IMPACT OF ADVERTISING CONTENT ON FOOD DEMAND BY NORMAL-WEIGHT VS. OVERWEIGHT INDIVIDUALS

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ABSTRACT

This study compares the food demand shift and rotation effects of anti-obesity and healthy food advertising on both overweight and normal-weight individuals. We show that consumer differentiation by weight is crucial in fully understanding the effects of advertising content on food demand. Our results suggest that anti-obesity advertising is more effective for overweight subjects and healthy food advertising is more effective for normal-weight subjects. We discuss possible explanations consistent with the empirical results and provide important information for policy-makers necessary to design and implement the most effective advertising campaigns for encouraging people to eat healthier foods.

BIOGRAPHICAL SKETCH

Born in Dalian, China, Ruitong Wang spent most of his childhood with families to explore the natural beauty of China and reading books in history. At eighteen, Mr. Wang moved to Xiamen to pursue his undergraduate degree in economics and lived a meaningful four years at this beautiful city, 1400 miles from his hometown. His journey in economics and the world continued at Ithaca, New York, 7000 miles away from hometown. Mr. Wang joined Charles Dyson School of Applied Economics and Management, focusing on food marketing.

My thesis is dedicated to my father, Gang Wang, and my mother, Hongli Yu. Though I seldom say it to them personally, I really thank you for their endless love and support during past years. I hope I have and will continue to keep them pride of me. Also, I would like to thank Yuan Zou for her support during the past two years.

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CHAPTER 1

INTRODUCTION

1.1 Background on Obesity and Anti-obesity Policies

Obesity is a substantial social problem in the United States. In 2012, 40% of the U.S. population was classified as overweight and 75% as overweight or obese (Flegal *et al.* 2012; Hellmich 2013). Medical research has indicated that obesity (and/or being overweight) is linked to significant health problems including diabetes, heart disease, and certain types of cancer (Andreyeva *et al.*, 2004). Rashad *et al.* show that obesity is the second-leading cause of death after smoking in United States. Cawley and Meyerhoefer (2012) estimate that obesity-related health problems raise the annual medical cost per person by $2,741 (in 2005 dollars), or $860.4 billion in total in United States.

It is well understood that a key factor contributing to obesity is the insufficient consumption of healthy foods coupled with the overconsumption of unhealthy foods, and that changing people's eating habits is essential to decreasing the obesity rate. Health experts have paid increasing attention to implementing policies aimed at encouraging healthy eating and/or discouraging unhealthy eating behavior. A number of studies have evaluated the efficacy of such policies. Fat taxes and thin subsidies (e.g., Andreyeva *et al.* 2011; Chouinard *et al.* 2007; Edwards 2011; Kuchler *et al.* 2005; Powell *et al.* 2009; Streleyskaya 2013) and information labeling (Downs, *et al.* 2009; Dumanovsky, *et al.* 2011; Harnck *et al.* 2008; Schwartz *et al.* 2012; Amatyakul 2013) are two most popular ones.

Fat taxes and thin subsidies are the most discussed policies to mitigate obesity and have been used in European countries for several years. Typical examples of fat tax and thin subsidies are taxes on soda and sweet or subsidies on fruit and vegetables. This policy is implemented based on the argument that the price of unhealthy food is too low compared with healthy food and does not reflect the high social external cost that related to excessive consumption of unhealthy food and insufficient consumption of healthy food. Mazzocchi *et al.* (2009) show that the real price of soda drink fell by 35%, while the real price of fruit and vegetables rose by 17% from the period of 1990 to 2003. The introduction of fat tax or thin subsidy is to realign the food prices to the social externality of obesity. Even though they have been applied to some countries, the efficacies of the fat tax and thin subsidies remain questioning. Current evidences show mixed results. Although modest effects of fat taxes have been reported in experimental settings (e.g., Andreyeva *et al.* 2011; Epstein *et al.* 2010; Streletskaya *et al.* 2013), some researchers (e.g., Chouinard *et al.* 2007; Kuchler *et al.* 2005) have found minimal impacts of such a tax when using secondary data due to the highly inelastic demand for food in the United States.

No country has yet implemented a comprehensive policy on food nutrition labelling. New York City Department of Health, however, has passed legislation that require all restraint should impose the nutrition details on the menu from July 1, 2007. And Obama administration currently pursue to extend the legislation of New York City to the entire country. The efficacy of food labelling remains unclear, several studies (Bassett *et al.* 2008; Burton *et al.* 2006 Chu *et al.* 2009; Roberto *et al.* 2010; Amatyakul 2013) have reported moderate changes in eating behavior, while others have found no or minimal impacts of information labeling (e.g., Downs *et al.*2009; Finkelstein *et al.* 2001; Vadiveloo *et al.* 2011). What is more, some researchers have argued that information labelling policies might have a perverse impact on food choice. For example,

Wansink and Chandon (2007) found that the "health halo impact" of food labelling. Their research showed that subject's calorie intakes rose by 50% when they consumed a snack with "low calorie" label.

Liu *et al.* (2014) argue that most anti-obesity policies are based on the assumption that people act rationally when making food choices, which implies that people make suboptimal choices due to a lack of either appropriate monetary incentives or imperfect information. However, strong evidence suggests that people eat mindlessly (Wansink, 2006). To enhance the effectiveness of anti-obesity policies, Galizzi (2014) suggest implementing conventional economic interventions, which affect individuals in a rational way, in combination with behavioral policies, which nudge individuals subconsciously.

1.2 Background on Advertising Campaign

Advertising campaigns, which can affect individuals both consciously and subconsciously, have shown great potential in nudging individuals to a healthier diet. For example, Pollard *et al.* (2008) show that the "Go for 2&5" campaign in Western Australia increased the average fruit and vegetable consumption by 20%. Healthy food and anti-obesity advertisements are the two major applicable campaigns to encourage (or discourage) healthy (or unhealthy) eating behavior. Currently, healthy food advertisements, which encourage the consumption of foods such as fruits and vegetables, are mainly sponsored by commodity marketing boards or state governments. Compared with the enormous amount spent on unhealthy food advertisements, the amount of healthy food advertising is negligible. Chapman *et al.* (2006) report that 80% of the food advertisements in Australia promote consumption of unhealthy food. The limited research on healthy food advertising (Liaukonyte *et al.* 2012; Pollard *et al.* 2008; Rickard *et al.* 2011;

Rusmevichientong *et al.* 2014; Streletskaya *et al.* 2013) have indicated that healthy food advertising has a substantial positive effect on increasing the consumption of fruit and vegetables.

Anti-obesity advertisements target primarily overweight/obese people and contain frightening messages to persuade these individuals to reduce unhealthy food consumption. This type of advertising is mainly state-sponsored and is controversial among audiences due to its aggressive nature. For example, "Stop Childhood Obesity: Why am I Fat" sponsored by Children's Health Care Atlanta resulted in a heated debate in Georgia. Critics argued that anti-obesity advertising could stigmatize overweight people, which could cause overweight people to engage in even unhealthier eating rather than healthy eating behavior (Keneally, 2012). Several psychologists (Brown, 2001; Brown and Locker, 2009; Ruiter *et al*., 2001) have also cast doubts on the efficacy of anti-obesity advertising because the negatively-framed advertising might have the unintended consequence of inducing resistance towards behavioral change. On the other hand, the frightening message delivered by anti-obesity advertising might be so strong that it could cause mental and physical discomfort for the audience and result in a decreased consumption for all food, including healthy food. However, these behavioral studies lack actual data on advertising and consumption to empirically support this notion. Moreover, very few studies have been conducted to examine the effects of anti-obesity advertising on consumption, with the exception of two recent experimental studies by Streletskaya *et al.* (2013) and Rusmevichientong *et al.* (2014), whose results are discussed in the next section.

1.3 Motivation, Purpose, and Structure of the Thesis

Previous studies have shown promising efficacy of healthy food and anti-obesity advertising; however, to our knowledge, no research has separated and compared the impact of advertising

content on normal-weight and overweight individuals[1]. Researchers have shown that overweight individuals are more likely to be present-biased[2] (Borghan *et al.* 2006; Ikeda *et al*. 2010; Komlos *et al.* 2004; Zhang *et al.* 2008) and have less self-control abilities (Fan and Jin 2014). Therefore, it is reasonable to conjecture that normal-weight and overweight individuals might have varying reactions to different advertising content. Furthermore, the content of advertising might vary based on the targeted groups and studying its impact for an entire population might produce biased results. For example, the content of advertising directed at overweight individuals might be designed to drastically change current eating behavior of overweight people, but not have any impact on normal weight individuals. Thus, it is important to differentiate between the two groups so that policymakers can more effectively design and implement strategies based on characteristics of the targeted group.

The overall purpose of this study is to examine the impact of healthy food and anti-obesity advertising on the demand for healthy and unhealthy foods for both overweight and normal-weight consumers. Based on experimental data collected from 183 adult subjects, we categorize the subjects based on their Body Mass Index (BMI) into normal-weight and overweight individuals and examine the impact of advertising on both groups, respectively. To examine the effects of advertising, we develop a structural model based on the theoretical framework proposed by Johnson and Myatt (2006) and separately measure both shift and rotation effects of advertisements on overweight and normal-weight individuals. It is important to identify both shift and rotation effects because each of these demand changes contain important information

[1] We adopt the terminology of the CDC, which categorizes individuals into underweight, normal-weight, overweight, and obese according to their Body Mass Index (BMI).

[2] Present-biased preferences can be seen as the result of the affective decision making system, which values immediate gratification and sharply discounts all future periods. This notion is supported in neuroeconomics studies (McClure *et al.*, 2007) and captured by various economic models (e.g., Fudenberg and Levine, 2006; O'Donoghue and Rabin, 1999).

on consumer heterogeneity. The shift effect provides information on the change in mean valuation and captures the mean impact of advertising. The rotation effect contains information on the change in dispersion in willingness-to-pay (WTP) among subjects and measures the variation of the impact of the advertising across individuals. An effective advertising campaign in our study should have a large shift effect and a decreasing dispersion impact on the demand, implying that most consumers are similarly persuaded to change to healthier eating behaviors.

To our knowledge, this research is the first to compare the efficacy of anti-obesity and healthy food advertising on the demand for healthy and unhealthy food by both overweight and normal-weight consumers. We find that advertising slightly changes most normal-weight subjects into a healthier diet selection, while it affects positively only some of the overweight subjects, but to a substantial degree. In addition, our results suggest that anti-obesity advertising appears to be more effective for overweight subjects and healthy food advertising is more effective for normal-weight subjects. We discuss possible explanations consistent with the empirical results and provide important information for policy-makers necessary to design and implement the most effective advertising campaigns for encouraging people to eat healthier foods.

The remainder of this paper is organized as follows. Section 2 gives an overview of literature from both economics and psychology related to this topic. Section 3 describes the experiment in which we collected the data and present the model to study the impact of advertising on consumers' WTP. Finally, we discuss the empirical findings in section 4 and analyze some implications of it in section 5.

CHAPTER 2

LITERATURE REVIEW

2.1 Psychology Theory on Advertising

Vakratsas and Ambler (1999) classify advertising effects on consumers into two categories: a mental effect, such as change in a consumer's belief and attitude, and a behavioral effect, which relates to purchasing behavior. Advertising achieves both mental and behavioral effects by persuasion. In the process of persuasion, both central and peripheral cues of advertisements play significant roles (Cacioppo *et al.* 1983). Via the central route, individuals change their attitudes towards the product due to the change of perceived pros and cons towards the product; while the peripheral route occurs when the person makes a simple inference about the merit of the advocated position based on various simple cues (Cacioippo *et al*. 1984). Petty and Cacioppo (1996) show that peripheral cues are more effective at altering consumer behavior than central cues in low personally-relevant condition; and the opposite is true under high personally-relevant condition. Similar to peripheral cues, Thaler and Sunstein (2008) promote the concept of "nudging" people towards optimal behavior by changing their choice architecture and environment.

Advertising can affect individuals subconsciously by providing "visceral cues" (Laibson 2001), such as the sight and sound of food. It can also affect decisions through information provision on healthy and unhealthy diets. In the context of our experiment, advertisements containing information on healthy or unhealthy diets are expected to be more effective to consumers who are concerned about their diet; whereas for those who are unconcerned about their eating behavior, emotional-type advertisements with more visceral cues are expected to be

more effective. Thus, a deeper look at advertising content can play a critical role in explaining how consumer reactions translate into their actions.

There are other psychology theories that explain how advertising affect consumers. However, it is beyond the scope of this study to detangle the psychological motivation to the effectiveness of advertisings. All the existing theories of adverting suggest that advertising can influence the consumer behavior, and we will use an econometrics model to quantify the impact of advertising on consumer behavior.

2.2 Theory on Quantifying the Impact of Advertising

Bagwell (2007) summarizes the three main effects of advertising as: (1) persuasiveness; (2) informative effect and (3) complementariness. Comanor and Wilson (1974, 1979) define the persuasive value of advertising as the change in preferences it causes for an established product that induces product differentiation. Nelson (1970, 1974) analyzes the informative role of advertising and finds that it assists in the process of matching consumer preferences and product attributes. Under the complementary view of advertising, advertising itself directly enters the preference in a manner that is complementary to the consumption of the advertised product and consumer draws utility from the advertising as well as the advertised products (Becker and Murphy 1993; Stigler and Becker 1973). Ackerberg (2001) empirically distinguishes between informative and persuasive role of advertising and finds a large and significant informative effect of advertising. Advertisement that gives consumers product information should primarily affect inexperienced consumers and thus decrease the dispersion of valuation for the product; while advertisement that create prestige effects should affect both experienced and inexperienced consumer and thus result in an increase of dispersion in valuation.

Johnson and Myatt (2006) categorize the impact of advertising into “pure hype” and “real information” effects. Advertising achieves its “pure hype” effect through providing universally-liked characteristics of the product or creating awareness of the product among consumers, which results in a change in the mean valuation among consumers. The rotation of the demand curve is associated with the “real information” effect of the advertising. By providing “real information”, advertising attracts the consumer whose preference is consistent with the product, but turns off other consumers. It thus increases the variance and dispersion among consumers’ WTP and rotates demand curve clockwise. In the context of our paper, information that stresses the benefits of a healthy diet and potential hazards of unhealthy eating behavior can be interpreted as the “real information” effect of the advertising, explaining the demand rotations, while a strong message that conveys unhealthy food as a “health killer” and health food as a “life saver” can be interpreted as having a “pure hype” effect, resulting in demand shifts.

2.3 Research Examining the Advertising’s Impact on Food Demand

The Johnson and Myatt (2006) framework has been used in several empirical studies of the food industry. Applying the Johnson and Myatt (2006) framework to experimental data, Rickard *et al.* (2011) find that “broad-based” generic advertising, which is generic advertising for all fruit and vegetables, has a more significant positive effect on WTP for fruits and vegetables than does commodity-specific (e.g., generic apple) advertising. Similarly, using the same framework, Richards and Nganje (2014) show that the rotation effect of a food recall announcement is substantial, but is still dominated in welfare calculations by the shift effect. Liaukonyte *et al.* (2014) measure the impact of food labels with and without additional negative information and find stark differences between “concerned” and “indifferent” consumers in terms of their response to negative information about products. In this paper we adopt the Johnson and Myatt

(2006) theoretical model and quantify the effects of two types of advertising content on the food demand for two types of consumers: normal-weight and overweight.

In addition to Rickard *et al.* (2011), several other studies have been conducted that use experimental data to quantify the impact of advertising on food choice and demand. Streletskaya *et al.* (2013) find that healthy food and anti-obesity advertising in combination with policies such as an unhealthy food tax and/or a healthy food subsidy reduces the calories, fat, and cholesterol in meal selection. Rusmevichientong *et al.* (2014) show that healthy food advertising has a stronger impact than anti-obesity advertising on reshaping consumers' eating behavior. However, the major limitation of these studies is that they treat consumers as a homogenous group and do not differentiate the impact of advertising by body weight. As we show in this paper, this differentiation is crucial in fully understanding the effects of healthy food and anti-obesity advertising as well as being able to design optimal advertising strategies to maximize the effects.

CHAPTER 3

METHODOLOGY

3.1 Experimental Design

A total of 183 adults (non-undergraduate students) participated in the experiment. Subjects were paid $30 in cash for their participation in the experiment, and they could use part of the cash payment to bid on the snack items presented in a series of auctions.

We conducted the experiment in two locations to have sufficiently large number of observations for both overweight and normal-weight groups. Among the 183 total subjects in the experiment, 75 subjects participated in the sessions held in the first location, a small conference

in a local shopping mall, and 108 of them attended the session on the second location, an experimental economics laboratory located at a northeastern university. When conducting experiments at the shopping mall, we had a recruitment table in front of a conference room with a sign that advertised the experiment. The sign informed potential subjects of the type of experiment, duration, and compensation, and interested people were given a detailed written description of what the experiment entailed. Participants could then sign up for one of the sessions that would be held on that day. Subjects participating in the on-campus experiment were recruited by an online announcement of the experiment that was sent to all university staff via a staff newsletter[3]. All subjects were randomly assigned into one of three groups: (1) control group (n=60), (2) anti-obesity advertising treatment (n=60), and (3) healthy food advertising treatment (n=63).

Each session of the experiment began with written and oral instructions on how the auction and bidding process worked. To maintain an incentive-compatible design, the Becker-Degroot-Marschak (BDM, 1964) auction was used to elicit subjects' WTP for snack food items.[4] The BDM mechanism is an ideal auction system for our experiment because it is incentive-compatible, demand-revealing, and does not raise "bidding competition" among the subjects. Before the auction, subjects were informed that one of the auctioned items was randomly selected before the experiment and would become binding for the subjects. With this announcement, we reduced the chance that subjects would submit lower bids due to potential satiation and budget constraint effects. Once all bids were submitted, the pre-selected binding

[3] We control for the possible systematic differences in the composition of the subject pool by including controls for location in our econometric estimation.

[4] In a BDM mechanism, each subject simultaneously submits a bid to purchase a good. Afterwards, a "sale" price is randomly drawn from a distribution of prices from zero to a price greater than the anticipated maximum possible willingness-to-pay among bidders. Any bidder who submits a bid greater than the "sale" price receives a unit of the good and pays an amount equal to the sale price.

item was revealed and a random market price was drawn for the item (from a distribution around the retail price of that item). The subjects whose bids were higher than the randomly drawn market price ended up purchasing the binding item for the market price from their $30 participation endowment.

To assure that the subjects understood the mechanisms of the bidding process, two practice rounds were held in which subjects submitted bids for a one dollar bill and a pen. In these practice rounds, the administrator explained why it is always best to bid one's true maximum WTP for the item since, for example, bidding lower than $1.00 for the dollar bill might result in foregoing an opportunity to purchase it at a lower than $1.00 price. After the practice rounds, subjects watched television excerpts and several advertising clips unique to the treatment. The subjects were then asked to submit their maximum WTP for eight snack items (four healthy and four unhealthy) presented by the administrator. The items included: a Fuji apple weighing about 150 grams, an orange weighing about 150 grams, a bottle of 591 ml Aquafina (or Dasani) water, a bottle of 591 ml Diet Coke (or Diet Pepsi)[5], a bottle of 591 ml Coca Cola (or Pepsi), a regular bag of Lay's classic potato chips weighing 81.5 grams, a small bag of Oreo Cookies weighing 57 grams, and a medium size Snickers Candy Bar weighing 52.7 grams. The retail price of all the auctioned items at the time the experiments were conducted varied from $1.00 to $1.50.

After finishing the auction, subjects completed a questionnaire regarding their attitudes towards the advertisement in the experiment, and demographic and socioeconomic characteristics about themselves. At the end of experiment, subjects were weighed on a scale and their height was measured (they were informed of this experiment component while signing the consent form prior to the start of the experiment).

[5] We do not include the WTP data for Diet Coke in our data analysis because there is some controversy on whether it is considered a healthy or unhealthy item.

In between the practice round and the real auction for the food and beverage items, participants in the control group watched four short segments (7 minutes in duration) of the television show "Portlandia," but did not see any advertisements. Subjects in the healthy food advertising treatment viewed the same television segments as in the control group and also viewed six healthy food advertisements added in between the segments (totaling 11.3 minutes in duration). Subjects in the anti-obesity advertising treatment viewed the same television segments as in the control and also viewed six anti-obesity advertisements added in between the segments (totaling 11.4 minutes in duration)[6].

Instead of using the self-reported measures of weight and height, which usually are highly inaccurate (Roland 1990; Spencer *et al.*, 2007), we obtained the true height and weight information of the subjects by measuring them at the end of the experiment. This allowed us to calculate the Body Mass Index (BMI) for each individual. Using the definitions of the World Health Organization (WHO), we divided our subjects into two groups: (1) overweight, whose BMI is higher than 25 (n=99), and (2) normal-weight with BMI lower than 25 (n=84). Thus, we have six comparison groups (2 [Overweight/Normal-weight Subjects] × 3 [Control/Anti-obesity Advertising/Healthy Food Advertising] of about equal size.[7]

3.2 Theoretical Framework

Our theoretical model is based on the idea that the shape of the demand curve is heterogeneous and depends on the characteristics of consumers. Even if we don't observe the consumers' characteristics directly, the rotations and shifts of the demand curve provide important insight on consumer behavior.

[6] Details of the advertisements are provided in the appendix.

[7] Control group: n(overweight)=33, n(normal-weight)=27. Anti-obesity advertising treatment: n(overweight)=32, n(normal-weight)=28. Healthy food advertising treatment: n(overweight)=34, n(normal-weight)=29.

According to the Johnson and Myatt (2006), the "pure hype" effect of advertising provides information, which are either universally attractive to all consumers or draw the awareness of the product among the consumers, leads to the outward shift of demand. The "pure hype" effect is related to informative and persuasive advertising, which simply draws consumer's attention to the existence of the product. In our setting, however, we expect to observe an inward shift of the demand curve for unhealthy product and outward shift demand curve of healthy product.

Rotations of the demand curve, on the other hand, in Johnson and Myatt framework occur due to the impact of "real information", which highlights the actual attributes of the product and allows consumers to search for the "best fit" product. As more real information that might not be universally attractive, some consumers could be turned off by the products, while others might increase their demand for the product. As a result, "real-information" content in advertising increase the variance among consumers and thus rotate the demand curve clockwise.

In Johnson and Myatt framework, we assume that there is a unit mass of consumers each with maximum willingness to pay of θ for one unit of a particular product. θ is drawn from the distribution $F_s(\theta)$, which is twice continuously differentiable in terms of both s and θ, with support on a $(\underline{\theta_s}, \overline{\theta_s})$ interval ($s \in$ S = $[\underline{s}, \overline{s}]$). s indexes a family of distributions and determines the shape of the valuation distributions. Keeping θ constant, an increase in s represents a spread in the density of θ, which leads to a clockwise rotation of $F_s(\theta)$ around some point θ. The effect of such spread in valuations on the distribution of market demand can be expressed through the inverse demand curve $P_s(q) = F_s(1 - p)$, where q is the proportion of consumers willing to purchase the product at price p, and is given by $q = 1 - F_s^{-1}(p)$. If the demand q is below some pivotal point $\breve{q}$, then $\frac{\partial P_s(q)}{\partial s} > 0$, which implies that an increase in the spread of valuations

causes a rise in the market price, and vice versa. In other words, if q is below the pivotal point $\hat{q}$, valuation would increase if demand curve rotate counter-clockwise; if q is above $\hat{q}$, counter-clockwise demand rotation leads to the decrease of market price. The heterogeneous price response to the demand rotation increase the dispersion of valuation among consumers.

Next, we derive a structural empirical model based on the theoretical framework of Johnson and Myatt. The econometric model empirical estimate both the shift and rotation impact of treatment on overweight and normal-weight individuals.

3.3 Econometric Model

Johnson and Myatt's (2006) theoretical model is well-suited to studying the shift and rotation effects of advertising. Here we utilize an empirical model to capture these impacts. In our study, we assume a random utility model for product *j* and consumer *i*:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \tag{1}$$

where V_{ij} is the deterministic component of the utility and ε_{ij} is an identical independently distributed error term following double exponential distribution. The deterministic component is a function of the treatment effect (T_k), {T_k=Control; Anti-obesity Advertising; Healthy Food Advertising}, product attribute (X_j), and other control variables (Z_i).

We specify an empirical model of utility function by assuming that utility is additive over the attribute augments:

$$V_{ij} = \sum_k T_k \alpha_{ik} + \sum_m \beta_m X_{jm} + \sum_n \gamma_n Z_{in} + \delta_j \tag{2}$$

where X_{jm} is the vector that contains known attributes of product *j* and β_m captures the marginal value for each product attribute; Z_{in} are the observed demographics and current state variables

for consumer i and γ_n represents the influence of each demographic or current state variable on utility; and δ_j is the independent identical econometric error term (Berry 1994). Moreover, α_{ik} is the individual-specific parameter and captures observed and unobserved heterogeneity in response to advertising which we further separate into two components:

$$\alpha_{ik} = \bar{\alpha}_k + \sigma_k \tau_{ik};\ \tau_{ik} \sim N(0,1) \qquad (3)$$

where $\bar{\alpha}_k$ is the average effect of treatment k and we can interpret it as the shift effect or the change in mean valuation of the product. The parameter, σ_k, can be interpreted as the rotation effect caused by the change in the dispersion of utility under treatment k and τ_{ik} captures the unobserved individual heterogeneity (Berry, 1994). In this research, we use the variation in WTP across the treatments to identify both the shift and dispersion effect of advertising. Rickard *et al.* (2011) show that by substituting WTP_{ij} with V_{ij} into a combination of equation (2) and (3), we can have an estimable econometric model of the impact of food advertising on food WTP across the treatments. Next we present the descriptive statistics of our collected data and the results of estimated random coefficients econometric model.

CHAPTER 4

EMPIRICAL FINDINGS

4.1 Descriptive Statistics

Table. 1

Table 1 presents the demographic and socioeconomic information as well as self-reported current state information at the time of the experiment of the subjects by groups. Among the 183

subjects who participated in the experiment, based on their calculated BMI, 54.1% were overweight or obese, 61.5% of them were Caucasian, 61.5% were female, and 38.6% of the subjects' had household earnings ranging from $40,000 to $80,000 per year. On average, the subjects were 38.3 years old with an average BMI of 28.2. Additionally, 73.2% of the subjects were considered to be the primary shoppers of the family

Compared with the normal-weight subjects, the overweight subjects have a much higher average BMI (33.2 vs. 22.2; $t(181))=14.850$, $p<0.01$). In addition, 83.9% of the normal-weight subjects believe their bodies are in good health conditions, while 60.8% of the overweight subjects believe so. Overall, subjects report a higher perceived impact of anti-obesity advertising (7.950) than healthy food advertising (6.587; $t(121)=9.880$, $p<0.01$). There are also differences in socio-demographic and current state variables among different segments. We include all these variables in the econometric model to control for the possible sample composition differences.

Using the submitted bids of the subjects, we plot the computed demand functions for healthy (or unhealthy) foods for both overweight and normal-weight subjects across the three treatments. As illustrated in Figs 1 and 2, the two groups of consumers have vastly different responses towards the two treatments. For unhealthy snacks, healthy food advertisements lead to a significant inward shift of the demand curve for overweight subjects, while it appears to rotate the demand curve of normal-weight subjects counterclockwise. The differences in these demand changes are more apparent for the healthy snacks; one can observe that the demand for healthy items increases much more for overweight subjects, whereas the demand of normal-weight subjects shifts outward only slightly. Though the patterns of change are vastly different for the two types of consumers, it is difficult to quantify such effects without controlling for the host of other factors that might affect the WTP.

Fig.1

Fig.2

Table 2(a) reports the empirical results of the random coefficient model, which controls for the differences in demographic information and quantify both the shift and rotation effects of the treatments. The qualitative patterns in Table 2 are consistent with the patterns observed graphically in Figs 1 and 2.

Table. 2

4.2 Effect of Anti-obesity Advertising

Relative to the control treatment, the anti-obesity advertising treatment leads to a substantial decrease in mean valuation of unhealthy snacks for both groups of subjects. Specifically, the estimated mean WTP for overweight subjects decreases from 0.667 to 0.269 (-59.7%) and for normal-weight individuals from 0.568 to 0.258 (-54.6%). Additionally, the dispersion in WTP for both overweight and normal-weight subjects decreases significantly after exposure to anti-obesity advertising. The estimated dispersion parameter decreases from 0.306 to 0.211 (-31.0%) for overweight subjects and from 0.426 to 0.359 (-15.7%) for normal-weight subjects. These changes are consistent with the inward shift and counter-clockwise rotation of the demand.

Interestingly, when comparing bids on healthy snacks, we observe that overweight and normal-weight subjects have opposite responses to anti-obesity advertising, in terms of both the shift and rotational effect. Specifically, the exposure to anti-obesity advertising results in a 26.7% increase in mean valuation (from 0.592 to 0.768) of healthy snacks for overweight subjects, compared with an 8.8% decrease (from 0.684 to 0.624) among normal-weight subjects. This decrease in healthy food valuation may be attributable to the extremely strong images and

language of anti-obesity ads that cause normal-weight individuals to be no longer interested in any food. We elaborate on other potential explanations in the next subsection. In terms of rotational demand effects, the estimated dispersion increases from 0.222 to 0.398 (79.2%) for overweight subjects and decreases from 0.681 to 0.332 (51.2%) for normal-weight subjects. These estimates imply that anti-obesity advertising leads to an inward shift and counter-clockwise rotation of demand for healthy foods among the normal-weight consumers and an outward shift and a clockwise rotation of demand among the overweight individuals.

4.3 Effect of Healthy Food Advertising

Exposure to healthy food advertisements has a similar shift impact for overweight and normal-weight subjects: the WTP for unhealthy snacks decreases by 18.7% for overweight and by 18.1% for normal-weight subjects. However, exposure to healthy food advertising leads to the rotation of the demand curve in the opposite direction for overweight (dispersion increases slightly from 0.306 to 0.336, demand rotates counter-clockwise) and normal-weight (dispersion decreases from 0.426 to 0.256; demand rotates clockwise).

Additionally, healthy food advertising leads to a more significant increase in mean valuation of healthy snacks for overweight subjects (24.2%) than for normal-weight ones (4.2%). For overweight subjects the mean valuation increases from 0.592 to 0.768, while for normal-weight subjects the increase is only slight: from 0.684 to 0.713. Similar to the effects on unhealthy snacks, the dispersion of WTP among overweight subjects increases from 0.222 to 0.429 (93.2%), whereas for normal-weight subjects the change in dispersion diminishes from 0.681 to 0.293 (57.0%). Thus, healthy food advertising shifts the demand of healthy items to the right for both groups, while rotating it clockwise for normal-weight and counter-clockwise for overweight

individuals. Next, we discuss the implications of such demand changes across the two types of consumers.

4.4 Discussion: Effect of Advertising on Normal-weight vs. Overweight Individuals

In this research, we have a particular interest in differentiating between the impacts of advertising on overweight vs. normal-weight subjects. Here we summarize the empirical results pertaining to the comparison of the demand change effects between these two groups.

Considering the shift effect of advertising, the difference in WTP change varies considerably for unhealthy and healthy foods between the two groups. Both types of advertising have a similar impact on the mean valuation of unhealthy snacks for both groups. They each significantly decrease the mean valuations of unhealthy snacks, and anti-obesity advertising has a larger shift impact on both groups. In terms of healthy snacks, the overweight group increases its mean WTP more than the normal-weight group after exposure to advertisements. Normal-weight subjects even decrease their WTP for healthy snack after exposure to anti-obesity advertising.

The difference between overweight and normal-weight subjects is more pronounced when considering the demand rotation. After watching the advertisements, the dispersion of normal-weight subjects diminished for both unhealthy and healthy foods, indicating a somewhat homogeneous within-group response. This also suggests that most normal-weight subjects are persuaded by the advertising and change to a healthier eating behavior as a result of advertising. When it comes to overweight individuals, the rotational advertising effect is exactly the opposite: the dispersion increases for unhealthy items in healthy food treatment and for healthy items in both treatments. It suggests more heterogeneous reactions to the advertising among overweight relative to normal weight individuals. Interestingly, considering both shift and rotation effects,

our results suggest that anti-obesity ads are extremely effective at discouraging unhealthy eating: they significantly decrease both the mean and the dispersion of WTP, suggesting that overweight consumers react somewhat homogeneously to anti-obesity advertising and that the effect is really strong.

Table. 3 (a) and (b)

The shift and rotation effects between overweight and normal-weight individuals are summarized in panels (a) and (b) in Table 3. Our results suggest that (1) most normal-weight subjects slightly change to a healthier selection after exposure to advertising; (2) part of the overweight subjects are nudged to a healthier behavior, but their responses are more heterogeneous; (3) anti-obesity advertising is more effective than healthy food advertising for overweight-subjects; and (4) healthy food advertising is more effective for normal-weight subjects.

One possible explanation for the differences between the two groups that is suggested in the literature (e.g., Brown, 2001; Brown and Locker, 2009; Ruiter *et al.*, 2001) is the stigma effect of negative advertising, implying that some overweight subjects might feel insulted by the advertising campaign, which in turn might lead to the unintended behavioral change. However, we find no empirical support for this hypothesis. We observe the opposite impact: anti-obesity advertising has a larger shift and diminishing rotation impact (compared with healthy food advertising) on overweight individuals, which suggests that anti-obesity advertising is more effective for overweight than for normal-weight subjects.

Another possible explanation is associated with the "irrational nature" of overweight subjects (Borghan *et al.* 2006; Fan and Jin 2014; Ikeda *et al.* 2010; Komlos *et al.* 2004; Zhang *et al.*

2008). More present-biased and lacking in self-control capability, overweight subjects might be more likely to be irrational when making food choices. Thus, simple knowledge about healthy/unhealthy diet might not be sufficient to motivate overweight individuals to alter their behavior. It might require a stronger message with more visceral cues which can subconsciously affect overweight individuals by motivating them to change their current diet. Thus, anti-obesity advertising with more visceral cues would be expected to have a larger shift effect and a diminishing dispersion in WTP (relative to healthy food advertising) on overweight individuals. What is more, the "irrationality" of overweight individuals leads to the higher dispersions of WTP for snack items among them after exposure to advertising. Compared with overweight individuals, normal-weight individuals appear more rational when making food choices and are more likely to be positively influenced by the rationally-presented information in advertising. Thus, it might be the case that advertising affects normal-weight individuals mainly by providing and reminding them of the pros and cons of healthy and unhealthy diets. The more negative messages of anti-obesity advertising do not have such a significant impact on this group of individuals and even might cause the opposite reaction by reducing overall food consumption.

4.5 Comparison of Empirical Result between Overall Market and Segments

In this study, we focus on examining whether there are different responses between different segments in the market. And we argue that it is important to differentiate the impact between different groups because it provides more insights on consumer heterogeneity. In Table 4, we present the empirical result of the model without differentiating overweight and normal-weight individuals.

Table. 4

We found that the information on different segments is valuable. Considering only the whole market, we cannot observe the negative impact of the anti-obesity advertising on normal-weight individual. Also, we cannot report the heterogeneity within overweight individuals without market segmentation. In the whole market, we find that the dispersion of consumer's valuation all decreases after exposure to treatment. If we do not separate the overweight and normal-weight individuals, we might draw the inaccurate conclusion that the whole market is persuaded by the advertising campaign and change to healthier eating behavior homogeneously. Overall, it is important to differentiate the impact between overweight and normal-weight groups.

CHAPTER 5

IMPLICATIONS AND CONCLUDING REMARKS

5.1 Significance

In this study, we compare the impact of anti-obesity and healthy food advertising on overweight and normal-weight individuals. Using experimental data and the Johnson and Myatt (2006) theoretical model, we estimate a random coefficients model to quantify the food demand shift and rotation effects of anti-obesity and healthy food advertising on both overweight and normal-weight individuals. The key finding of this study is that there is a substantial difference between overweight and normal-weight individuals in terms of their response to advertising. Further, this response is different depending on advertising content.

A comparison of shift and rotation effects reveals that anti-obesity advertising is more effective on overweight individuals, while healthy food advertising is more effective on normal-weight individuals. We find that anti-obesity advertising is particularly effective at reducing unhealthy food consumption for overweight consumers and that the within-group reaction to this

type of advertising is rather homogeneous. Additionally, we find that both types of advertisements are better at reducing unhealthy food consumption than increasing the consumption of healthy food. We do not find evidence to support the idea of a stigma effect of anti-obesity advertising (Brown, 2001; Brown and Locker, 2009; Ruiter *et al.*, 2001), however, we observe an overall reduction in food demand for normal-weight individuals as a result of anti-obesity advertising.

Our study proposes a reasonable hypothesis to interpret different responses of overweight and normal-weight individuals to food advertising. Overweight individuals might be more likely to act "irrationally" when making food choice because they are more present-biased and lacking in self-control capabilities (Borghan *et al.* 2006; Fan and Jin 2014; Ikeda *et al.* 2010; Komlos *et al.* 2004; Zhang *et al.* 2008). Thus, they might not be easily influenced by rational incentives, such as information about a healthy diet, but are more likely to be nudged to healthier diet subconsciously by visceral cues and exaggerated message.

The results of our study suggest that different advertising tactics might be more effective on different groups of individuals: visceral cues and exaggerated messages might be more effective for overweight individuals who may be more likely to be affected subconsciously; normal-weight individuals, on the other hand, might be more rational in their diet choices and thus might be more likely to accept and utilize the diet knowledge delivered by the advertising. Therefore, advertising content should be carefully designed based on the targeted group. Advertisements that target overweight individuals should include stronger messages and more visceral cues to influence the targeted group more effectively. However, such a strategy might not work well on normal-weight individuals and could even lead to the opposite of the intended impact. Advertisements targeting normal-weight individuals should serve an informational role – to

provide information and remind consumers about a healthy diet. Additionally, policymakers should be aware that advertising campaigns might be comparatively more effective in reducing unhealthy food consumption than increasing the consumption of healthy food.

This study adds a new perspective to the current debate about anti-obesity policy. To the best of our knowledge, our study is not only the first to distinguish the impact of advertising between overweight and normal-weight individuals, but also the first to compare the impact of any anti-obesity policies between two groups. Previous studies on fat taxes and thin subsidies (e.g., Andreyeva *et al.* 2011; Chouinard *et al.* 2007), information labeling (e.g., Dumanovsky, *et al.* 2011; Schwartz *et al.* 2012), or advertising campaigns (e.g., Streletskaya *et al.* 2013; Rusmevichientong *et al.* 2014) have shown mixed results on the efficacy of anti-obesity policies. However, their results are based on the estimation of the whole market without differentiating the impact across relevant segments. It is hard to argue the efficacy of an anti-obesity policy without understanding whether there are heterogeneous reactions among different targeted groups. For example, if normal-weight individuals eliminate their soda consumption while overweight individuals maintain their previous one after the introduction of a fat tax, we can still observe a substantial mean impact of soda tax on reducing soda consumption. In such a scenario, however, the fat tax would not be a very effective policy in fighting obesity. Besides capturing the mean impact, researchers need to also understand the heterogeneity between the segments, and policymakers should design the best strategy based on the characteristics of the targeted group.

5.2 Limitation and Extension

As a study based on experimental data, this research cannot avoid the common caveat of any experimental study that generalization of results to the field should be done with caution (Levitt

and List 2007). We suggest that these results serve as the upper-bound on the actual advertising impacts because people will likely pay less attention to such advertising in reality and may make diet decisions more carefully in the experimental setting where they know they are being observed. Though we suggest a reasonable mechanism to interpret the difference between overweight and normal-weight individuals, we lack the knowledge to explain the heterogeneous behaviors among the overweight individuals. Further research should explore why some overweight individuals are persuaded by advertising, while others are not, and what underlying differences between them are. In our study, we have attempted to explain the difference among overweight individuals through linking their response to social demographical information, but find no significant evidence to report. Besides advertising, further research should also examine the heterogeneous reactions between overweight and normal-weight individuals to other anti-obesity policies, such as fat taxes, thin subsidies, and nutrition labeling. Further studies need to focus on differentiate the impact between overweight and normal-weight individuals, explain the difference from psychological and sociological background, provide guidance for the design of most effective anti-obesity policies to mitigate the obesity issues.

LIST OF TABLES

TABLE 1. DESCRIPTIVE STATISTICS OF SOCIAL DEMOGRAPHICS AND CURRENT STATE VARIABLES

	Control Group		Anti-obesity Advertising		Healthy Food Advertising	
Variables	Overweight	Normal-weight	Overweight	Normal-weight	Overweight	Normal-weight
BMI	33.548	21.936	32.540	22.461	33.436	22.125
	(5.701)	(2.042)	(6.604)	(1.687)	(7.117)	(2.113)
Age	39.727	38.815	42.218	37.385	39.294	34.827
	(13.960)	(15.393)	(14.640)	(13.211)	(13.757)	(15.091)
Male	0.393	0.370	0.438	0.384	0.471	0.345
	(0.490)	(0.556)	(0.557)	(0.488)	(0.500)	(0.476)
Married	0.606	0.370	0.531	0.500	0.647	0.483
	(0.778)	(0.484)	(0.500)	(0.501)	(0.537)	(0.501)
Children	0.424	0.185	0.156	0.423	0.324	0.207
	(0.495)	(0.389)	(0.364)	(0.568)	(0.469)	(0.406)
Caucasian	0.636	0.518	0.563	0.692	0.647	0.586
	(0.482)	(0.501)	(0.497)	(0.463)	(0.479)	(0.494)
Asian	0.121	0.148	0.219	0.231	0.059	0.241
	(0.327)	(0.356)	(0.414)	(0.422)	(0.236)	(0.429)
Some College Without Degree	0.212	0.269	0.250	0.154	0.235	0.172
	(0.410)	(0.447)	(0.434)	(0.362)	(0.425)	(0.379)
College Degree	0.303	0.346	0.281	0.385	0.382	0.448
	(0.460)	(0.477)	(0.450)	(0.488)	(0.487)	(0.498)
Graduate Degree	0.152	0.269	0.281	0.346	0.147	0.207
	(0.359)	(0.445)	(0.450)	(0.477)	(0.355)	(0.406)
Income less than $40,000	0.455	0.308	0.406	0.333	0.353	0.345
	(0.499)	(0.463)	(0.492)	(0.473)	(0.479)	(0.476)
Income from $40,000 to $80,000	0.394	0.500	0.468	0.333	0.265	0.379
	(0.490)	(0.501)	(0.500)	(0.473)	(0.442)	(0.486)
Primary Shopper	0.727	0.703	0.719	0.807	0.676	0.724
	(0.446)	(0.458)	(0.450)	(0.395)	(0.468)	(0.447)
Feeling Healthy	0.697	0.889	0.438	0.730	0.697	0.896
	(0.675)	(0.417)	(0.790)	(0.593)	(0.628)	(0.403)
Hungry	0.423	0.381	0.360	0.440	0.571	0.320
	(0.495)	(0.487)	(0.481)	(0.498)	(0.496)	(0.468)
Thirsty	0.634	0.428	0.800	0.600	0.821	0.640
	(0.477)	(0.496)	(0.401)	(0.491)	(0.384)	(0.481)
Never Snack	0.364	0.308	0.344	0.231	0.235	0.379
	(0.481)	(0.463)	(0.476)	(0.422)	(0.425)	(0.486)
Snack Occasionally	0.606	0.577	0.531	0.653	0.588	0.552
	(0.490)	(0.495)	(0.500)	(0.477)	(0.493)	(0.498)
Perceived Ad Impact (from 1 to 10)	N.A.	N.A.	8.250	7.500	6.559	6.621
			(2.096)	(2.443)	(2.149)	(1.959)
Number of Observations[8]	229	187	220	196	230	203

[8] 16 observations have been dropped due to the missing values.

Table 2. Random Coefficient Model Estimates

	Unhealthy Snack		Healthy Snack	
VARIABLES	Overweight	Normal-weight	Overweight	Normal-weight
	Mean Estimates (Demand Shifts)			
Control	0.667***	0.568***	0.592***	0.684***
	(0.092)	(0.118)	(0.093)	(0.158)
Anti-obesity Advertising	0.269***	0.258***	0.768***	0.624***
	(0.083)	(0.116)	(0.110)	(0.115)
Healthy food Advertising	0.542***	0.465***	0.735***	0.713***
	(0.094)	(0.093)	(0.112)	(0.099)
	Standard Deviation Estimates (Demand Rotations)			
Control	0.306***	0.426***	0.222***	0.681***
	(0.049)	(0.075)	(0.050)	(0.100)
Anti-obesity Advertising	0.211***	0.359***	0.398***	0.324**
	(0.042)	(0.065)	(0.064)	(0.062)
Healthy food Advertising	0.336***	0.256***	0.429***	0.293***
	(0.050)	(0.058)	(0.062)	(0.057)
Product Fixed Effect	Y	Y	Y	Y
Current State Effect	Y	Y	Y	Y
Socioeconomic Controls	Y	Y	Y	Y
Log Likelihood	-145.866	-201.621	-150.851	-141.485
Observations	391	332	294	248

Robust standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

TABLE 3 (A) COMPARISON OF DEMAND SHIFT EFFECTS: OVERWEIGHT VS. NORMAL-WEIGHT SUBJECTS

Overweight vs. Normal-weight	Anti-obesity Advertising	Healthy Food Advertising
Healthy Food	+26.7% vs. -8.8%	+24.2% vs. +4.2%
Unhealthy Food	-59.7% vs. -54.6%	-18.7% vs. -18.6%

TABLE 3 (B) COMPARISON OF DEMAND ROTATION EFFECTS: OVERWEIGHT VS. NORMAL-WEIGHT SUBJECTS

Overweight vs. Normal-weight	Anti-obesity Advertising	Healthy Food Advertising
Healthy Food	+79.2% vs. -52.4%	+93.2% vs. -56.9%
Unhealthy Food	-31.0% vs. -15.7%	+9.8% vs. -40.0%

TABLE 4. RANDOM COEFFICIENT MODEL ESTIMATES

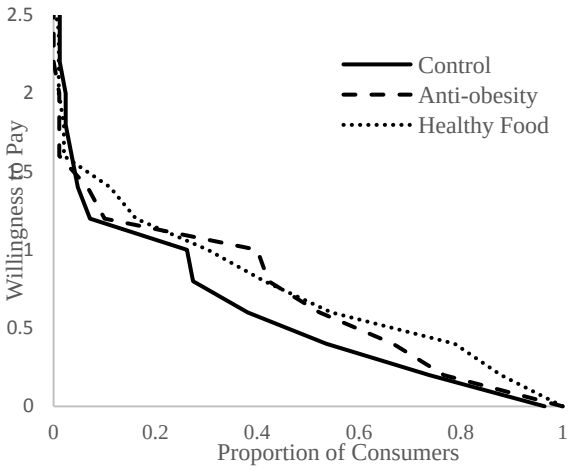
	Unhealthy Snack	Healthy Snack
	Mean Estimates (Demand Shifts)	
Control	0.632***	0.664***
	(0.073)	(0.090)
Anti-obesity Advertising	0.275***	0.741***
	(0.067)	(0.080)
Healthy food Advertising	0.525***	0.749***
	(0.067)	(0.076)
	Standard Deviation Estimates (Demand Rotations)	
Control	0.383***	0.508***
	(0.043)	(0.054)
Anti-obesity Advertising	0.294***	0.376***
	(0.039)	(0.045)
Healthy food Advertising	0.336***	0.374***
	(0.039)	(0.042)
Product Fixed Effect	Y	Y
Current State Effect	Y	Y
Socioeconomic Controls	Y	Y
Log Likelihood	-390.926	-326.244
Observations	732	542

Robust standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

LIST OF FIGURES

FIG. 1. EMPIRICAL DEMAND SCHEDULES FOR HEALTHY ITEMS ACROSS TREATMENTS

(a) Normal-weight



(b) Overweight

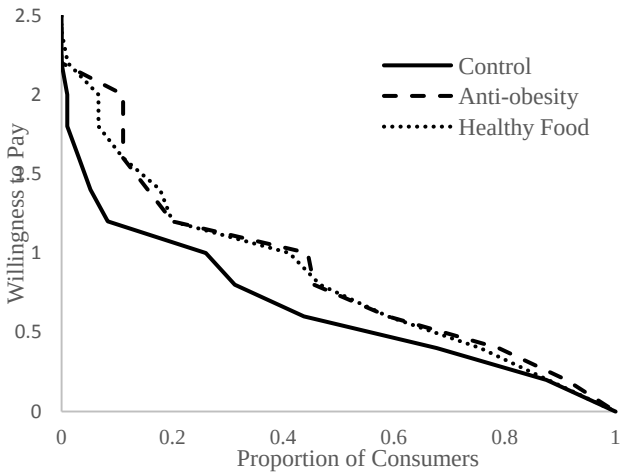
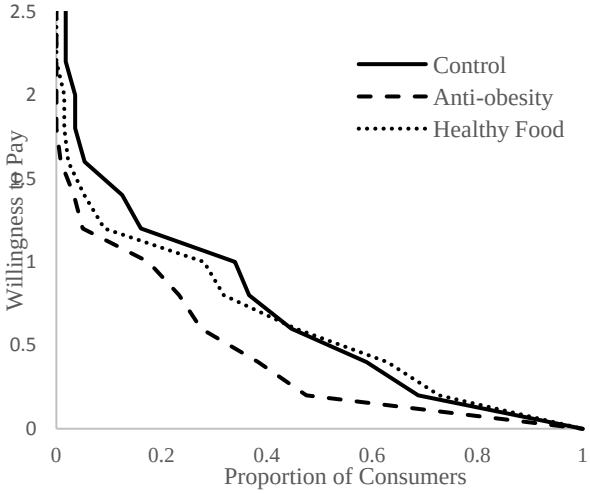
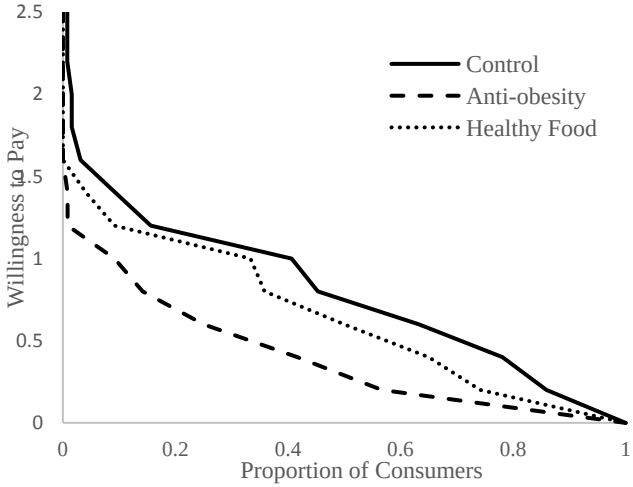


FIG. 2. EMPIRICAL DEMAND SCHEDULES FOR HEALTHY ITEMS ACROSS TREATMENTS

(c) Normal-weight



(d) Overweight



APPENDIX

A.1 TV-EXCERPTS AND ADVERTISEMENTS USED IN THE EXPERIMENT

Used in	Name	Source
All Treatments	Rube Goldberg Machine	Portlandia, Season3, Episode 8
All Treatments	2 Girls 2 Shirts	Portlandia, Season2, Episode 6
All Treatments	Books on Parenting	Portlandia, Season3, Episode 9
All Treatments	Wilson Light Bulbs	Portlandia, Season3, Episode 3
Healthy Food Treatment	Challenge Someone to Live Well	Live Well Colorado
Healthy Food Treatment	Growing a Healthy Child (2007)	Arizona Nutrition Network
Healthy Food Treatment	Growing a Healthy Child (2008)	Arizona Nutrition Network
Healthy Food Treatment	Wouldn’t It Be Nice	Independent producer
Healthy Food Treatment	Make a Clean Start	Terry Walters
Healthy Food Treatment	Eat 2 Fruit + 2 Veggies Every Day	Health Promotion Board, Singapore
Anti-obesity Treatment	This is Joe	CDC
Anti-obesity Treatment	Be Food Smart	Change4Life England
Anti-obesity Treatment	Eating Out	Blue Cross and Blue Shield Minnesota
Anti-obesity Treatment	Don’t Drink Yourself Fat	NYC Department of Health
Anti-obesity Treatment	Man Eating Sugar	NYC Department of Healthy
Anti-obesity Treatment	Stop the Cycle	Strong4Life Atlanta

A.2 SURVEY QUESTIONS

Question

1. What is your age?

2. What is your gender?

3. What is your race?

4. What is your weight?

5. What is your height?

6. I feel __healthy __unhealthy __not sure about my health condition (mark one that apply)

7. What is your household income level? ____ less than $40,000 ___ $40,000-$80,000 ____ $80,000 - $120,000 ___ $120,000-$160,000 ___ over $160,000

8. What is the highest education level that you have achieved? __ High School __ some college but no degree ____Associates Degree __ College Degree ____ Master's Degree __ Doctoral

9. Are you married or living with someone in a long term relationship? _____ Yes _____No

10. Do you have children under 18 years old living at home? Yes____ No _____

11. Are you a Vegetarian or Vegan? Yes ____ No ____

12. How many meals per week do you purchase from a restaurant or a cafeteria?

13. Are you the primary food shopper in your family? Yes ____ No ____

14. How likely are you to purchase a snack food that you have not tried before? ____ Not at all likely ____ Not very likely ____ Somewhat likely ____Likely _____ Very likely

15. On average, how frequently do you eat snack foods? (mark one)

Once a day, twice a day, three times a day, more than 3 times a day, less than once a week

16. How much did you like the TV show? Using a scale from 1 (dislike it very much) to 10 (like it very much) ___

17. How much did you like the TV show? Using a scale from 1 (dislike it very much) to 10 (like it very much) ___

A.3 Experiment Instruction

Welcome to an experiment in consumer decision making. Please read these instructions carefully and refrain from communicating with other participants. As stated in the Consent Form, your participation in this experiment is voluntary and you can withdraw from this experiment at any time, however if you do not complete the experiment you will not be paid.

Submitting Your Bid

In today's experiment, you will be asked to indicate the highest amount of money you would be willing to pay for different products. We will refer to this amount as your bid. You will indicate your bid on a piece of paper. Below is a useful way to think about the bidding process.

We will offer you an opportunity to buy a product, and you will not have to spend any more for the product than your bid. We'd like you to tell us the **highest** price you are willing to spend for this product (your bid) before the purchase price is determined. Once all bids have been submitted, we will randomly draw the "market price" from a bag of chips; the chips are labeled with different prices that are distributed around the average retail price for the item. If the price drawn is less than or equal to your bid, you will buy the item for the price on the chip, and this amount will be deducted from your $30 participation payment. If the price drawn is greater than your bid, you will not purchase the item and you will keep the $30.

This procedure ensures that it is best for you to truthfully reveal the maximum price you are willing to pay. If you submit a bid that is higher than your maximum willingness to pay, you may actually have to pay that higher price. If you submit a bid that is lower, you may be disappointed if the drawn price is higher than your bid but lower than your "true" bid. Note that you cannot influence the randomly drawn "market price" with your bid. Because we draw the "market price" from the bag of chips, it is completely random and independent of whatever bid you place.

Part A: Practice Round

Our first two auctions are hypothetical and are used to help you become familiar with our auction process. After you have seen the item, listened to the information provided by the administrator and are ready to bid, you will be asked to write down a bid for that item. Here you will need to write down the **maximum** amount you are willing to pay for this item. After everyone has written down their bids for that product, the administrator will randomly draw a chip from the bag to determine the "market price". These are just practice rounds for illustrative purposes, so you would only "hypothetically" buy the product if your bid was equal to or exceeded the randomly drawn "market price".

Entering a bid that reflects the highest price you would be willing to pay gives you the chance to purchase the product at a price equal to or less than your bid, and you will never have to pay when the randomly drawn price is larger than your bid. In general, in our experiment, the more you are willing to pay, the chances are higher that you will get the product (but not necessarily pay the bid price).

Part B: Real Auction

This part of the experiment will operate in the same manner as the practice round, except that it will now involve auctions for multiple food items. We will run our auction for multiple rounds, and we will

watch videos in between the two rounds. The randomly determined “market price” for one of these food items will be drawn from the bag of chips at the end of experiment after all participants have bid on all food items.

The other important way that these auctions are different from the practice round is that bid may become binding for one of the auction items.

You will be asked to list a bid between $0.00 and $5.00 for each of multiple food products. We have randomly selected **only one** of the products that will actually be sold, which will be revealed at the end of the experiment. That is, even though you will be bidding on each of the items, you will end up buying **at most** only **one** of the products today.

If your bid is greater than the randomly drawn price for one of the items, the bidding item, you will purchase that item at the “market price” that is randomly drawn. In this case, your $30 participant payment will be reduced by the randomly drawn “market price” and you will receive the food item to take home with you.

Since we are paying you $30 for your time, we urge you to bid your true maximum willingness to pay for each of the items. Also remember that everyone whose bid is equal to or exceeds the random price will pay the same price (randomly drawn) for the product.

Thank you, and enjoy the experiment.

A.4 Consent Form

You are invited to take part in a research study of the demand for selected food items. We have also distributed instructions for the experiment and will go through the instructions carefully before we begin. Please read this form and the instructions carefully, and ask any questions you may have before agreeing to take part in the study.

What the study is about: The purpose of this study is to better understand consumer demand for some food items. We hope the information collected in this experiment will provide us with information that sheds new light on issues related to snack food markets.

What we will ask you to do: We will introduce eight food items and ask you to submit your willingness to pay through a system of auctions. This system of auctions will be fully explained later. At the end of the experiment there will be the possibility of purchasing the aforementioned items. We will also ask you to complete a questionnaire which will elicit demographic and socioeconomic information regarding yourself. Lastly, we will measure your weight and height in privacy.

Risks and benefits: We do not anticipate any risks to you participating in this study other than those encountered in day-to-day life.

Compensation: If you decide to purchase the selected item, your compensation would be item plus $30 reduced by the price of the item (the price of the item would be no more than $5). If you decide not to purchase the select item, your compensation would be $30.

Your answers will be confidential: The records of this study will be kept private. In any sort of report we make public we will not include any information that will make it possible to identify you. Research records will be kept in a locked file; only the researchers will have access to the records.

Taking part is voluntary: Taking part in this study is completely voluntary. You are free at all times to stop with the experiment.

If you have any questions: The researcher conducting this study is Ruitong Wang. Please ask any questions you have now. If you have questions later, you may contact wangruitong24@gmail.com. If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) at 607.255.5138 or access their website at http://www.irb.cornell.edu. You may also report your concerns or complaints anonymously through Ethicspoint or by calling toll free at 866.293.3077. Ethicspoint is an independent organization that serves as a liaison between the University and the person bringing the complaint so that anonymity can be ensured.

Statement of Consent: I have read the above information, and have received answers to any questions I asked. I consent to take part in the study.

Your Signature _____ Date _____

Your Name (printed) _____

Signature of person obtaining consent _____Date _____

Printed name of person obtaining consent _____Date _____

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