Economic analyses on sustainable behaviors through cognitive interventions: Experimental approach

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ECONOMIC ANALYSES ON SUSTAINABLE BEHAVIORS THROUGH COGNITIVE INTERVENTIONS: EXPERIMENTAL APPROACH

ABSTRACT

Sustainable behaviors are crucial for ensuring long-term wellbeing and stability across social, economic and environmental systems. Adopting sustainable behaviors, such as sustainable consumption and reducing inequality, is essential for addressing climate change, improving health outcomes and achieving Sustainable Development Goals (SDGs). To understand these behaviors, concern and commitment for the next generation, i.e., generativity, is established to be important. However, little is known about how generativity is related to sustainable food purchase intentions and what encourages people to make a lasting shift to sustainable food consumption (SFC). In addition, few studies have investigated how fairness and inequality arise from the status quo of equality and how winners righteously act to losers in different situations. Therefore, the aim of this study is to examine the effect of cognitive interventions, i.e., future design (FD) approach and accountability, for the persistent change to sustainable behaviors and suggest some possible policy recommendations to achieve SDGs in both developed and developing countries.

The first study in this research considers the extended theory of planned behavior (TPB), investigating the question "how generativity matters for consumers' intentions to purchase sustainable foods along with environmental concerns (EC)?" and the hypothesis "prosocial attitudes for future generations (PAF), one measure of generativity, is the key determinant." We employ a field survey, collecting data on the intentions to purchase organic foods (INT), TPB constructs, i.e., attitudes, subjective norms and perceived behavioral controls, PAF and EC with 300 household heads in Bangladesh. We confirm the significance of PAF and EC on top of TPB constructs by testing the causality through partial-least squares structural equation modeling, yielding two main results. First, not only PAF but also EC have

substantial positive effects on consumer intentions to purchase organic foods. Second, the relations between PAF and INT as well as those between EC and INT are fully and partially mediated by attitudes, respectively. Thus, PAF and EC are established to be key determinants for favorable attitudes toward sustainable food-purchase intentions. Overall, the results demonstrate that enhancement of people's orientations for environment and future generations is effective at shaping sustainable food cultures and practices, and to this end, some future-studies approaches in education, i.e., school and family levels, shall be recommended.

In the second study, we consider a FD approach where people are asked to think about a problem and take actions through taking a perspective of future generations, investigating the question "how does the FD approach impact food consumption?" and the hypothesis "FD induces a lasting shift to SFC." We employ a social experiment with three treatments of "control group," "deliberation" and "FD," collecting data on organic and nonorganic vegetable consumption with 300 households in Bangladesh over three months. In the control group, households report the consumption. In deliberation, they additionally deliberate among their family members to think of a vision, a mission and a strategy for the consumption. In the FD treatment, participants additionally consider the perspectives of past, current and future generations before deliberating on the same issues. Results indicate that FD affects people to have a sustained increase (decrease) in organic (nonorganic) vegetable consumption as compared to any other treatment, and the effect under FD is approximately twice as much as that under deliberation in magnitude and in each round. Overall, FD demonstrates a great potential for inducing people to make a persistent change to SFC.

The third study considers the accountability, investigating "how being accountable for decisions influence winners to behave toward losers, even when the winners are determined by chance." It is hypothesized that "winners behave righteously (or fairly) to losers as they are asked to be accountable for their decisions." We institute a winner righteousness game (WRG) in a group of three subjects with equal endowments as the control, and conduct a laboratory experiment with 297 subjects that consists of three steps. First, each subject decides how much to take endowments from losers as if she is a winner. Second, a lottery determines whether she becomes a winner or a loser. Third, she takes the endowment

from each loser following her decisions in the 1st step if she is a winner. Otherwise, her endowment shall be taken by each winner. Two treatments are prepared: (i) intragenerational accountability (IAA) and (ii) intergenerational accountability (IRA). Additionally, every subject is asked to be accountable for her "take" decisions, providing the reasons and advice to unknown others in groups that will play WRG later for IAA or to unknown others in the "subsequent groups" within a generational lineup for IRA. Being accountable signifies subjects not to take the endowments as compared to those in the control, and the "take" reduction in IRA is twice as much as that in IAA. Overall, winners righteously behave towards losers for fairness and equality, specially when they are accountable for their decisions with an intergenerational linkage of groups.

Key Words: Sustainable food consumption; Organic vegetables; Purchase intentions; Righteousness; Generitivity; Environmental concerns, Future design; Accountability; Social experiment; Laboratory experiment; Bangladesh; Japan

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Chapter 1

Introduction

Humanity is currently facing the effects of unsustainable lifestyles in various domains. Climate change and the transgression of other planetary boundaries are more evident in our daily lives than ever (Rockström et al., 2009). Extreme weather, wildfires, droughts, floods, crop failures and biodiversity loss are but a few instances among many. A way to tackle these pressing issues is through individual behavioral change. Behaviors are deemed sustainable if they serve current requirements without compromising the capacity of future generations to satisfy their own needs (Brundtland, 1987). Sustainable behaviors are vital in societies because they help build resilient communities that ensure social equity, environmental protection and long-term well-being for current and future generations (Höpfl et al., 2024, Pinho and Gomes, 2023). By embracing fairness and justice, individuals contribute to systems where resources and opportunities are accessible to all, fostering inclusion, trust and a sense of collective responsibility. Such practices mitigate urgent global challenges, such as climate change, inequality and resource depletion while promoting solidarity and enhancing quality of life for everyone involved. With the 2030 deadline approaching in five years, the Sustainable Development Goals (SDGs) report presents a sobering evaluation: "while the SDGs have enhanced millions of lives, the existing rate of progress is inadequate to accomplish all the Goals by 2030 (UN, 2025)." Nevertheless, progress towards the SDGs has been precarious and uneven, with millions still experiencing extreme poverty, hunger, escalating conflicts, climate turmoil, increasing inequalities and inadequate access to essential services. Consequently, this study seeks to experimentally address some possible medium-term or long-term behavioral changes towards sustainability.

Sustainable consumption behaviors are incorporated in the UN's 2030 Agenda for Sustainable Development as Goal 12 (Szulc-Obłoza and Żurek, 2024). It is recognized as one of the three primary objectives that are crucial elements of sustainable development, alongside eliminating poverty and natural resource management, to promote economic and social development (UN, 2024). During this

fifteen-year plan, little changes in consumption can significantly influence society, the environment and the economy. Another sustainable behavior involves reducing inequality, i.e., winner's righteousness to losers, in contemporary winner-take-all societies, which aligns with Goal 10 of SDGs. Globally, 20 % of individuals claim to have experienced discrimination based on grounds prohibited by international law in the past year, with the highest rates observed in Least Developed Countries, averaging 24.3 % (UN, 2024). Inequality poses a significant threat to sustained social and economic development, undermines efforts to reduce poverty and diminishes individuals' sense of fulfillment and self-worth. This can lead to crime, disease and environmental degradation. Sustainable development cannot be attained, nor can the planet be improved for all, if individuals are deprived of the opportunity for an enhanced quality of life. Overall, sustainable consumption and reducing inequality are both critically important, as they address the root causes and symptoms of many global challenges, including poverty and environmental degradation.

Human behaviors are argued to be explained via dual-process theories in cognition (Evans, 2008, Kahneman, 2011). The theory posits two distinct cognitive processes that govern decisions and behaviors, i.e., automatic and deliberative ones. The automatic processes are concerned with peripheral routes of information processing, while the deliberative ones are concerned with the central routes that require some cognitive efforts. Thus, the deliberative one is known to be associated with languages and with the capacity to think about future and counterfactual possibilities. It is demonstrated that some interventions on the automatic and deliberative processes can have short-term or immediate effects across different domains, while the long-term effects are not well documented (Allcott and Rogers, 2014, Abrahamse, 2020). Such long-term behavioral changes are known to be achieved through habit formations, a change in mental contents and cognition, recursive social exchanges and benefit calculation in deliberative cognitive processes (Rogers and Frey, 2015, Volpp and Loewenstein, 2020). Rothman et al. (2009) suggests that interventions on deliberative processes shall be effective at maintaining a long-term behavioral change, requiring systematic data collection over sufficiently long time. Moreover, the determinants of sustainable behaviors have been examined through multiple theoretical lenses, with particular emphasis on the relationship between people intentions, motivations and their

enacted behaviors. Among these approaches, the theory of planned behavior (TPB), an extension of Fishbein and Ajzen's theory of reasoned action, stands out as a widely influential framework, demonstrating substantial explanatory power across a broad range of behavioral domains (Fishbein and Ajzen, 2009, Ajzen, 2011).

Limited studies have investigated how generativity, concern and commitment for the next generation, is related to sustainable behavioral intentions and what encourages people to make a lasting shift to sustainable behaviors, i.e., sustainable food consumption (SFC) and winner's righteousness to losers. Therefore, in this research, we first identify the drivers for sustainable food purchase intentions, focusing on prosocial attitudes for future generations and environmental concerns on top of theory of planned behavior (TPB) constructs. In the second stage, we experimentally identify the causal effect of a deliberative cognitive interventions, such as future design (FD) approach, for inducing people to make a persistent change to sustainable food consumption. Finally, we investigate how asking people to be accountable for decisions influences their behaviors toward losers as they are winners by chance. The lessons learned from this study shall be useful for guiding the ongoing issues to achieve SDGs.

The latter parts of this thesis are organized as follows: **Chapter** 2 entitled "drivers for sustainable food purchase intentions: Prosocial attitudes for future generations and environmental concerns" examines how generativity matters for consumers' intentions to purchase sustainable foods along with environmental concerns (EC) from a field survey. The study of deliberative cognitive interventions, i.e., FD, for sustainable food consumption, which presents a social experiment in Bangladesh and the main findings related to this experiment, is presented in **Chapter** 3 entitled "does future design induce people to make a persistent change to sustainable food consumption?" **Chapter** 4 presents a laboratory experiment in Japan entitled "accountability and righteousness" that addresses how being accountable for decisions influence winners to behave toward losers, even when the winners are determined by chance. Finally, **Chapter** 5 renders the conclusion.

Chapter 2

Drivers for sustainable food purchase intentions: Prosocial attitudes for future generations and environmental concerns

2.1 Introduction

Practicing sustainable food consumption is an essential component to minimize environmental impacts and to conserve our planet for future generations (Ivanova et al., 2016, UN, 2024). We are using resources almost twice as fast as the Earth can regenerate them and contributing 34 % of greenhouse gas emissions into the atmosphere through our food systems, causing various environmental impacts, i.e., high global temperature and rising sea levels, to jeopardize the needs of future generations (Grooten and Almond, 2018, Crippa et al., 2021, Lin et al., 2023, UNEP, 2024). Sustainable foods respond to basic needs and improve quality of life, minimizing natural resource consumptions, toxic materials and emissions of waste and pollutants over the life cycle to protect the needs of future generations (Oslo Ministerial Roundtable, 1994, Reisch et al., 2013). In order to achieve economic growth and sustainable development, it is imperative that we promptly change our food consumption by encouraging the purchase intentions of sustainable foods, such as organic foods (Schader et al., 2015, Nguyen et al., 2021, Randall et al., 2024). There are several studies that have examined generativity, concern and commitment for the next generation, as a key for understanding people's sustainable behaviors (Wells et al., 2016, Luo et al., 2023, Wang et al., 2023). This research addresses prosocial attitudes for future generations, one measure of generativity, along with environmental concerns to characterize sustainable food purchase intentions.

The theory of planned behavior (TPB) asserts that the intentions to engage on a behavior can predict people's actual behaviors (Ajzen, 1991, 2015). In this theory, intentions are determined by three

conceptually independent sociopsychological constructs, i.e., attitudes, subjective norms and perceived behavioral controls. Attitudes refer to the degree to which a person has a favorable or unfavorable evaluation for performing a behavior, having a more substantial effect on intentions than subjective norms and perceived behavioral controls (Ajzen, 2015, Savari and Gharechaee, 2020). The subjective norms indicate that behavioral intentions are based on the approval or disapproval of some individuals who are important to the person. In addition, perceived behavioral control refers to one's level of perception of ease and difficulty in performing a behavior. Some factors, such as opportunities, resources, time, knowledge and skills, may not be in control but they affect their intentions. In a variety of contexts, several studies have already demonstrated the predictive efficacy of this theory concerning people's food purchase intentions (Verbeke and Vackier, 2005, Vermeir and Verbeke, 2007, Fleșeriu et al., 2020, Parrella et al., 2024, Bahraseman et al., 2025). Robinson and Smith (2002) demonstrate that attitudes, perceived behavioral control and subjective norms independently predict purchase intentions of sustainable products. Accordingly, people have a high intention to perform a certain behavior, when they assess the results of the behavior as favorable (attitudes), when they perceive social pressure to perform the behavior (subjective norms) and when they believe that they possess the capability to perform the behavior (perceived behavioral controls).

Lierature reveals that environmental concerns (EC), as an additional domain-specific factor, exert a positive effect on attitudes associated with sustainable foods and the purchase intentions of green products (Verhoef, 2005, Newton et al., 2015, Goh and Balaji, 2016, Yadav, 2016, Maehle and Skjeret, 2022, Prakash et al., 2023). Kim and Choi (2005) estimate the causal effect of collectivism, environmental concerns and perceived consumer effectiveness on ecological consumption by conducting a field survey at a university, reporting that environmental concerns directly influence sustainable purchase behaviors. Nguyen et al. (2021) have investigated the determinants of consumer intentions to purchase organic meat by conducting a survey with 402 Vietnamese consumers at five food stores and find that consumers who are concerned about environment are likely to possess favorable attitudes associated with organic foods purchase. However, some studies report an insignificant association between EC and behavioral intentions (Smith and Paladino, 2010, Donald et al., 2014, Hwang, 2016). Yadav and

Pathak (2016) investigate Indian consumers' intentions to purchase organic foods via a questionnaire survey for 220 young adults. They proclaim that EC does not have any influence on purchase intentions. As the results in the related literature have been inconsistent, it is claimed that further research on the effects of EC on purchasing behaviors is necessary (Kautish and Dash, 2017).

Prior research has highlighted the positive role of generativity in characterizing green policy attitudes and various sustainable behaviors, such as environmentalism, reducing household wastes, water and energy saving (Milfont and Sibley, 2011, Urien and Kilbourne, 2011, Alisat et al., 2014, Jia et al., 2015, Wells et al., 2016, Aitken et al., 2020, Watkins and Goodwin, 2020, Sharma et al., 2023). Wang et al. (2023) examine the role of generativity on sustainable behaviors of tourists by conducting a questionnaire survey with 702 on-site tourists in China. They reveal that generative concerns positively influence environmentally responsible behaviors. Luo et al. (2023) demonstrate in their field research that generativity has a significantly positive effect on green policy and behaviors, while employees' green attitudes and commitments play a mediating role. Prosocial attitudes for future generations (PAF) are the general sense of responsibility for the community and future generations that are instead central to Erikson's conceptuality of generativity (Erikson, 1963, Morselli and Passini, 2015). It is considered one measure of generativity and is more consistently linked to future orientations than other generativity measures (Morselli and Passini, 2015, Barnett et al., 2021). Syropoulos et al. (2020) find that those who feel responsible towards protecting future generations are reported to have pro-environmental beliefs, intentions and support for environmental policies. Overall, measuring generativity through PAF can be considered crucial to combat societal challenges, such as climate change and the depletion of natural resources, as well as achieving sustainable development goals (SDGs) (Aaldering et al., 2024, Barnett et al., 2021).

Previous studies have established the concepts of generativity and EC, confirming the relationships with some key behaviors to SDGs (Hirose et al., 2023, Sharma et al., 2023). People's consumption intentions and behaviors have been examined by addressing other constructs and factors in TPB, i.e., trust, labels, certifications, moral obligations or food habits (Al-Swidi et al., 2014, Rana and Paul, 2017, Fleșeriu et al., 2020, Chen, 2020, Leyva-Hernández et al., 2023, Randall et al., 2024). However, little

is known about how generativity and EC are related to food consumption intentions and behaviors. In this study, we focus on the effect of PAF (one measure of generativity) and EC together on top of TPB constructs, examining whether or not they are the drivers for sustainable food purchase intentions. Therefore, we pose a question "how generativity matters for consumers' intentions to purchase sustainable foods along with environmental concerns (EC)?" hypothesizing that PAF is the key determinant. We design and institute a field survey, collecting data on intentions to purchase organic foods (INT), TPB constructs, i.e., attitudes, subjective norms and perceived behavioral controls, PAF and EC, with 300 household heads in Bangladesh. The novelties of this study lie in considering PAF and EC together in a single framework on top of TPB constructs and in testing the causality of sustainable food purchase intentions through partial-least squares structural equation modeling. Addressing the question and hypothesis in the analytical framework shall be beneficial for suggesting a new perspective towards sustainable food cultures and practices as well as tackling issues related to SDGs.

2.2 Theoretical background

In formulating the conceptual framework, we employ the theory of planned behavior (TPB) as proposed by Ajzen (1985) (see figure 2.2). It is an effective foundation for addressing the intricacies of human behaviors. The theory integrates key concepts from social and behavioral sciences, defining them in a manner that facilitates the prediction and comprehension of specific behaviors within designated situations (Ajzen, 1991). Attitudes (ATT) towards a behavior, subjective norms (SN) for the behavior and perceived behavioral controls (PBC) are formulated to predict the behavioral intentions with considerable accuracy. Although the TPB assumes that intentions is explained by ATT, SN and PBC, other variables may be relevant since they enhance the comprehension of people's behavior (Fishbein and Ajzen, 2009). The pertinent background factors to be incorporated in TPB models vary according to the behaviors and population being examined, although their impact on behavioral intentions is anticipated to be mediated by TPB constructs (Ajzen, 2011).

TPB is fundamentally receptive to the incorporation of additional constructs (Fishbein and Ajzen,

2009). Consequently, an expanding corpus of work employs models derived from TPB while incorporating other variables to account for anticipated behaviors. Environmental concerns (EC) have been a prevailing social theme since the 1990s (Roberts and Bacon, 1997, Kim and Choi, 2005, Fleșeriu et al., 2020). It refers to the extent to which people are aware of environmental issues and support the attempts and/or willing to contribute to sustainability (Grunert and Juhl, 1995, Dunlap and Jones, 2002, Rhead et al., 2015). Environmental consciousness among people is associated with the altruistic values of consumers or their altruistic purchase intentions, since consumers frequently choose sustainable foods due to their pro-environmental behaviors (Yadav, 2016). According to Roberts and Bacon (1997) and Yadav and Pathak (2016), people's responses on items, such as "the balance of nature is very delicate and can be easily upset," "human beings are severely abusing the environment," "human must maintain the balance with nature in order to survive" and "human interferences with nature often produce disastrous consequences," can reflect their environmental concerns. Overall, individual concerns for the environment are fundamental to environmental research and have a relationship with environment-friendly attitudes and behaviors (Hines et al., 1987, Goh and Balaji, 2016).

Future-studies approaches have been studied in the past few decades to provide institutional proposals and theoretical frameworks for changing behavioral intentions and strategies towards sustainability (Swart et al., 2004, Bell, 2009, Phdungsilp, 2011, Timilsina et al., 2020). It is gradually established that how people are concerned about the future and how they take the perspective of future generations change their behaviors and preferences (Saijo, 2020, Pandit et al., 2021, Shahen et al., 2021). One popular way to incorporate it as a determinant of behavioral intentions is "generativity." It refers to concern for and commitment to the wellbeing of future generations (Erikson, 1963, McAdams and Logan, 2004). Erikson (1963)'s theory of human development posits that such a concern encompasses a broad spectrum, extending from the impulse to have children to a willingness to contribute for future generations. Therefore, it is closely linked to notions of social responsibility and agency (McAdams et al., 1993, Morselli and Passini, 2015). Generativity has been studied by many researchers through utilizing the different measurements, such as the generative behavior checklist (GBC) (McAdams et al., 1993, Aubin and McAdams, 1995, Shahen et al., 2019, Timilsina et al., 2019a). However, a generative con-

cern by the prosocial attitudes for future generations (PAF) is considered more appropriate to measure a future orientation than any other measure, i.e., Erikson Generativity Scale (EGS) and Loyola Generativity Scale (LGS) (Morselli and Passini, 2015, Barnett et al., 2021). With the reason, we decide to use PAF as a measure of the generativity concerns in our study for sustainable food purchase intentions, and the measuring items, i.e., "I carry out activities in order to ensure a better world for future generations," "I give up part of my daily comforts to foster the development of next generations," "I commit myself to do things that will survive even after I die" and "I help people to improve themselves," are designed to capture the concerns for future generations and social responsibilities (Morselli and Passini, 2015). On the basis of above discussion we take the further steps to add on existing literature, considering PAF along with EC as important factors in TPB to determine sustainable food purchase intentions (see figure 2.2).

2.3 Food consumptions in Bangladesh

Up to the mid-20th century, the food system in Bangladesh could be broadly characterized as sustainable, being considered a pre-stage of organic agriculture (MoA, 2016). Farmers used to grow different crops, using organic inputs and depending on the hydrological conditions. A household food consumption pattern was the type of "cereal-sugar-aquatic" with low food consumption quantity from 1961 to 1971 (Jia et al., 2023). To become self-sufficient in food production, Bangladesh entered an era of the green revolution in 1972 and started practicing conventional agriculture systems through the application of chemical fertilizers, pesticides and plant growth promoters, such as hormones (Ferdous et al., 2021). The average application rate of chemical fertilizer on per hectare of arable land was only 16.2 kg in 1970 and it dramatically increases to 384 kg in 2021 (FAO, 2021), targeting the increases in cropping intensity and food production for a growing population. As a result, organic farming took a backseat and consumers began purchasing nonorganic foods, because of the sheer abundance and low prices. At present, the food preferences of Bangladeshi consumers are mostly centered around cereals, such as rice and wheat, with vegetables, fruits, fish and meat (GoB, 2021, Ishra et al., 2022).

The consumption of rice and wheat approximately accounts for 44 % of total food intake per capita per day in 2022. According to the household income and expenditure survey of Bangladesh in 2022, the per capita intake of vegetables and fruits has increased from 0.209 kg to 0.297 kg during the past decade (BBS, 2023a). Due to its abundance of rivers and ponds, fish serves as the main source of protein in Bangladesh, meeting 60 % of the country's total animal protein needs (Shamsuzzaman et al., 2020, BBS, 2023b). In general, household food cultures and practices in Bangladesh are dominated by nonorganic foods from the conventional agriculture.

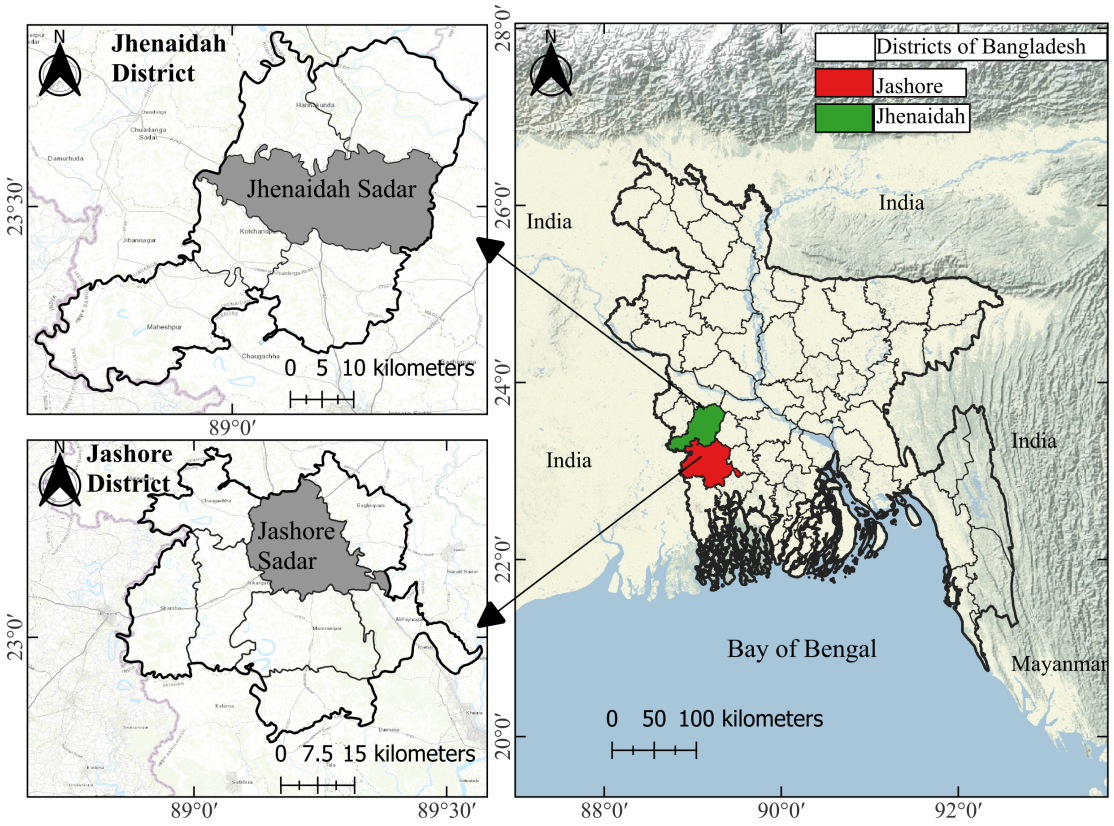
Increasing income, population growth and urbanization are now changing lifestyles and, consequently, food consumptions patterns and food systems, turning out to be diversified with increasing total food consumptions (Mottaleb et al., 2018, BBS, 2023a, Jia et al., 2023). Multiple studies find that the use of pesticides in agricultural production in Bangladesh is extensive and it encompasses the utilization of highly hazardous chemicals as well as banned pesticides (Akter et al., 2018, Dasgupta and Meisner, 2005, Hasan et al., 2014). As a consequence, there have been several risks to human health and environment, which undermine the safety of foods (Haque et al., 2017, Islam et al., 2021). In response to these outcomes, non-governmental organizations initiated the implementation of organic agriculture in the early 1990s and have continued to increase purchase intentions of organic foods among consumers (Ferdous et al., 2021). Additionally, the government introduced the national organic agriculture policy in 2016, with a focus on promoting sustainable food production and consumption (MoA, 2016). Many consumers embrace the belief that "you are what you eat" and comprehend the meaning of food quality, safety and environmental impacts. This has led to an increase in demand for organic foods, while the market in Bangladesh is in a nascent phase (Ishra et al., 2022, Willer et al., 2024). Overall, the shift in consumption behaviors through favorable consumer attitudes towards organic food-purchase intentions is still urgent for achieving sustainable food consumption (Rana and Paul, 2017, Kabir and Islam, 2022, Akter et al., 2023).

2.4 Methods

2.4.1 Study areas, sample and sampling strategy

We selected Jashore and Jhenaidah as our study areas, situated in the south-western region of Bangladesh and considered as a regional agricultural hub. Figure 2.1 depicts our study areas and these are the ones of some specific areas in Bangladesh where locally produced foods meet certain requirements for organic foods and people can purchase them in the markets or from the farm gates as their daily practices (Dhaka Tribune, 2014, Musa et al., 2015, Seraj, 2019, Hajong et al., 2024, Kabir, 2025). Jhenaidah is considered as a gateway of the south-western region of Bangladesh and it has six sub-districts. Jashore is the thirteen biggest district in Bangladesh from the side of administrative structure, having eight sub-districts (figure 2.1). On average, both areas are 250 kilometres from capital Dhaka by road. The sociodemographic and ethnic profiles of these areas' populations are homogeneous and closely align with the national average (BBS, 2020, 2023b). A cross-sectional design was applied to collect data from household heads during the month of January 2023. The household heads were selected by following the stratified random sampling techniques. As organic vegetables are locally grown and marketed mainly in the study areas, we consider the household heads in these areas as the sampling units for our research and divided it into two strata, i.e., Jashore and Jhenaidah, based on their geographic location. The sampling frame had been prepared from the existing residence list kept in respective local government offices (Upazila Parishad). We randomly selected 150 household heads in each of Jashore and Jhenaidah areas by using the residence list and the random number generators, finally identifying a total of 300 household heads. The 1st author administered the survey, organized and trained local support staffs as well as research assistants. Research assistants contacted the selected household heads, collected written consent and obtained their sociodemographic information, sociopsychological constructs and organic foods purchase intentions by conducting the survey questionnaires. We followed the face to face data collection method and the total questionnaire session took almost 30 minutes to complete. There was a fixed participation fee (= 50 BDT) per household head,

Figure 2.1: The study areas in Bangladesh, Jashore and Jhenaidah



transferring to their bank accounts after completing the survey.

2.4.2 Key variables

A field survey with two-parts questionnaire was conducted for collecting the data of key variables. The first part includes the sociodemographic characteristics of household heads: gender, age, household income, education and household members. The second part includes a series of statements designed to measure sociopsychological constructs: attitudes (ATT), subjective norms (SN), perceived behavioral control (PBC), prosocial attitudes for future generations (PAF), environmental concerns (EC) and intentions to purchase organic foods (INT). Before finalizing the questionnaires, it underwent a pretesting procedure with 10 household heads in each area by the authors. We do not use the data from the pretesting procedure in our analysis. We assess the constructs by employing multi-item scales, and

Table 2.1: Definitions of variables

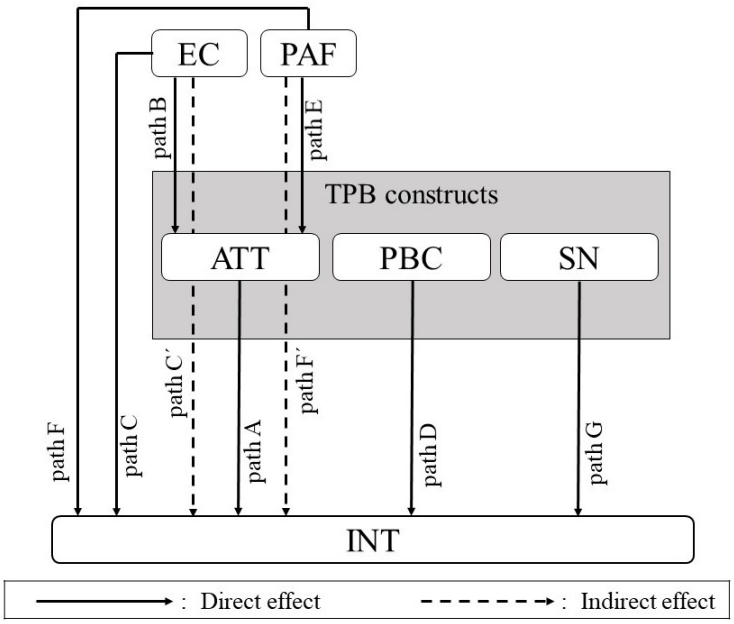
Variables	Measuring items
Attitudes (ATT)	(Singh and Verma, 2017, Pacho, 2020, Dorce et al., 2021)
	ATT1: I think purchasing organic foods would be pleasant
	ATT2: I believe organic foods is very useful to meet the nutritional needs
	ATT3: I think purchasing organic foods is a good idea
Subjective norms (SN)	(Al-Swidi et al., 2014, Pacho, 2020)
	SN1: People whose opinion I value would generally believe that organic foods are better for health
	SN2: My close friends would appreciate if I purchase organic foods
	SN3: My family thinks that I should buy organic foods rather than nonorganic
Perceived behavioral controls (PBC)	(Al-Swidi et al., 2014, Asif et al., 2018)
	PBC1: I can take the decision independently to buy organic foods
	PBC2: I have the financial capability to buy organic foods
	PBC3: I can handle any difficulties (money, time and information related) associated with my buying decision
Environmental concerns (EC)	(Yadav and Pathak, 2016, Fleșeriu et al., 2020)
	EC1: The balance of nature is very delicate and can be easily upset
	EC2: Human beings are severely abusing the environment
	EC3: Humans must maintain the balance with nature in order to survive
	EC4: Human interferences with nature often produce disastrous consequences
Prosocial attitudes for future generations (PAF)	(Morselli and Passini, 2015)
	PAF1: I carry out activities in order to ensure a better world for future generations
	PAF2: I give up part of my daily comforts to foster the development of next generations
	PAF3: I commit myself to do things that will survive even after I die
	PAF4: I help people to improve themselves
Intentions to purchase organic foods (INT)	(Yadav and Pathak, 2016, Pacho, 2020)
	INT1: I am willing to purchase organic foods in future
	INT2: I will purchase organic foods on regular basis
	INT3: I try to consume organic foods if they are available for purchase

those are derived from previous research and subsequently adjust for the purposes of this study (see table 2.1). All measuring items adhere to the principle of construct compatibility and the standards for constructing the theory of planned behavior (TPB) questionnaire (Francis et al., 2004, Fishbein and Ajzen, 2009, Lang et al., 2023). Aside from sociodemographic characteristics, all other questions related to measure sociopsychological constructs are designed using a 7-point Likert scale to reduce statistical issues, ranging from 1 (strongly disagree) to 7 (strongly agree) (Fornell, 1992, Gansser and Reich, 2023). The measuring items were subjected to back-translation by native speakers to verify that the contents and meanings remain consistent with the original wordings. In the field, there is a lack of access to computers or devices equipped with internet connectivity. Consequently, all the survey procedures were performed manually by the research assistants. The household heads in the study were literate and used writing tools, including pens and papers, to answer the questions. Whenever the household heads had questions, the research assistants address them in a real-time manner.

2.4.3 Statistical analysis

The analyses utilize cross-sectional survey data from two areas, including variables, such as ATT, SN, PBC, EC, PAF, INT and sociodemographic characteristics (table 2.1 and table 2.2 provide the definitions of all variables). Descriptive statistics are performed to characterize the sample and the main features of the measures. To estimate the direct and indirect effect of sociopsychological constructs on INT, we apply partial-least squares structural equation modeling (PLS-SEM) by using the software SmartPLS 4 (Savari and Gharechaee, 2020, Pennanen et al., 2023, Sobaih et al., 2023, Salma et al., 2024). It has been widely used in various disciplines characterized by nonnormal data, small sample size and complex model structures (Hair et al., 2014, Dorce et al., 2021). The PLS-SEM utilizes the items listed in table 2.1 as reflective indicators for their corresponding constructs, formulating both measurement and structural models (figure 2.3). A satisfactory measurement model is first established by assessing indicator reliability, convergent validity and discriminant validity. Indicators reliability is confirmed by estimating factor loadings of each measuring items (> 0.5), Cronebach's α (> 0.70) and

Figure 2.2: A conceptual framework describing the relationships among attitudes (ATT), subjective norms (SN), perceived behavioral control (PBC), prosocial attitudes for future generations (PAF), environmental concerns (EC) and intentions to purchase organic foods (INT).



composite reliability (C.R) (> 0.70) of each constructs. Both convergent and discriminant validity are corroborated by estimating average variance extracted (AVE) (> 0.50) and Fornell-Lacker (square root of each construct's AVE is grater than the correlations with other constructs) and heterotrait-monotrait ratios (HTMT) (< 0.90), respectively. The thresholds of all reliability and validity indicators mentioned in parentheses are predetermined before conducting data analysis based on Hair et al. (2014). The assessment of the structural model relies on the variance inflation factor (VIF) (< 4.00); model fit indices, i.e., standardized root mean square residuals (SRMR) (< 0.08), d_ULS (i.e., the squared Euclidean distance, offer values that are not significant), d_G (i.e., the geodesic distance, offer values that are not significant) and normed fit index (NFI) (> 0.90); R^2 and path coefficients (Dash and Paul, 2021, Hair and Alamer, 2022). To assess the significance of each path coefficient, we use a bootstrapping procedure with 5000 subsamples and test the mediation effects (Zhao et al., 2010, Dorce et al., 2021).

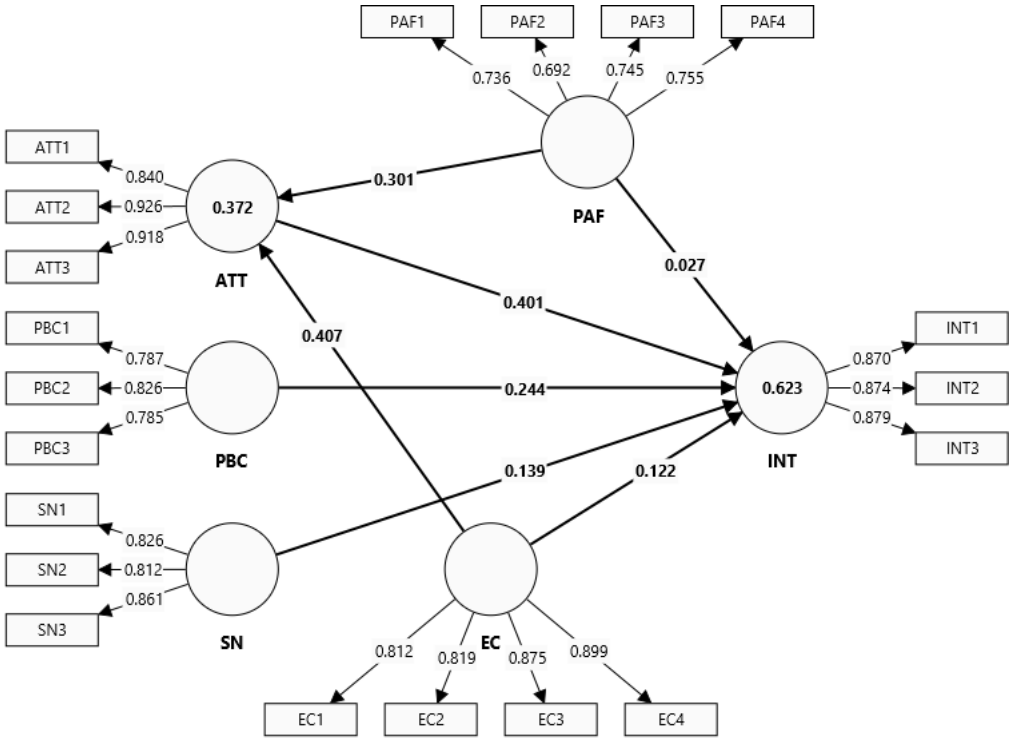
The conceptual framework in figure 2.2 visualizes the relationships among sociopsychological constructs (ATT, PBC, SN, PAF, EC) and intentions to purchase organic foods (INT). We test the direct

and indirect relationships among variables using mediation analysis in figure 2.2 represented by plane and dot arrows respectively. With the framework in mind, our focus is on estimating the path coefficients β^K of each direct (path A: ATT -> INT, path B: EC -> ATT, path C: EC -> INT, path D: PBC -> INT, path E: PAF -> ATT, path F: PAF -> INT and path G: SN -> INT) and indirect paths (path F$'$: PAF -> ATT -> INT and path C$'$: EC -> ATT -> INT) in figure 2.2, where $K = \{\text{path A}, \text{path B}, \text{path C}, \text{path C}', \text{path D}, \text{path E}, \text{path F}, \text{path F}', \text{path G}\}$. Recall our research question: "how generativity matters for consumers' intentions to purchase sustainable foods along with environmental concerns (EC)?" In this regard, the estimated paths coefficients are key parameters enabling us to answer the research question. Specifically, the hypothesis of our research question is posed as, $H_0 : \beta^K = 0$ while the alternatives are $H_1 : \beta^K \neq 0; K = \{\text{path F}, \text{path F}'\}$. It is expected that PAF has the substantial positive effects on INT so that increasing in people's orientations for future generations can improve favorable attitudes toward sustainable food purchase intention.

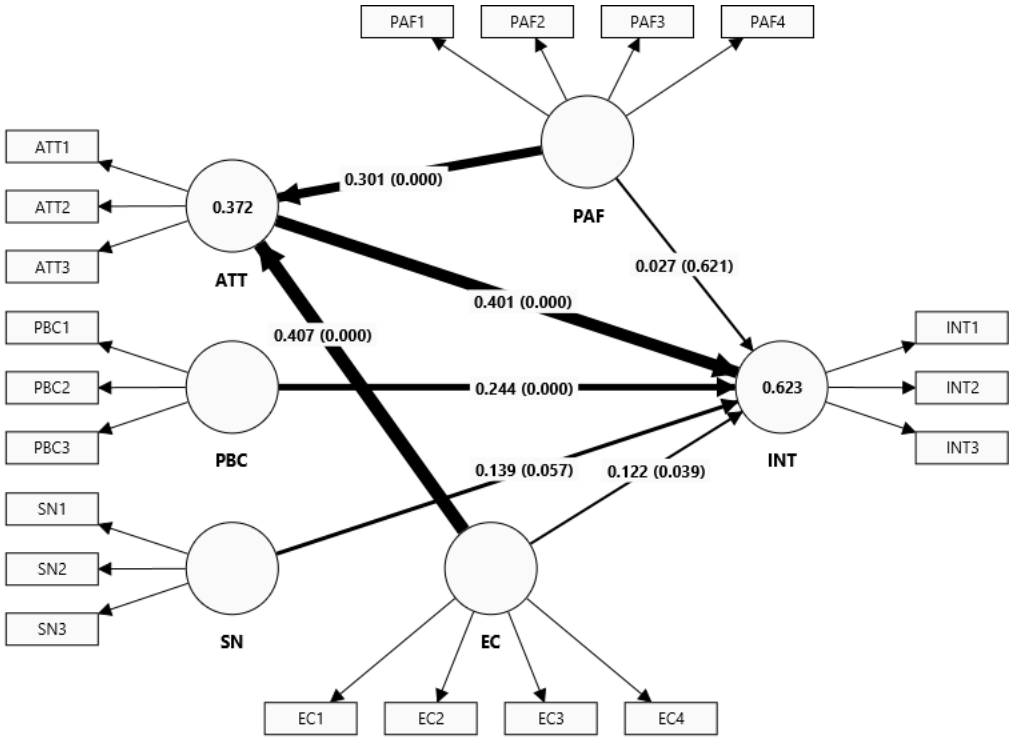
2.5 Results

Sociodemographic characteristics of the 300 household heads are reported in table 2.2. The sample exhibits gender imbalance, with male-headed household heads being the majority (58 %). Half of the participants are younger than 36 years old. Nearly 80 % of the households earn a monthly income below 31 000 BDT. Regarding education, 82 % of household heads have at least 6 years of schooling. Nearly 60 % of households have 4 to 5 persons as household members. According to the household level data reported by the Bangladesh Bureau of Statistics, a notable increase in female-headed households is observed recently in national level, reaching its highest level (17.4 %) in a decade (BBS, 2023b,a). Nearly 40 % people in Bangladesh are between 16 to 35 years of age and the literacy rate is 74.66 %. The average monthly household income is 32 422 BDT and the average household size is 4.26 at the national level. In these sense, the results can be interpreted that the sample closely mirrors the population of Bangladeshi household heads.

The results in table 2.3 shows the percentages of household heads who respond with each score (1



(a) Measurement model



(b) Structural model

Figure 2.3: Measurement and structural models for intention to purchase organic foods

Table 2.2: Sociodemographic characteristics of the respondents

Sociodemographic characteristics	Frequency	Percentage (%)	Average (Median)	Standard deviation
Gender[a]			0.42 (0.00)	0.49
Male	174	58		
Female	126	42		
Age			36.73 (35.00)	12.13
16-25 years old	63	21		
26-35 years old	92	31		
36-45 years old	77	25		
46-55 years old	42	14		
56 years old and above	26	9		
Household income[b]			25969 (20000)	16706.01
Less than 10 000 BDT[c]	16	5		
10000-20 000 BDT	143	47		
21000-30 000 BDT	74	25		
31000-40 000 BDT	30	10		
41000-50 000 BDT	14	5		
More than 50 000 BDT	23	8		
Education[d]			2.55 (2.00)	1.07
1-5 years of schooling	55	18		
6-10 years of schooling	105	35		
11-12 years of schooling	60	20		
Undergraduate or graduate degree	80	27		
Household members[e]			4.59 (4.00)	1.67
1-3 persons	64	21		
4-5 persons	175	59		
More than 5 persons	61	20		

[a] Gender is a dummy variable. It takes 1 when a subject is female, otherwise 0.
[b] Monthly household income in BDT
[c] BDT stands for Bangladeshi currency "taka."
[d] 1 to 5 years of schooling $=$ 1, 6 to 10 years of schooling $=$ 2, 11 to 12 years of schooling $=$ 3, and undergraduate or graduate degree $=$ 4
[e] Total number of household members

Table 2.3: Percentage of participants who respond with each score (1 to 7-strongly disagree to strongly agree) for each measuring items.

Measuring items	Scores						
	1	2	3	4	5	6	7
ATT1	1.000	1.333	4.667	16.000	42.333	28.333	6.333
ATT2	0.000	0.333	4.000	19.333	39.333	27.667	9.333
ATT3	0.000	0.000	3.000	13.667	43.333	26.667	13.333
SN1	1.000	2.667	5.333	18.000	48.333	19.333	5.333
SN2	2.667	4.333	8.000	24.667	40.333	15.333	4.667
SN3	0.667	2.000	5.333	11.667	47.000	25.667	7.667
PBC1	2.667	2.333	10.667	12.667	50.667	14.333	6.667
PBC2	2.333	6.667	7.667	9.333	50.333	17.333	6.333
PBC3	2.667	7.333	21.000	26.667	35.333	5.333	1.667
EC1	1.333	1.667	6.333	20.333	45.000	16.333	9.000
EC2	0.667	2.333	3.667	5.667	39.333	33.000	15.333
EC3	0.667	1.000	1.000	7.667	45.333	26.333	18.000
EC4	0.333	1.000	4.333	14.667	44.667	20.667	14.333
PAF1	5.667	4.333	11.667	12.667	43.667	17.667	4.333
PAF2	1.000	1.000	3.000	11.667	50.000	26.333	7.000
PAF3	3.000	1.667	3.000	6.333	48.667	24.667	12.667
PAF4	0.667	1.667	3.667	6.000	48.000	32.333	7.667
INT1	0.333	1.333	2.000	5.333	49.667	28.333	13.000
INT2	1.333	0.000	4.333	9.333	46.333	28.667	10.000
INT3	0.667	0.667	3.667	12.000	46.000	28.000	9.000

to 7) for each measuring item of constructs. In general, the results indicate a tendency towards positive attitudes (ATT), encouraging subjective norms (SN) and slightly high perceived behavioral controls (PBC) and high intentions to purchase organic foods (INT). This is because at least 60 % of household heads give their responses at score 5 or higher for the majority of the statements used to measure these constructs (with the exception of PBC3). The results also expose that the environmental concerns (EC) and prosocial attitude for future generations (PAF) are quite high among household heads, as more than 70 % of them choose responses of 5 or higher for the majority of the of the statements used to measure these two constructs (with the exception of PAF1). Overall, table 2.3 confirms that household heads exhibit a tendency to choose positive responses of the measuring items regarding all constructs.

Table 2.4 presents the results of the constructs reliability, convergent validity and internal consistency to assess a measurement model showed in figure 2.3a. The factor loading values of measuring items, cronbach's α and composite reliability (C.R) values of the constructs range from 0.692 to 0.926, 0.713 to 0.876 and 0.716 to 0.896, respectively. These values are all well above the threshold levels. The values of average variance extracted (AVE) range from 0.536 to 0.801, which is within the acceptable limit of 0.500. The results of discriminant validity are presented in table 2.5, measuring the values of Fornell-Larcker criterion and Heterotrait-monotrait (HTMT) ratios. In Fornell-Larcker criterion, square root of each construct's AVE (ATT $= 0.895$, EC $= 0.852$, INT $= 0.874$, PBC $= 0.800$, PAF $= 0.732$ and SN $= 0.833$) is grater than the correlations with other constructs. Furthermore, HTMT ratios are in acceptable limits, ranging from 0.560 to 0.895. The predictive value, i.e., R^2, of the model indicates that almost 62 % of the variance in INT is explained by PAF, EC and TPB constructs together. Overall, these results can be considered suitable for validating the measurement model.

After obtaining a suitable measurement model, we perform structural model estimation to identify the effect of PAF and EC together on top of TPB constructs (ATT, SN, PBC), testing causality on INT through an interplay with ATT (figure 2.3b). The VIFs (ranges from 1.000 to 2.998) indicate no multicollinearity among constructs. The model fit indices, such as standardized root mean square residuals (SRMR $= 0.065$), d_ULS ($= 0.805$), d_G ($= 0.369$) and normed fit index (NFI $= 0.810$) which are acceptable in range, indicating a proper model fit (Savari and Gharechaee, 2020, Dash and

Table 2.4: Construct reliability and validity indicators of the measurement models

Constructs	Measuring items	Factor loading	Cronbach's α	C.R[a]	AVE[b]
Attitudes (ATT)	ATT1	0.840	0.876	0.896	0.801
	ATT2	0.926			
	ATT3	0.918			
Subjective norms (SN)	SN1	0.826	0.780	0.779	0.694
	SN2	0.812			
	SN3	0.861			
Perceived behavioral controls (PBC)	PBC1	0.787	0.718	0.718	0.639
	PBC2	0.826			
	PBC3	0.785			
Environmental concerns (EC)	EC1	0.812	0.874	0.886	0.726
	EC2	0.819			
	EC3	0.875			
	EC4	0.899			
Prosocial attitudes for future generations (PAF)	PAF1	0.736	0.713	0.716	0.536
	PAF2	0.692			
	PAF3	0.745			
	PAF4	0.755			
Intentions to purchase organic foods (INT)	INT1	0.870	0.846	0.847	0.765
	INT2	0.874			
	INT3	0.879			

[a] C.R stands for composite reliability (roh a)
[b] AVE stands for average variance extracted

Table 2.5: Fornell-Larcker and Heterotrait-monotrait (HTMT) criterion for discriminant validity

	ATT	EC	INT	PBC	PAF	SN
	Fornell-Larcker criterion					
ATT	0.895					
EC	0.548	0.852				
INT	0.728	0.540	0.874			
PBC	0.593	0.449	0.643	0.800		
PAF	0.492	0.467	0.490	0.495	0.732	
SN	0.735	0.544	0.681	0.671	0.629	0.833
	Heterotrait-monotrait (HTMT) ratio					
ATT						
EC	0.613					
INT	0.839	0.621				
PBC	0.736	0.560	0.821			
PAF	0.606	0.597	0.628	0.686		
SN	0.881	0.653	0.837	0.895	0.838	

ATT= Attitudes, EC= Environmental concerns, INT= Intentions to purchase organic foods, PBC= Perceived behavioral controls, PAF= Prosocial attitudes for future generations, SN= Subjective norms

[a] C.R stands for composite reliability

[b] AVE stands for average variance extracted

Paul, 2021, Hair and Alamer, 2022). The results presented in table 2.6 show that most of the path coefficients related to the direct effects of constructs are positive, statistically significant at a 1 to 10 % level and have modest to moderate effect sizes[1]. Among the TPB constructs, ATT ($\beta = 0.401, t = 6.035, p < 0.01, \mathrm{f}^2 = 0.177$ emerge as the most significant determinant of INT followed by PBC ($\beta = 0.244, t = 4.487, p < 0.01, \mathrm{f}^2 = 0.082$) and SN ($\beta = 0.139, t = 1.901, p < 0.10, \mathrm{f}^2 = 0.02$), being in line with some previous literature (Dowd and Burke, 2013, Pacho, 2020). Vermeir and Verbeke (2007), Yadav and Pathak (2016) and Dorce et al. (2021) report that the TPB constructs support the sustainable food purchase intentions, measuring the direct effect through structural equation modeling. Table 2.6 also shows that EC ($\beta = 0.407, t = 6.274, p < 0.01, \mathrm{f}^2 = 0.206$) emerge as the most significant determinant of ATT followed by PAF ($\beta = 0.301, t = 4.501, p < 0.01, \mathrm{f}^2 = 0.113$).

The results in table 2.7 show the effect of EC and PAF on INT through an interplay with ATT using mediation analysis. The path coefficients reveal that EC ($\beta = 0.122, t = 2.065, p < 0.05, \mathrm{f}^2 = 0.03$) has the significant direct effect (path C in figure 2.2) on INT at a 5 % level. This result is considered another confirmation of how environmental concerns are important for inducing sustainable behavioral intentions (Newton et al., 2015, Goh and Balaji, 2016, Prakash et al., 2023). However, the indirect effects of EC ($\beta = 0.164, t = 4.606, p < 0.01$) and PAF ($\beta = 0.121, t = 3.401, p < 0.01$) on INT through ATT (path C$'$ and path F$'$ in figure 2.2) are positive and statistically significant at a 1 % level, resulting partial and full mediation, respectively. EC can be considered a concept that directly influences the sustainable food purchase intentions even in short, medium and long run through both automatic and deliberative cognitive processes, because it is claimed to evoke a sense of urgency, personal responsibility and moral obligation in people's cognitions for the change (Evans, 2008, Kahneman, 2011, Yadav, 2016). It is plausible that EC has a direct contemporaneous effect on the intentions, being partially mediated by attitudes (ATT). On the other hand, PAF can be considered a concept that indirectly influences the intentions only in long run through the deliberative cognitive process, because it is

[1]The path coefficients in the structural model ranging from 0 to 0.10, 0.11 to 0.30, 0.31 to 0.50 and >0.50 are indicative of weak, modest, moderate and strong effect sizes (Dorce et al., 2021, Hair and Alamer, 2022); f^2 value 0.02, 0.15 and 0.35 indicate small, moderate and large effect sizes (Cohen, 1988, Ali et al., 2016).

claimed not to be immediate for most of people to realize the connection between "future generations" and food consumption for the changes (Evans, 2008, Mostafizur et al., 2024). It is plausible that PAF does not have a direct contemporaneous effect on the intentions, being fully mediated by ATT. In other words, PAF characterizes ATT and influences their intentions to act only through the ATT. Overall, PAF ($\beta = 0.148, t = 2.185, p < 0.05$) as well as EC ($\beta = 0.286, t = 4.140, p < 0.01$) have substantial total positive effect on INT. For the robustness check of our results, we include sociodemographic characteristics of the respondents, i.e., gender, age, household income, education and household members, as control variables in our extended TPB models. We confirm that the main results remain the same and report the results in the appendix (see Appendix A for structural and measurement models that include control variables).

Overall, it is evident from the summary statistics that the random selection of the sample are effective enough to represent the Bangladeshi household heads. The sample household heads exhibit a tendency to choose positive responses of the measurement items regarding all sociopsychological constructs. We quantify the direct and indirect effects of PAF, EC and TPB constructs through partial-least squares structural equation modeling (PLS-SEM). The estimation results of construct reliability and validity in table 2.4 confirm a satisfactory measurement model (figure 2.3a). The results associated with structural model in table 2.6 and mediation analysis in table 2.7 provide answers to our research question (how generativity matters for consumers' intentions to purchase sustainable foods along with environmental concerns (EC)?) and support the alternative hypothesis (prosocial attitudes for future generations (PAF), one measure of generativity, is the key determinant) by rejecting the null. It can be concluded that not only PAF, but EC also have substantial positive effects on INT, and relations between PAF and INT as well as EC and INT are fully and partially mediated by ATT, respectively. The results suggest that sustainable food cultures and practices can be improved through increases in people's orientations for future generations and the environment.

Future-studies approaches, such as visioning, backcasting, scenario planning and future design, demonstrate how individuals or organizations can be changed to anticipated future trends and make a behavioral and/or strategic shift in a paradigm (Bell, 2009, Amer et al., 2013, Bibri and Krogstie, 2019,

Table 2.6: Results of the structural model

Relationships between constructs	Path coefficients (β)	Standard deviation	T statistics	Cohen's f^2	Results
ATT -> INT : path A	0.401***	0.067	6.034	0.177	Statistically supported
EC -> ATT : path B	0.407***	0.065	6.274	0.206	Statistically supported
EC -> INT : path C	0.122**	0.059	2.065	0.030	Statistically supported
PBC -> INT : path D	0.244***	0.054	4.487	0.082	Statistically supported
PAF -> ATT : path E	0.301***	0.067	4.501	0.113	Statistically supported
PAF -> INT : path F	0.027	0.054	0.494	0.001	Statistically not supported
SN -> INT : path G	0.139*	0.073	1.901	0.020	Statistically supported

ATT= Attitudes, EC= Environmental concerns, INT= Intentions to purchase organic foods, PBC= Perceived behavioral controls, PAF= Prosocial attitudes for future generations, SN= Subjective norms

***significant at the 1 percent level, **at the 5 percent level and *at the 10 percent level

[a] C.R stands for composite reliability

[b] AVE stands for average variance extracted

Table 2.7: Results of the mediation analysis

Hypothesis	Total effects	Direct effects	Specific indirect effects (β)	LCI	UCI	Results
EC -> ATT -> INT : path C′	0.286***	0.122**	0.164***	0.100	0.237	Partial mediation
PAF -> ATT -> INT : path F′	0.148**	0.027	0.121***	0.059	0.197	Full mediation

ATT= Attitudes, EC= Environmental concerns, INT= Intentions to purchase organic foods, PBC= Perceived behavioral controls, PAF= Prosocial attitudes for future generations, SN= Subjective norms

***significant at the 1 percent level, **at the 5 percent level and *at the 10 percent level

[a] LCI stands for lower confidence interval (2.5 %)

[b] UCI stands for upper confidence interval (97.5 %)

Melkonyan et al., 2019, Saijo, 2020, Ziegler and Oliveira, 2022). They are claimed to improve people's perspectives in problem identification and to enhance people's orientations for future generations and environment (Cook et al., 2014, Tuominen et al., 2014, Wodak and Neale, 2015, Lacroix et al., 2019, Timilsina et al., 2020, Pandit et al., 2021, Shahen et al., 2021, Mostafizur et al., 2024). Given the results in this study, it can be said that introducing some future-studies approaches in education, i.e., school and family levels, is an effective way to build up the orientations, contributing to the organic foods purchase intentions and behaviors. For example, at the school level, future-studies approaches can be integrated to be part of food-intake education, expanding children's perspectives and understanding for sustainability. At the family level, they can also be utilized to induce family members to deliberate about household food problems, thinking about their visions, missions and strategies along with their different perspectives as demonstrated in Mostafizur et al. (2024). Overall, future-studies approaches shall be promising for the applications in education, enabling people to be visionary and to shape sustainable food cultures and practices through identifying the problems and forming the habits at school and family levels.

This research offers contributions both theoretically and managerially. From the theoretical perspective, our extended TPB model is considered to offer a general framework for comprehending the determinants that affect consumer intentions to purchase sustainable foods through studying Bangladeshi people. In TPB, attitudes denote the extent to which a person holds a favorable assessment or belief for performing a behavior, while the origins of these assessments or beliefs are not delineated (Ajzen, 2011). The extended model implies that EC and PAF are the possible background factors that influence the assessments and beliefs. To further establish our findings to be a theoretical contribution, it shall be essential to evaluate whether or not it has the external validity. In general, the TPB is argued to predict behavioral intentions across various cultures and economies despite an existence of the nuanced differences (Muthayya et al., 2014, Hirschfelder et al., 2020, Yuan et al., 2022, Randall et al., 2024). Therefore, understanding the food intentions of Bangladeshi consumers is considered a useful guidance for approximating those of other South and Southeast Asian consumers that share the same types of food cultures, such as rice-based food consumption, corresponding to almost one third of world popu-

lation (IRRI, 2018, Yeung et al., 2018). In addition, due to an increasing importance of global climate change and planetary conservation among people, it is recommended to examine whether or not our model possesses external validity for explaining the intentions in any other part of the world with different food cultures, such as Western countries with wheat-based food consumption. Future research should be able to conduct some cross-cultural comparisons for corroborating the validity of our model by focusing on such a key distinction in food practices.

From the managerial perspective, first, businesses and policymakers shall be able to seize opportunities to cultivate concerns about environment and future generations among targeted consumers, such as household heads and wives in families who have some controls for food purchases. An increase in such concerns among the household heads and wives will encourage family-level favorable attitudes toward sustainable food-purchase intentions. To this end, the future-studies approaches can be applied to be part of the education programs to families, and they can be organized to include some instructions of how food practices are linked to environmental problems as well as welfare of or concerns to future generations for the purpose of enhancing their EC and PAF in relation to the intentions. Second, sustainable food marketers can design their promotional activities through behavioral nudges in supermarkets, focusing on consumers' PAF and EC. For example, when sustainable foods are displayed or promoted in supermarkets, it is good to explicitly indicate or advertise how the consumption shall contribute to environmental problems or the welfare of or concerns to future generations through the pictures, images, animation and other visualizations in the food shelves. Finally, the above targeted consumer education and behavioral nudges shall contribute to the sustainable food purchase intentions, consequently leading to an increase in the consumption based on our extended TPB model.

2.6 Conclusion

This paper has examined the drivers for sustainable food purchase intentions by considering the extended theory of planned behavior (TPB), investigating the question "how generativity matters for consumers' intentions to purchase sustainable foods along with environmental concerns (EC)?" and

the hypothesis "prosocial attitudes for future generations (PAF), one measure of generativity, is the key determinant." To this end, we have implemented a field survey for collecting data on intentions to purchase organic foods (INT), TPB constructs, i.e., attitudes, subjective norms and perceived behavioral controls, PAF and EC, with 300 household heads in Bangladesh. The results show that not only PAF, EC also have substantial positive effects on consumer intention to purchase organic foods along with TPB constructs. The relations between PAF and INT as well as EC and INT are fully and partially mediated by attitudes, respectively. Overall, this research identifies an importance of people's orientations for future generations and environment to shape sustainable food cultures and practices, and to this end, some future-studies approaches shall be recommended due to their effectiveness for enhancing the orientations.

Chapter 3

Does future design induce people to make a persistent change to sustainable food consumption?

3.1 Introduction

Climate change substantially threatens ecological systems, intensifies severe weather events, reduces biodiversity and presents complex risks to our current societal framework (O'neill et al., 2017). The food system is responsible for more than a third of greenhouse gas (GHG) emissions, directly contributing to climate change (Reisch et al., 2013, Crippa et al., 2021). Food is a crucial link between human wellbeing and the planet's health (Sánchez et al., 2021). Household consumptions account for approximately 60 % of global GHG emissions and food is among the most impactful consumption category in terms of emissions (Wellesley et al., 2015, Ivanova et al., 2016). Moreover, dietary factors play a significant role in the worldwide burden of diseases, resulting in 11 million deaths and 255 million disability-adjusted life-years (DALYs) in 2017 (Afshin et al., 2021). Ample evidence indicates that nearly every dimension of human health is also affected by food practices and the disease burdens along with aggregate ecosystem alterations have been growing (Myers et al., 2013). To mitigate ongoing problems with climate change and health, it is crucial to transition our food consumption to be sustainable, i.e., sustainable food consumption (SFC) practices (Vittersø and Tangeland, 2015). There are several studies that have examined the determinants of short-term or immediate changes in food consumption (Vecchio and Cavallo, 2019, Thøgersen, 2000). This research seeks to experimentally address some possible medium-term or long-term behavioral changes to SFC.

Jackson (2006) argues that a SFC concept has emerged recently and it is attributed to the Agenda 21 document, a significant policy suggestion from the United Nations Earth Summit held in Rio in 1992. The SFC is defined to be the use of food products "that respond to basic needs and bring a better quality of life while minimizing the use of natural resources, toxic materials and emissions of waste and

pollutants over the life cycle, so as not to jeopardize the needs of future generations" (Oslo Ministerial Roundtable, 1994). Extensive scientific research and public opinion indicate that current rates and methods of food production and consumption are unsustainable, and such failures of sustainability have resulted in or will result in irreversible negative consequences for future societal wellbeing (Pollard et al., 2010, Grooten and Almond, 2018, Kemper and Ballantine, 2019). Some food consumption is viewed as an effective way to achieve a transition to SFC, such as an increase in organic and/or plant-based food consumption and/or reduction in specific meat consumption (Hoek et al., 2004, Hughner et al., 2007, Vittersø and Tangeland, 2015). Switching consumption from nonorganic to organic foods is considered sustainable because organic agriculture ensures the elimination of synthetic fertilizers and pesticides, veterinary drugs, preservatives and additives from production systems, and helps in the conservation of soil and water. This switching is argued to bring some individual-level and/or family-level consequences, i.e., an increase in food expenditures and an improvement in health status (FAO, 1998, Wheeler et al., 2015, FAO, 2023).

Several field and lab experiments have examined some impacts of interventions on automatic processes, such as nudging, labels and visual prompts, in a variety of contexts to alter people's consumption behaviors (Brunner et al., 2018, Hummel and Maedche, 2019, Majer et al., 2022, Qi et al., 2022, Segovia et al., 2023). A field experiment by Vandenbroele et al. (2018) investigates whether introducing some small-sized commodity to a retailer's assortment encourages consumers to buy, finding that it successfully nudges consumers to do so. Lohmann et al. (2022) estimate the causal effect of some labels on individual food choices through experiments at cafeterias at five different universities, revealing that carbon footprint labels promote climatarian diets. Another set of studies has carried out a series of experiments to investigate the immediate effects of interventions on deliberative processes by noting descriptive information provisions and social norms to subjects, confirming the existence of such effects on people's decisions and behaviors (Monroe et al., 2015, Sparkman and Walton, 2017, Stöckli et al., 2018, Nguyen et al., 2022, Bazoche et al., 2023). A study by Carfora et al. (2019) tests the impact of different messaging interventions on people's attitudes and behaviors with respect to red and processed meat consumption in field experiments with 350 university students in Italy. Their results

suggest that health and environmental messages have some prolonged effects even after one month of the interventions. Overall, the literature has generally established that some interventions in automatic and deliberative processes can have short-term or immediate effects on consumption behaviors, while the long-term effects are not well documented (Allcott and Rogers, 2014, Abrahamse, 2020).

Future studies approaches, i.e., visioning, backcasting and scenario planning, have been studied in the past few decades to depict how a group of people or organizations adapt to anticipated future trends and to provide insights into opportunities for changes in behaviors and strategies (Bell, 2009, Amer et al., 2013). Most of these future studies approaches utilize visioning to share and understand a thorough, robust and consensus-based vision among the participants in the workshops (Costanza, 2000, Potschin et al., 2010, Wiek and Iwaniec, 2014). Prior research has applied backcasting and/or scenario planning with visioning in various domains, such as businesses, natural resource management and economies in a society, for various adaptations and changes (Pereverza et al., 2019, Thorén and Vendel, 2019, Sandström et al., 2020). However, there is little empirical evidence regarding how much such future studies approaches impact people's or organizational behaviors and strategies (Oliver, 2023). A new approach called future design (FD) has gained attention and research interest, empirically establishing the impact on the behaviors and strategies in experiments (Saijo, 2020, Timilsina et al., 2020, Pandit et al., 2021, Shahen et al., 2021). However, the impacts have yet to be proven to persist in the medium or long-term. FD comprises a series of procedures where people read a case-method material and think about a problem by taking each perspective of past, current and future (Nakagawa et al., 2019, Pandit et al., 2021). After that they take the perspective of future generations, make deliberations and request some visions, missions and strategies to current generations. Finally, taking the current generations perspective, people suggest their own visions, missions and strategies for the problem. To enhance intergenerational sustainability, researchers introduce future ahead and back (FAB) and intergenerational accountability mechanisms as part of FD approaches (Shahen et al., 2021, Timilsina et al., 2023). MacAskill (2022) also proposes a similar idea to introduce "longtermism" as a view that we should do much more to protect the interests of future generations, recognizing that our current actions will have a significant impact on countless future people. Nevertheless, FD offers a series of procedures

to address a problem, developing self accountability through visions, missions and strategies and taking the perspective of different times.

Previous research has focused primarily on examining immediate or short-term changes in people's behaviors. Few studies have documented sustained behavioral changes and studied how some interventions, such as future studies approaches, affect people in the medium or long run. Some recent researches have presented a great potential of FD approach to induce people to make long-term changes in their behaviors, demonstrating its strong effectiveness for short-term changes through laboratory and field experiments (Timilsina et al., 2020, Pandit et al., 2021, Shahen et al., 2021, Timilsina et al., 2023). In this study, we focus on examining the possible impacts on people's food consumption behaviors by FD interventions as an experimental study for long-term behavioral changes because the persistent shift to SFC is known to be crucial for addressing global climate change and health issues. Therefore, we pose a question "how does the FD approach impact food consumption," hypothesizing that FD induces a lasting shift to SFC. We design and institute a 3-round social experiment with three treatments of "control group," "deliberation" and "FD," collecting data on organic and nonorganic vegetable consumption with 300 households in Bangladesh over three months. Addressing this question and hypothesis will be beneficial for inducing people to make a persistent change to SFC in tackling issues related to the Sustainable Development Goals (SDGs).

3.2 Methods

3.2.1 Study areas and sampling strategy

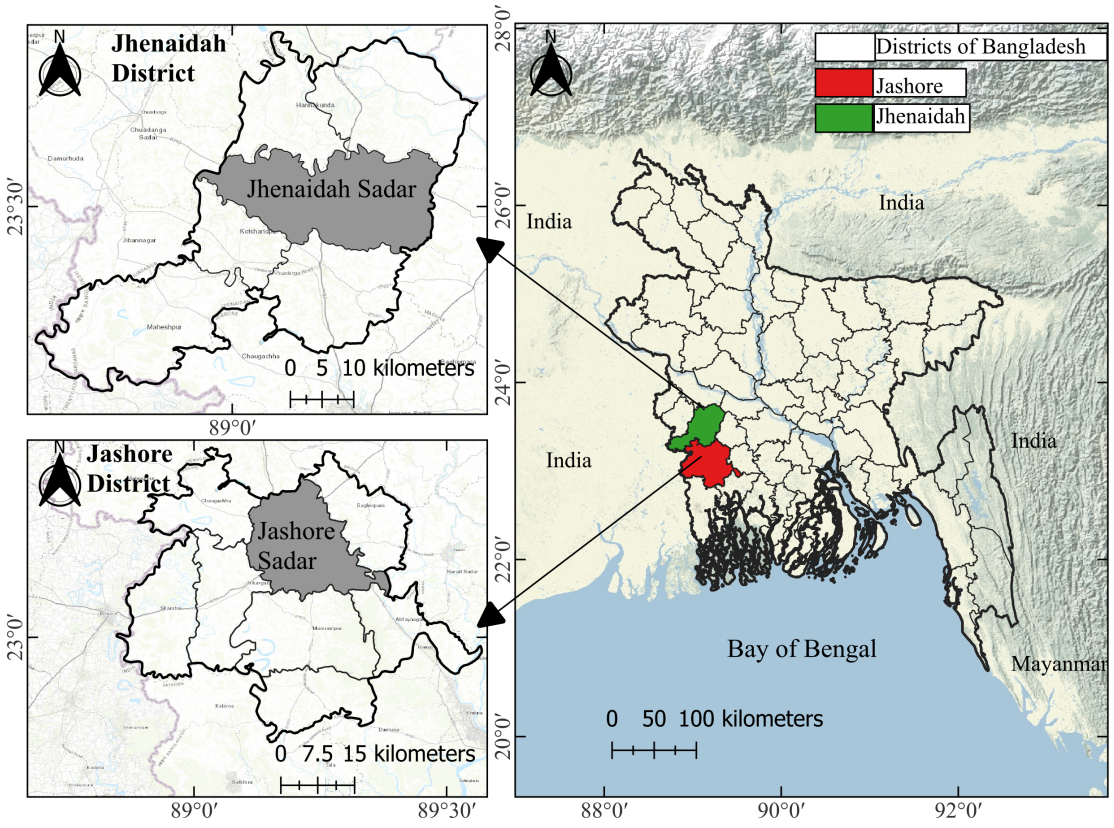
We chose Jashore and Jhenaidah as our study areas and they are located in the southwestern region of Bangladesh. Figure 3.1 illustrates the study areas which are recognized as a regional center of agriculture, particularly vegetable production (BBS, 2022). People's sociodemographic and ethnic profiles in these two areas are homogeneous and close to the country's average (BBS, 2020). In Bangladesh, there are some specific areas where local agricultural production meets certain requirements for organic agriculture, and our study areas are the ones that engage in such organic agriculture (Dhaka Tribune,

2014, Seraj, 2019). Organic agriculture is a comprehensive approach toward food production that aims to improve the health of agroecosystems including biodiversity, biological cycles and soil activities (Gomez and Thivant, 2017). This approach highlights the utilization of natural inputs, such as minerals and plant-derived products, while abstaining from the use of synthetic fertilizers and pesticides (Singh and George, 2012, Ferdous et al., 2021). However, nonorganic agriculture involves modern agricultural practices that rely heavily on synthetic chemical fertilizers, fungicides, insecticides and herbicides (Campion et al., 2020). In the areas, the market prices of organic vegetables are comparable to those of nonorganic vegetables, and farmers can choose how much organic and nonorganic vegetables to produce depending on their production environments, modes and methods in each growing season (FAO, 2023). Therefore, both organic and nonorganic vegetables are produced and traded in agricultural markets at the local vicinity, while local people have some experience purchasing and consuming organic and nonorganic vegetables from the markets or from farm gates as part of their daily practices[1] (Dhaka Tribune, 2014, Musa et al., 2015, Seraj, 2019). The features in our study areas are considered appropriate for conducting our social experiments.

Three treatments, control group, deliberation and future design (FD), are prepared for the experiments over three rounds ($t = 1, 2$ and 3) between January 2023 and March 2023, comprising one pretreatment round and two posttreatment rounds (figure 3.2a). The households were selected by following the stratified random sampling techniques. As organic vegetables are locally grown and marketed mainly in the study areas, we considered the households in these areas as the sampling units for our research and divided them into two strata, i.e., Jashore and Jhenaidah, based on their geographic

[1]In the areas, 25 % to 30 % of organic-vegetable farmers sell their products by themselves as traders in local markets, and the rest of the farmers ask some traders to sell their products. In such market environments, households recognize the local traders who sell organic vegetables by the two reasons. First, due to the nature of short-shelf lives for organic vegetables, the traders prioritize to sell them by voluntarily making some verbal communications and informal labels in different baskets to households (or customers). These communications and informal labels enable households to know which traders sell organic vegetables and to purchase them. Second, local people understand vegetables to be organic or nonorganic by visual observations in the following three points: (1) glossiness, (2) imperfections in shapes and (3) freshness. They identify vegetables to be organic, when the vegetables are less glossy, imperfect on shapes and fresh.

Figure 3.1: The study areas in Bangladesh, Jashore and Jhenaidah



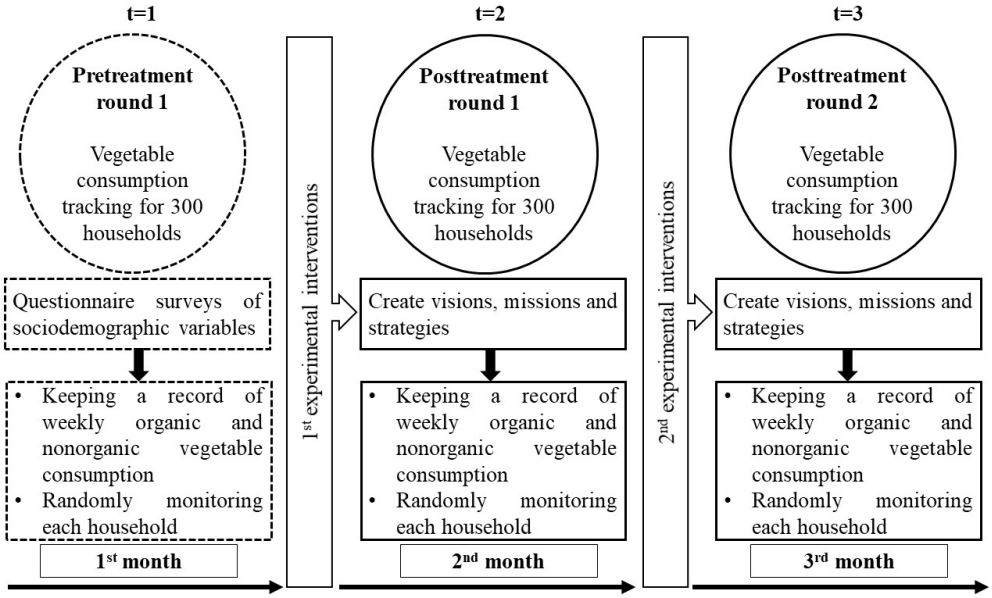
location. The sampling frame had been prepared from the existing residence list kept in respective local government offices (Upazila Parishad). We randomly selected 150 households in each of Jashore and Jhenaidah areas by using the residence list and the random number generators, totaling 300 households. The randomization procedures were also employed to assign 50 out of the 150 households to each of the three treatments within one area, and consequently, 100 households are assigned to each treatment.[2] In each area, we conducted 6 experimental sessions and in each session, we randomly assigned households to one of three treatments. The 1st author administered the experiments, organized and trained local support staff as well as research assistants for the households' recruitment, participation and data collection, explaining our experiments as the programs organized by the university and the Upazila agriculture office to the households. The households received an instruction for an overview of the programs and signed an informed consent form for their participation in advance (see the appendix material B for the experimental instructions). Therefore, they participated without noticing that they are part of our experiments, while the participation rate was approximately 85 %.[3] This reflects that a majority of households are familiar with organic and nonorganic vegetables, considering the program participation fee (= 900 BDT) to be good enough. The fees were solely provided as the compensation for their involvement in the programs comprising the three rounds of our experiments, and the amount was the same for all the households.

3.2.2 Experimental setup and procedures

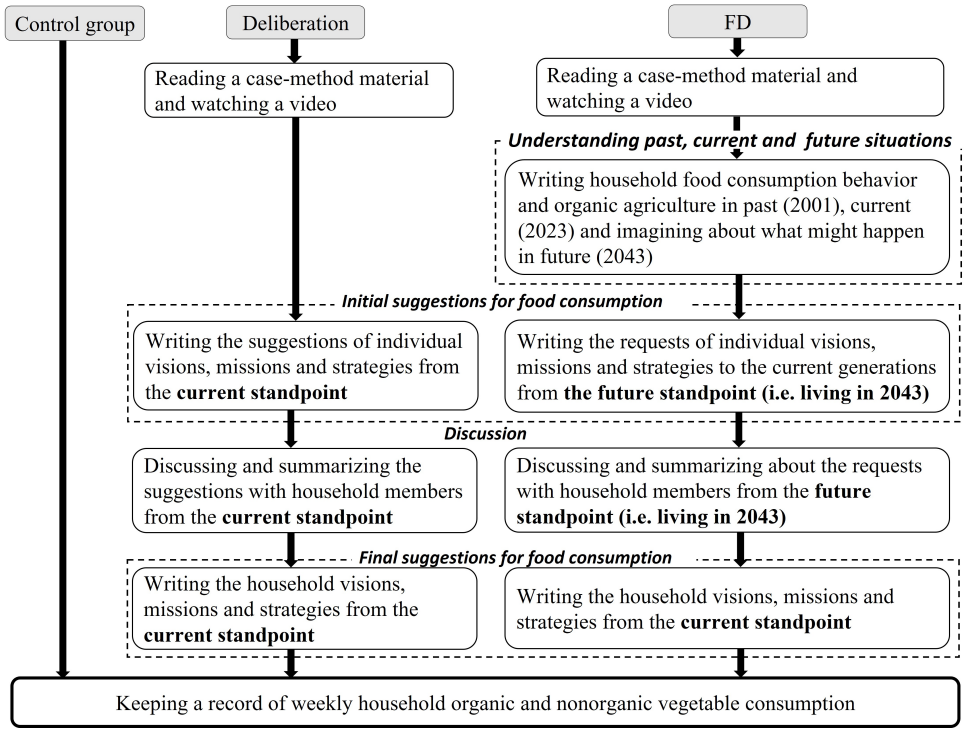
The social experiments along with questionnaire surveys were conducted to collect necessary information from the households regarding their sociodemographic variables, daily organic and nonorganic vegetable consumption in a week for each round to calculate their weekly organic vegetable consump-

[2]We include every household in the analysis that was randomly recruited with his/her agreement and allocated to be in one group following an intention-to-treat principle (Montori and Guyatt, 2001, Gupta, 2011, McCoy, 2017).

[3]Some households rejected their participation due to several reasons, such as health problems. We sought to recruit households for reaching a sample size of 300. The participation rate represents the ratio between the number of households we invited through sampling processes and the number of households who actually participated in the programs.



(a) The temporal flows of experiments over three rounds, pretreatment round 1, posttreatment round 1 and posttreatment round 2



(b) The procedures in each of the 1st and 2nd experimental interventions for deliberation and future design (FD) treatments as compared to no intervention for control group

Figure 3.2: Experimental procedures over time and the flow of experimental interventions per treatment

tion (OVC) and nonorganic vegetable consumption (NVC) (figure 4.4). We collect weekly vegetable consumption data in each round, implicitly choosing a specific week with an interval of one month. We do so to capture the persistent change precisely, considering the food culture of Bangladeshi households, as well as the time and cost involved in conducting the research.[4] The sociodemographic variables include the household head's pretreatment knowledge about organic food, age, gender, education, household income, a number of family members under 18 and earning members (see the appendix material C for collecting information of the pretreatmnt knowledge). The information regarding some time-invariant sociodemographic variables is collected only in the pretreatment round. The prices for OVC and NVC are not included as independent variables, because they remain the same for households across treatments over three periods. In the field, there is a lack of access to computers or devices equipped with internet connectivity. Consequently, all the procedures were conducted manually by the experimenter and research assistants. The households in the study were literate and employed traditional writing instruments, namely pens and papers, to respond to the inquiries. Whenever the households had questions, the experimenter or research assistants sought to answer them in a real-time manner.

Deliberation and future design (FD) treatments are set to examine the effects on household food consumption in each area on top of control group one, consisting of the 1st and 2nd experimental interventions between two rounds (figure 3.2b). With this design, we test a hypothesis "FD induces a lasting shift to SFC as compared to the control group and deliberation." Households in control group are asked to help in recording and reporting their OVC and NVC over three rounds without any experimental

[4]Households think that they are under monitoring all the weeks in each round without knowing that experimenters implicitly choose a week for precisely monitoring and measuring food consumption. At the same time, we admit that there may be an alternative way to quantify a persistent change in food consumption, such as trying to collect every-day data over months without specifying a week. However, we conclude that these procedures become too demanding for our research team as well as for households in terms of time and cost, and it shall be very difficult to precisely collect all day consumption data. Overall, considering food cultures, practices and the nature of Bangladeshi households, we do believe that the data-collection procedure we use in this research is one of the most effective ways to precisely measure and quantify the persistent change by streamlining the burden, costs and time on several aspects.

intervention, being considered "untreated" over all periods. In deliberation and FD, households receive some experimental interventions that consist of reading case-method materials, watching a video and discussing about their food consumption regarding OVC and NVC between the two rounds (figure 3.2b). Therefore, households in deliberation and FD are considered "untreated" in pretreatment round 1 ($t = 1$), and "treated" in posttreatment rounds 1 and 2 ($t = 2$ and 3). The case-method materials provide households with a brief history, definitions and current situations of organic and nonorganic foods in their native language for easy comprehension (see the appendix D for case-method materials). In a video, scientific information and facts about organic and nonorganic foods along with the detailed production and consumption processes in Bangladesh are introduced over 10 minutes, referring to some books, reports and articles (Sarker and Itohara, 2008, Yoshino, 2010, Zulfiqar and Thapa, 2016, Gomez and Thivant, 2017, Ferdous et al., 2021, BBS, 2022). In the native language (Bengali) version of a case-method material and video, we use easy and simple translations of all words and sentences so that the subject matter is easy to understand and free from citations and academic jargon.

In deliberation, household heads are first asked to write their initial suggestions for betterment of household food consumption after reading the case-method materials and watching a video (figure 3.2b). They are asked to sit for approximately 10 to 20 minutes of discussion with household members and then to summarize the suggestions raised via the discussion. Ultimately, they are requested to write their household visions, missions and strategies as the final suggestions for the betterment. In FD, after reading case-method materials and watching a video, household heads are asked to write down their evaluations and understanding about food consumption and organic agriculture, taking each perspective of people in the past (2001), in the current (2023). Additionally, they are asked to imagine what will possibly happen or what they should do in terms of food consumption in the future, taking perspectives of people both in the current (2023) and in the future (2043) to expand their ways of thinking and their viewpoints (Timilsina et al., 2020, Pandit et al., 2021, Shahen et al., 2021) (figure 3.2b). When household heads and members take the future standpoint, they are asked to think and write possible requests of visions, missions and strategies for food consumption to the current as if they are people in the future (2043). Therefore, they discuss with their household members from the future

standpoint and summarize the requests. Finally, household heads and members are asked to get back to the current standpoint, writing their final suggestions of household visions, missions and strategies for food consumption. In deliberation, household heads and members complete every intervention only from their own current standpoint. However, in FD, household heads and members go through different perspectives of people in the past, current and future to complete every intervention. In particular, they are asked to make the requests to the current from the future standpoint, finally getting back to the current standpoint for finalizing their visions, missions and strategies.

We track and monitor weekly organic and nonorganic vegetable consumption for 300 households in pretreatment round 1, posttreatment round 1 and posttreatment round 2 over three months. Households are randomly monitored through visits by RAs or the 1st author over a month in each round, and we sought to confirm that their vegetable purchases and consumption are truthfully reported.[5] In particular, we implicitly pick a specific week for intensive observations and monitoring of each household in each round across treatment to obtain precise OVC and NVC, and households never know which week is that specific week. In experimental economics research, there are concerns that subjects may feel pressured when they consider what the experimenters want them to do ("wants" effect) and how their behaviors are monitored ("monitoring" effect). We consider that the implicit "wants" and "monitoring" effects households perceive from our experiments shall not be so different among the treatments.[6] In addition,

[5]There are 5 and 6 markets in Jhenaidah and Jashore areas, respectively, where both organic and nonorganic vegetables are traded and households purchase them there. We assigned 5 to 7 RAs to a market and each RA is in charge of handling 5-7 households in a specific week for daily intensive observations and monitoring in each round across treatments. Each RA is asked to be present in a market approximately 3 hours during the trade opening time every day, observing and recording the organic and nonorganic vegetables the households actually purchase by knowing which trader deals with organic or nonorganic vegetables in advance. After the records are obtained, they are cross-checked with the self-reported OVC and NVC by households. Note that, in the areas, it is customary that traders do not generate any purchase receipts for customers, and this local custom prevents us from using the receipts for the confirmation of OVC and NVC.

[6]In the three treatments, explanations were provided to all households on what they are going to do through participating in the governmental programs and how they are going to be monitored for tracking OVC and NVC in advance. On the one hand, they are not aware of the other treatments. Based on their understanding, they are asked to decide their participation by signing consent forms. Given the education level of our sampled households, even those in the control group are likely to recognize which vegetables are considered healthy. As a result, they may align with the program's preference for organic

the households are not incentivized by OVC and NVC, receiving uniform payments independently of their consumption by participating in the experiments. In pretreatment round 1, all households are asked to provide sociodemographic information by completing questionnaires and the weekly vegetable consumption without any experimental intervention (figure 3.2a). Just before posttreatment round 1, the 1st experimental interventions take place for the households in deliberation and FD (see the 1st experimental interventions in figure 3.2a). After the 1st interventions, we track weekly vegetable consumption and randomly monitor each household over posttreatment round 1. In total, we conduct 12 sessions and organize a session of 20 to 30 households for the experimental interventions in the control group, deliberation and FD treatments that take approximately 30, 80 and 100 minutes, respectively. Just before posttreatment round 2, the 2nd experimental interventions are implemented, following the same procedures as the 1st experimental interventions. After that, we keep track of the consumption and monitor each household over posttreatment round 2 as in posttreatment round 1. Upon completing the three rounds, a program participation fee was transferred to the bank accounts of the participating households.

3.2.3 Statistical analyses

Difference-in-differences (DID) method has become an increasingly popular way to estimate causal relationships, identifying a specific treatment (Chakrabarti et al., 2018, Hossain et al., 2019). We utilize this method in our analysis to estimate the treatment effects by controlling or accounting for time-invariant variables as well as pre and post treatment periods (Angrist and Pischke, 2009, Chakrabarti et al., 2018). In DID, the underlying assumption is that a dependent variable is assumed to be normally distributed. With this assumption, the estimates and their standard errors are derived from ordinary least squares estimators in panel data (Wooldridge, 2010). DID estimates are (consistent, unbiased and) inefficient when the distributional assumption is not satisfied. In the analysis, our dependent variables,

over nonorganic options. Moreover, they are likely aware of the implicit pressures associated with the program, once they choose to participate. In other words, what the participating households commonly know and understand irrespective of the treatments is an existence of the "wants" and "monitoring" effects.

Table 3.1: Definitions of variables

Variables	Descriptions
Dependent variables	
Organic vegetable consumption (OVC)	Weekly consumption of organic vegetable in kg
Nonorganic vegetable consumption (NVC)	Weekly consumption of nonorganic vegetable in kg
Independent variables	
Treatments (Base group = Control group)	
Deliberation treatment	It takes 1 when a household is in deliberation treatment, otherwise 0
Future design treatment	It takes 1 when a household is in future design treatment, otherwise 0
Sociodemographic variables	
Preknowledge	Household head's pretreatment knowledge about organic food from 1 to 7 (low = 1, mostly low = 2, somewhat low = 3, neither high nor low = 4, somewhat high = 5, mostly high = 6 and high = 7)
Age	Household head's age is expressed by years
Gender	It takes 1 when a subject is female, otherwise 0
Household income	Monthly income in BDT[a]
Education	Household head's education from 0 to 6 (no formal education or no schooling = 0, 1 to 5 years of schooling = 1, 6 to 8 years of schooling = 2, 9 to 10 years of schooling or secondary school certificate = 3, 11 to 12 years of schooling or higher secondary school certificate = 4, undergraduate university degree or equivalent = 5 and graduate degree or equivalent = 6)
Total family members under 18 (TFM)	Number of persons in a family living together under 18 years old
Total earning members (TEM)	Number of earning persons in a family

[a] BDT stands for Bangladeshi currency "taka."

namely, OVC and NVC, are considered semicontinuous, including 10 % to 20 % of the observations to be zero. This implies that the distributions are not normal, and the associated DID estimates may mislead the conclusions due to possible inefficiency. Considering this, we apply a two-part model for the robustness check, because it provides flexibility in the specifications and distributional assumptions for semicontinuous dependent variables (Belotti et al., 2015, Pallegedara, 2020, Jiang and Ni, 2020, Cameron and Trivedi, 2022a). It also allows us to utilize both cross-sectional and panel structures in our data, estimating the marginal effects of treatments along with control factors, i.e., sociodemographic variables.

The experimental panel data over three rounds of $t = \{1, 2, 3\}$ from 300 households are organized and utilized for the statistical analyses, consisting of OVC, NVC, treatment dummies and sociodemographic variables (see table 3.1 for the definitions of all variables). To estimate the treatment effects, we apply a DID method with multiple-time periods (see, e.g., Wooldridge, 2010, Callaway and Sant'Anna, 2021, Braghieri et al., 2022, Cameron and Trivedi, 2022b, Kemigisha et al., 2023). DID compares changes over time in two groups: one that received the intervention and one that did not. By comparing how both groups' behaviors changed before and after the intervention, this method helps isolate the effect of Future Design from other external influences. With this method, the pre-post difference in the mean vegetable (organic and nonorganic) household consumption in deliberation or FD is compared with that in the control group, and it enables the identification of the aggregated average treatment effect on the treated denoted by $AATT_j^K$ for $K = \{\text{OVC}, \text{NVC}\}$ and $j = \{\text{deliberation}, \text{FD}\}$ (Callaway and Sant'Anna, 2021).

The equations are specified as follows:

$$AATT_j^K = \sum_{t=2}^{3} \omega(g,t) \cdot ATT_j^K(g,t) \tag{3.1}$$

$$Y_{it}^K = \gamma_t^K + \gamma_g^K + \sum_{e=0}^{1} \gamma_e^K \, deliberation_{it}^e + \gamma_x^K \mathbf{X}_i + u_{it} \tag{3.2}$$

$$Y_{it}^K = \lambda_t^K + \lambda_g^K + \sum_{e=0}^{1} \lambda_e^K \, FD_{it}^e + \lambda_x^K \mathbf{X}_i + \epsilon_{it}. \tag{3.3}$$

where g is the time period when a household first becomes treated, $\omega(g,t)$ is the weighting function and $ATT_j^K(g,t)$ is the average treatment effects on the treated (Callaway and Sant'Anna, 2021). Households in the control group had remained untreated for all periods, being specified as a group by $g = 0$, whereas those in deliberation and FD treatments are treated in the periods $t = 2$ and $t = 3$, being specified as a group by $g = 2$. In equations (3.2) and (3.3), Y_{it}^Ks are the dependent variables of OVC and NVC from households indexed by $i = 1, \ldots, 300$; $deliberation_{it}^e$ and FD_{it}^e are the treatment dummy variables, taking a value of 1 when household i is treated at time period t; e is the length of a treatment exposure ($e = t - g$); $\mathbf{X}_i$ is a vector of the pretreatment sociodemographic variables; γ_t^K and λ_t^K are parameters for time-fixed effects; γ_g^K and λ_g^K are parameters for group-fixed effects; γ_x^K and λ_x^K are vectors of parameters associated with $\mathbf{X}_i$; and u_{it} and ϵ_{it} are error terms. Finally, γ_e^K and λ_e^K are the main parameters of interests used to measure the average treatment effects across different lengths of exposure to the treatment, i.e., $ATT_{\text{deli}}^K(2,2) = \mathbb{E}(\gamma_0^K)$, $ATT_{\text{deli}}^K(2,3) = \mathbb{E}(\gamma_0^K + \gamma_1^K)$, $ATT_{\text{FD}}^K(2,2) = \mathbb{E}(\lambda_0^K)$ and $ATT_{\text{FD}}^K(2,3) = \mathbb{E}(\lambda_0^K + \lambda_1^K)$.

As a robustness check, we apply a two-part model with random effects using the probit-glm framework (see, e.g., Belotti et al., 2015, Eisenberg et al., 2015, Farewell et al., 2017, Pallegedara, 2020, Jiang and Ni, 2020, Dangerfield et al., 2021, Amore and Murtinu, 2021, Kruse et al., 2021, Cameron and Trivedi, 2022a, Bazoche et al., 2023). This model accounts for controlling potential confounding variables, i.e., sociodemographic factors, in both cross-sectional and panel structures in our data for efficient estimations as there might be some systematic differences between treated and control households. In general, the first part of this model looks at whether a household consume any amount of organic (nonorganic) vegetables (yes/no) and the second part examines how much they consume, conditional on confirming a consumption. This approach is particularly appropriate when many households have zero consumption (Cameron and Trivedi, 2022a). In the first part, a probit model is estimated for the probability of observing a positive OVC or a positive NVC versus zero. In the second part, conditional on positive consumption, a generalized linear model (glm) is estimated with a family of gamma and log links through validating a modified Park and Prigibon test, respectively (see, e.g., Polgreen and

Brooks, 2012, Glick, 2015, Ng and Cribbie, 2017). The two-part model is specified as follows:

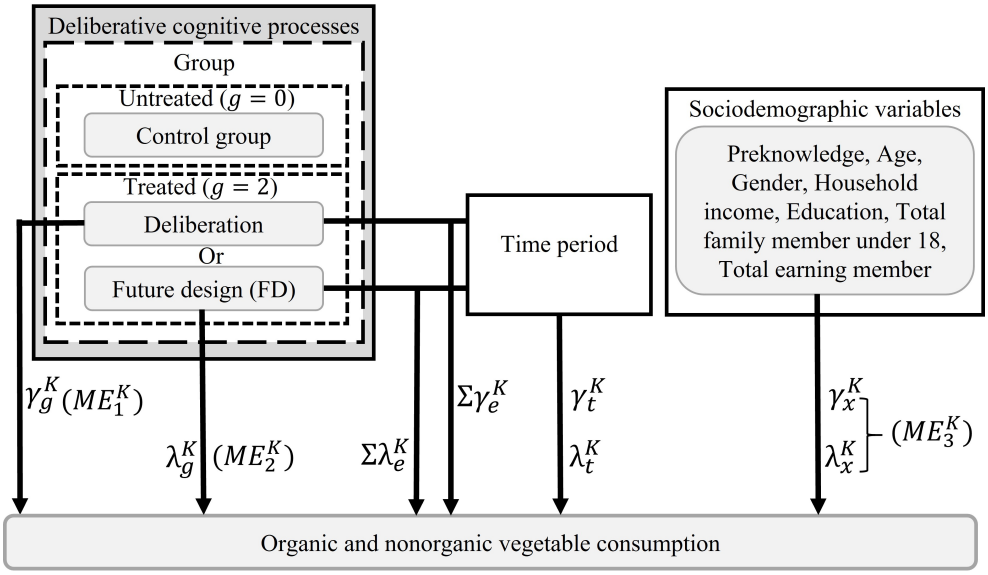
$$\Phi^{-1}\Pr(Y_{it}^K > 0|\mathbf{W}_{it}) = \alpha_0^K + \alpha_1^K \textit{deliberation}_{it} + \alpha_2^K \textit{FD}_{it} + \alpha_3^K \mathbf{X}_{it} + V_i^K \tag{3.4}$$

$$\log[\mathbb{E}(Y_{it}^K|Y_{it}^K > 0, \mathbf{W}_{it})] = \beta_0^K + \beta_1^K \textit{deliberation}_{it} + \beta_2^K \textit{FD}_{it} + \beta_3^K \mathbf{X}_{it} + U_i^K \tag{3.5}$$

where Φ^{-1} is the probit link function; Y_{it}^Ks are dependent variables of OVC and NVC for household i at time period t; $\mathbf{W}_{it}$ is a vector of all the independent variables; $\textit{deliberation}_{it}$ and $\textit{FD}_{it}$ are treatment dummy variables that take a value of 1 when household i is in deliberation or FD at time period t, respectively; $\mathbf{X}_{it}$ is a vector of the pretreatment sociodemographic variables; and V_i^K and U_i^K are random intercepts which are assumed to be uncorrelated with $\mathbf{W}_{it}$. The α_1^K, α_2^K and α_3^K (β_1^K, β_2^K and β_3^K) are parameters to be estimated by the probit model (glm), and our main concerns are related to estimating $\alpha_1^K, \alpha_2^K, \beta_1^K$ and β_2^K associated with $\textit{deliberation}_{it}$ and $\textit{FD}_{it}$, controlling for other independent variables. We estimate the two-part model of equations (3.4) and (3.5) for posttreatment round 1, posttreatment round 2 as well as for the panel data by applying the generalized structural equation model (GSEM) approach (Jiang and Ni, 2020, Cameron and Trivedi, 2022a). Finally, the combined marginal effects for each independent variable in all models are computed with the estimated coefficients to quantify the magnitude of the impacts by deliberation and FD treatments on the dependent variables (Wooldridge, 2010, Jiang and Ni, 2020, Cameron and Trivedi, 2022a).

Figure 3.3 displays a conceptual framework for our empirical analysis, considering the DID and two-part model to estimate treatment effects. It visualizes the relationships among groups (g), time periods (t), sociodemographic variables ($\mathbf{X}_i$) and households' consumption of organic and nonorganic vegetables (Y_{it}^K). The relationships among variables represented by plain arrows in figure 3.3 are statistically identified by estimating parameters in equations (3.1) to (3.5). In DID, our focus is on estimating the coefficients of λ_e^K, λ_g^K, λ_t^K and λ_x^K in figure 3.3 and on comparing the estimates with those in equation (3.2). In two-part model, we focus on the marginal effects of $\textit{ME}_1^K$, $\textit{ME}_2^K$ and $\textit{ME}_3^K$ estimated from the parameters in equations (3.4) and (3.5) associated with $\textit{deliberation}_{it}$, $\textit{FD}_{it}$ and $\mathbf{X}_{it}$, respectively (see figure 3.3). Recall our research question "how does the FD approach impact food con-

Figure 3.3: A conceptual framework describing the relationships among group, time period, sociodemographic variables, organic vegetable consumption (OVC) and nonorganic vegetable consumption (NVC) where γ_g^K, γ_t^K, γ_e^K, λ_g^K, λ_t^K, λ_e^K and γ_x^K, λ_x^K are coefficients and vector coefficients for the corresponding factor in DID model; $K = \{\text{OVC}, \text{NVC}\}$; and in parenthesis, ME_1^K, ME_2^K and ME_3^K indicate the marginal effects associated with $deliberation_{it}$, FD_{it} and $\mathbf{X}_{it}$ in two-part model, respectively.



sumption?" and the hypothesis "FD induces a lasting shift to SFC." The coefficients of λ_e^Ks (ME_2^Ks) are the most important key parameters enabling us to answer the research question and hypothesis. Specifically, the hypothesis can be posed as follows: $H_0 : \lambda_e^K = 0; (ME_2^K = 0)$ and $H_1 : \lambda_e^K \neq 0; (ME_2^K \neq 0)$ for $e = \{0, 1\}$. The main objective of this framework is to determine how FD approach impacts households' OVC (NVC). In this regard, we expect that households in FD increase (decrease) their OVC (NVC) over the rounds compared with those in the control group and deliberation or equivalently $AATT_{FD}^K$ is estimated to be practically and statistically significant.

3.3 Results

Table 3.2 reports the summary statistics of the major independent variables for households in control group, deliberation, future design (FD) and overall sample. The averages of the sociodemographic variables conditional on specific treatments are similar to the overall (unconditional) averages. Household heads across the different treatment groups had similar levels of prior knowledge about organic

Table 3.2: Summary statistics of the independent variables

	Treatments			Overall	p-value
	Control group	Deliberation	Future design		
Preknowledge[a]					
Average (Median) [b]	3.95 (4.38)	4.08 (4.25)	4.19 (4.75)	4.07 (4.50)	
SD[c]	1.39	1.25	1.34	1.33	0.32[g]
Min	1.00	1.00	1.00	1.00	
Max	7.00	6.75	6.50	7.00	
Age					
Average (Median)	37.89 (35.00)	35.2 (35.00)	37.09 (35.00)	36.73 (35.00)	
SD	13.60	10.97	11.63	12.13	0.44[g]
Min	18.00	17.00	16.00	16.00	
Max	69.00	63.00	65.00	69.00	
Gender[d]					
Average (Median)	0.43 (0.00)	0.42 (0.00)	0.41 (0.00)	0.42 (0.00)	
Min	0.00	0.00	0.00	0.00	0.96[h]
Max	1.00	1.00	1.00	1.00	
Education[e]					
Average (Median)	3.05 (3.00)	3.07 (3.00)	3.62 (4.00)	3.25 (3.00)	
SD	1.48	1.60	1.76	1.64	0.02[h]
Min	1.00	0.00	0.00	0.00	
Max	6.00	6.00	6.00	6.00	
Total family member under 18 (TFM)					
Average (Median)	1.15 (1.00)	1.33 (1.00)	1.40 (1.00)	1.29 (1.00)	
SD	0.96	1.12	0.93	1.00	0.76[h]
Min	0.00	0.00	0.00	0.00	
Max	5.00	7.00	4.00	7.00	
Total earning member (TEM)					
Average (Median)	1.41 (1.00)	1.32 (1.00)	1.34 (1.00)	1.36 (1.00)	
SD	0.67	0.51	0.64	0.61	0.87[h]
Min	1.00	1.00	1.00	1.00	
Max	5.00	3.00	5.00	5.00	
Household income [f]					
Average (Median)	25825 (20000)	25258 (20000)	26825 (20000)	25969 (20000)	
SD	16854.45	14605.83	18553.60	16706.01	0.94[g]
Min	5000	6500	6000	5000	
Max	100000	90000	110000	110000	
Sample size	100	100	100	300	

[a] Preknowledge low $=$ 1, mostly low $=$ 2, somewhat low $=$ 3, neither high nor low $=$ 4, somewhat high $=$ 5, mostly high $=$ 6 and high $=$ 7

[b] Median in parentheses

[c] SD stands for standard deviation.

[d] Gender $=$ 1, when a subject is female

[e] No formal education $=$ 0, 1 to 5 years of schooling $=$ 1, 6 to 8 years of schooling $=$ 2, 9 to 10 years of schooling or secondary school certificate $=$ 3, 11 to 12 years of schooling or higher secondary school certificate $=$ 4, undergraduate university degree or equivalent $=$ 5 and graduate degree or equivalent $=$ 6

[f] Household income in BDT (Bangladeshi currency "taka.")

[g] The Kruskal-Wallis test is applied to examine whether or not the frequencies of the variables are independent among the treatment groups.

[h] The chi-squared test is applied to examine whether or not the frequencies of the variables are independent among the treatment groups.

and nonorganic food, with the overall average being moderate (4.07). The mean age of the household head in the three treatments does not vary, and the average age is approximately 37 years. Considering gender, 43 %, 42 %, and 41 % household heads are female in the control group, deliberation and FD, respectively. Regarding education, the average for years of schooling in the overall sample is 9 to 10, which is not so different from the national average in Bangladesh ($= 10.16$) (UNESCO, 2019). The household heads in the control group and deliberation possess ten years of schooling as a median, whereas in FD, household heads usually receive twelve years of schooling as a median.[7] Table 3.2 also indicates that, on average, households in each treatment include one earning member and one family member under the age of 18. The average monthly household income is approximately 26 000 BDT in the overall sample, which does not vary among the treatments. The chi-squared and Kruskal-Wallis test results indicate that most of the independent variables are not significantly different among the treatments, implying that the random assignments of the treatments through sampling processes are effective enough as initially intended.

Table 3.3 presents the summary statistics for weekly organic vegetable consumption (OVC) and nonorganic vegetable consumption (NVC) over the three rounds. In pretreatment round 1, households in the control group, deliberation and FD weekly consume 0.88, 0.82 and 0.64 kg (7.53, 7.21 and 7.31 kg) of organic (nonorganic) vegetables, respectively, indicating almost the same amount of vegetable consumption among the treatments. However, households in the control group, deliberation and FD weekly consume organic (nonorganic) vegetables 1.42, 2.47 and 3.24 kg (6.73, 5.62 and 4.63 kg) in the posttreatment round 1 and 2.18, 3.69 and 4.21 kg (5.25, 3.85 and 3.23 kg) in the posttreatment round 2, respectively. This implies that households in deliberation and FD gradually increase (decrease) OVC (NVC) compared to control group over the two posttreatment rounds and the degree of increase (decrease) is higher in FD. Overall, table 3.3 reveals that households in different treatments exhibit different OVC (NVC) during the posttreatment rounds compared to the pretreatment. It also appears

[7] In Bangladesh context, the practical differences between these two education categories (9 to 10 years and 11 to 12 years of schooling) household heads are quite limited in terms of their food consumption behaviors, sustainability concerns and participation in experimental programs. In addition, we control for it along with other sociodemographic variables in our DID and two-part models.

Table 3.3: Summary statistics of the dependent variables

	Pretreatment round 1			Posttreatment round 1			Posttreatment round 2			Overall
	Control group	Deliberation	FD[b]	Control group	Deliberation	FD	Control group	Deliberation	FD	
Organic vegetable consumption (OVC)[a]										
Average	0.88	0.82	0.64	1.42	2.47	3.24	2.18	3.69	4.21	2.17
Median	0.00	0.00	0.00	0.50	1.50	2.50	1.50	3.00	3.75	1.00
SD[c]	1.87	1.59	1.34	1.94	2.99	2.87	2.17	3.25	2.69	2.69
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max	9.00	7.25	7.80	8.00	20.00	13.00	9.5	23.00	18.00	23.00
Nonorganic vegetable consumption (NVC)[a]										
Average	7.53	7.21	7.31	6.73	5.62	4.63	5.25	3.85	3.23	5.71
Median	6.63	6.50	6.50	6.50	5.50	4.13	5.00	3.25	2.50	5.00
SD	4.49	3.99	3.69	3.10	3.10	3.09	3.39	2.43	2.43	3.67
Min	0.00	1.00	2.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00
Max	27.50	24.00	20.50	20.50	15.00	14.00	28.00	11.00	17.00	28.00
Sample size	100	100	100	100	100	100	100	100	100	900

[a] Weekly consumption in kg
[b] FD stands for future design.
[c] SD stands for standard deviation.

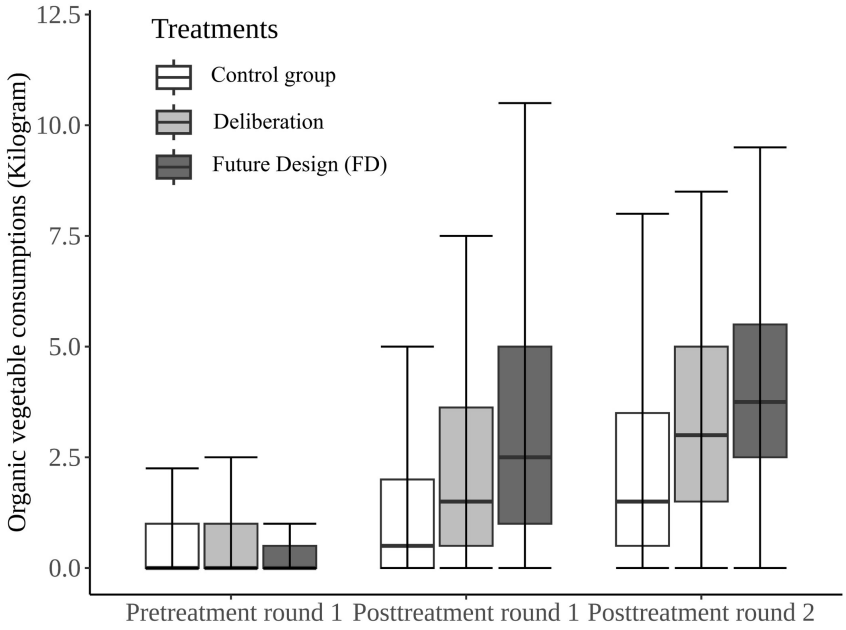
to be true qualitatively in figure 4.4. In addition, the Mann-Whitney test results validate the significant differences in the distributions between control group and other treatments (deliberation and FD) at 1 % level.

Table 3.4 exhibits the difference-in-differences (DID) estimates, i.e., average treatment effects on the treated (ATT), based on equations (3.1) to (3.3), indicating the impact of the treatments. It is apparent that DID estimates of deliberation and FD for OVC show consistently positive and statistically significant results at 1 % level in models 1-1 and 1-2, respectively (table 3.4). However, DID estimates of FD on NVC are statistically significant at 1 to 5 % level with a negative sign in model 2-2. Particularly in posttreatment round 1 that households receive deliberation and FD, OVC are estimated to increase by 1.12 and 1.92 kg, respectively and in posttreatment round 2, they are estimated to increase by 1.62 and 2.21 kg, respectively, as compared to control group. The aggregate coefficients reveal that over three rounds, households in deliberation and FD weekly consume organic vegetable on average $ATT^{\text{OVC}}_{\text{deli}}(2,3) = 1.37$ and $ATT^{\text{OVC}}_{\text{FD}}(2,3) = 2.07$ kg more than control group, respectively. Moreover, in posttreatment round 1 and posttreatment round 2, NVC are estimated to decrease by 1.78 and 1.65 kg for FD households as compared to control group, respectively. The aggregate coefficient shows that over three rounds, households in FD weekly consume nonorganic vegetable on average $ATT^{\text{NVC}}_{\text{FD}}(2,3) = 1.72$ kg less than control group. Overall, it can be interpreted that FD induces a lasting shift from nonorganic to organic vegetable consumption as compared to control group and it has a more economically significant impact, almost 2.0 times greater than deliberation. In addition, we perform subsample analyses by considering deliberation as a base group and obtain positive (negative) impacts of FD on OVC (NVC) which demonstrate a great potential of FD compared to any other treatments.[8]

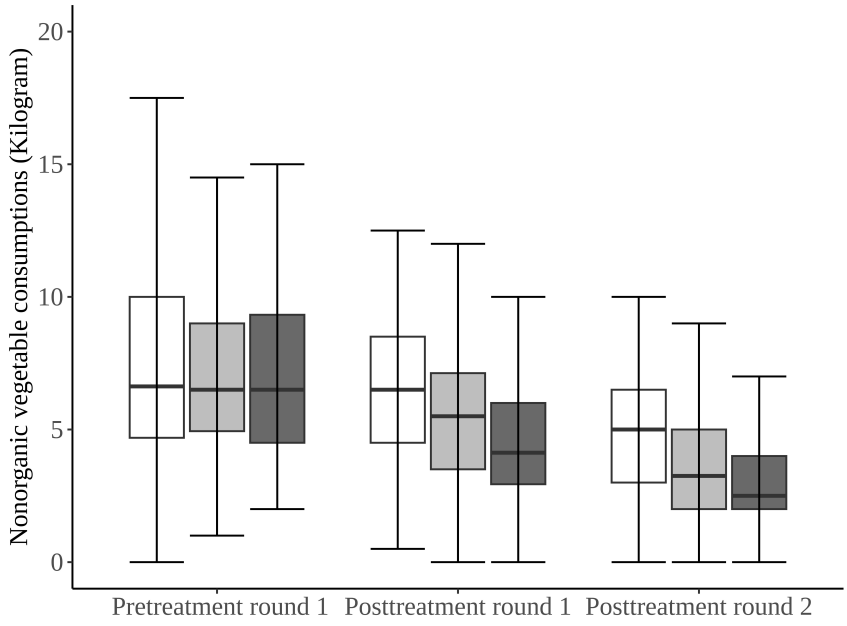
Table 3.5 represents the marginal effects of the independent variables in two-part models to check the robustness of our results and the main results remain the same.[9] We mainly center on reporting the

[8]In subsample analyses that include deliberation (base group) and FD treatments, DID estimates of FD on OVC (NVC) show positive (negative) and statistically significant results at 10 % level in posttreatment round 1 and at 11 to 12 % level in aggregate, respectively (see the appendix E for the results of subsample analyses). These results can be considered practically significant in view of the weekly organic and nonorganic vegetable consumption of Bangladeshi households.

[9]Because of having less number of zero observations (approximately 5 %), we apply glm (gamma-



(a) Household organic vegetable consumption (OVC) in three rounds



(b) Household nonorganic vegetable consumption (NVC) in three rounds

Figure 3.4: Boxplots of organic and nonorganic vegetable consumption

Table 3.4: Average treatment effect on organic (OVC) and nonorganic (NVC) vegetable consumption

Difference-in-differences (DID) models	ATT[a] on OVC[b]			Sample size
	Posttreatment round 1 Coefficient	Posttreatment round 2 Coefficient	Aggregate Coefficient	
Treatments				
Deliberation treatment vs control group (model 1-1)	1.12***	1.62***	1.37***	600
Future design treatment vs control group (model 1-2)	1.92***	2.21***	2.07***	600
	ATT on NVC[c]			
	Posttreatment round 1 Coefficient	Posttreatment round 2 Coefficient	Aggregate Coefficient	
Treatments				
Deliberation treatment vs control group (model 2-1)	−0.69	−1.18*	−0.93	600
Future design treatment vs control group (model 2-2)	−1.78***	−1.65**	−1.72***	600

***significant at the 1 percent level, **at the 5 percent level and *at the 10 percent level.

[a] ATT stands for average treatment effects on the treated to indicate a change in the weekly organic (nonorganic) vegetable consumption of a treatment group compare to a control group.

[b] OVC stands for weekly organic vegetable consumption in kg.

[c] NVC stands for weekly nonorganic vegetable consumption in kg.

Table 3.5: Marginal effects of the independent variables on household organic and nonorganic vegetable consumption

	Posttreatment round 1		Posttreatment round 2		Panel	
	OVC[a]	NVC[b]	OVC	NVC	OVC	NVC
	ME[c](combined)	ME	ME (combined)	ME	ME (combined)	ME
	Model 1-1 (two part)	Model 1-2 (glm)	Model 2-1 (two part)	Model 2-2 (glm)	Model 3-1 (two part)	Model 3-2 (glm)
Treatment dummies						
(Base group = Control group)						
Deliberation treatment	1.19***	−1.08***	1.44***	−1.18***	1.94***	−1.86***
Future design treatment	1.89***	−2.17***	1.85***	−1.71***	2.48***	−2.65***
Control factors						
Preknowledge[d]	0.08	−0.18	−0.09	0.03	0.09*	−0.18*
Age	0.03**	0.019	0.04***	−0.01	0.03***	0.007
Gender (Base group = Male)	−0.41	−0.59*	−0.31	−0.78**	−0.26	−0.63**
Household income[e]	-5.12×10^{-06}	1.80×10^{-05}*	-9.57×10^{-06}	1.74×10^{-05}*	-4.78×10^{-06}	3.1×10^{-05}***
Education[f]	0.09	0.05	0.25**	−0.19*	0.08	−0.06
Total family members under 18	0.22	0.29	0.37**	0.03	0.28***	0.14
Total earning member	0.22	0.10	0.09	0.16	0.11	0.007
Sample size	300	300	300	300	900	900

***significant at the 1 percent level, **at the 5 percent level and *at the 10 percent level

[a] OVC stands for weekly organic vegetable consumption in kg.

[b] NVC stands for weekly nonorganic vegetable consumption kg.

[c] ME stands for a marginal effect to indicate a change in the weekly organic (or nonorganic) vegetable consumption when one independent variable increases by one unit, holding other factors fixed.

[d] Preknowledge low = 1, mostly low = 2, somewhat low = 3, neither high nor low = 4, somewhat high = 5, mostly high = 6 and high = 7

[e] Household income in BDT (Bangladeshi currency "taka.")

[f] No formal education = 0, 1 to 5 years of schooling = 1, 6 to 8 years of schooling = 2, 9 to 10 years of schooling or secondary school certificate = 3, 11 to 12 years of schooling or higher secondary school certificate = 4, undergraduate university degree or equivalent = 5 and graduate degree or equivalent = 6

marginal effects of treatment dummies, age, gender and household income, because they are identified to remain significant at 1 to 10 % in posttreatment round 1, posttreatment round 2 and panel. In models 1-1, 2-1 and 3-1, the age is identified to be consistent and statistically significant with a positive sign on OVC, meaning that an additional year increase of household head's age is associated with an increase in OVC. In models 1-2, 2-2 and 3-2, regarding the gender dummy, females are interpreted to be consistently significant with a negative sign and household income is identified to be statistically significant (having a very small magnitude) with positive signs for NVC. This means that women are generally more negative toward nonorganic vegetable consumptions than men are. In posttreatment round 1 in which households receive deliberation and FD, OVC (NVC) are estimated to increase (decrease) by 1.19 and 1.89 kg (1.08 and 2.17 kg), respectively and in posttreatment round 2, they are estimated to increase (decrease) by 1.44 and 1.85 kg (1.18 and 1.71 kg), respectively, as compared to control group. In the panel regression, it is evident that deliberation and FD receiving households weekly consume 1.94 and 2.48 kg (1.86 and 2.65 kg) more (less) organic (nonorganic) vegetable than control group, respectively. It can be concluded that FD results in a sustained transition from nonorganic to organic vegetable consumptions relative to control group, and it has a nearly 1.5-times greater economic impact than deliberation. Furthermore, we conduct subsample analyses that take into account deliberation as a base group and FD treatments.[10] These analyses also reveal that FD has positive (negative) impacts on OVC (NVC) which highlights its significant potential compared to any other treatments.

Overall, it is evident from the summary statistics that the random assignments of the treatments through sampling processes are effective enough (table 3.2) and household vegetable consumption (organic and nonorganic) get different as time goes from pretreatment round to posttreatment rounds (table 3.3). We quantify the difference and check its robustness across the treatments through DID and two-part model. As indicated in our conceptual framework, household OVC and NVC are impacted

log) by using equation (3.5) to identify the effect of independent variables on NVC (Wooldridge, 2010, Smith et al., 2017).

[10]In subsample analyses that include deliberation (base group) and FD treatments, the marginal effects of FD on OVC (NVC) show positive (negative) and statistically significant results at 5 % level in posttreatment round 1 and in panel, respectively (see the appendix D for the results of subsample analysis).

by FD over the time periods as compared to those in the control group and deliberation in practical and statistically significant manners (figure 3.3). In summary, the average treatment effects across different lengths of treatment exposure for OVC are $ATT^{\text{OVC}}_{\text{deli}}(2,2) = 1.12$, $ATT^{\text{OVC}}_{\text{deli}}(2,3) = 1.37$, $ATT^{\text{OVC}}_{\text{FD}}(2,2) = 1.92$ and $ATT^{\text{OVC}}_{\text{FD}}(2,3) = 2.07$, whereas those for NVC are $ATT^{\text{NVC}}_{\text{FD}}(2,2) = -1.78$ and $ATT^{\text{NVC}}_{\text{FD}} = -1.72$ (table 3.4). The estimated average effects indicate that over three rounds, households in FD weekly consume organic (nonorganic) vegetable on average 2.07 kg (1.72 kg) more (less) than control group. FD results in a sustained transition from nonorganic to organic vegetable consumption and the effect under FD is approximately twice as much as that under deliberation in magnitude. These findings are robust and consistent with the results obtained from two-part panel regressions. The estimation results associated with OVC and NVC provide answers to our research questions (how does the FD approach impact food consumption?) and support the alternative hypothesis (FD induces a lasting shift to SFC) by rejecting the null. Finally, our research establishes that FD demonstrates a great potential for inducing people to make a persistent change to sustainable food consumption (SFC).

3.4 Discussion and policy implications

It is claimed that people change their behaviors in long run, when they receive some information and find the meaning and significance as a story through their deliberative cognitive processes, such as psychological ownership, in relation to their life (Evans, 2008, Frankl, 2008, Kahneman, 2011, Rosa et al., 2021). In this sense, a set of interventions introduced by future design (FD) is considered one effective approach that induces people to endogenously trigger their deliberative cognitive processes, edit and interpret information as their long-run life story. A plausible mechanism behind this interpretation can be argued by forward-looking behaviors and time inconsistency (Galperti and Strulovici, 2014, Barreda-Tarrazona et al., 2021). Forward-looking behaviors refer to a tendency for people to make their decisions based on some anticipation of future outcomes rather than on immediate or short-term benefits (Pashardes, 1986, Kim et al., 2023). They are claimed to allow people to maximize their wellbeing, to promote sustainable practices and to contribute to economic stability (Chevalier and Goolsbee, 2009,

Aron-Dine et al., 2012, Harrison et al., 2024). However, people's preferences for one future outcome over another may change with the passage of time, which is commonly referred to as time inconsistency (Strotz, 1955, Sayman and Öncüler, 2009). We conjecture that FD influences people to engage in forward-looking behaviors as well as to prevent themselves from experiencing time inconsistency. Markus and Nurius (1986) contend that the adaptive role of future-oriented thought is to enhance motivations for being ideal, specifically suggesting that a person exhibits heightened effort and engagement in tasks for the creation of the optimal futureself. This argument is in line with a flow of intervention procedures in FD that ask people to have visions, missions and strategies. Thus, it shall be possible to argue that households in our experiments have made a persistent change to SFC, voluntarily finding the meaning and significance by FD or equivalently enhancing their forward-looking behaviors without time inconsistency.

The future-studies approaches, such as visioning, backcasting, scenario planning and FD, have been applied for the formations of visions, missions and strategies in businesses and public organizations. To a certain extent, the effectiveness is confirmed as evidence for some specific purposes, such as sustainable urban transformation, city planning, and forest and waste management (Barrella and Amekudzi, 2011, Phdungsilp, 2011, McPhearson et al., 2016, Weddfelt et al., 2016, Nakagawa et al., 2019, Sandström et al., 2020, Pandit et al., 2021). Nevertheless, their applications to intrahousehold management issues have neither been addressed nor been appraised with the visions, missions and strategies at household levels from a long-run perspective (Abrahamse, 2020). Thus, this research is considered a novel attempt to provide evidence that some future-studies approach, i.e., FD, successfully guides households to persistently change their food consumption. Gratton and Scott (2016) highlights that people must take a proactive approach to planning their future from a long-run perspective due to an expectation of their 100-years extended lives, emphasizing the importance of having thoughtful food and health management to be sustainable. Being consistent with the argument, it shall be very important to think about how some future-studies approaches, such as FD, can be effectively applied to households and incorporated into public policies and businesses for thoughtful intrahousehold practices and management of food consumption. Our results suggest that households in FD interventions weekly

consume organic (nonorganic) vegetables 2.07 kg (1.72 kg) more (less) than those in the control group over 3 months on average. To this end, new networking services and/or digital-technology platforms shall be designed, administered and managed for changing and guiding each household to shift to SFC, enabling to easily organize and implement a FD workshop at household levels as tools or services for facilitation of information editing by the household. These could be part of public and/or business activities not only for fulfilling some commercial or social purposes but also for affecting the households to voluntarily have their visions, missions and strategies as well as to endogenously resolve their food consumption problems through persistent behavioral changes. Implementing FD in such services or platforms may face some challenges in low-income countries, because people tend to have limited digital access and some resistances to long-term thinking just by the online instruction and guidance due to their religious or cultural norms. In both cases, holding some FD face-to-face workshops shall be considered possible alternatives.

Information-based policy interventions, such as labels, education and campaigns, have high acceptance among people compared to market-based and regulatory ones (Reisch et al., 2013, Ammann et al., 2023). One possible weakness in these interventions is that they are considered to be a one-way information provision from a government to people, prompting only short-term behavioral changes. In contrast, FD is unique and different from them, because it is established to have the following two points: (i) motivate people to voluntarily and proactively think for the future changes and (ii) have a persistent change in their behaviors as a two-way information flow through the workshops between government and people. As mentioned earlier, the implementation of FD workshops at household levels is one possible approach to be part of information-based policy interventions through the use of networking services and/or digital-technology platforms. Once such platforms are established, it may be a cost-effective policy intervention with some potential applicability in both developing and developed countries. In the processes, the contents of FD interventions, such as case-method materials or workshops, are flexible enough to be customized based on different cultural and socioeconomic contexts, i.e., social classes, religious beliefs and wealth distributions. This customizability is another advantage for the applications, and thus, a wide variety of sustainability issues, such as education, learning, en-

ergy use, poverty and discrimination, can be approached by FD through changing household practices in future.

3.5 Conclusion

This paper has examined the effect of the future design (FD) approach on sustainable food consumption (SFC), investigating the question "how does the FD approach impact food consumption?" and the hypothesis "FD induces a lasting shift to SFC." To this end, we have implemented a 3-round social experiment with three treatments of "control group," "deliberation" and "FD," for collecting data on organic vegetable consumption (OVC), nonorganic vegetable consumption (NVC) and sociodemographic factors of 300 households in Bangladesh over three months. The results show that FD induces people to have a sustained increase in organic and decrease in nonorganic vegetable consumption as compared to any other treatment, and the effect under FD is approximately twice as much as that under deliberation in magnitude and in each round. Overall, FD demonstrates a great potential for inducing people to make a persistent change to SFC. The novel aspects of this study are (i) to consider the perspective taking of future generations for analyzing households' lasting shifts to SFC by conducting a social experiments across multiple rounds and (ii) to empirically identify real choices and consumption of organic and nonorganic vegetables by households instead of declared intentions.

Chapter 4

Accountability and righteousness

4.1 Introduction

Nearly all men can stand adversity but if you want to test a man's character, give him power, this is the supreme test (Ingersholl, 1895). The assertion suggests that individuals possess an incentive to abuse their power and this can have far-reaching effects on societies (Vredenburgh and Brender, 1998). Often, the exercise of power leads to a few entities misusing various resources, resulting in inefficient and/or unfair situations (Fearon, 2004, Powell, 2004, Lancet, 2006). Such misuse of power can also be considered the causes of many social problems, such as corruption, inequality and conflicts, and there are many real-world examples of how those who have power to prodigiously make decisions affect powerless people and a whole economy (Sidanius and Pratto, 2012, Jetten et al., 2017). Such powerful or powerless people can be interpreted to get determined as "winners" or "losers" by chance from the status quo of equality due to the capitalist narrative that has been posed by societies (Gupta et al., 2002, De Nardi and Fella, 2017, Frank, 2016, Alvaredo et al., 2017). As a consequence, how winners behave towards losers can be a reflection of candor in a society, being important determinants for evolution of fairness and inequality (Williamson, 2008, Hossain and Ali, 2014, Burns, 2017). It is for this reason that this paper experimentally examines how inequality arises from an original situation of equality and winners behave "righteously" towards losers.

Decision making of winners towards losers is influenced by their valuation of what is considered just or fair (Konow, 1996, Nowak et al., 2000, Butler et al., 2011). The concept of fairness or righteousness in winner-loser settings is studied in economic literature, and there are some examples that emulate winners' regards and behaviors for losers in experimental economics, such as dictator and solidarity games (Schotter et al., 1996, Bolton et al., 1998, Selten and Ockenfels, 1998, Camerer, 2003, Schurter and Wilson, 2009, Engel, 2011, Forgas and Tan, 2013, Konow et al., 2020, Grech et al., 2022,

Cartwright and Thompson, 2023, Goerres and Eicheler, 2025). A laboratory experiment by Servátka (2010) investigates the influence of information regarding a paired subject's prior actions on individual behaviors within a nonstrategic context of a dictator game, revealing that dictators allocate funds to recipients known for their generosity compared to those lacking a reputation. Ouvrard et al. (2025) examine the preferences of Indian farmers concerning surface water allocation by employing a dictator game in lab-in-the-field experimental contexts. Their findings indicate that participants prefer to provide less water to downstream farmers than to upstream ones, and that effective water allocation behaviors can be elicited by altering the choice architecture, namely through loss framing.

In solidarity games, Selten and Ockenfels (1998) investigate how "probabilistic winners" give their money to "probabilistic losers" in a three-person laboratory setting.[1] This game incorporates a motivational aspect of confidence in reciprocity, distinguishing it from the dictator game. The majority of individuals are inclined to offer significant conditional donations to losers if they are winners by chance, taking into account educational, gender, and false consensus effects. A study by Oliveira et al. (2014) examine voluntary informal risk sharing through a graphic representation of the solidarity game designed for low-literacy people in field experiments including low-income participants in Texas. Their findings reveal much greater instances of "fixed gift to loser" behavior and less "egotistical" behavior compared to earlier studies. While the dictator and solidarity games demonstrate "giving behaviors" by winners to losers, limited number of papers study the "taking behaviors" that can mirror the winner-take-all societies (Frank and Cook, 1995, List, 2007, Bardsley, 2008, Dreber et al., 2013, Korenok et al., 2014, Flage, 2024).

Accountability, which entails providing justifications for one's acts, can affect both the content and manner of individuals' thinking, potentially diminishing decision makers' vulnerability to many prevalent judgment and choice errors (Simonson and Nye, 1992, Konow, 2000, Salisbury et al., 2022, Scobie et al., 2025). The accountability principle asserts that the extent of equitable distributions is contingent upon the relevant variables subject to individual influence (e.g., action-work effort) while

[1] In a group of three subjects, a lottery decides who becomes winners or losers, and then the probabilistic winners are allowed to give their endowments to losers.

those beyond individual control (e.g., congenital physical disabilities) are often excluded from consideration (Konow, 2000). As part of public and social communication for self-governance, "reasons" and "advice" are two crucial components of accountability (Mulgan, 2000, Wagner, 2005). A lab-in-the-field experiment of intergenerational sustainability (IS) dilemma games by Timilsina et al. (2023) investigate the efficacy of intergenerational accountability (IRA) in preserving IS, revealing that IRA encourages generations to select the sustainable option through positive reasons and advice. Gan et al. (2025) examine the influence of environmental auditing on the environmental, social and governance (ESG) performance of A-share listed Chinese businesses from 2009 to 2021, employing a multi-period double-difference model to elucidate its underlying mechanisms. Their findings indicate that post-event accountability through environmental audits can enhance corporate ESG performance for firms. Nonetheless, accountability serves as a unidirectional communication mechanism between groups for intragenerational situations and from the current generation to subsequent generations for intergenerational contexts (Timilsina et al., 2019b).

Previous research has focused primarily on examining decision making of winners towards losers in various game settings through demonstrating giving behaviors of winners. Few studies have documented how inequality arises from the status quo of equality through examining winners taking behaviors and studied some interventions, such as accountability, that induce people to act righteously to losers as they are winners by chance. Some present research have extended a grate potential of accountability to boost adherence and people thinking through reducing decision errors (Salisbury et al., 2022, Timilsina et al., 2023). In this study, we focus on examining the possible impacts on winners behaviors towards losers by accountability interventions as an laboratory experiment because the winner righteousness will characterize how good the society or organizations are. Therefore, we pose a question "how being accountable for decisions influence winners to behave toward losers, even when the winners are determined by chance," hypothesizing that "winners behave righteously (or fairly) to losers as they are asked to be accountable for their decisions." We design and institute a winner righteousness game (WRG) in a group of three subjects with equal endowments as the control, and conduct a laboratory experiment with 297 subjects in Japan, examining the impact of two treatments on sub-

jects endowment taking behaviors: (i) intragenerational accountability (IAA) and (ii) intergenerational accountability (IRA). Addressing this question and hypothesis will be beneficial for inducing winners to act righteously to losers for fairness and equality in winner-take-all societies.

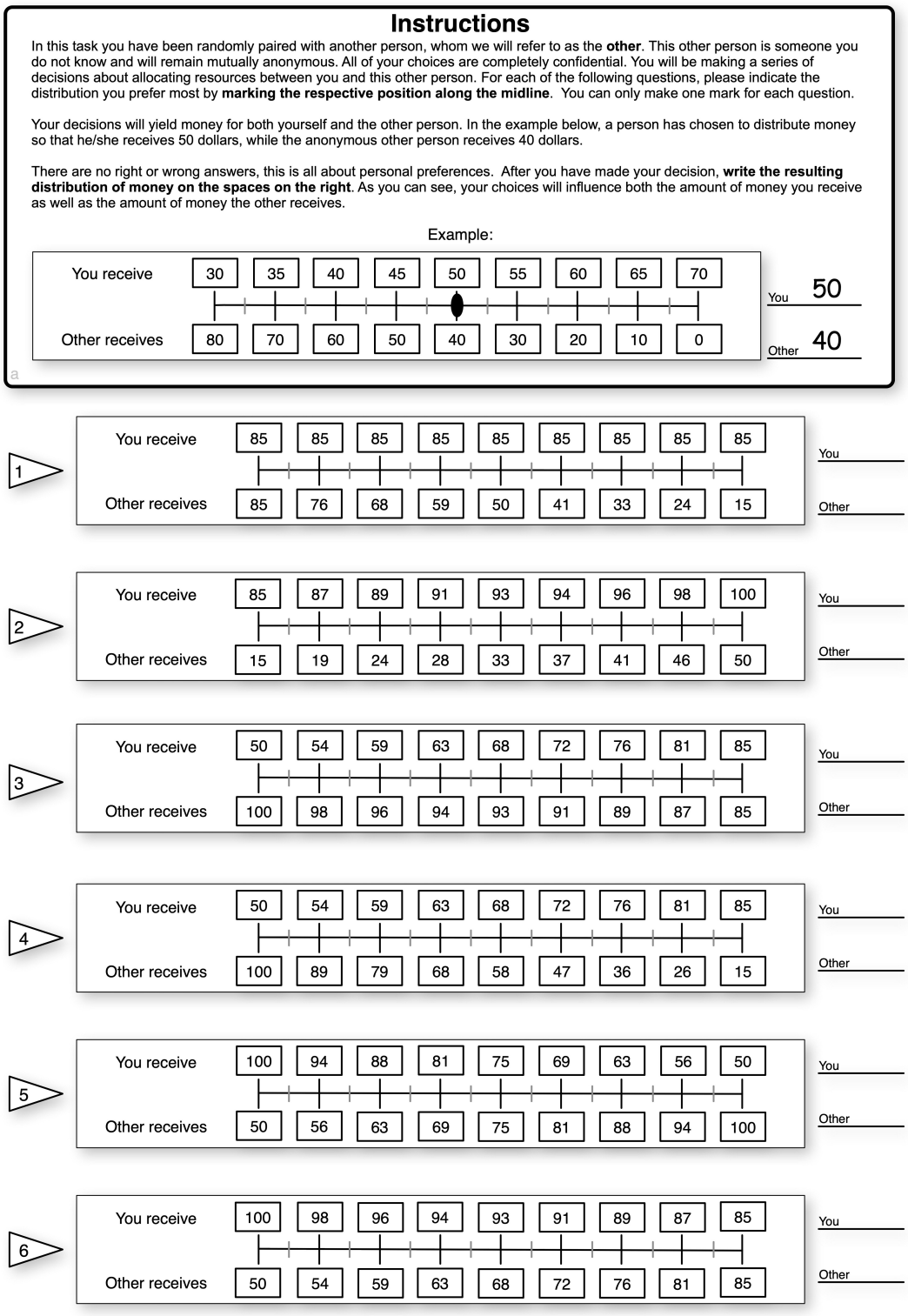
4.2 Methods

4.2.1 Experimental design and procedures

The experiments were conducted in the computerized experimental laboratories of Kochi University of Technology and Kochi Prefectural University. The experiments consisted of 13 sessions, each comprising 18 to 30 subjects, totaling 297 subjects. The subjects were volunteer undergraduate students from different disciplines, including economics, engineering and management. Each subject engaged in a single session lasting roughly 1.5 hours, receiving an average cumulative payoff of 2000 JPY. The subjects exhibit adequate homogeneity throughout the three treatments, characterized by comparable age ranges and a balanced male-to-female ratio, hence providing consistency among the experimental groups. Each session is split into three parts. The 1st part entails participating in a social value orientation (SVO) game. The 2nd part is a winner righteousness game (WRG). The 3rd part comprises a questionnaire survey that gathers sociodemographic data. The 1st and 3rd parts are identical across all sessions. The 2nd part differs by sessions, each randomly allocated to one of the three treatments: control WRG, intragenerational accountability (IAA) and intergenerational accountability (IRA). The control WRG, IAA and IRA comprise 4, 4 and 5 sessions, respectively. Fundamental techniques in each session adhering to prior literature, including Selten and Ockenfels (1998) and Timilsina et al. (2023).

An SVO game classifies each subject's social viewpoint to be one of altruistic, prosocial, individualistic and competitive (Van Lange et al., 1997, 2007, Brosig et al., 2011, Carlsson et al., 2014, Sutters et al., 2018). A "slider method" is utilized to evaluate how subjects prioritize their advantages relative to others (Borghans et al., 2008, Murphy et al., 2011). Figure 4.1 indicates that subjects reply to six items and each item provides nine alternatives for allocating points between themselves and an

Figure 4.1: Instructions to measure social value orientation (SVO) by the slider method



anonymous partner. Each subject selects one alternative for each item by marking a line at the spot that signifies her desired allocation. The average distributions for the subject $\overline{A}_s$ and the partner $\overline{A}_p$ are calculated from all six aspects. Then, 50 is deducted from $\overline{A}_s$ and $\overline{A}_p$ to reposition the origin of the resultant angle to the center of the circle $(50, 50)$. The SVO index of a subject is calculated as SVO $= \arctan \frac{(\overline{A}_p)-50}{(\overline{A}_s)-50}$. According to the SVO indices, social preferences are classified as altruistic (SVO $> 57.15°$), prosocial ($22.45° <$ SVO $< 57.15°$), individualistic ($-12.04° <$ SVO $< 22.45°$), and competitive (SVO $< -12.04°$). This study classifies "altruistic" and "prosocial" kinds as "prosocial" subjects, whereas "individualistic" and "competitive" types are labeled as "proself" (see Murphy et al., 2011).

In the laboratory WRG, we adhere to the fundamental design and procedures established by Selten and Ockenfels (1998). We implement the control WRG in a group of randomly assigned three subjects, consisting of three steps. First, each member in a group have 1000 points as endowments and decides how much to take endowments from losers as she is a winner. In decision making, she considers two situations: (i) endowment takes in the case of one winner (ETs1) and (ii) endowment takes in the case of two winners (ETs2). Second, a lottery determines whether she becomes a winner (with a probability of $1/3$) or a loser (with a probability of $2/3$). In the lottery, each member must role a dice and research assistants record the outcome, i.e., winner or loser. The rule is that numbers one or two win, while three, four, five and six lose. Third, each member in the group takes the endowment from each loser following her take decision in the 1st step, provided she is a winner. Otherwise her endowment shall be taken by each winner. If the lottery results for everyone "winner" or "loser," in a group, there will be no take decisions, taking into account simply the initial endowment as the total points. For each group, the payoffs resulting from winning or losing are calculated for all subjects. In the game, a dominant strategy or a Nash equilibrium strategy for each winner subject is to take endowment 1000 points from each loser, as it maximize her payoff, irrespective of other winner's take decisions in a group. A Pareto optimal allocation includes any endowment taken by a winner from a loser such that increasing a winner's take necessarily decreases the loser's endowment. In WRG, a fair Pareto optimal allocation is a winner takes nothing form a loser, while taking all endowments from a loser is the most

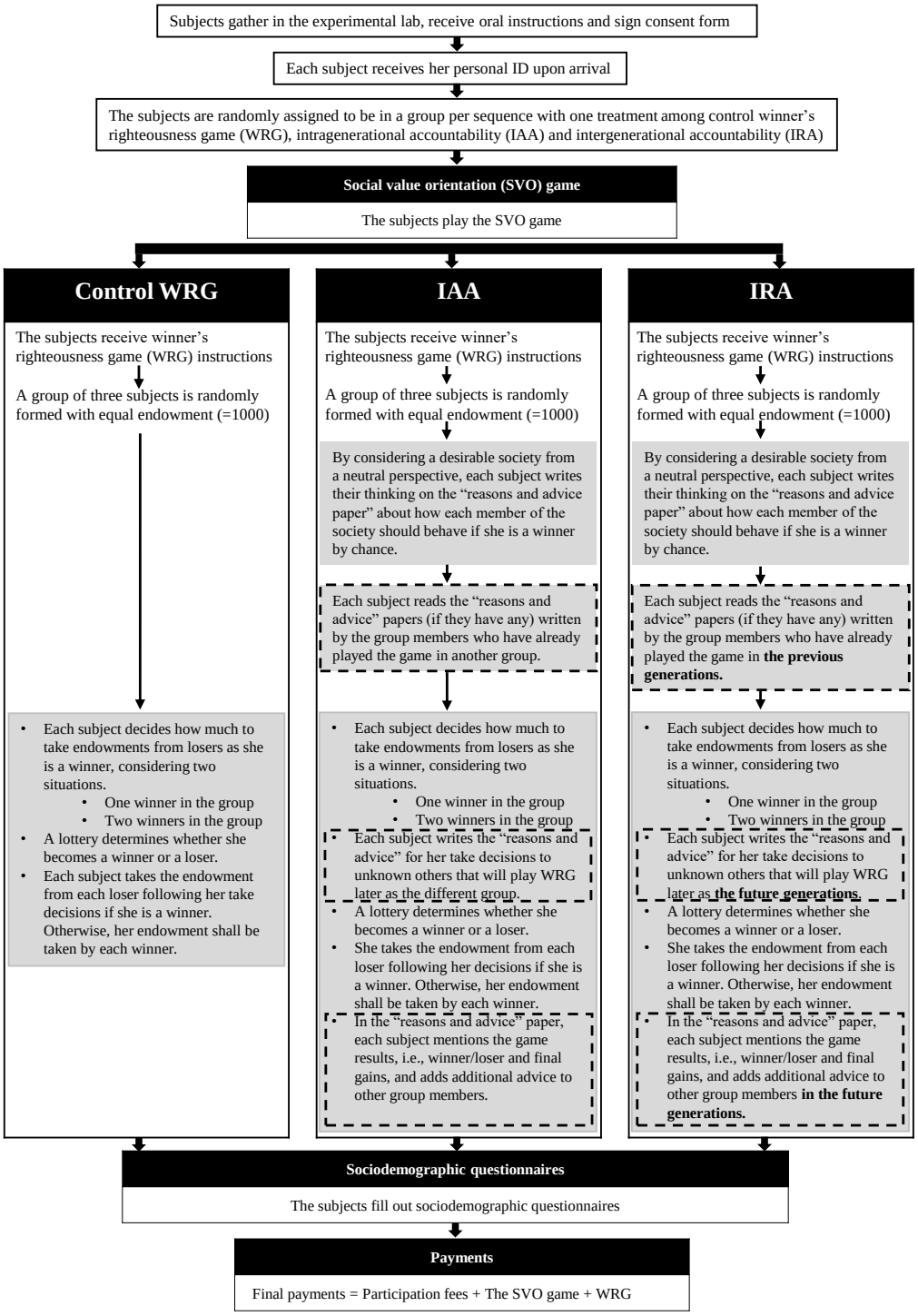
unfair one. Any other allocation between the fair and the unfair ones is also a Pareto optimal allocation.

In the IAA, first, a group of three subjects in a generation is randomly formed with an equal endowment for each ($= 1000$ points) after receiving WRG instructions. Second, subjects are asked to write their thinking on the "reasons and advice paper" about how each member of the society should behave if she is a winner by chance, considering a desirable society from a neutral perspective. Third, each subject read "reasons and advice papers" (if they have any) written by the group members who had previously played the game in another group. Fourth, each subject determines their two endowment take decisions: ETs1 and ETs2, and write the reasons and advice for her decision to unknown others who will subsequently engage in the game as the different group. After that each subject takes the endowment from each loser following her decisions if she is a winner from the lottery. Otherwise, her endowment shall be taken by each winner. Fifth, in the "reasons and advice paper," each subject mention the game results, i.e., winner or loser, and final gains, while also providing additional advice to other group members.

In the IRA, after receiving WRG instructions, three subjects with an equal endowment ($= 1000$ points) for each are randomly assigned to form a group, referred to as a generation in a sequence. Each subject write her thinking about winner's behaviors to losers in a society as same as IAA. However, she read "reasons and advice papers" (if they have any) written by the group members who have already played the game in the previous generations. After that each subject sets her ETs1 and ETs2, and asked to be accountable for that, providing the reasons and advice to unknown others that will play WRG later as the future generations with a generational lineup. Finally, each subject go through the lottery, take the endowment from losers (or her endowment shall be taken), and in the "reasons and advice paper," mentions the game results and adds additional advice to other group members in the future generations.

In experiments, a subject enrolls and engages in a single session. Subjects in a session are assigned to one treatment, therefore categorizing our experiments as a between-subject design. Upon arrival at the laboratory, they are sent to computers interconnected inside a network for the exchange of information regarding their decisions, advice and payoffs with the administrative PC through z-tree software (Fischbacher, 2007). Subjects are provided with the written instructions and consent forms detailing

Figure 4.2: A flow chart of experimental procedures for subjects in the intragenerational accountability (IAA) and intergenerational accountability (IRA) treatments as compared to control winner righteousness game (WRG) in one sessions



the experimental procedures involved in the treatment, and they are requested to sign the forms upon agreeing to participate (see the appendix F for experimental instructions). After we observe each subject's agreement, the experimenter delivers oral instructions to all subjects in that session using neutral terminologies, ensuring comprehension of each procedure without any bias. First, the subjects engage in an SVO game for approximately 20 minutes, choosing selections that indicate their SVOs. Second, the WRG is conducted, requiring a duration of 30 to 45 minutes, contingent upon the treatments. Third, following the WRG, subjects fill out the sociodemographic questions in 10 minutes. The session concludes with the disbursement of an experimental reward to each subject that last approximately 5 to 10 minutes. Each subject receives a fixed participation fee of 500 JPY. Depending on the performance, subjects earn 300 JPY from the SVO game and 1200 JPY from WRG on average. A flow chart summarizing the experimental procedures for a session is presented in figure 4.2.

4.2.2 Statistical analyses

The experimental cross sectional data from 297 subjects are systematically organized and employed for statistical analyses, comprising ETs1, ETs2, two treatment dummies: (i) IAA and (ii) IRA, gender dummy, SVO dummy, average points taken by previous group members in the case of one (AP1) and two winners (AP2) and three reasons and advice dummies: (i) one set (RA1), (ii) two sets (RA2) and (iii) three or more sets (RA3) of reason and advice papers (see table 4.1 for the definitions of all variables). The median regression is used to statistically analyze the treatment effects on ETs1 and ETs2 instead of parametric mean-based regressions, when observations of ETs1 and ETs2 in the sample are deemed nonnormally distributed and/or skewed. The literature asserts that median regressions are superior to parametric mean-based methods, such as ordinary least squares (OLS) regression, as they provide robust estimations against boundary values and/or outliers, particularly when the dependent variable is constrained within a specific support range, non-normally distributed and skewed (Hao and Naiman, 2007, Hirose and Kotani, 2022). We have conducted Shapiro-Wilk tests on ETs1 and ETs2 to assess their normality with a null hypothesis positing that the variables are normally distributed.

Table 4.1: Descriptions of variables

Variables	Descriptions
Dependent variables	
Endowment takes in the case of one winner (ETs1)	A variable that represents the endowment take decision by each subject from losers as she is the sole winner in a group.
Endowment takes in the case of two winners (ETs2)	A variable that represents the endowment take decision by each subject from a loser as she is the one winner out of two winners in a group.
Independent variables	
Treatments (Base group = Control WRG)[a]	
Intragenerational accountability (IAA)	A dummy variable that takes 1 when a subject is in IAA treatment, otherwise 0.
Intergenerational accountability (IRA)	A dummy variable that takes 1 when a subject is in IRA treatment, otherwise 0.
Gender (Base group = female)	A dummy variable that takes 1 when a subject is male, otherwise 0.
SVO (Base group = Prosocial)[b]	A dummy variable that takes 1 when a subject is identified as proself, otherwise 0.
AP1	Average points taken by previous group members in the case of one winner that is mentioned in the reason and advice papers
AP2	Average points taken by previous group members in the case of two winners that is mentioned in the reason and advice papers
Reasons and advice (Base group = No reasons and advice paper)	
One set of reasons and advice papers (RA1)	A dummy variable that takes 1 when a subject has one set of the reasons and advice papers from previous groups, otherwise 0.
Two sets of reasons and advice papers (RA2)	A dummy variable that takes 1 when a subject has two sets of the reasons and advice papers from previous groups, otherwise 0.
Three or more reasons and advice (RA3)	A dummy variable that takes 1 when a subject has three or more sets of the reasons and advice papers, otherwise 0.

[a] Winner righteousness game (WRG)
[b] Social value orientation (SVO)

The findings reject the null hypothesis for ETs1 ($z = 2.87, p < 0.01$) and ETs2 ($z = 4.32, p < 0.01$). Consequently, we employ the median regressions for ETs1 and ETs2 with the specifications of equation (4.1).

$$\mathbf{Y}_i^K = \mathbf{X}_i \boldsymbol{\beta}^K + \epsilon_i \tag{4.1}$$

where Y_i^Ks are dependent variables that indicate endowment take decisions of subjects indexed by $i = 1, \ldots, 297$ for $K = \{\text{ETs1}, \text{ETs2}\}$. $\mathbf{X}_i = (1, X_{1i}, X_{2i}, \ldots, X_{\ell i})$ represents a vectors of $\ell + 1$ independent variables consisting of intercept, IAA, IRA, gender, prosocial, AP1, AP2, RA1, RA2 and RA3, respectively. Finally $\boldsymbol{\beta}^K = (\beta_0^K, \beta_1^K, \ldots, \beta_\ell^K)$ is a vector of the coefficients associated with $\mathbf{X}_i$ to be estimated through the least absolute distance estimation method and ϵ_i is an error term. Each coefficient represents the alteration in the median resulting from a one-unit increase in a continuous (or dummy) independent variable (or from zero to one), holding other variables constant.

4.3 Experimental results

Tables 4.2 and 4.3 report the summary statistics of the major variables for subjects in the control winner righteousness game (WRG), intragenerational accountability (IAA) and intergenerational accountability (IRA) and overall sample. In table 4.2, the averages of the independent variables, i.e., gender and social value orientation (SVO), conditional on specific treatments are almost similar to the overall (unconditional) averages of taking the same variables. Considering gender and SVO, 67 %, 67 %, and 56 % subjects are male, and 57 %, 43 %, and 56 % subjects are proself in the control WRG, IAA and IRA, respectively. These results imply that the random assignments of the treatments through sampling processes are effective enough as initially intended. However, subjects across the different treatments had different information on the average points of one (AP1) and two winners (AP2) that is taken by previous group members, including different number of reasons and advice papers. Table 4.3 presents the summary statistics for two dependent variables, such as endowment takes in the case of one winner (ETs1) and two winners (ETs2). Subjects in the control WRG decide to take endowments

Table 4.2: Summary statistics of the independent variables

	Treatments			Overall
	Control WRG[a]	IAA[b]	IRA[c]	
Gender[d]				
Average (Median)[e]	0.67 (1.00)	0.67 (1.00)	0.56 (1.00)	0.63 (1.00)
SD[f]	0.47	0.47	0.49	0.48
Min	0.00	0.00	0.00	0.00
Max	1.00	1.00	1.00	1.00
Social value orientation (SVO)[g]				
Average (Median)	0.57 (1.00)	0.43 (0.00)	0.56 (1.00)	0.52 (1.00)
SD	0.49	0.49	0.49	0.50
Min	0.00	0.00	0.00	0.00
Max	1.00	1.00	1.00	1.00
AP1[h]				
Average (Median)	0.00 (0.00)	245.19 (0.00)	344.92 (300.00)	194.23 (0.00)
SD	0.00	328.14	278.81	285.89
Min	0.00	0.00	0.00	0.00
Max	0.00	1000.00	1000.00	1000.00
AP2[i]				
Average (Median)	0.00 (0.00)	243.36 (0.00)	280.92 (216.00)	172.30 (0.00)
SD	0.00	334.48	255.82	270.89
Min	0.00	0.00	0.00	0.00
Max	0.00	1000.00	1000.00	1000.00
One set of reasons and advice papers (RA1)[j]				
Average (Median)	0.00 (0.00)	0.25 (0.00)	0.24 (0.00)	0.16 (0.00)
SD	0.00	0.44	0.43	0.37
Min	0.00	0.00	0.00	0.00
Max	0.00	1.00	1.00	1.00
Two sets of reasons and advice papers (RA2)[k]				
Average (Median)	0.00 (0.00)	0.25 (0.00)	0.09 (0.00)	0.11 (0.00)
SD	0.00	0.44	0.29	0.31
Min	0.00	0.00	0.00	0.00
Max	0.00	1.00	1.00	1.00
Three or more sets of reasons and advice papers (RA3)[l]				
Average (Median)	0.00 (0.00)	0.00 (0.00)	0.42 (0.00)	0.14 (0.00)
SD	0.00	0.00	0.49	0.34
Min	0.00	0.00	0.00	0.00
Max	0.00	0.00	1.00	1.00
Sample size	102	96	99	297

[a] WRG stands for winner righteousness game
[b] IAA stands for intragenerational accountability
[c] IRA stands for intergenerational accountability
[d] Gender = 1, when a subject is male, otherwise 0.
[e] Median in parentheses
[f] SD stands for standard deviation.
[g] SVO = 1, when a subject is proself, otherwise 0.
[h] AP1 stands for average points taken by previous group members in the case of one winner that is mentioned in the reasons and advice papers
[i] AP2 stands for average points taken by previous group members in the case of two winners that is mentioned in the reasons and advice papers
[j] RA1 = 1, when a subject has one set of reasons and advice paper, otherwise 0.
[k] RA2 = 1, when a subject has two sets of reasons and advice papers, otherwise 0.
[l] RA3 = 1, when a subject has three sets of reasons and advice papers, otherwise 0.

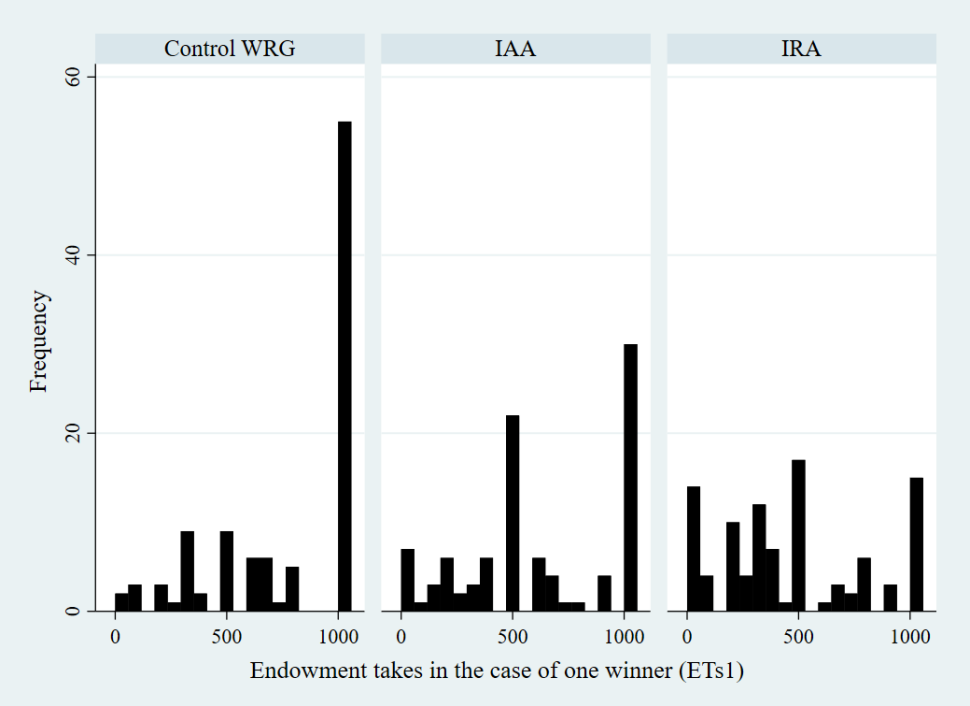
Table 4.3: Summary statistics of the dependent variables

	Treatments			Overall
	Control WRG[a]	IAA[b]	IRA[c]	
Endowment takes in the case of one winner (ETs1)				
Average	752.45	605.00	459.61	607.18
Median	1000.00	500.00	400.00	600.00
SD[d]	309.93	332.93	329.77	344.84
Min	0.00	0.00	0.00	0.00
Max	1000.00	1000.00	1000.00	1000.00
Endowment takes in the case of two winners (ETs2)				
Average	745.39	616.88	394.08	586.75
Median	1000.00	550.00	300.00	500.00
SD	322.07	348.35	322.29	360.71
Min	0.00	0.00	0.00	0.00
Max	1000.00	1000.00	1000.00	1000.00
Sample size	102	96	99	297

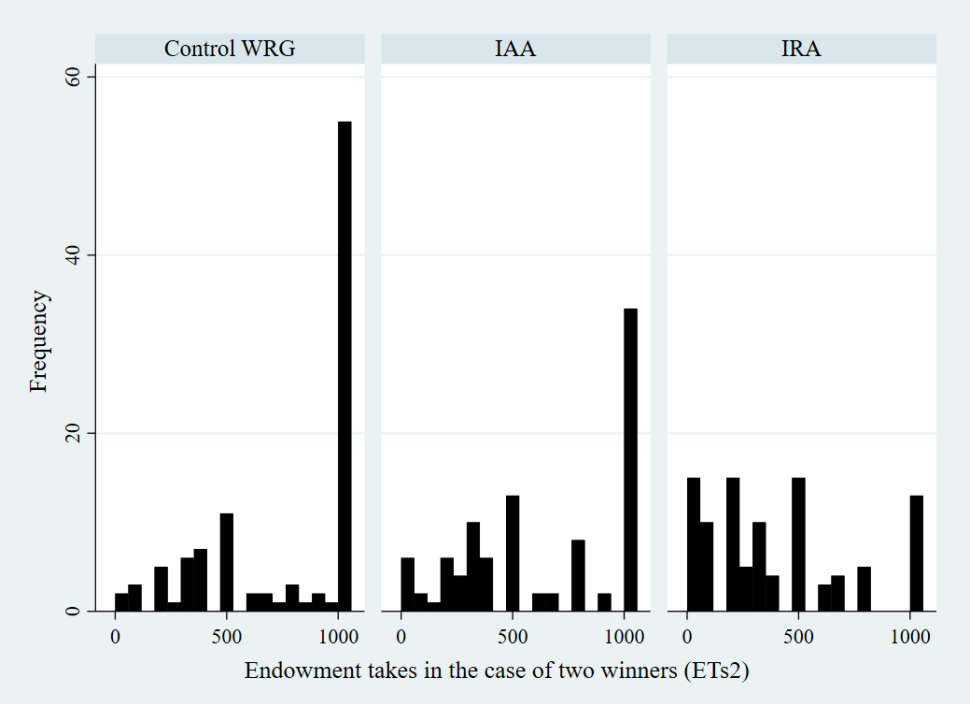
[a] WRG stands for winner righteousness game
[b] IAA stands for intragenerational accountability
[c] IRA stands for intergenerational accountability
[d] SD stands for standard deviation.

752.45 and 745.39 points from losers as she is a winner in the case of one winner and two winners in a group, respectively. However, subjects in IAA and IRA decide to take endowments 605.00 (616.88) and 459.61 (394.08) points from losers as she is winner in the case of one winner (two winners) in a group, respectively. Overall, table 4.3 reveals that subjects in different treatments exhibit different ETs1 and ETs2.

Figure 4.3 shows the frequency distributions of the ETs1 and ETs2 under the three treatments: control WRG, IAA and IRA. Figure 4.3a (figure 4.3b) demonstrates that the distribution under the control WRG is skewed to the right, as the peak of the distribution is 1000 points, indicating that a considerable portion of subjects take all endowments from losers as she is a winner in the case of one winner (two winners) in a group. On the other hand, the distribution under the IAA and IRA are close to flattened, with concentration of around 0 to 500 points. We also draw the corresponding boxplots in figure 4.4 for the same distributions under the control WRG, IAA and IRA, corroborating that the location parameters, such as medians and quantiles, for the ETs1 and ETs2 per subject in the IAA and IRA treatments are generally lower than those in the control WRG. We also run a Mann-Whitney test with the null hypothesis that the distributions of the ETs1 and ETs2 per subject between the control

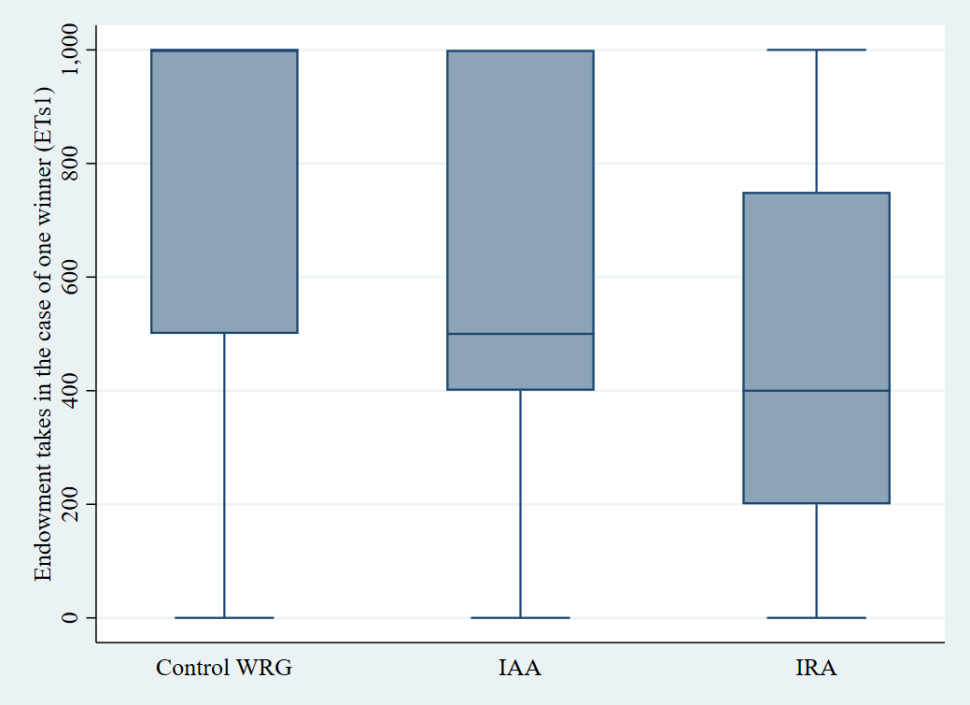


(a) Frequency distribution of the ETs1 in the treatments

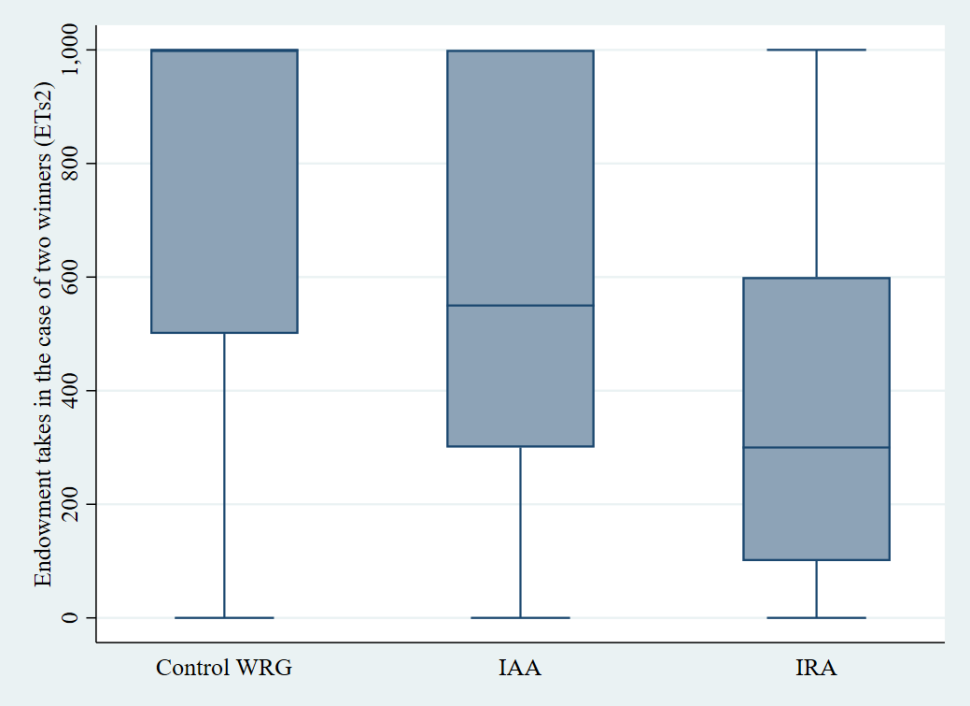


(b) Frequency distribution of ETs2 in the treatments

Figure 4.3: Frequency distribution of ETs1 and ETs2 in the control WRG, intragenerational accountability (IAA) and intergenerational accountability (IRA) treatments



(a) Subject ETs1 in three treatments



(b) Subject ETs2 in three treatments

Figure 4.4: Boxplots of endowment takes (ETs1 and ETs2) by subjects from losers as they are winners in three treatments, i.e., control WRG (winner righteousness game), intragenerational accountability (IAA) and intergenerational accountability (IRA).

Table 4.4: Estimation results of median regression on endowment takes

Variables	Endowment takes in the case of one winner (ETs1)			Endowment takes in the case of two winners (ETs2)		
	Model-1	Model-2	Model-3	Model-4	Model-5	Model-6
Treatment dummies						
(Base group = Control WRG)[a]						
Intragenerational accountability (IAA)	−500.00***	−150.00***	−150.00**	−400.00***	−100.00	−100.00
	(73.24)	(47.83)	(68.62)	(110.90)	(92.00)	(64.25)
Intergenerational accountability (IRA)	−600.00***	−300.00***	−300.00***	−700.00***	−400.00***	−391.18***
	(61.58)	(47.35)	(54.59)	(85.46)	(99.98)	(63.59)
Control factors						
Gender (Base group = Female)		200.00***	200.00***		300.00***	258.82***
		(40.57)	(23.96)		(50.45)	(48.63)
SVO[b](Base group = Prosocial)		300.00***	300.00***		200.00**	250.00***
		(32.87)	(35.46)		(93.66)	(47.01)
AP1[c]			0.30***			−
			(0.11)			
AP2[d]			−			0.47***
						(0.13)
Reasons and advice (Base group = No reasons and advice paper)						
One set of reasons and advice papers (RA1)			−200.00***			−235.29***
			(76.81)			(75.36)
Two sets of reasons and advice papers (RA2)			−137.50			−252.94***
			(94.22)			(63.56)
Three or more sets of reasons and advice papers (RA3)			−120.00			−97.06
			(104.12)			(88.34)
Sample size	297	296	296	297	296	296

Standard errors are in parentheses

***significant at the 1 percent level, **at the 5 percent level and *at the 10 percent level

[a] WRG stands for winner righteousness game

[b] SVO stands for social value orientation

[c] AP1 stands for average points taken by previous group members in the case of one winner that is mentioned in the reason and advice papers

[d] AP2 stands for average points taken by previous group members in the case of two winners that is mentioned in the reason and advice papers

WRG and other treatments (IAA and IRA) are the same. The null hypothesis is rejected at the 1 % significance level, implying the significant differences in the distributions between control WRG and other treatments.

To quantitatively characterize the research question, we perform the median regressions in which ETs1 and ETs2 are taken as dependent variables, and IAA and IRA are taken as an independent one along with other control factors, as described in equation (4.1). Table A3 reports the estimated coefficients, their corresponding standard errors and the statistical significance level of the independent variables on ETs1 and ETs2 in median regression models. Model-1 (Model-4) in table A3 contains two treatment dummies, such as IAA and IRA, as independent variables. Next, we gradually add gender dummy, SVO and other control factors as independent variables in models 2 to 3 (models 5 to 6), building upon model-1 (model-4). We mainly center on reporting the estimated coefficients of treatment dummies and some control variables, such as gender, SVO, AP1, AP2 and RA1, because they are identified to remain significant at 1 to 5 % in all models. The results reveal that male subjects tend to take more ETs1 and ETs2 by $200.00 \sim 300.00$ points as compared to females. Regarding SVO, subjects who are identified as a proself take more ETs1 and ETs2 by $200.00 \sim 300.00$ points as compared to prosocial. Subjects are found to increase ETs1 (ETs2) by 0.30 (0.47) points as the average points taken by previous group members increased by one point in the case of one winner (two winners) that is mentioned in the reasons and advice papers. Subjects having one set of reasons and advice papers take $200.00 \sim 235.29$ points less ETs1 and ETs2 as compared to having no reasons and advice papers. Regarding treatment dummies, the estimated coefficients of IAA on ETs1 are statistically significant with a negative sign in models 1, 2 and 3. However, the estimated coefficients of IRA on both ETs1 and ETs2 are statistically significant with negative sign across all models. The results indicate that subjects under IAA tend to decrease endowment takes by $150.00 \sim 500.00$ points on the median ETs1 as compared to control WRG, holding other variables constant. In IRA, subjects tend to decrease endowment takes by $300.00 \sim 600.00$ and $391.81 \sim 700.00$ points on the median ETs1 and ETs2, respectively, as compared to control WRG, holding other variables constant.[2] Overall, the finding suggest that being

[2]For the robustness check, we also estimate the results of median regression on endowment takes

accountable signifies subjects not to take the endowments as compared to those in the control, and the "take" reduction in IRA is twice as much as that in IAA.

Overall, it is evident from the summary statistics that the random assignments of the treatments are effective enough (table 4.2) and subjects endowment takes from losers as she is a winner in the case of one and two winners in a group get different in three treatments (table 4.3). It also appears to be true qualitatively in figure 4.4. We quantify the difference across the treatments through median regressions. The estimated coefficients indicate that subjects in IRA (IAA) tend to decrease endowment takes by $300.00 \sim 600.00$ ($150.00 \sim 500.00$) and $391.81 \sim 700.00$ points on the median ETs1 and ETs2, respectively, as compared to the control WRG, holding other variables constant. These findings are robust and consistent with the results obtained from different models in table A3. The estimation results associated with ETs1 and ETs2 provide answers to our research questions (how being accountable for decisions influence winners to behave toward losers, even when the winners are determined by chance?) and support the alternative hypothesis (winners behave righteously (or fairly) to losers as they are asked to be accountable for their decisions) by rejecting the null. Finally, our research establishes that winners righteously behave towards losers for fairness and equality, when they are accountable for their decisions along with awareness to an intergenerational linkage of groups in comparison to that to an intragenerational linkage.

Globalization, technological transformations and climate change are claimed to be main uncontrollable factors that push disparities among people in winner-take-all societies (Conroy and Glasmeier, 1992, Frank and Cook, 1995, Mittelman, 1996, 2000, O'Brien and Leichenko, 2003, UN, 2020, Rodríguez-Pose et al., 2023). Kapstein (2000) analyzes in his review essay that globalization and trade liberalization have influenced the evolving patterns of income distribution in industrial economies. He asserts that whereas free trade produces overall economic efficiency benefits, it simultaneously reallocates the rewards to factors of production, such as labor, resulting in identifiable groupings of benefactors and disadvantaged persons, or, in other terms, winners and losers. Furthermore, climate impact

by excluding the first generation data from analyses and the main results remain the same (see the appendix G).

assessments consistently highlight disparities in the regional and sectoral effects of climate change, and there is an increasing acknowledgement that the execution of climate change mitigation policies generates both winners and losers (McCarthy et al., 2001, O'Brien and Leichenko, 2003, Parry et al., 2007). Leading to the interpretation, our society tend to be like winner-loser determination by lottery (Frank, 2016); and the WRG that we design for the experiment represents the current environment of winner-take-all societies where each subject in a group decides how much to take endowments from losers as she is a winner by chance (i.e, lottery) and how inequality arises from the status quo of equality when accountability is not considered. The understanding of how winner-take-all markets lead to income inequality may influence societal efforts to modify market distributions for the sake of fairness (Frank and Cook, 1995). Research by social psychologists and anthropologists indicates that social learning via observation and communication fosters empathy and reduces social distance towards people from other groups (Behrens et al., 2008, Smith and Paladino, 2010, Heyes, 2012). In alignment with existing literature, the one-sided communication of reasons and advice from one group to unknown others in the "subsequent groups" within a generational lineup for IRA serves as a social mechanism that reduces social disparity and conveys shared perceptions of righteousness (Timilsina et al., 2023). Therefore, it shall be possible to argue that subjects in our experiments have righteously behaved to enhance fairness and equality, raising sympathy and solidarity beyond self-interests by IRA.

4.4 Conclusion

This paper has examined the effect of the accountability on winners behaviors to losers, investigating "how being accountable for decisions influence winners to behave toward losers, even when the winners are determined by chance." It is hypothesized that "winners behave righteously (or fairly) to losers as they are asked to be accountable for their decisions." To this end, we have implemented a laboratory experiment with three treatments of "control winner righteousness game (WRG)," "intra-generational accountability (IAA)" and "intergenerational accountability (IRA)," for collecting data on endowment takes in the case of one winners (ETs1) and two winners (ETs2) and control factors of 297

student-subjects in two Japanese universities. The results show that being accountable under IAA and IRA signifies subjects not to take the endowments as compared to those in the control, and the "take" reduction in IRA is twice as much as that in IAA. Overall, winners righteously behave towards losers for fairness and equality, specially when they are accountable for their decisions with an intergenerational linkage of groups. The novel aspects of this study are (i) to consider the accountability for analyzing the winner righteousness to losers by conducting a laboratory experiment and (ii) to empirically identify real decisions and behaviors toward losers by winners in a game settings instead of declared intentions.

Chapter 5

Conclusion

Adopting sustainable behaviors is crucial for ensuring long-term wellbeing and stability across social, economic and environmental systems. Previous studies have established the concepts of generativity and environmental concerns (EC), confirming the relationships with some key behaviors to SDGs (Hirose et al., 2023, Sharma et al., 2023). People's consumption intentions and behaviors have been examined by addressing other constructs and factors in theory of planned behavior (TPB), i.e., trust, labels, certifications, moral obligations or food habits (Rana and Paul, 2017, Chen, 2020, Leyva-Hernández et al., 2023, Randall et al., 2024). However, little is known about how generativity and EC are related to food consumption intentions and behaviors. Furthermore, existing research has focused primarily on examining immediate or short-term changes in people's behaviors through some interventions, such as nudging, labels, visual prompts and information provisions (Brunner et al., 2018, Majer et al., 2022, Qi et al., 2022, Segovia et al., 2023, Bazoche et al., 2023). Some recent researches have presented a great potential of future design (FD) approach to induce people to make long-term changes in their behaviors, demonstrating its strong effectiveness for short-term changes through laboratory and field experiments (Pandit et al., 2021, Shahen et al., 2021, Timilsina et al., 2023). Conversely, few studies have documented sustained behavioral changes and studied how some interventions, such as future studies approaches, affect people in the medium or long run. Finally, the existing body of work has focused on examining decision making of winners towards losers in various game settings through demonstrating giving behaviors of winners (Schotter et al., 1996, Selten and Ockenfels, 1998, Konow et al., 2020, Grech et al., 2022, Cartwright and Thompson, 2023, Goerres and Eicheler, 2025). Some present research have extended a grate potential of accountability to boost adherence and people thinking through reducing decision errors (Salisbury et al., 2022, Timilsina et al., 2023). In contrast, few studies have documented how inequality arises from the status quo of equality through examining winners taking behaviors and studied some interventions, such as accountability, that induce people to

act righteously to losers as they are winners by chance.

Therefore, in the first study of this thesis, we examine the drivers for sustainable food purchase intentions by considering the extended TPB, investigating the question "how generativity matters for consumers' intentions to purchase sustainable foods along with EC?" and the hypothesis "prosocial attitudes for future generations (PAF), one measure of generativity, is the key determinant." To this end, we have implemented a field survey for collecting data on intentions to purchase organic foods (INT), TPB constructs, i.e., attitudes, subjective norms and perceived behavioral controls, PAF and EC, with 300 household heads in Bangladesh. The results show that not only PAF, EC also have substantial positive effects on consumer intention to purchase organic foods along with TPB constructs. The relations between PAF and INT as well as EC and INT are fully and partially mediated by attitudes, respectively. Overall, this research identifies an importance of people's orientations for future generations and environment to shape sustainable food cultures and practices, and to this end, some future-studies approaches shall be recommended due to their effectiveness for enhancing the orientations.

In the third chapter, we examine the effect of the FD approach on sustainable food consumption (SFC), investigating the question "how does the FD approach impact food consumption?" and the hypothesis "FD induces a lasting shift to SFC." To this end, we have implemented a 3-round social experiment with three treatments of "control group," "deliberation" and "FD," for collecting data on organic vegetable consumption (OVC), nonorganic vegetable consumption (NVC) and sociodemographic factors of 300 households in Bangladesh over three months. The results show that FD induces people to have a sustained increase in organic and decrease in nonorganic vegetable consumption as compared to any other treatment, and the effect under FD is approximately twice as much as that under deliberation in magnitude and in each round. Overall, FD demonstrates a great potential for inducing people to make a persistent change to SFC. The novel aspects of this study are (i) to consider the perspective taking of future generations for analyzing households' lasting shifts to SFC by conducting a social experiments across multiple rounds and (ii) to empirically identify real choices and consumption of organic and nonorganic vegetables by households instead of declared intentions.

In the fourth chapter, we examine the effect of the accountability on winners behaviors to losers,

investigating the question "how being accountable for decisions influence winners to behave toward losers, even when the winners are determined by chance." It is hypothesized that "winners behave righteously (or fairly) to losers as they are asked to be accountable for their decisions." To this end, we have implemented a laboratory experiment with three treatments of "control winner righteousness game (WRG)," "intragenerational accountability (IAA)" and "intergenerational accountability (IRA)," for collecting data on endowment takes in the case of one winners (ETs1) and two winners (ETs2) and control factors of 297 student-subjects in two Japanese universities. The results show that being accountable under IAA and IRA signifies subjects not to take the endowments as compared to those in the control, and the "take" reduction in IRA is twice as much as that in IAA. Overall, winners righteously behave towards losers for fairness and equality, specially when they are accountable for their decisions with an intergenerational linkage of groups. The novel aspects of this study are (i) to consider the accountability for analyzing the winner righteousness to losers by conducting a laboratory experiment and (ii) to empirically identify real decisions and behaviors toward losers by winners in a game settings instead of declared intentions.

Finally, we recognize particular constraints in our study and suggest potential avenues for future investigation. First, the second chapter research is limited to evaluating the purchasing intentions of organic foods to predict actual purchasing behaviors and consumptions of sustainable foods, which is deemed the most accurate approximation in the context of Bangladesh. While prior research has established a good correlation between behavioral intentions and actual behaviors, future studies must integrate real purchasing behaviors alongside the intentions. Secondly, household heads in our study report their own self-perception on different constructs that may results in social desirability biases. Future studies should consider using behavioral tracking data or experimental approaches to validate self-reported intentions. Third, our research has assessed the purchase intentions of organic foods in general. Future research should gather and analyze purchase intentions for diverse organic items, including meat, fish, vegetables and fruits to ascertain precise outcomes. Fourth, there may be additional determinants of INT, including trust, health consciousness, labeling and certification, that are not included in this study. We could not able to collect these data due to several constraints that we faced

with respect to time, subjects and budgets.

The third chapter focuses on organic and nonorganic vegetable consumption by households to examine the sustained impact of FD on SFC, which is considered the best approximation we can make in the context of Bangladesh. Nevertheless, future studies should be able to collect and use household total food consumption and food waste data to identify the detailed results. Our study does not analyze the intricate mechanisms of how and why FD affects households motivations, decisions and behaviors on SFC. With an additional experimental design or further experiments using the neuropsychological approach and qualitative interviews, future studies should be able to characterize how and why FD households change their behaviors (Shahen et al., 2021). In order to extend the applicability of our research findings, future studies should employ the FD approach to address several other sustainability problems. Future studies should combine FD approach with other information-based interventions in a digital technology platform by customizing the contents of FD, such as case-method materials or workshops, for a substantial impact on SFC.

Finally, we note that there are two potential biases in our research, i.e., selection and self-reporting biases. For selection biases, we follow the standard rules of experimental research in social science. That is, we randomly recruit and allocate households to be subjects per treatment in our experiments when they voluntarily agree to participate. Because the participation is on voluntary basis, we must admit that the households that voluntarily agreed to participate in our experiment may be systematically different from the population of our study areas. However, the participation rate in our experiment is high (approximately 85 %) and samples across treatments are well balanced. Therefore, we argue that such a selection bias may exist but it shall not be so strong to change our main findings. Future studies may be able to address the bias by increasing the sample sizes and further balancing the characteristics of the households across treatment and control groups by improving the participating rates or random sampling processes. For potential self-reporting biases, we made an effort for the minimization in our experiment. Research assistants double-checked the consumption independently of self-reported one through their intensive observations and monitoring. Future studies may be able to avoid self-reporting biases by utilizing information technology, taking pictures of what they eat and/or purchase as well

as other scientific confirmation with some digital devices. Furthermore, in developed countries where receipt provision is customary in every transaction, future studies can incorporate purchase receipts to minimize self-reporting biases.

In the fourth chapter, we recognize certain limitations in our research on accountability and righteousness, and suggest possible directions for future work. First, our study does not investigate the inner functioning of how and why IAA and IRA influences subjects motivations, decisions and behaviors on righteousness to losers. Future studies should incorporate an alternative experimental design or additional tests utilizing the psychological method and qualitative interviews to elucidate how and why IAA and IRA subjects modify their behaviors. Second, the gender effect is a compelling phenomena; nevertheless, the underlying reasons remain ambiguous. Third, in order to extend the applicability of our research findings, future studies should employ both IAA and IRA in social experiments to address several economic and social inequality issues.

Although we acknowledge potential limitations in our research, we assert that it signifies progress in understanding the effectiveness of people's orientations for future generations and environment to have favorable attitudes toward sustainable food-purchase intentions. We also believe that it becomes an advancement in demonstrating a persistent change to SFC by FD and represents an advancement in promoting winners righteousness to losers through accountability. Finally, we hope that further studies on these topics will ensue to investigate our findings.

NOMENCLATURE

AATT Aggregated average treatment effect on the treated

ATT Attitudes

BDT Taka, Bangladeshi currency

DALYs Disability-adjusted life-years

DID Difference-in-differences

EC Environmental concerns

ESG Environmental, social and governance

ETs1 Endowment takes in the case of one winner

ETs2 Endowment takes in the case of two winners

FD Future design

GHG Greenhouse gas

glm Generalized linear model

GSEM Generalized structural equation model

INT Intentions to purchase organic foods

IAA Intragenerational accountability

IRA Intergenerational accountability

IS Intergenerational sustainability

JPY Japanese yen

NVC Nonorganic vegetable consumption

OVC Organic vegetable consumption

OLS Ordinary least squares

PAF Prosocial attitudes for future generations

PBC Perceived behavioral controls

PLS-SEM Partial-least squares structural equation modeling

RAs Research assistants

SDGs Sustainable Development Goals

SVO Social value orientation

SN Subjective norms

SFC Sustainable food consumption

TEM Total earning members

TFM Total family members under 18

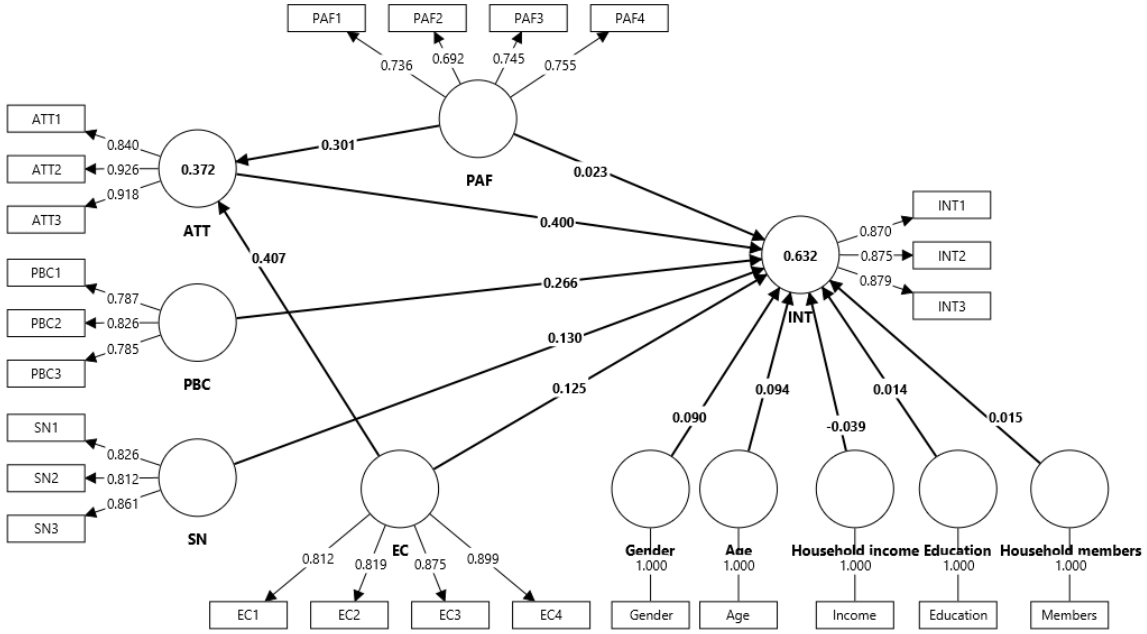
TPB Theory of planned behavior

USD US dollar

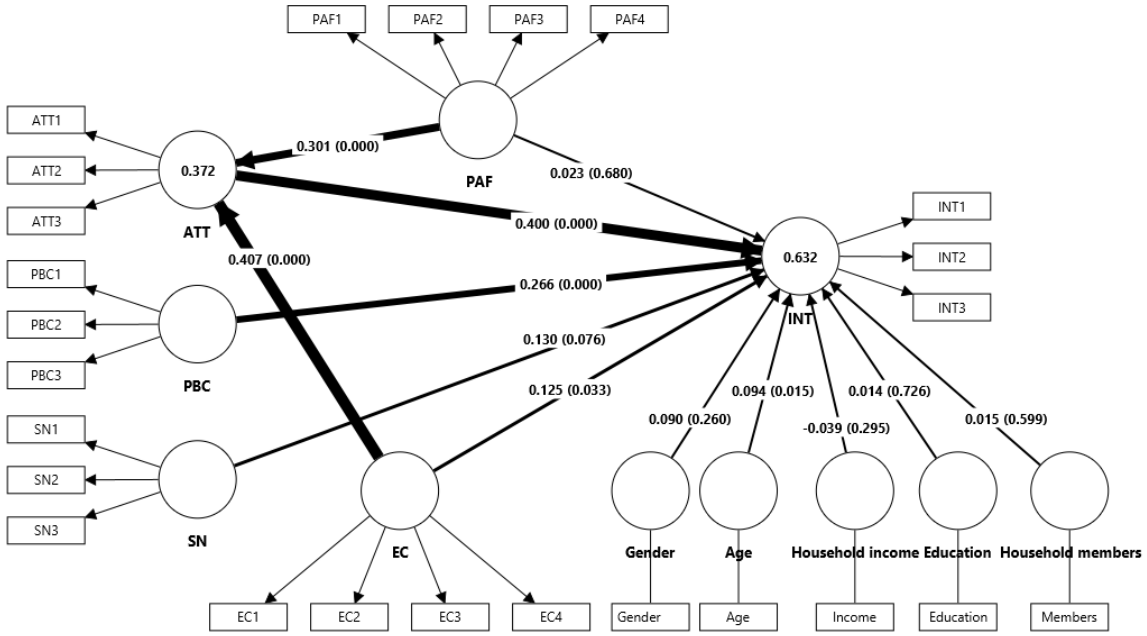
WRG Winner righteousness game

APPENDIX

Appendix A: The figures of measurement and structural models for intention to purchase organic foods by considering control variables, i.e., gender, age, household income, education and household members



(a) Measurement model



(b) Structural model

Figure 5.1: Measurement and structural models for intention to purchase organic foods by considering control variables, i.e., gender, age, household income, education and household members

Appendix B: Experimental Instructions (by English translation)

Instructions for Future design (FD) treatment

Step 1: Reading a case-method material and watching a video

Instructions: Please read the provided case-method materials on "History and current situation of organic and nonorganic foods" and watch the video regarding scientific information and facts for organic and nonorganic foods in 10 minutes.

Step 2: Understanding past, current and future situations of household consumption behavior, regarding organic and nonorganic foods

Instructions: Please take the provided paper and pen and write your answers regarding following questions in 20 minutes. Please write at least one sentence for each question.

1. How was your household food consumption behaviors and organic agriculture in past, i.e., 2001?

2. What is the current situation of your household food consumption behaviors and organic agriculture? as well as what might happen to the behaviors and agriculture in future, i.e., 2043?

Step 3: Initial suggestions for food consumptions

Instructions: Please answer the following questions and write at least three sentences for each question.

1. Write your suggestions of visions, missions and strategies for food consumptions from the current standpoint in 10 minutes.[1]

2. Write your requests of visions, missions and strategies for food consumptions to the current generations from the future standpoint (i.e., living in 2043) in 10 minutes.

Step 4: Discussion

Instructions: Please discuss with your household members on the followings.

1. Discuss the suggestions of visions, missions and strategies for food consumptions and summarize

[1]A vision is explained to be one simple statement that describes a long-term and ideal goal in the future for a household's food-consumption practice. A mission is explained to be several statements that describes what kind of problems a household specifically need to resolve for the vision. A strategy is explained to be several statements that describe how a household takes actions or changes their behaviors as well as habits for achieving the missions.

it with household members from the current standpoint in 20 minutes.

2. Discuss the requests of visions, missions and strategies for food consumptions and summarize it with household members from the future standpoint (i.e., living in 2043) in 20 minutes.

Step 5: Final suggestions for food consumptions

Instructions: Please write (at least 3 sentences) household visions, missions and strategies for food consumptions from the current standpoint in 10 minutes.

Step 6: Keeping records of vegetable consumptions

Instructions: Please help in recording household vegetable consumptions for the next one month.

Instructions for "Deliberation" treatment

Step 1: Reading a case-method material and watching a video

Instructions: Please read the provided case-method materials on "History and current situation of organic and nonorganic foods" and watch the video regarding scientific information and facts for organic and nonorganic foods in 10 minutes.

Step 2: Understanding past, current and future situations of household consumption behavior, regarding organic and nonorganic foods

Instructions: Please take the provided paper and pen and write your answers regarding following questions in 20 minutes. Please write at least one sentence for each question.

1. How was your household food consumption behaviors and organic agriculture in past, i.e., 2001?

2. What is the current situation of your household food consumption behaviors and organic agriculture? as well as what might happen to the behaviors and agriculture in future, i.e., 2043?

Step 3: Initial suggestions for food consumptions

Instructions: Please answer the following questions and write at least three sentences for each question.

1. Write your requests of visions, missions and strategies for food consumptions to the current generations from the future standpoint (i.e., living in 2043) in 10 minutes.

Step 4: Discussion

Instructions: Please discuss with your household members on the followings.

1. Discuss the requests of visions, missions and strategies for food consumptions and summarize it with household members from the future standpoint (i.e., living in 2043) in 20 minutes.

Step 5: Final suggestions for food consumptions

Instructions: Please write (at least 3 sentences) household visions, missions and strategies for food consumptions from the current standpoint in 10 minutes.

Step 6: Keeping records of vegetable consumptions

Instructions: Please help in recording household vegetable consumptions for the next one month.

Instructions for control group

Step 6: Keeping records of vegetable consumption

Instructions: Please help in recording household vegetable consumptions for the next one month.

Thank you for your kind cooperation.

Appendix C: The information of household heads pretreatment knowledge about organic food

The information of household heads pretreatment knowledge about organic food (preknowledge) was collected by asking their responses to the following four statements (Pacho, 2020).[2] Answers were taken in a seven point likert scale, such as Completely disagree (1), Mostly disagree (2), Somewhat disagree (3), Neither disagree nor agree (4), Somewhat agree (5), Mostly agree (6) and Completely agree (7).

Statements:

Q1. I know different types of organic foods.

Q2. I think I know enough about the term organic food.

Q3. I know about organic food well enough to be able to purchase them.

Q4. I have been interested to learn about organic foods.

[2]The four questions are developed and justified to be used as the measurement of people's preknowledge about organic foods in developing countries by Pacho (2020). We interpret that the responses represent confidence each subject has regarding her knowledge to organic foods for the type, concept, purchasing behaviors and interests. Because our experiments were conducted in a developing country and the questions are easy to answer, we judge that the measurement shall be the best fit as an approximation to the pretreatment knowledge about organic foods Bangladeshi people have.

Appendix D: Case-method material (by English translation)

History and current situation of organic and nonorganic foods[3]

1. Introduction: Organic farming was the predominant method of food production in the agricultural world before the rise of so-called "nonorganic agriculture." Organic agriculture can be defined as an integrated production management system that promotes and enhances the health of agroecosystems (Gomez and Thivant, 2017, Ferdous et al., 2021). This includes biodiversity, biological cycles, and soil biological activity. It emphasizes the use of natural inputs, such as minerals and products generated from plants, and discourages artificial fertilizers and pesticides. On the other hand, the term "nonorganic agriculture" refers to a method of crop production that is characterized by its heavy reliance on artificial fertilizers and pesticides as well as extensive water consumption (Zulfiqar and Thapa, 2016).[4]

2. History: By the end of the Second World War, a substantial segment of the global population had been affected by poverty. The primary factors contributing to this were limited access to contemporary technologies, suboptimal productivity levels and numerous instances of natural calamities (Yoshino, 2010, Ferdous et al., 2021). Traditional societies shifted their attention from agricultural pursuits to manufacturing and service sectors due to the arrival of "modern" technology, resulting in a decrease in the need on manual labor. Consequently, labor-intensive organic food production has been marginalized and stigmatized as outdated. The extensive utilization of agrochemicals in recent decades has played a role in the emergence of specific health problems, the degradation of the environment, the pollution of surface and groundwater and the increase in production costs. Consequently, there is an increasing global demand for food produced without synthetic chemicals, leading to the rise of organic farming methods.

[3]Adult members in each household across the treatment groups mostly have primary knowledge and experiences to purchase and consume organic and nonorganic vegetables in the markets or from the farm gates as their daily practices. It is expected that households in the field will be able to use their firsthand knowledge and experience to propose and discuss actionable points, i.e., how to distinguish or select which specific vegetables in the market are organically produced or how to smartly purchase them via deliberation and FD treatments (Dhaka Tribune, 2014, Musa et al., 2015, Seraj, 2019).

[4]In the native language (Bengali) version of a case-method material and video, we use simple words or paraphrase for their easy understanding even when we put some citations and academic jargon.

Figure 5.2: Organic inputs and pest management systems in Bangladesh

Prior to the Green Revolution in Bangladesh, farmers engaged in the cultivation of a variety of crops, selecting them based on the specific hydrological conditions of their fields (Ferdous et al., 2021). This would result in consistent agricultural yields. Despite the extensive flooding that took place in Bangladesh in 1988, agricultural production remained high. This can be ascribed to the cultivation of a certain type of rice in the country, referred to as "aman" rice, which is colloquially known as "deep-water rice." In the 1960s, Bangladesh experienced the Green Revolution, which involved the implementation of high-yielding crop types, extensive irrigation, insecticides, and nonorganic fertilizers. The government provided extra support to the Green Revolution with financial aid, high-yielding seeds and fertilizers, all of which were supplied by the government. Consequently, the farmers shifted their focus to farming nonorganic rice monoculture.

3. Current situations: Prior to 1950, Bangladesh's agriculture primarily relied on traditional organic methods of food production. The introduction of fertilizers in Bangladesh occurred in 1959. Subsequently, the Green Revolution made a substantial contribution to nourishing the rapidly growing population by enhancing food production. According to the (BBS, 2022), the application rate of chemical fertilizer increased significantly from an average of 24 kg/hectare in 1975–1976 to 384 kg/hectare in 2020–2021. A similar pattern is also noted in the utilization of insecticides. Since the start of the 21st century, the soil organic matter content in Bangladesh has decreased due to the increased cropping intensity and reliance on synthetic soil amendments. In the present time, both non-governmental organizations (NGOs) and the government are actively promoting organic food production as a solution to the

Figure 5.3: Nonorganic inputs and pest management systems in Bangladesh

environmental harm caused by nonorganic agricultural practices (Sarker and Itohara, 2008, Yoshino, 2010). The Forum for Regenerative Agriculture Movement (FORAM) in Bangladesh has curated a comprehensive roster of 137 organizations that demonstrate a keen interest in adopting ecologically sustainable practices. Out of the total, 47 individuals are practicing organic farming, 87 are actively engaged in sustainable farming, and three are involved in lobbying, campaigning, and advocating for sustainable development. Over two hundred voluntary organizations in Bangladesh have spearheaded initiatives to advance organic agriculture.

Appendix E: The tables of sub-sample analyses by considering deliberation (base group) and future design treatments

Table A1: Average treatment effect on organic (OVCs) and nonorganic (NVCs) vegetable consumptions in the sub-sample analyses by considering deliberation (base group) and future design treatments

Difference-in-difference (DID) models	ATT[a] on OVCs[b]						Sample size
	Posttreatment round 1		Posttreatment round 2		Aggregate		
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	
Treatments							
Future design treatment vs Deliberation treatment (model 1-1)	0.82*	0.09	0.48	0.28	0.65	0.11	600
	ATT[a] on NVCs[c]						
	Posttreatment round 1		Posttreatment round 2		Aggregate		
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	
Treatments							
Future design treatment vs Deliberation treatment (model 2-1)	−1.16*	0.06	−0.59	0.33	−0.88	0.12	600

***significant at the 1 percent level, **at the 5 percent level and *at the 10 percent level.

[a] ATT stands for average treatment effects on the treated

[b] OVCs stands for weekly organic vegetable consumptions in kg

[c] NVCs stands for weekly nonorganic vegetable consumptions in kg

Table A2: Marginal effects of the independent variables on household's organic and nonorganic vegetable consumptions in the sub-sample analyses by considering deliberation (base group) and future design treatments

	Posttreatment round 1		Posttreatment round 2		Panel	
	OVCs[a]	NVCs[b]	OVCs	NVCs	OVCs	NVCs
	ME[c](combined)	ME	ME (combined)	ME	ME (combined)	ME
	Model 1-1 (two part)	Model 1-2 (glm)	Model 2-1 (glm)	Model 2-2 (glm)	Model 3-1 (two part)	Model 3-2 (glm)
Treatment dummies						
(Base group = Deliberation treatment)						
Future design treatment	0.75*	−1.11**	0.53	−0.56*	0.60**	−0.81**
Control factors						
Knowledge	−0.18	−0.15	−0.35***	0.15	−0.27***	−0.01
Age	0.04**	0.01	0.05***	0.01	0.05***	0.01
Gender (Base group = Male)	−0.44	−0.54	−0.65*	−0.66**	−0.56**	−0.59*
Household income	-3.90×10^{-6}	1.06×10^{-5}	4.36×10^{-6}	-6.79×10^{-6}	7.52×10^{-7}	3.19×10^{-6}
Education	0.10	0.09	0.16	−0.08	0.13	−0.02
Total family members under 18	0.18	0.45*	0.57***	0.01	0.39***	0.19
Total earning member	0.49	−0.08	0.01	0.43	0.21	0.09
Sample size	200	200	200	200	400	400

***significant at the 1 percent level, **at the 5 percent level and *at the 10 percent level

[a] OVCs stands for weekly organic vegetable consumptions in kg

[b] NVCs stands for weekly nonorganic vegetable consumptions kg

[c] ME stands for a marginal effect to indicate a change in the weekly organic (or nonorganic) vegetable consumptions when one independent variable increases by one unit, holding other factors fixed

Appendix F: Experimental Instructions for the winner righteousness game (WRG) (translated from Japanese)

Thank you for your participation. In this game, you will make simple decisions. By making decisions, you will have opportunities to earn money. Any money earned during this game is yours to keep. Therefore, it is important that you read these instructions carefully. Please do not communicate with other participants during the experiment.

Game

In the game, a group of three players is randomly formed. Each player never knows who are the other players in the same group. This game is played in groups, and each player in a group gets **1000 points** as her/his **initial endowment points** at the start of game. In addition to the individual endowment points, you can earn **variable points** depending on your decision and the game rules. Variable points can be positive or negative and will affect your total points as follows.

Your total points $=$ **Initial endowment points** $\pm$ **Variable points**

Finally, **your total points** are converted in cash by exchanging two **individual points** with 1.00 ¥. The cash earning is considered as rewards from the WRG. The higher the total points, the higher the game reward you earn from it. Please read the following instructions carefully as we will be discussing WRG in detail. Please raise your hand if you have any questions. I will answer them individually. In the WRG, participants are asked to play a simple decision-making game on the computer.

In the game, a sequence of groups is organized, consisting of group 1, group 2, group 3, . . . and so on. You are a player of one group in a sequence, and each group plays the game only once, following the group order in the sequence. The game starts with group 1 and continue to next groups. Each member of a group rolls the dice once and is assigned "winner" or "loser".

Your **total points** is defined by the summation of your initial endowment points and variable points,

according to **Rule I** and **Rule II**:

Rule I

I - 1: If the dice roll 1 or 2, you are a "winner". In this case, you can take as many points as you want from the members of the same group who are "losers", in the range of 0 to 1000. This take amount will be your positive variable points.

I - 2: If the dice roll 3, 4, 5 or 6, you are a "loser." In this case, a member of the same group who is a "winner" may take your points in the range of 0 to 1000. This take amount will be your negative variable points.

The same rules apply to each other member of the same group.[5]

Control WRG

Decision making part:

Assume the situation where you are a "winner" and decide in advance how much endowments to take from a "loser" members in the same group. If you are a "winner" and you decide to take, there are two possible situations.

1. Situation 1: Two group members are "winners" and one is "loser"

2. Situation 2: One group member is "winner" and two are "losers"

You have to decide how much to take endowments from "loser" members as you are a "winner", considering two situations in the same group. Please enter the amount to take points in the range of 0 to 1000.

[5]The dice are not actually rolled. The dice work is reproduced on the computer by programming. It is the same as the actual rolling of dice.

A lottery determines whether you becomes “winner” or “loser.” You will take the endowment from each loser following your take decisions if you are a winner. Otherwise, your endowment shall be taken by each winner in your group.

Intragenerational accountability (IAA) treatment

Thinking part:

It is assumed that you fully understand the game rules. I will then first ask you to think that you are a member of some group that will be the first, second or so on and think of the sequence you are a part of as a continuing society. By considering a desirable society from a neutral perspective, please write your thinking on the “reasons and advice paper” about how each member of the society should behave if she is a “winner” by chance.

Decision making part:

Before rolling the dice, please read the “reasons and advice papers” (if any you have) written by the group members who have already played the game in another group. In addition, assume the situation where you are a “winner” and decide in advance how much points to take from a “loser” members in the same group, while writing the “reasons and advice” for your take decisions. If you are a “winner” and you decide to take, there are two possible situations.

1. Situation 1: Two group members are “winners” and one is “loser”

2. Situation 2: One group member is “winner” and two are “losers”

You have to decide how much to take endowments from “loser” members as you are a “winner”, considering two situations in the same group. Please enter the amount to take points in the range of 0 to 1000.

A lottery determines whether you becomes “winner” or “loser.” After that in your “reasons and advice paper,” please mention your lottery results and final gains, and add additional advice to other group members.

Intergenerational accountability (IRA) treatment

Thinking part:

It is assumed that you fully understand the game rules. I will then first ask you to think that you are a member of some group that will be the first, second or so on and think of the sequence you are a part of as a continuing society. By considering a desirable society from a neutral perspective, please write your thinking on the "reasons and advice paper" about how each member of the society should behave if she is a "winner" by chance.

Decision making:

Before rolling the dice, please read the "reasons and advice papers" (if any you have) written by the group members who have already played the game **in the previous generations**. In addition, assume the situation where you are a "winner" and decide in advance how much points to take from a "loser" members in the same group, while writing the "reasons and advice" for your take decisions **to unknown others that will play the game later as the future generations**. If you are a "winner" and you decide to take, there are two possible situations.

1. Situation 1: Two group members are "winners" and one is "loser"

2. Situation 2: One group member is "winner" and two are "losers"

You have to decide how much to take endowments from "loser" members as you are a "winner", considering two situations in the same group. Please enter the amount to take points in the range of 0 to 1000.

A lottery determines whether you becomes "winner" or "loser." After that in your "reasons and advice paper," please mention your lottery results and final gains, and add additional advice **to other group members in the future generations.**

Total point calculation:

After the decision making part, the dices are rolled. The results of the dice roll will be shown on the computer screen. It will be announced whether you are a "winner" or "loser" and whether your group is in "situation 1" or "situation 2." Total points are calculated and announced according to the situation determined by the dice, the type ("winner" or "loser") of you and the other members of your group and the points you took in each decision making part. If the dice result in everyone having the same type (all members are "winners"or "losers") there will be no taking of points among members and the initial points will be used as the total points.

- If the dice result shows that your group is in situation 1 or 2 and if you are a "winner," your predetermined take decisions in that situation becomes a positive variable point and is added to your initial points to become your total points.
- If you are a "loser," the amount taken by the "winner" members of the same group in that situation will be your negative variable points and will be subtracted from your initial points. The reminder will be your total points. If the sum of the take of two "winner" members in situation 1 is greater than the initial points of the "loser" member, the total points for that "loser" member will be negative.

Game Procedures for Control WRG

Each of you is given 1000 points as your individual endowment points, and is notified of which group you belong to in a sequence just before starting the game.

- ID entry: Enter the given ID number
- Decision making part: Assume the situation where you are a "winner" and decide in advance how much points to take from a "loser" members in the same group. If you are a "winner" and you decide to take, there are two possible situations and please enter the amount of points you will take on the computer screen.

  - Situation 1: Two group members are “winners” and one is “loser”
  - Situation 2: One group member is “winner” and two are “losers”

- A lottery: It determines whether you becomes “winner” or “loser.” You will take the endowment from each loser following your take decisions if you are a winner. Otherwise, your endowment shall be taken by each winner in your group.

Game Procedures for IAA

Each of you is given 1000 points as your individual endowment points, and is notified of which group you belong to in a sequence just before starting the game.

- ID entry: Enter the given ID number

- Thinking part: you are a member of some group that will be the first, second or so on and think of the sequence you are a part of as a continuing society. By considering a desirable society from a neutral perspective, please write your thinking on the “reasons and advice paper” about how each member of the society should behave if she is a “winner” by chance.

- Decision making part: Before rolling the dice, please read the “reasons and advice papers” (if any you have) written by the group members who have already played the game in another group. Assume the situation where you are a “winner” and decide in advance how much points to take from a “loser” members in the same group, while writing the “reasons and advice” for your take decisions on the reasons and advice papers. If you are a “winner” and you decide to take, there are two possible situations and please enter the amount of points you will take on the computer screen.
  - Situation 1: Two group members are “winners” and one is “loser”
  - Situation 2: One group member is “winner” and two are “losers”

- A lottery: In your “reasons and advice paper”, please mention your lottery results and final gains and add additional advice to other group members.

Your reasons and advice papers will be handed to the group members who will participate in the in the sequence to which you belong.

Game Procedures for IRA

Each of you is given 1000 points as your individual endowment points, and is notified of which group you belong to in a sequence just before starting the game.

- ID entry: Enter the given ID number
- Thinking part: You are a member of some group that will be the first, second or so on and think of the sequence you are a part of as a continuing society. By considering a desirable society from a neutral perspective, please write your thinking on the “reasons and advice paper” about how each member of the society should behave if she is a “winner” by chance.
- Decision making part: Before rolling the dice, please read the “reasons and advice papers” (if any you have) written by the group members who have already played the game in the previous generations. Assume the situation where you are a “winner” and decide in advance how much points to take from a “loser” members in the same group, while writing the “reasons and advice” for your take decisions on the reasons and advice papers to unknown others that will play the game later as the future generations. If you are a “winner” and you decide to take, there are two possible situations and please enter the amount of points you will take on the computer screen.
  - Situation 1: Two group members are “winners” and one is “loser”
  - Situation 2: One group member is “winner” and two are “losers”
- A lottery: In your “reasons and advice paper”, please mention your lottery results and final gains and add additional advice to other group members in the future generations.

Your reasons and advice papers will be handed to the group members in the future generations.

Some examples

Example 5.0.1 *Suppose, the dice result shous that you are a "loser" and two other members of the same group are "winners". This would be the situation 1. One of the members who is a "winner" has decided to take* 300 *points and other has decided to take* 800 *points. Your total points are:*

Total points = Initial points ± Variable points(sum of the take of the two winner members)

Total points $= 1000 - (300 + 800) = -100$

The total points you earn in this game will be -100*. The total points earned by other "winner" members are* 1300 *points and* 1800 *points, respectively.*

Example 5.0.2 *Suppose, the dice result shous that you are a "winner" and two other members of the same group are "losers". This would be the situation 2. You have decided to take* 100 *points from each loser. Your total points are:*

Total points = Initial points ± Variable points(sum of the take from the two loser members)

Total points $= 1000 + (100 + 100) = 1200$

The total points you earn in this game will be 1200*. The total points earned by each of the other "loser" members are* 900 *points.*

THANK YOU

Appendix G: Estimation results of median regression on endowment takes by excluding the first generation data

Table A3: Estimation results of median regression on endowment takes (excluding the first generation data)

Variables	Endowment takes in the case of one winner (ETs1)			Endowment takes in the case of two winners (ETs2)		
	Model-1	Model-2	Model-3	Model-4	Model-5	Model-6
Treatment dummies						
(Base group = Control WRG)[a]						
Intragenerational accountability (IAA)	−500.00***	−150.00*	−150.00*	−400.00***	−100.00	−68.00
	(90.04)	(80.56)	(85.18)	(122.62)	(102.47)	(48.03)
Intergenerational accountability (IRA)	−600.00***	−300.00***	−300.00***	−700.00***	−300.00***	−300.00***
	(69.22)	(88.95)	(101.68)	(87.03)	(106.39)	(73.73)
Control factors						
Gender (Base group = Female)		200.00***	200.00***		300.00***	300.00***
		(40.70)	(61.78)		(91.92)	(42.50)
SVO[b](Base group = Prosocial)		300.00***	300.00***		300.00***	300.00***
		(107.04)	(56.66)		(98.96)	(39.48)
AP1[c]			0.30***			−
			(0.11)			
AP2[d]			−			0.44***
						(0.08)
Reasons and advice (Base group = No reasons and advice paper)						
One set of reasons and advice papers (RA1)			−200.00**			−252.00***
			(99.25)			(77.99)
Two sets of reasons and advice papers (RA2)			−137.50			−262.00***
			(124.70)			(77.66)
Three or more sets of reasons and advice papers (RA3)			−120.00			−132.00
			(135.87)			(89.13)
Sample size	279	278	278	279	278	278

Standard errors are in parentheses

***significant at the 1 percent level, **at the 5 percent level and *at the 10 percent level

[a] WRG stands for winner righteousness game

[b] SVO stands for social value orientation

[c] AP1 stands for average points taken by previous group members in the case of one winner that is mentioned in the reason and advice papers

[d] AP2 stands for average points taken by previous group members in the case of two winners that is mentioned in the reason and advice papers

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