The Framing of Portion-sizes:

One Man’s Tall is another Man’s Small

Abstract

The food industry often uses normative labels such as “Large,” or “Super-size” to describe their portion offerings. Are these superficial labels evidence of firms using loss aversion to impact choice behavior? A field experiment shows consumer willingness-to-pay is inconsistent with loss aversion. Though portions were clearly visible, individuals appeared to use the labels as objective information about their size. To further examine this, a second experiment measured plate waste, showing people leave more uneaten when a portion is given a larger sounding name. If labels are used as size information, policies governing normative names could help reduce food consumption.

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Introduction

At the Starbucks coffee chain, the smallest size for most beverages is labeled a “short” offering 8 fluid ounces. The next size up is a “tall,” offering 12 ounces—the same size as a standard can of soft drink. A couple larger options exist, such as the “Grande”. This range of names suggests that the normal portion size is somewhere in between the “tall” and the “short,” though no sizes exist in this space. By comparison, McDonald’s “large” soft drink is advertised to be 32 fluid ounces, while their “medium” is advertised as 21 fluid ounces. The “child” size (which is smaller than their “small” size) is 12 fluid ounces. This also happens to be the size of their “small” coffee. Thus what is “tall” at Starbucks is “small” at McDonald’s. Such wide disparity in product labeling may be evidence of marketers trying to manipulate consumer behavior.

Firms often use normative-size labels to describe their product options. This is particularly true among food manufacturers, retailers, and restaurants where normative labels describe bags of chips, servings of pasta, containers of French fries, the size of salads, drink offerings, or nearly anything else that comes in multiple sizes. A normative label like “regular” or “large” informs a consumer about how much food is offered relative to some hypothetical normal, or regular, amount. In most cases, these labels are proportional (such as medium vs. large, or short vs. tall), though they may be accompanied by absolute amounts (e.g., the 64 ounce Super Big Gulp).

On the surface, normative labels do not appear to be purely informational. Often more accurate size descriptions will accompany these labels. For example, the amount of meat in a burger is often listed prominently (such as with Wendy’s “¼ lb. Single,” “½ lb. Double” or “¾ lb. Triple”). Most fast food restaurants also prominently display examples of drink sizes, though many have ceased to display smaller sizes and often do not list them on their menus. If objective size information is so available, why would the normative names matter? It may be that individuals have some preference for the implied size given by the label itself. Alternatively, it could be that individuals fail to internalize the visual cues of size, instead using suggestive names to inform their decisions.

With an increased policy focus on obesity, the use of normative portion size labels raises two important questions. First: how is consumer choice influenced by the labels alone (holding the size options constant)? Food retailers have often been accused of marketing obesity (Wansink and Huckabee 2005). Suppose, for example, that individuals are willing to pay more to purchase items that have larger sounding names irrespective of size. In this case, it should be possible for firms to reap larger profits by offering smaller portions with larger names. Determining the motivation of consumers can illuminate the profit motive for food retailers and perhaps help us understand why larger portions are becoming the norm. Second, understanding how size labels influence choice would be useful in determining whether a menu-labeling policy could help mitigate this portion size "arms race." If individuals are responding to normative names rather than actual sizes, there may be a reasonable role the government could play in providing general guidelines regarding the size labels that can be applied to various physical quantities of a product. Such label guidelines could potentially reduce consumption without restricting the physical quantity of the food being offered.[1]

In general, economists have assumed that utility of consumption, and thus willingness to pay, depended entirely on the objective quantity consumed. Were this the case, the various names attached to sizes of foods items would simply be superfluous information that would be discarded by the consumer, especially when the actual portions are clearly visible. The intricate systems of naming – particularly at fast food restaurants – suggest that the names may not be superfluous, but rather important in consumer perceptions of the portion sizes. It could be that many customers ignore the visual cues of size, instead blindly relying on the normative names to determine what portion they should order and eat.

Ample evidence exists to suggest that individuals are highly inaccurate in using visual cues to determine the volume of, for example, a poured drink (Wansink and van Ittersum 2003). Moreover, food psychologists have found substantial evidence that individuals do not judge satiation or satisfaction by the volume of the food they eat, but rather by a series of visual cues (cf. Wansink 2004). For example, an individual consuming a small portion from a small plate is more likely to feel satisfied by the portion than one who consumes the same portion from a larger plate (Wansink 2004). In an extreme example, individuals given a 32 ounce bowl of soup

[1] Of course these adjustments must be made within reason. Otherwise, a consumer could get wise to the fact that 3oz soda is not a normal consumption portion and compensate by purchasing larger or multiple portions.

consumed an average of 73% more soup, but felt equally full, sated, and satisfied. Another group was given the same size bowl of identical soup, but (unknown to the participants) the bowl was designed to refill itself as one ate. These participants consumed more than 131 extra calories of soup before feeling satisfied (Wansink, Painter, and North 2005).

Behavioral theory suggests two important ways in which normative labels may influence consumer preferences over portions sizes. First, normative labels could suggest a social norm, or how much the individual *should* consume. In this case, individuals may gravitate to normal, regular, or medium sizes in order to comply with the implied social norms. Alternatively, normative labels could establish a frame or reference point in consumption, leading to loss averse behavior (Tversky and Kahneman, 1991). Thus, one who consumes a “large” may feel a gain relative to the “regular,” while someone consuming a “small” may feel a loss relative to the regular. Loss aversion supposes that losses are felt more keenly on the margin than gains. Thus individuals will exert greater effort to avoid a loss than to obtain a similar gain. Interestingly, these models both imply very similar behavior when examining choice between normative labels. Alternatively, there is substantial evidence that individuals are subject to errors in judgment of size when using visual cues. Thus, it may be that individuals make use of the size information contained in the normative names despite the availability of either visual or even objective measures of size information.

In this paper we present evidence that apparent framing effects due to portion size labels do not occur due to loss aversion. Individuals in a cafeteria were offered food in one or two sizes. While the physical sizes of the portions remained the same throughout each of the experiments, in some conditions the sizes would be labeled “half-size” and “regular” (which we will refer to as the HALF condition), while in others they would be called “regular” and “double-size” (which we will refer to as the DOUBLE condition). We examine willingness-to-pay for each of the sizes. The results are then discussed in the context of the potential theoretical explanations. The results largely support the notion that individuals use normative names as objective information regarding the size of the portion even when the sizes are visible. Implications for policy are then developed and discussed.

Reference Points and Consumption

Kahneman and Tversky (1979) introduced economists to the notion of framing and loss aversion, and Tversky and Kahneman (1991) applied loss aversion within the context of consumption. A decision frame establishes a status quo or reference point against which the individual judges all alternatives. For example, Tversky and Kahneman (1981) famously elicited responses to the following question:

> "Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, whish is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the program are as follows:
>
> "If Program A is adopted, 200 people will be saved
>
> "If Program B is adopted, there is a 1/3 probability that 600 people will be saved and another 2/3 probability that no people will be saved"

Of those responding, 72% chose program A. Alternatively, another group was given the same scenario, but the two alternatives were presented as

> "If Program C is adopted, 400 people will die
>
> "If Program D is adopted, there is a 1/3 probability that nobody will die and 2/3 probability that 600 people will die "

Though these scenarios are identical to A and B, here 78% chose program D. By shifting the wording of the question, the second scenario suggests a reference point of no deaths, while the first establishes a reference point of no one saved. This turn of wording induces loss aversion – where the individual displays a much steeper aversion to losses relative to the status quo than an affinity for gains. Such loss aversion has been found to influence many economic decisions, such as stock and bond purchases (Benartzi and Thaler, 1995).

Within the context of normative labels, loss aversion implies a few distinct predictions. The normative quantity may create a reference point whereby all may judge any quantity less than the "regular" or "medium" to be a loss, and any quantity greater to be a gain, with the utility function being much steeper over losses than gains. Generally the literature suggests that losses are felt about twice the rate of a decline in a gain (Thaler, 1980).

Let $\theta \in \mathbf{R}_{+}^{n}$ be a vector representing the stated norm size for each of *n* goods (e.g., the "regular"). These stated norms create a reference point by which gains or losses may be measured. Thus individuals that are subject to loss averse preferences will behave so as to solve

$$\max_{\mathbf{x}\in\mathbf{C}} U\left(\mathbf{x} \mid \theta\right) \tag{1}$$

subject to

(2) $$\mathbf{p}(\mathbf{x}) \cdot \mathbf{x} \le y,$$

where $\mathbf{x} \in \mathbf{R}_+^n$ is a vector of quantities purchased, $\mathbf{C} \subseteq \mathbf{R}_+^n$ is the set of available quantity choices (which must include the origin), $\mathbf{p}(\mathbf{x}) \in \mathbf{R}_+^n$ is a vector of corresponding prices as a function of the amounts of each good consumed, y is the amount of money budgeted for the meal, and $U(\cdot \mid \cdot) \in \mathbf{R}$ is the loss averse value of consumption given the stated norm. Prices are represented as a function of quantity to allow for the non-linear pricing scheme that is so common when dealing with varying portion sizes. For example, if one could purchase a 12-ounce soft drink for $1, and a 24-ounce drink for $1.50, we could allow only non-negative integer purchases in each via restrictions on $\mathbf{C}$ and represent the different prices via the function **p**(**x**).

Loss aversion implies that the utility function will display $U_{\theta_i}(\mathbf{x} \mid \theta) < 0$ for all $x_i > 0$, but that $U_{x_i}(\mathbf{x} \mid \theta^1) < U_{x_i}(\mathbf{x} \mid \theta^2)$ where θ^1 and θ^2 are identical except that $\theta_i^1 < x_i < \theta_i^2$. Moreover, increasing the reference point will result in a smaller diminishing of utility in the gain domain than in the loss domain, or $0 > U_{\theta_i}(\mathbf{x} \mid \theta^1) > U_{\theta_i}(\mathbf{x} \mid \theta^2)$ whenever θ^1 and θ^2 are identical except that $\theta_i^1 < x_i < \theta_i^2$.

Raising the reference point is the same as reducing the utility of a gain when consumption is above the reference point. Alternatively, it functions as increasing a loss if consumption is below the reference point. Finally, we assume that $U_{\theta_i}(\mathbf{x} \mid \theta) = 0$ whenever $x_i = 0$, so that any good not puchased is not considered a gain or a loss. This leads to Claim 1.

Claim 1: *Let $\underline{x} < \overline{x}$ be any two consumption quantities for a consumption good i and suppose that the individual displays loss averse preferences. If $\theta_i \in [\underline{x}, \overline{x}]$, then increasing θ_i will increase the additional willingness to pay for $\overline{x}$ relative to $\underline{x}$.*

Proof: Additional willingness to pay for $\overline{x}$ over $\underline{x}$ is defined implicitly as the difference in price for good i in amounts $\overline{x}$ and $\underline{x}$ such that $U(\mathbf{x}_{-i}^*(\theta, \overline{x}), \overline{x} \mid \theta) = U(\mathbf{x}_{-i}^*(\theta, \underline{x}), \underline{x} \mid \theta)$. Consider any two norm points θ^1, θ^2 that are equal in all dimensions except i, and with $\overline{x} \ge \theta_i^2 > \theta_i^1 \ge \underline{x}$. Under any price for good i:

(i) $U\left(\mathbf{x}_{-i}*\left(\theta^1,\bar{x}\right),\bar{x}\,|\,\theta^1\right)-U\left(\mathbf{x}_{-i}*\left(\theta^2,\bar{x}\right),\bar{x}\,|\,\theta^2\right)\equiv k_g>0$

(ii) $U\left(\mathbf{x}_{-i}*\left(\theta^1,\underline{x}\right),\underline{x}\,|\,\theta^1\right)-U\left(\mathbf{x}_{-i}*\left(\theta^2,\underline{x}\right),\underline{x}\,|\,\theta^2\right)\equiv k_l>0$

(iii) $k_l>k_g$.

This last point is due to $0 > U_{\theta_i}\left(\mathbf{x}^*_{-i}(\tilde{\theta},\bar{x}),\bar{x}\middle|\tilde{\theta}\right) > U_{\theta_i}\left(\mathbf{x}^*_{-i}(\tilde{\theta},\underline{x}),\underline{x}\middle|\tilde{\theta}\right)$ whenever $\tilde{\theta}=\alpha\theta^1+(1-\alpha)\theta^2,\ \alpha\in[0,1]$. As a starting point, consider any set of prices where the additional price for $\bar{x}$ over $\underline{x}$ is replaced by the additional willingness to pay for $\bar{x}$ under θ^1, so that $U\left(\mathbf{x}_{-i}*\left(\theta^1,\bar{x}\right),\bar{x}\,|\,\theta^1\right)=U\left(\mathbf{x}_{-i}*\left(\theta^1,\underline{x}\right),\underline{x}\,|\,\theta^1\right)$. By (iii) above $U\left(\mathbf{x}_{-i}*\left(\theta^2,\bar{x}\right),\bar{x}\,|\,\theta^2\right)>U\left(\mathbf{x}_{-i}*\left(\theta^2,\underline{x}\right),\underline{x}\,|\,\theta^2\right)$. Thus, a greater difference in price between $\bar{x}$ and $\underline{x}$ is required under θ^2 to make the individual indifferent between consuming $\bar{x}$ or $\underline{x}$. $\blacksquare$

Claim 1 shows that loss averse behavior implies an increased willingness to pay to increase consumption from a smaller to a larger size when the larger sizes are renamed the norm. This is the primary result of the loss aversion model.

Normative Portion Labels as Objective Information about Size

We propose an alternative model of preferences over normative portion size labels based on the notion that individuals fail to utilize the objective information regarding portion size that are available to them. In this case, normative sizes are used as a substitute for objective information about the size of a portion. Thus, the individual perceives their utility based on the relationship between the normative size and the size chosen. Using the same notation as in the previous model, the utility function would now display $U_{\theta_i}(\mathbf{x}\,|\,\theta)<0$ whenever $x_i>0$, because raising the normative size relative to the chosen size will be information for the individual indicating that the portion they have chosen is smaller. Moreover, we assume that utility is homogeneous in consumption and normative size, so $U\left(\mathbf{x}_{-i},\alpha x_i\,|\,\theta_{-i},\alpha\theta_i\right)=k>0$, for all $\alpha>0$ and for some *k*. Thus, utility is a function of the ratio x_i/θ_i. The individual perceives their utility only in relation to the normative size name.

Thus, a 12-ounce “regular” soda would lead to the same utility as a 36-ounce “regular” soda. The individual discards the objective information about size, and simply assumes they will receive a “regular” amount of soda. Similarly, the moniker “small” or “large” will determine value rather than the amount actually included in these portions. Certainly this is an abstraction, as extreme sizes would necessarily induce some change in perception. However, within a reasonable (and probably quite large) range, this abstraction is plausible. As before, we assume that $U_{\theta_i}(\mathbf{x}|\theta)=0$ whenever $x_i=0$, and $U_{x_j\theta_i}(\mathbf{x}|\theta)=0$ whenever $j \neq i$. We will refer to preferences displaying these properties as *informational preferences.*

This model leads us to the following claim.

Claim 2: *Let $\underline{x} < \overline{x}$ be any two consumption quantities for a consumption good i and suppose that the individual displays informational preferences. Then, increasing θ_i from $\theta_i = \underline{x}$ to $\theta_i = \overline{x}$ may decrease the additional willingness to pay for $\overline{x}$ relative to $\underline{x}$.*

Proof: If $\theta_i = \underline{x}$, homogeneity of the utility function implies that the willingness to upgrade is the change in the price of good *i* that would make $U\left(\mathbf{x}_{-i}*(\theta,\theta),\theta|\theta\right)=U\left(\mathbf{x}_{-i}*(\theta,\alpha\theta),\alpha\theta|\theta\right)$, where $\alpha=\overline{x}/\underline{x}$. Similarly, if $\theta_i = \overline{x}$, homogeneity of the utility function implies that the willingness to upgrade is the change in the price of good *i* that would make $U\left(\mathbf{x}_{-i}*(\theta,\theta/\alpha),\theta/\alpha|\theta\right)=U\left(\mathbf{x}_{-i}*(\theta,\theta),\theta|\theta\right)$. The relative change in prices depends on the size of α and the rate of diminishing marginal utility. To see that it may decrease, suppose that the individual obtains constant marginal utility from consuming good *i*. Then, increasing consumption from θ to $\alpha\theta$ generates utility proportional to $(\alpha-1)$, while increasing consumption from θ/α to θ generates utility proportional to $(1-1/\alpha)$. A decrease in relative willingness to pay will occur if $\alpha-1>1-1/\alpha$, or $\alpha^2-2\alpha+1>0$ which is always true if $\alpha \neq 1$.

■

Intuitively, the increase from a regular to a double is perceived to involve a larger increase (a full regular) in portion than the increase from a half to a regular (which only involves an extra half portion). For any two fixed portions, the individual will always perceive the relative increase in portions to be larger above the normative size than below. If this distortion in the perception of portion size increase is large enough to overcome diminishing marginal utility of consumption, willingness to pay will be relatively higher from upgrading above the normative size than from upgrading to the normative size.

Overview of Studies and Methodology

To test between these models, we conducted two field experiments. Diners in each of the experiments were college students and staff ages 18 to 55. Each session of the experiment was conducted within an al la carte cafeteria on campus and diners were recruited from patrons who were entering the dining facility. Each diner was given $15 in cash with which they could purchase their lunch and told that they could keep whatever portion of the money was not spent. Diners would enter a special section of the dining facility that was separated from the purchasing and eating area by temporary opaque walls. Within this area was a serving line that resembled the standard serving lines within the facility and a seating area. Experimental sessions were conducted from 11:00a.m. to 2:00a.m. on weekdays, though diners could enter and leave at anytime within these bounds. Diners would enter the facility as they arrived and would leave once they had completed their meal and a short survey. All sessions were conducted between March 31st and April 18th.

Diners could purchase spaghetti, chef's salad, rolls, soft drink, water and pudding. Each of the items offered were identical to those available within the dining facility. The spaghetti, salad and pudding were each offered in two different sizes—one exactly twice as large as the other. For example, the spaghetti was available in either 1 cup or two cup portions with either 3/8 or ¾ cups sauce. Pudding and salad was available in either ¾ or 1 ½ cup portions. To avoid confusion, we will refer to these as *small* and *large* portions respectively. The naming of the portion sizes was varied between treatments. In some treatments (HALF) the small portions were labeled as a *"half-size"* and the larger portions were labeled a *"regular"*. In other treatments (DOUBLE) the small portions were labeled as "*regular"* and the larger portions were labeled the *"double-size"*.

The first experiment was designed to determine the individual's willingness to pay to upgrade from a smaller portion to a larger portion. In accordance with our theory, those using size names as information may be willing to pay more to upgrade beyond the normative size than those upgrading to a normative size. The second experiment more directly tested the use of size names as information by monitoring plate waste for those told they were consuming a "*regular*" a "*double"* or a "*half*" within both treatments.

Experiment 1: Framing and Willingness to Pay to Upgrade

Experiment 1 involves a field study in which we measure individual willingness to pay for two portion sizes of various foods. While the sizes remain the same, we randomly assign individuals to conditions where the larger size or the smaller size is presented as the normal size.

Method and Procedure

Our experiment involved 45 diners recruited to participate in one of two lunch sessions. Within each session, a participant would receive their money and was told that they would be participating in an auction to determine the food they would purchase. Upon entering the facility, they were led to the serving area and were shown displays of all portions of each food with signs prominently labeling the size name for each item. Once they had viewed all of the food options, the auction mechanism was explained, and several examples were given. At this point individuals were asked for their bids and the auction mechanism was executed.

The auction mechanism was a modified version of the *n*th price sealed bid auction that is standard in the literature. Prices were fixed for rolls, soft drinks and water at levels that were common in the local dining facility. Diners were asked to place a bid on the small size for spaghetti, salad and pudding, b_s. Then, they were asked to bid on an upgrade to the larger size, d. They were instructed that the total of the two numbers $b_l = b_s + d$ constituted their bid for the larger size. The price would be set at the 15th highest bid for the larger item, with all those bidding at or above this bid receiving the larger food item at this price. The price for the smaller item would be the third lowest bid, b_s, of those not receiving the larger item. Instructions were given to diners that it was in their best interest to bid what the food was worth to them in each case.

Once bids were placed, prices were determined and food was delivered to the diners table. After receiving their food, the individual would sit in the eating area. Once they had completed their meal, a lab worker would retrieve their tray and hand them a survey to be filled out. Diners were assigned to treatments based on the day in which they participated. Those entering the experiment on a Wednesday were placed in the DOUBLE treatment, while those entering on a Friday were placed in the HALF treatment. Both sizes were available in each session.

Results

The demographic statistics for the diners in both treatments are presented in Table 1. The demographics are similar between the two treatments, and no difference is statistically significant. Nevertheless, we test hypotheses using both uncontrolled test statistics and test statistics that allow for covariate controls.

--Insert Table 1 --

Table 2 presents the uncontrolled mean bids for each of the foods. The bid for each food significantly increases when the normative name for the food suggests a larger size. All willingness to pay measures for the larger normative size (HALF) are significantly smaller than under the smaller normative size name (DOUBLE). This is consistent with both the loss averse and the information preference model.

--Insert Table 2 --

However, Claim 1 and Claim 2 state that under loss aversion the difference in willingness to pay to upgrade to the larger from the smaller size should be higher under the HALF treatment. This relationship is violated significantly for all three foods where individuals displayed a greater difference in willingness to pay under DOUBLE than HALF in all cases. This points to the possibility that individuals are using the names as information rather than simply to form reference points or social norms. Indeed, the proof of Claim 2 shows that if marginal utility of consumption is not declining too quickly, the individual should be willing to pay more to double the regular than to double the half portion.

Suppose an individual may have in mind their willingness to pay for a regular (with some adjustment for the particular size). Then, when calculating the price of a "double-size" they may simply double this amount with some adjustment downward. Conversely, when calculating the price of a "half-size," they may halve this estimate and then adjust somewhat upward. Such a process, whereby the name is used to determine willingness to pay, would lead to the types of price differences observed in Table 2 that are inconsistent with the more prominent behavioral models. Figures 1 to 3 display the cumulative distribution of bids by treatment. As can be seen, in each case the bids under DOUBLE stochastically dominate the bids for HALF, or nearly so.

--Insert Figures 1 to 3 --

With some slight demographic differences between treatments, it may be important to control for exogenous demographic variation between treatments. We make use of the minimum distance matching technique developed by Abadie et al. (2001). Table 3 contains treatment effects for the bids using controls for demographics. While significance is diminished for salad bids with the demographic controls, other relationships retain significance.

--Insert Table 3 --

Discussion

The preferences consumers revealed while bidding for their food enable us to make some useful generalizations about normative labeling. First, they show that the reason these labels influence people is not because it suggests a norm, as originally suspected (Wansink and van Ittersum 2007), or because it produces feelings of loss or gain (Tversky and Kahneman 1991). Willingness-to-pay was solidly inconsistent with loss aversion. Instead, we find evidence that people are using these labels as objective information about the size of the portion—even though the food was clearly visible. The concern is that this may mislead the consumer as to how much they ultimately consume. Experiment 2 provides a more direct test of whether consumers are using the label as information about the objective size of the portion.

Experiment 2. How Do Portion Size Labels Bias Actual Consumption

Experiment 2 involves a field study in which individuals consumed one of two different sizes of various dishes. We monitored the amount consumed by the individual when each of the sizes was given a different normative name. If labels are used as objective information, individuals will leave more on their plate when consuming a larger named portion.

Method and Procedure

In Study 2, 134 diners were recruited and randomly assigned to either DOUBLE or HALF conditions. All participants were encouraged to participate in two separate lunch sessions, two weeks apart. Some attended only the first session. As well, others were recruited to participate only in the second session for a total of 172 diners. Within each session, a participant would enter the facility and be told they would be receiving a lunch of spaghetti and a salad. Once in the facility they would enter a line in the serving area passing displays of each available food for the day and signs prominently labeling the size. Once at the front of the line they would place their order and one of the food service workers would deliver the desired items while the individual paid for the food. After receiving their food, the individual would sit in the eating area. Once they had completed their meal, a lab worker would retrieve their tray and hand them a survey to be filled out. The lab worker would then inconspicuously take the tray to the serving area and record the weights of the food remaining on the tray and then collect the survey and attach the waste data to the survey.

During the first week of participation, individuals would be presented only with the regular portion (the small portion in DOUBLE and the larger portion in HALF). In the second week they were presented the "half-size" if participating in HALF and the "double-size" if participating in DOUBLE. This experiment is designed to see if individuals use the size labels as information about how much they should consume. If the individual believes that the labels convey true information about relative size, an individual consuming the larger portion may leave more if it is labeled a "double" than when it is labeled a "regular."

Results

Table 4 presents summary statistics for plate waste in week 1 and 2 for both treatments. Notably, individuals tend to leave more on their plate when they are told they are consuming a larger than normal portion. These differences are significant for all sizes and goods aside from the larger size of pudding where the relationship is insignificantly reversed. This appears to have occurred due to the generally small numbers purchasing pudding in general, but a larger portion taking the pudding when it was given a smaller size label. Potentially, many individuals wanted to avoid eating too much of the dessert or found the oversize portion unappealing. In the case of the large spaghetti, those receiving the larger label left 10 times as much as those receiving the smaller label.

--Insert Table 4 --

It is interesting to note how the change in size labeling might influence overall consumption. For the sessions with the larger portions, the reduction in calories consumed when given a larger name was substantial. Total calories consumed was reduced 41% from 463 to 305 (an elasticity of calories to portion size of about 0.82). In examining spaghetti, the decline in calorie consumption when offered a small "regular" versus a large "regular" was about 63%, giving an approximate elasticity of calorie consumption to portion size of 1.3 within item.
This allows us to estimate a treatment effect controlling for important covariates. Table 5 presents average treatment effects controlling for gender (Model 1), and gender, height, weight and age (Model 2). The results largely uphold those found with the uncontrolled means, though the effect of the treatment on plate waste for pudding and salad fails to be significant except in one case.

--Insert Table 5--.

Discussion

Interestingly, size labels not only influenced the purchase of items, but also the amount individuals decide to consume once they have obtained the items. For example, individuals leave substantially more spaghetti when eating the large size is called a "double-size" than when eating the large size when called "regular". Similar results obtain for the salad. When consuming the small size, individuals leave more on their plate when it is labeled "regular" than when labeled "half-size".

Thus, it appears that individuals not only judge the amount to purchase, but also their satiation point by the normative labels applied to the foods—they leave more on their plate when the name suggests a larger amount of food. The results of these two experiments triangulate on the explanation that individuals are in fact using the labels as information. The information contained in the labels appears to supersede any sensory experience of satiation. While individuals did not purchase more with larger size names, they used the names to judge what portion of the food they should eat.

Conclusion

Food retailers and especially fast food restaurants have utilized normative size labels for their food products. We find that consumers respond to these labels independently of the actual size of the products. Further, it appears that consumers are responding to the labels primarily for the rule-of-thumb informational content they provide rather than because of a more complex mechanism. If this is indeed the case, size labels may mislead casual consumers about the true size of the portions they are purchasing and consuming. This provides some rationale for government guidelines suggesting standard size-labels for foods – as was done with the Nutritional Labeling Act of 1994 – so that the information gleaned by the consumer is congruent with the true size of the portion. Suggesting normative names could have substantial effects on consumption behavior, potentially leading to healthier consumption volumes. Such guidelines would likely have negative impacts on restaurant revenues. However, it would also lead restaurants to compete on aspects of their product other than size. With the tremendous increase in obesity experienced in the US over the last decades, there may be a substantive role for government in creating an atmosphere where a casual (and non-cognizant) consumer may be pointed toward healthier portions without removing individual choice and without restricting a firm's ability to market whatever quantities they wish.

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Table 1. Demographic Information by Treatment: Study 2 Auction Experiment

Variable	HALF Mean	DOUBLE Mean	Z-Stat (P-Value)
	N = 25	*N* = 20	
Gender (1 = Female)	0.53 (0.51)	0.42 (0.51)	0.641 (0.52)
Height (inches)	67.9 (4.3)	67.9 (5.1)	0.175 (0.86)
Weight (pounds)	145 (26)	147 (25)	-0.095 (0.92)
Age	19.3 (1.2)	19.7 (2.2)	-0.033 (0.97)

Standard errors in parentheses in the first two data columns. Tests represent the Wilcoxon test for rank sum of the distributions.
*P <.10, ** P <.05, P <.01

Table 2. Average Bids by Treatments

Variable	HALF Mean	DOUBLE Mean	Z-Stat (P-Value)
	N = 25	*N* = 20	
Small Spaghetti***	$1.07 (1.06)	$2.18 (1.02)	-3.400 (0.00)
Larger Spaghetti***	$1.67 (1.60)	$3.50 (1.82)	-3.378 (0.00)
Small Salad**	$0.71 (0.98)	$1.18 (0.78)	-2.428 (0.02)
Larger Salad**	$1.08 (1.33)	$1.71 (1.06)	-2.199 (0.03)
Small Pudding**	$0.44 (0.40)	$0.89 (0.71)	-2.288 (0.02)
Larger Pudding***	$0.62 (0.63)	$1.53 (1.02)	-3.087 (0.00)
d Spaghetti**	$0.63 (0.68)	$1.31 (1.25)	-2.539 (0.01)
d Salad**	$0.37 (0.51)	$0.58 (0.35)	-2.167 (0.03)
d Pudding***	$0.18 (0.31)	$0.64 (0.53)	-3.406 (0.00)

Standard errors in parentheses in the first two data columns. Tests represent the Wilcoxon test for rank sum of the distributions.
**P* <.10, ** *P* <.05, *P* <.01

Table 3. Treatment Effects on Bids Controlling for Demographics

Variable	Model 1	Model 2
Small Spaghetti	$1.13*** (0.33)	$1.11*** (0.36)
Larger Spaghetti	$1.82*** (0.55)	$1.86*** (0.62)
Small Salad	$0.39 (0.31)	$0.29 (0.37)
Larger Salad	$0.38 (0.42)	$0.21 (0.48)
Small Pudding	$0.43** (0.18)	$0.36* (0.20)
Larger Pudding	$0.84*** (0.28)	$0.76*** (0.29)
d Spaghetti	$0.68** (0.32)	$0.75** (0.35)
d Salad	$0.05 (0.16)	$0.01 (0.17)
d Pudding	$0.41*** (0.15)	$0.40** (0.16)

Model 1 controls for gender, Model 2 controls for gender, height, weight and age. Plate waste measured in grams.
**P* <.10, ** *P* <.05, *P* <.01

Table 4. Summary of Consumption Decisions by Treatment in Week 1 and Week2

Variable (Intake is in gms)	HALF	DOUBLE	Z-Stat (P-Value)
Large Only			
Spaghetti Waste***	2 (27)	20 (53)	5.348 (0.00)
Salad Waste**	7 (19)	3 (17)	2.435 (0.01)
Pudding Waste	22 (71)	11 (52)	1.346 (0.18)
Total Calories Consumed ***	463 (231)	325 (235)	2.854 (0.00)
Proportion Purchasing			
Spaghetti ***	0.705 (0.459)	0.302 (0.463)	4.259 (0.00)
Salad	0.312 (0.466)	0.434 (0.500)	-1.420 (0.16)
Pudding	0.169 (0.377)	0.113 (0.320)	0.879 (0.380)
Rolls	0.573 (0.497)	0.566 (0.499)	0.093 (0.93)
Soft drinks	0.417 (0.496)	0.447 (0.501)	-0.403 (0.69)
Water	0.563 (0.499)	0.658 (0.478)	-1.267 (0.21)
Small Only			
Spaghetti Waste***	7 (27)	18 (42)	-3.03 (0.00)
Salad Waste**	1 (13)	3 (10)	-2.265 (0.02)
Pudding Waste**	6 (25)	14 (41)	-1.986 (0.05)
Total Calories Consumed ***	231 (139)	305 (146)	-2.65 (0.01)
Proportion Purchasing			
Spaghetti **	0.413 (0.495)	0.632 (0.487)	-2.519 (0.01)
Salad	0.375 (0.487)	0.421 (0.498)	-0.542 (0.588)
Pudding	0.163 (0.371)	0.228 (0.423)	-0.961 (0.34)
Rolls ***	0.469 (0.502)	0.697 (0.462)	-2.999 (0.00)
Soft drink	0.354 (0.481)	0.474 (0.503)	-1.580 (0.11)
Water	0.500 (0.503)	0.579 (0.497)	-1.028 (0.30)

Standard errors in parentheses in the first two data columns. Tests represent the Wilcoxon test for rank sum of the distributions. Plate waste measured in grams.
*P <.10, ** P <.05, P <.01

Table 5. Treatment Effects Controlling for Demographics in Week 1 and Week2

Variable	Model 1	Model 2
	Large Only	
Spaghetti Waste	-86*** (18)	-82*** (20)
Salad Waste	-5 (3)	-7** (3)
Pudding Waste	-18 (12)	-3 (14)
Total Calories Consumed	-102** (46)	-83 (53)
	Small Only	
Spaghetti Waste	13** (6)	12* (7)
Salad Waste	1 (2)	1 (3)
Pudding Waste	8 (7)	10 (8)
Total Calories Consumed	76*** (25)	58** (28)

Model 1 controls for gender, Model 2 controls for gender, height, weight and age. Plate waste measured in grams.
*P <.10, ** P <.05, P <.01

Figure 1. Cumulative Distribution of Bids for Spaghetti by Treatment (1 = HALF, 0 = DOUBLE)

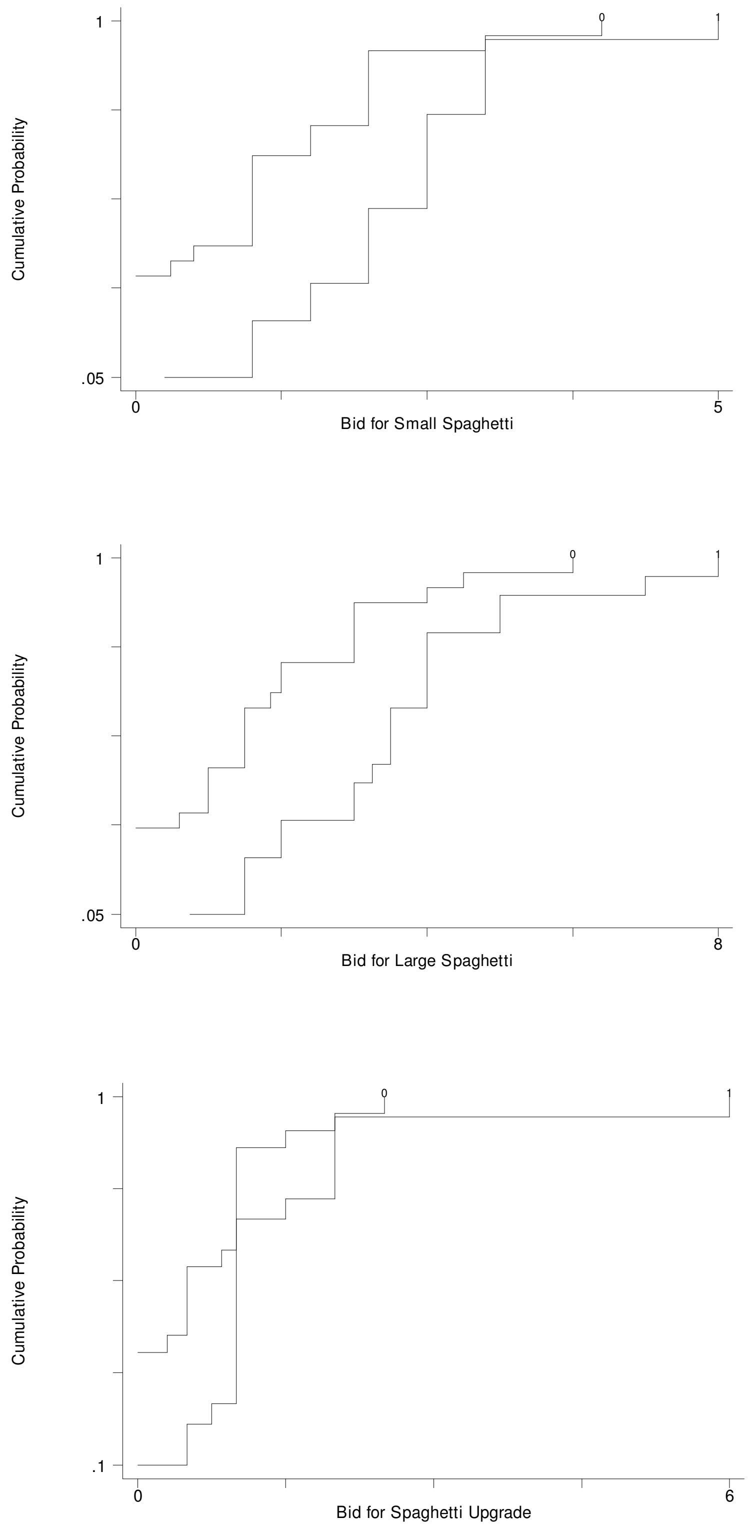

Figure 2. Cumulative Distribution of Bids for Salad by Treatment (1 = HALF, 0 = DOUBLE)

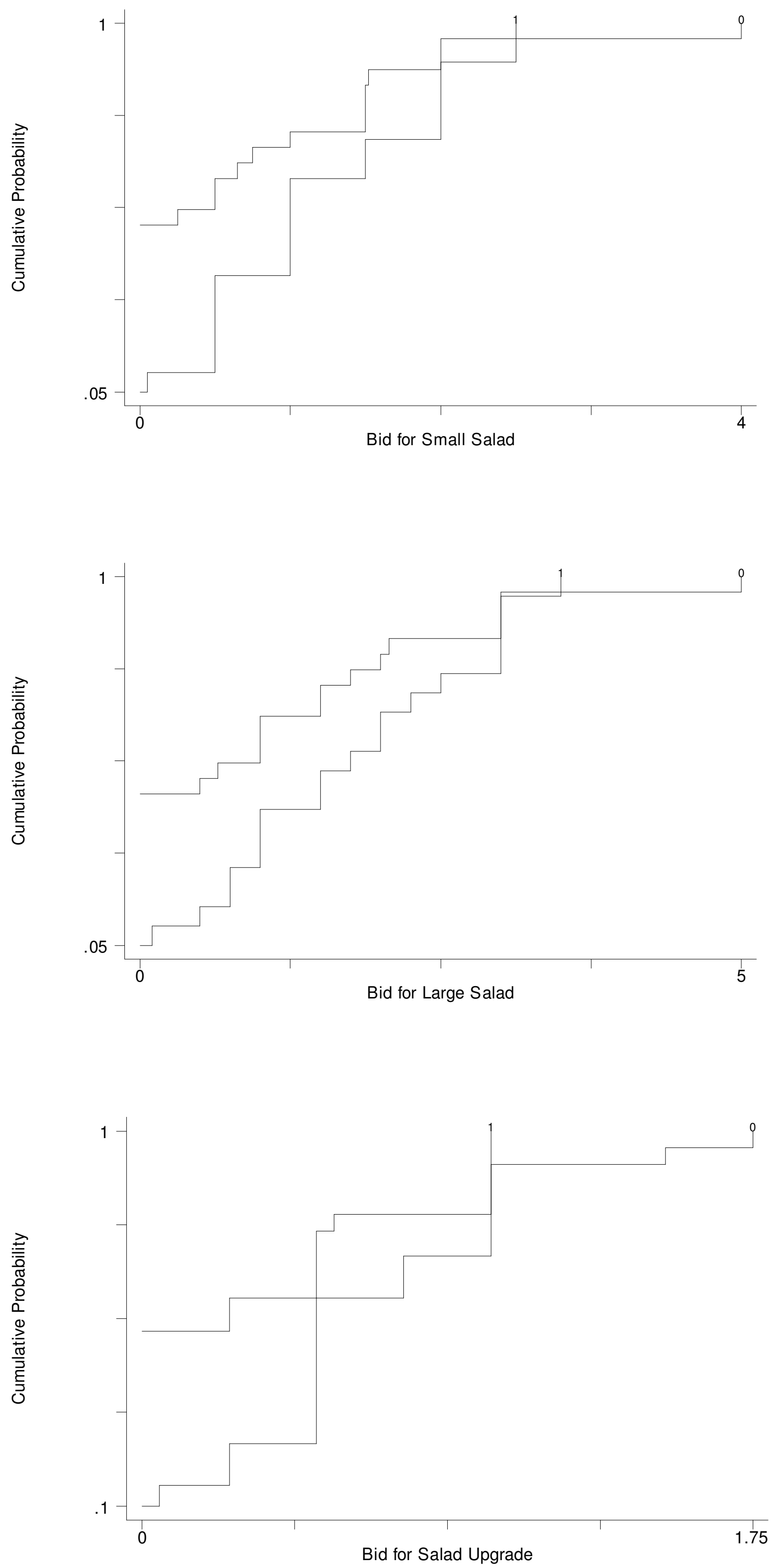

Figure 3. Cumulative Distribution of Bids for Pudding by Treatment (1 = HALF, 0 = DOUBLE)