P(Y = 1) = \frac{e^{(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3)}}{1 + e^{(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3)}} \quad (6)$$

Where $P(Y = 1)$ is the probability of making a sustainable choice, X_1, X_2, X_3 represent income, education, and intervention exposure, respectively, $\beta_0, \beta_1, \beta_2, \beta_3$ are estimated coefficients.

3.3.3. Behavioral impact index (BII)

The behavioral impact index integrates purchase behavior and decision-making speed:

$$BII = \alpha PR + \beta SR + \gamma(5 - DL) \quad (7)$$

where α, β, γ are regression-derived weights.

3.4. Experimental validity and ethical considerations

To minimize selection bias, participants were randomly allocated to intervention groups to maximize internal validity. Augmenting survey-reported attitudes with real-world purchasing behaviors helps to improve external validity, as seen in recent consumer behavior [2, 37]. The study complied with ethical principles governing human research participation, including informed consent, confidentiality of data, and autonomy of the participant [38].

The proposal of this methodologies section summarizes the broad experimental framework, quantitative metrics, and the statistical models adopted in this work. The description of behavioral experimental effects is performed with the main read on randomized experiments, regression modeling, and behavioral indices, thus providing a solid analytical structure to the understanding of behavioral economic interventions in sustainability.

4. Results

4.1. Impact of behavioural interventions on sustainable purchasing rates

This study focuses on understanding how effective behavioral interventions are in influencing sustainable purchasing decisions. Across two studies, the experiment investigated the effects of default options, framing effects, social norms/peer pressure, against a control group. The default options exploit the status quo bias, resulting in less resistance by consumers to sustainable products. With framing effects highlighting the advantages of green options, consumer perception is changed. The text Social Norms Messaging capitalizes on peer influences to promote pro-environmental behavior. Table 3 shows how much did these interventions affected the purchasing rates, offering a comparison between their efficacies.

Table 3. Analysis of Sustainable Purchasing Across Experimental Groups

Intervention Type	Participants (n)	Purchase Rate (%)	Standard Deviation (SD)	Confidence Interval (95%)	Mean Difference (vs. Control)	p-value (ANOVA)
Default Options	125	76.0	8.2	[73.5, 78.5]	+21.0%	<0.001
Framing	125	68.0	10.1	[65.2, 70.8]	+13.0%	0.003

Social Norms	125	71.0	9.0	[68.6, 73.4]	+16.0%	0.002
Control	125	55.0	12.4	[52.2, 57.8]	Baseline	N/A

The findings indicate a clear advantage of behavioral interventions over the control condition, with default options producing the highest sustainable purchasing rate (76%). This suggests that pre-selecting sustainable options as the default effectively reduces consumer inertia, aligning with previous research on status quo bias in behavioral economics. The social norms intervention also significantly increased purchasing rates (71%), confirming the influence of peer behavior on decision-making. Framing interventions led to a moderate but meaningful increase (68%), demonstrating that how choices are presented can shape consumer decisions. The statistical significance ($p < 0.05$) across interventions underscores that these behavioral strategies significantly outperform no intervention in promoting sustainable choices.

4.2. Decision latency and consumer switching behavior

Decision latency reflects the cognitive effort required for a purchasing decision, with shorter decision times suggesting automatic acceptance of a choice, whereas longer times indicate deliberation or hesitancy. This study measured how different behavioral interventions influenced time-to-decision and whether participants switched their initial selections. Default interventions were expected to reduce decision time by minimizing choice complexity, while social norms messaging was hypothesized to accelerate decisions by reinforcing peer behavior. Framing interventions, by presenting eco-friendly options as financially or ethically superior, could lead to longer deliberation periods as consumers process these additional considerations.

Table 4. Decision Latency and Switching Behavior Across Experimental Groups

Intervention Type	Decision Latency (Mean, s)	SD	95% CI	Mean Difference (vs. Control)	Switch Rate (%)	p-value (ANOVA)
Default Options	18.0	3.4	[16.8, 19.2]	-9.0 s	5.0%	<0.001
Framing	24.0	5.1	[22.6, 25.4]	-3.0 s	12.0%	0.003
Social Norms	20.0	4.2	[18.8, 21.2]	-7.0 s	8.0%	0.002
Control	27.0	6.8	[25.4, 28.6]	Baseline	20.0%	N/A

Results confirm that default options led to the shortest decision latency (18s), suggesting that reducing active choice effort increases consumer compliance with sustainable options. Social norms interventions reduced latency to 20s, reflecting the power of peer influence in expediting decision-making. The framing intervention had the longest latency (24s) among interventions, indicating that additional cognitive processing was required when consumers evaluated financial and environmental benefits. The highest switch rate occurred in the control group (20%), suggesting that when no intervention was applied, participants exhibited the greatest indecision and choice reversal. Conversely, defaults had the lowest switch rate (5%), reinforcing the tendency to stick with pre-selected options.

4.3. Behavioural predictors of sustainable purchasing: logistic regression analysis

A logistic regression model was created to identify independent drivers of sustainable purchasing, including income, education level, age, and intervention exposure. This statistical method quantifies the likelihood of consumer choice for sustainable balances according to demographic information and experimental situation. Previous studies indicate that consumers with higher income and education levels are more environmentally conscious, and younger consumers are more flexible in adopting sustainable consumption patterns.

Table 5. Logistic Regression Results: Predictors of Sustainable Purchasing

Variable	Coefficient (β)	Odds Ratio (OR)	95% Confidence Interval	p-value
Income (per $10,000)	0.18	1.20	[1.15, 1.26]	<0.001
Higher Education Level	0.45	1.57	[1.42, 1.74]	<0.001
Younger Age Group	0.10	1.11	[1.05, 1.17]	0.002
Intervention Exposure	0.38	1.46	[1.32, 1.60]	<0.001

Regression analysis indicates that higher education (OR = 1.57) has the strongest effect on sustainable purchasing likelihood, supporting literature that higher awareness correlates with greener choices. Income also positively predicts sustainable purchasing (OR = 1.20), reinforcing the notion that financial stability enables environmentally conscious consumption. Age exhibits a weaker but significant effect (OR = 1.11), indicating that younger individuals are slightly more likely to adopt sustainable habits. Most notably, intervention exposure (OR = 1.46) suggests that behavioral nudges substantially enhance the probability of sustainable purchasing beyond demographic predictors.

4.4. Perceived barriers to sustainable consumption

Despite the effectiveness of behavioral interventions, not all consumers opt for sustainable choices. This section examines the key barriers preventing widespread adoption of eco-friendly products. Prior research suggests that cost concerns, convenience issues, and information gaps are significant deterrents in sustainable purchasing decisions. Consumers often perceive eco-friendly products as financially burdensome, or they may lack sufficient information about environmental benefits. By quantifying these barriers, this analysis provides insight into the structural challenges that must be addressed to enhance intervention effectiveness.

Table 6. Perceived Barriers to Sustainable Consumption Across Consumer Segments

Barrier Type	Overall (%)	Young Adults (18–29)	Middle-Aged Adults (30–49)	Older Adults (50+)	Standard Deviation (SD)	Confidence Interval (95%)
Cost concerns	65.0%	58.0%	67.5%	71.0%	8.4	[62.8, 67.2]
Inconvenience	62.0%	55.5%	63.0%	67.8%	7.9	[59.8, 64.2]
Lack of information	58.0%	64.0%	57.0%	50.5%	7.1	[55.9, 60.1]

Findings reveal that cost concerns are the most frequently reported barrier (65%), particularly among older adults (71%), suggesting that price sensitivity is a significant factor in sustainability decisions. Inconvenience is another major issue (62% overall), particularly among middle-aged and older adults, indicating that accessibility and usability of eco-friendly options must be improved. Interestingly, younger consumers (64%) report lack of information as their primary barrier, emphasizing the need for targeted awareness campaigns. This segmentation suggests that different demographic groups require tailored approaches to overcome these sustainability barriers. These findings are consistent with generational purchasing research demonstrating that younger consumers exhibit greater sensitivity to informational cues and environmental messaging, while older groups respond more strongly to convenience-based or cost-based motivators.

4.5. Effectiveness of behavioral nudges vs. financial incentives

Behavioral interventions are often compared to financial incentives in their ability to drive sustainable behavior. While economic incentives—such as discounts, rebates, or subsidies—are widely used, research suggests that behavioral nudges may offer cost-effective alternatives. This study compares the relative

effectiveness of default options, framing, social norms, and direct financial incentives to determine which strategy yields the greatest increase in sustainable purchasing rates.

Table 7. Effectiveness of Behavioral Nudges vs. Financial Incentives

Intervention Type	Participants (n)	Purchase Rate (%)	Discount Applied (USD)	Decision Latency (s)	Standard Deviation (SD)	Confidence Interval (95%)
Default Options	125	78.0%	N/A	18	7.9	[75.6, 80.4]
Framing	125	70.0%	N/A	22	9.5	[67.3, 72.7]
Social Norms	125	74.0%	N/A	20	8.3	[71.8, 76.2]
Financial Incentives	125	80.0%	$6.50	16	6.8	[78.1, 81.9]

Results indicate that financial incentives (80%) marginally outperform behavioral nudges, yet require monetary investment. Among nudges, default options (78%) were nearly as effective as financial incentives, reinforcing that pre-selection of eco-friendly options remains a powerful and cost-effective strategy. Social norms interventions (74%) also demonstrated strong effectiveness, confirming the impact of peer influence in consumer behavior. Framing interventions, while effective (70% adoption rate), required greater cognitive effort, as evidenced by the longest decision latency (22s). Notably, financial incentives led to the shortest decision latency (16s), demonstrating that monetary rewards expedite decision-making. These results suggest that behavioral nudges—particularly defaults and social norms—can substitute for financial incentives without imposing additional costs.

These results provide a comprehensive analysis of behavioral economic interventions in driving sustainable consumer choices. The study confirms that default options are the most effective non-monetary nudge, closely matching financial incentives in their ability to increase adoption of eco-friendly products. Social norms interventions also show strong effects, reinforcing that peer influence is a key driver of sustainability behavior. The study also highlights structural barriers to sustainable consumption, emphasizing that addressing cost concerns, convenience, and information gaps is essential for widespread adoption. By integrating these insights, policymakers and businesses can develop cost-efficient, scalable strategies to promote sustainability at a broader level.

5. Discussion

The results of this study add to the literature investigating behavioral economics approaches to encourage environment-friendly consumer behavior. This study illustrates how the inability to choose can be executed as a non-monetary nudge that has similar effects to monetary incentives by demonstrating the power of default options, framing, and social norms compared to standard economic incentives. The findings are consistent with prior studies, while also providing new evidence regarding the relative effectiveness of various behavioral strategies. This Discussion puts these results in the context of existing work, considers theoretical and practical implications, and discusses limitations and future work.

The unexpected finding is how effective a default option is in promoting sustainable purchases, with a participation rate of 78%, almost identical to the financial incentives (80%) but without requiring massive monetary subsidies. This corroborates prior work on status quo bias, marked by people sticking to pre-established choices as a result of cognitive inertia. Defaults were highly influential on behavior, as indicated by less decision effort, especially when sustainable choices were made as normative [27]. Likewise, the study by Rummo et al. [38] found that the default options increased healthy food selection among low-income consumers without the need for further financial incentives. This suggests that default-based interventions

can be powerful and sometimes low-cost assets to sustainability policy because they do not rely on consumer deliberation, they leverage default decision-making tendencies.

The influence of social norms messaging on consumer behavior is also consistent with prior literature on the topic. They found a 74% adoption rate due to this intervention, providing evidence that peer influence works in permanent sustainable consumption. Balabanis et al.[29] found that social norms are more relevant in the cross-cultural situation, where consumers in collectivist countries are more likely to keep sustainable practice if they believe that others also keep sustainable practice. This indicates that while social norms apply globally, they might be more pronounced in societies with notable community-level determinants in the herding process. Moreover, studies by Greene et al.[39] emphasized how behavioral interventions such as Descriptive Norms showcased significant promotion of sustainable behavior in travel decision making, indicating this technique's cross-field applicability in a meta-analysis regarding tourism.

Though framing interventions generated a lower adoption rate (70%), they are still a powerful method for shaping consumer perception. According to previous studies, the effectiveness of sustainability can depend on how it is framed, such as through the lens of financial benefits, health advantages or ethical considerations. Zhang et al.[28] concluded that advertisement framing had an impact, increasing consumers' willingness-to-pay for green products, especially when messages for sustainability matched with personal values and incentives. Though, showed the one of the highest decision latencies for framing, which indicates that consumers need a higher cognitive effort to process sustainability messages. This means that framing plays a big role, but that it can be overpowered or dampened by default options or social proof for example.

Perhaps the most policy-relevant result is one about behavioral nudges and financial incentives. Though cash-in-palm incentives performed marginally better than the behavioral nudges (80% vs. 78%), the latter would potentially avoid direct economic subsidies and would therefore represent a more scalable and affordable approach. This is consistent with the findings of Akin and Akin[40] claimed that structural incentives and behavioral design will support sustainable practices in real estate better than monetary compensation. Moreover, Rummo et al.[38] however, the researchers concluded with the findings that financial rewards are beneficial only short-term and not always translating to long-term behavior change unlike behavioral nudges that can establish more permanent habits. This raises an important question for policy makers as to whether an immediate adoption curve through economic mechanisms (like tax incentives) or a gradual behavioral reform cycle (nudge) is preferable [25, 41].

Cross-country analyses indicate that these effects vary substantially between developed and developing markets, where socio-economic conditions, environmental awareness, and technological maturity influence consumer responsiveness to interventions [10, 19]. Additionally, emerging fintech-based eco-incentive systems have shown strong potential to motivate sustainable behavior by integrating rewards into digital financial platforms [9].

Although the study has strengths, some limitations should be mentioned. Although the experimental design provided for controlled comparisons, it does not perfectly mirror long-term consumer behavior. Another study emphasized that sustainable decisions are those that should be the product of a longer time assessability to make sure that the changed behavior would not only be a temporary change but rather a habit[42], thus leading us to understand that we should be responsible about the exodus interveners. Afterall, future research should include longitudinal studies to evaluate if behavioral nudges translate into sustained behavior rather than a one-time experience.

Despite the study sample did cover a wide range, the sample was restricted to certain consumer cohorts. Previous studies have demonstrated that socio-culture and economy can influence health behavior

interventions [29]. For example, Ramli et al.[43] found that the adoption of sustainable behaviors in smart city environments varies according to income groups and urban infrastructure availability. Future studies should look at cross-country differences in behavioral interventions, especially in developing economies where financial limitations may act as a better predictor than cognitive biases.

Another caveat is the possibility of behavioral reactance. Although defaults and social norms were successful, previous research shows that some consumers can oppose interventions perceive as manipulative. Markovych and Demkura[37] argued that transparency and voluntary participation in social initiatives are crucial to guarantee that behavioral nudges are not implemented unethically. Consumer perspectives on nudging strategies, specifically as they relate to consumer autonomy and ethics, should also be explored in future research.

This was mostly an individual-level behavioral change study, and the analysis did not take into account systemic and institutional barriers toward sustainable consumption. Rusyani et al.[44] pointed out, the acceptance of sustainability is not only driven by consumer choice, but also by supply chain dynamics, corporate responsibility, and government regulations. Future research should seek to understand how structural solutions grounded in policy and technology can be harnessed by behavioral nudges to systematically and comprehensively compound to deliver sustainable solutions, for example, the synergistic effect of policy reforms, industry regulations, and technological innovations.

The findings of this study contribute to existing literature on the applications of behavioral economics in achieving sustainable consumer behavior, highlighting the power of defaults, social norms, and framing effects can affect purchasing behavior. In line with previous research on habit formation and decision inertia, these interventions provide cost-efficient substitutes for monetary incentives. However, the findings also underscore critical challenges, such as obstacles to adoption, cultural variability, and ethical considerations. The future of this research will be to consider how we can combine behavioral nudges with the structural incentive approach to formulate long-term scalable approaches that will result in sustainable consumption. By recognizing psychological and systemic drivers, future interventions can maximize effectiveness, ethical integrity, and global relevance.

6. Conclusions

The article examined the use of principles of behavioral economics to encourage environmentally sustainable consumer behavior, dealing with the implications of default choices, social norms and framing effects, vis-a-vis financial incentives. The researchers examined consumer decision-making processes in a controlled experimental design and solvable survey data to offer valuable insights on the impact of subtle behavioral nudges on sustainability adoption. Those results show how powerful choice architecture can be — changes in the way decisions are presented can greatly reduce decision inertia and help shape how people view their choices, making buying decisions more in line with sustainability aims.

The main takeaway of this study is that behavioral nudges can be about as powerful as financial incentives in promoting sustainable consumption. Sure, direct economic incentives may seem like the most effective approach to nudge consumers towards purchasing eco-friendly products, but non-financial interventions including defaults and social norms rely on psychological principles to drive similar behavior. This indicates that sustainability initiatives do not need to involve heavy financial investments to produce an impact. Rather, they can be designed through behavioral insights that lightly steer consumer behavior without limiting choice. Such a result of the default option strategy in general emphasizes that when sustainability options are set as the norm, they lead to significantly higher adoption rates without the need for

consumers to involve themselves. This is an important finding because it implies that behavioral interventions could be employed at scale at low cost, making them appealing to policymakers and businesses looking for efficient sustainability strategies at the lowest cost (businesses looking to improve their green profile).

Moreover, the study highlights the power of social influence in determining consumer behavior. Because social norms messaging was a powerful motivator, evidence of others adopting eco-friendly habits primarily strengthened social norms messaging (people will adopt an ecofriendly habit, simply because they can see others that do the same). This is the most key finding for what we can do on a large-scale level when it comes to sustainability; harness the power of community behavioral reinforcement. Such social norm-based approaches could be complemented by peer comparison mechanisms, public commitments, and feedback loops that consider the intersection of incentives salient for both consumers and businesses and that help policymakers and businesses adopt and adapt the most effective strategies in their areas. The effect of framing interventions also points out that the way sustainability messages are communicated is crucial in decision-making. When presented more in terms of financial savings or health benefits, ethical considerations, or opportunity costs, consumers are more likely to choose sustainable options. This clue suggests sustainability campaigns need to be sensitive to the reflective and reactive messaging strategies of the different consumer segments identified.

Although the findings provide convincing support for the effects of behavioral interventions, they also point to important barriers to be overcome in order to maximize their impact. Cost-related issues have become a major hurdle for many consumers where sustainable choices are sometimes seen as having higher prices than non-sustainable counterparts. While behavioral nudges can, indeed, help influence decision-making, they must be supported by pricing strategies, subsidies, or incentives that help break down financial barriers." In addition, the study identifies a lack of information as a significant barrier to being sustainable. The fifth factor is consumer awareness, with a significant gap between the level of awareness about eco-friendly options and the anticipated benefits of these eco-friendly alternatives, implying that educational campaigns, transparent labeling, and certification programs might prove to be key drivers in awareness and trust building.

From a policy perspective, the study supports the integration of behavioral insights into sustainability initiatives. Governments and businesses can implement low-cost, scalable interventions that capitalize on human psychology to drive environmental responsibility. Given the strong effect of default options, policy frameworks could mandate automatic enrollment in sustainable programs while preserving consumer autonomy to opt out. Retailers and service providers could also implement social norm feedback systems, displaying real-time sustainability statistics to encourage behavioral shifts. Additionally, businesses could enhance their sustainability messaging by incorporating framing techniques that resonate with consumers' economic, ethical, or social values.

Future research should explore long-term behavioral effects to assess whether habit formation occurs beyond the initial intervention phase. Understanding whether default options and social norms lead to permanent shifts in consumer behavior remains an open question that requires further investigation. Additionally, cross-cultural studies could provide insight into how behavioral interventions perform across different economic and social contexts. The variability in the effectiveness of nudges suggests that regional and demographic factors must be considered when designing behavioral policies for sustainability. Policy frameworks should incorporate structured intervention components identified as effective in recent systematic reviews, including multi-stage nudges, informational reinforcement, and emotional engagement

strategies. Fintech-based incentive systems can complement behavioral approaches by embedding eco-rewards into digital payments and mobile platforms. Businesses should adopt managerial strategies that integrate perceived value, product familiarity, customer involvement, and social identity cues into sustainability campaigns. interventions should be tailored to generational needs, acknowledging the distinct motivations documented among young adults and older consumers.

This study highlights the power of behavioral economics in driving sustainable consumer choices, demonstrating that strategic interventions can rival financial incentives in effectiveness. By leveraging psychological principles such as status quo bias, social influence, and framing effects, policymakers and businesses can design cost-effective, scalable solutions that promote environmental responsibility. Moving forward, the integration of behavioral science into sustainability policy offers a promising avenue for addressing global environmental challenges while maintaining economic efficiency.

Conflict of interest

The authors declare no conflict of interest

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