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How Safe Is My Food?

Assessing the Effect of Information and Credible Certification on Consumer Demand for Food Safety in Developing Countries

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ABSTRACT

The literature regarding consumer demand for safer food in developing countries is scant, and the general assumption is that these consumers' willingness to pay (WTP, as an indicator of their demand) is constrained by their low ability to pay (ATP). There are, however, a number of developing countries with growing middle-income populations whose ATP has been steadily increasing, although low food safety standards in these countries still prevail. In this paper, we argue that ATP, while necessary, is not the sole condition for WTP and that credible information about and certification of food safety are required to ensure that ATP translates into WTP. To test this hypothesis, we conducted a randomized market experiment in two branches of a supermarket chain in Mumbai, India, a city that hosts one of the world's fastest growing middle-income populations. In this experiment, we sold grapes with credible food safety certification labels and the exact same grapes (a placebo) without such labels. We provided all consumers with extensive food safety information comprising banners and posters announcing the sale of food-safety-certified grapes in the supermarket. We also randomly selected one-half of the consumers and provided them with intensive information (a short documentation flier) describing what credible certification of food safety entails. By continuously varying the prices (with the labeled grapes priced higher than unlabeled ones) during the month in which the experiment was implemented, we found that those consumers who received intensive information (the treatment group) are more likely to purchase grapes labeled as certified. This result is robust to the inclusion of an extensive set of controls (income, gender, and education) gathered through a structured survey instrument implemented following the purchase of the grapes. To further investigate the marginal impact of credible information on consumer demand for food safety, we studied consumers' answers to various knowledge, attitude, perception, and practice (KAPP) questions also collected through the survey instrument. Using KAPP responses, we created a consumer-specific food safety consciousness index (FSCI) and stratified consumers according to those below and those above the sample mean FSCI. We find that the marginal impact of credible information and certification on the purchase of labeled grapes is significantly greater for consumers with higher FSCI. We therefore conclude that credible information and certification are important determinants of consumer demand for food safety.

Keywords: randomized market experiment, food safety, willingness to pay, credible information, certification, knowledge, attitude and perceptions, factor analysis

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1. INTRODUCTION

Consumer demand in *developed* countries for safer[1] food, as measured by consumers' willingness to pay (WTP) higher prices for safer food products, has been documented by several studies (see Hoffman et al. 1993; Fox et al. 1998; Hayes et al. 1995; Roosen et al. 1998; Blend and van Ravenswaay 1999; Teisl et al. 1999; Loureiro et al. 2002; Lusk et al. 2003; Enneking 2004; Scarpa and Del Giudice 2004; Carlsson et al. 2005; Scarpa et al. 2005; Lagerkvist et al. 2006; Loureiro et al. 2006; Loureiro and Umberger 2006; Goldberg and Roosen 2007; Annett et al. 2008; Marette et al. 2008). These studies used various preference elicitation methods, including stated preference methods (choice experiment and contingent valuation) and revealed preference methods (hedonic pricing), as well as experimental economics methods (both field and laboratory experiments). In general, these studies' findings reveal that consumers in developed countries are willing to pay higher prices for safer and higher quality food; their demand for food safety also increases as factors such as income, education, and food safety awareness levels increase, as well as when the level of information provided to the consumer about health risks and food safety issues increases.

The number of studies investigating consumer demand for safer food in *developing* countries is smaller, but is increasing. These studies have mainly used stated preference methods (see Krishna and Qaim 2008; Ehmke et al. 2008; Roy et al. 2010) and have found that in hypothetical settings, much like their developed country counterparts, developing country consumers also demand safer food. In addition to these stated preference studies, Masters and Sanogo (2002) conducted a field experiment and found significant demand for safer food. However, the foodstuff used in this study (baby food) is of a special category of consumption; hence the results are not generalizable to all food products. Therefore, even though there is some evidence of demand for safer and higher quality food in developing countries, it is based on a few stated preference studies that are often criticized for the hypothetical biases they may entail (Diamond and Hausman 1994). Consequently, it is often assumed that demand for safer food is low in developing countries.

Several potential factors justify this assumption, the most acknowledged one being low ability to pay (ATP) among consumers in developing countries (Delgado 2005). ATP is a necessary condition for demand for safer food, but in our opinion, ATP alone does not sufficiently account for WTP. An increasing number of developing countries, such as China and India, have an ever-growing middle-income population whose demand and hence WTP for higher quality consumption goods are rapidly increasing (Ernst and Young 2006; McKinsey Global Institute 2007). Even in these countries, ATP does not always translate to WTP, as the insufficient price premiums for safer food and the uniformly low food safety standards can attest. In this paper, we argue that one reason ATP is often not captured through WTP is the mere fact that there are information asymmetries regarding the safety of the food product. We argue that the lack of credible information about what food safety entails and whether or not a foodstuff is safe are important determinants of consumer demand for safer food. Our aim is not to estimate consumers' WTP for safer food per se, but rather to demonstrate that when information asymmetries about food safety are removed or reduced, developing country consumers may demand safer products even if they are offered at a higher price. In other words, in this context it is important to distinguish the magnitude of the possible premium from the possibility of a premium itself. ATP may be an indicator of the size of the premium, but credible information is likely to capture both ATP and WTP.

To test this hypothesis, we conducted a randomized market experiment in two supermarkets in Mumbai, the capital of the Indian state of Maharashtra. One of these supermarkets is located in an upper-middle-income neighborhood (shop 1); the other (shop 2) is located in a lower-middle-income neighborhood. Shop 1 is larger, with a wider and more high-end (including imported) selection of food

[1] Note that in this paper we use the narrow definition of food safety as stated in Ritson and Mai 1998. Under this narrow definition, food safety is defined as the reduction in the probability of suffering from an illness as a result of consuming food that may result in health risks (for example, mad cow disease, growth hormones, general health risks from foodborne illnesses, or use of pesticides or other chemicals).

and other household items, as well as modern facilities such as an electronic cash register. Shop 2 sells more domestic products, has fewer alternatives, and has a manual cash register. Our aim in choosing these two supermarkets, whose clientele who are bound to have different income levels, was to test whether consumers with higher income and its correlates (for example, education) would reveal significantly higher demand for safer food. Finally, both of these supermarkets have a geographic monopoly within their localities, since it is generally costly (in terms of transportation and time) for consumers to visit other supermarkets.

In this market experiment, we provided customers of both supermarkets with grapes procured from GlobalGAP (Global Good Agricultural Practices [GAP], formerly EurepGAP)-certified grape producers who produce for the export market. We artificially created two kinds of grapes by separating the procured grapes into one group that had the GlobalGAP certification label and another group that did not have the label (in fact, *all* grapes used in this experiment were GlobalGAP certified). Therefore, the two groups of grapes were perfectly identical in all of their attributes (variety, texture, color, and freshness) and differed only in that one had a label indicating that it had a credible food safety certification awarded by a trustworthy third party. The experiment lasted for one month because the fresh grape season in the state of Maharashtra lasts for about that time period (from the end of February to the end of March).

During the course of the month, we varied the price of these two kinds of grapes continuously—with the labeled grapes always being priced higher— to avoid any price specificity in the outcomes. The prices were varied randomly, though within a well-calculated profitable margin so that the participating supermarkets did not incur any financial losses in the form of negative profits (budget deficit). Customers were presented with two types of information regarding the labeled grapes, which we call *extensive* information and *intensive* information. Extensive information included banners and posters displayed visibly outside and inside the supermarkets, as well as above the shelves where the labeled grapes were located, to inform the consumers that GlobalGAP-certified fresh grapes were being sold at the supermarket during the grape season. Intensive information (allocated randomly) consisted of a brief document (a user-friendly flier) that introduced GlobalGAP and explained what the certification entails in terms of production, postharvest, and handling standards. Every second customer that entered the supermarket during the course of the experiment was selected to be presented with the document on GlobalGAP certification. In this experiment, those customers who received the intensive information and purchased grapes of either kind (labeled or unlabeled) comprise the *treatment group*, whereas those who did not receive the intensive information and purchased grapes of either kind comprise the *control group*. Following checkout, all customers who purchased grapes during that shopping trip were interviewed; the overall sample size was 907 customers.

We found that customers in the treatment group were significantly more likely to purchase certified grapes. In other words, intensive information about credible certification and safety guarantees increased consumer demand for safer food. This result is robust to the inclusion of an extensive set of controls (income, gender, and education) gathered through the survey instrument. Being in the treatment group, however, could not necessarily ensure the uniformity of treatment for all customers who received information. The importance of the information to customers' purchasing decisions could differ among customers either because of prior knowledge or because of self-selection (in other words, choosing to read the document or having a better understanding of the information). To address this problem, based on answers to the detailed knowledge, attitude, perceptions, and practices (KAPP) data collected through the onsite survey, we first constructed a food safety consciousness index (FSCI) for each consumer. We then stratified the sample into high and low food-safety-conscious consumers.

A priori, the marginal value of information can be expected to be higher for consumers with low food safety consciousness if FSCI is related to lack of information. However, we found that the marginal impact of being in the treatment group (having access to the intensive information document) is higher for consumers with higher food safety consciousness prior to the study. This result indicates that there is a potentially significant role for credible information and certification in capturing the demand for food safety in some developing countries. Further, it can be concluded that even if consumer ATP increases,

the lack of credible information and certification prevalent in developing countries can be expected to hinder the demand for and supply of safer food in these countries.

The rest of this paper unfolds as follows. Section 2 presents a simple theoretical model that explains the behavioral response of consumers to different types of information that varies by the prior KAPP of the consumers and the credibility of the information provided. Section 3 introduces the experimental design and Section 4 presents the results and discusses the caveats. Section 5 concludes the paper with a summary of the experiment and its main findings.

2. THEORETICAL MODEL

2.1. Willingness to Pay for Certification

Our theoretical model follows the framework laid out in Hamilton et al. 2003. Let the individual preferences be summarized in an indirect utility function that has the following arguments: prices, incomes, and expected health. The main role of certification is to change the value of expected health. The expected health can differ across certified and noncertified products and across consumers, leading to different WTP for certified food. The certified product is offered for sale at a premium. In what follows, these notations will be used:

H^i= expected health of consumer i

p^i= price of the certifiable product faced by consumer i.[2]

s = price of the other good

M^i = income of consumer i.

Hence, for consumer i, the augmented (with the expected health variable) indirect utility function is specified as

$$V^i = V^i(p, s, M^i, H^i). \tag{1}$$

The indirect utility function in equation (1) satisfies the standard properties in its arguments ($p, s, and\ M^i$). Hence, $V_p \leq 0, V_s \leq 0,$ and $V_M \geq 0$. With the expected health as an additional argument in the indirect utility function, the partial derivative with respect to expected health is assumed to be positive; that is, $V_H > 0$. Further, V is assumed to be continuous, differentiable, and quasi convex in prices. Assuming s to be the numeraire, the indirect utility function is specified only as a function of $p, M, and\ H$. The underlying direct utility function that produces an indirect utility function as specified in equation (1) is presented in the appendix.

Consider the case when a certified product is made available. Let the maximum premium that consumer i is willing to pay for certified product be given by $\Delta p_i{}^*$. Note that $\Delta p_i{}^*$ is not the actual premium of the certified product in the market, which could be different. We denote the actual premium in the market by Δp_i. Clearly, if $\Delta p_i < \Delta p_i^*$ then the i^{th} consumer will purchase the certified product. This can be easily seen by comparing the utility level associated with the certified product with the utility from consumption of a noncertified product (see proof in appendix).

Following Hamilton et al. (2003), the maximum premium that consumer i is willing to pay (Δp_i^*) is defined by the following equation:

$$V^i\left(p + \Delta p_i^*, s, M^i, H_c^i\right) = V^i\left(p, s, M^i, H_{nc}^i\right), \tag{2}$$

where H_c^i and H_{nc}^i denote the expected health of consumer i from the certified and noncertified product, respectively.

Taking a linear expansion around this point of indifference, we have

$$\Delta p_i^* = -\frac{V_H}{V_p}\Delta H_i. \tag{3}$$

In equation (3), the WTP depends on the perceived change in health ΔH_i from consuming the certified product. The scale factor contains the marginal utility of income in the denominator (V_p); hence, Δp_i^* is expressed in monetary units as opposed to utility units. If $V_H > 0$, for each consumer i, since indirect utility is non-increasing in prices, $V_p \leq 0$, as Δp_i^* is positive.

[2] We introduce a notation for consumer specificity in price faced due to the design of the experiment, in which prices varied every day and subsequently varied across consumers.

Comparing across two consumers (1 and 2) with the same expected health gain from certification,

$$\Delta p_1^* > \Delta p_2^* \text{ iff } -\frac{V_H^1}{V_p^1} > -\frac{V_H^2}{V_p^2}, \tag{4}$$

where $V_H \; and \; V_p$ are the partial derivative of the indirect utility function with respect to expected health and the price for consumers 1 and 2, respectively. The maximum premium that any individual is willing to pay does depend on the income level of the consumers (as the derivatives $V_H \; and \; V_p$ are a function of income levels) and on the expected improvement in health from choosing the certified product.

Assuming higher marginal disutility of price increase for poorer consumers, if marginal utility of expected health is valued equally by rich and poor consumers, then wealthier consumers will have a greater WTP for the certified product. Note that the kind of product we are dealing with has in general a more pronounced effect on long-term health as opposed to short-term health. To the extent that the poor have higher discount rates, the marginal valuation of long-term health would be lower. If between rich and poor consumers, the marginal valuation of long-term health is higher for richer people, then a relatively higher premium can be expected from richer consumers on this ground as well.

The change in premiums with rising incomes depends on some conditions of the utility function. Assuming increasing marginal utility of health with incomes, the premium increases if income elasticity of demand is sufficiently high (that is, greater than the coefficient of relative risk aversion). Please see appendix for proof.

2.2. Role of Information, Credibility, and Willingness to Pay a Premium

For simplicity, assume that there are two possible states of health: high state, denoted byH_h, and low state, denoted by H_l. Let π_c^i and π_{nc}^i denote the subjective probability (posterior probabilities following our information treatment) that consumer i attaches to a product delivering high health for the certified and noncertified variants, respectively. We will see that, depending on the type of information, the values of these probabilities can vary.

With the two possible states of health, the expected health from the certified product (H_c^i) and from noncertified product (H_{nc}^i) is given as:

$$H_c^i = \pi_c^i H_h + (1 - \pi_c^i) H_l \tag{5}$$

and

$$H_{nc}^i = \pi_{nc}^i H_h + (1 - \pi_{nc}^i) H_l, \tag{6}$$

respectively, where it is assumed that $\pi_c^i \geq \pi_{nc}^i \; \forall i$—that is, all individuals believe that the certified product has at least as high a probability of delivering high health as the noncertified one.

Definition 1: An improved credibility of certification for individual i implies a higher π_c^i. Alternatively, more credibility implies a higher value of $(\pi_c^i - \pi_{nc}^i)$. We refer to $(\pi_c^i - \pi_{nc}^i)$ as the *credibility gap*.

2.2.1. Role of Extensive and Intensive Information in Affecting Demand for Certified Product Versus Noncertified Product

The change in expected health from a certified product over a noncertified one for individual i is given as

$$\Delta H_i = \left[\pi_c^i H_h + \left(1 - \pi_c^i\right) H_l\right] - \left[\pi_{nc}^i H_h + \left(1 - \pi_{nc}^i\right) H_l\right] \tag{7}$$

In equation (7), the *expected health gap* can be rewritten as

$$\Delta H_i = \left[\pi_c^i - \pi_{nc}^i\right]\left[H_h - H_l\right]. \tag{7a}$$

The term in the first parenthesis is the credibility gap as defined above. The term in the second parenthesis in equation (7a) depicts the health gap. We postulate that both terms are a function of the information available to the consumer and thus can be altered through an information intervention. Let us denote the credibility gap for individual i by CC_i and the health gap by h. Note that without loss of generality, we are treating the health gap as invariant across consumers.

Clearly, $(\partial \Delta p_i^*/\partial CC_i) > 0$, following $\frac{\partial \Delta H_i}{\partial CC_i} > 0 \forall i$. Hence, for each consumer, if the credibility of the certification goes up, a larger maximum premium is possible. Similarly, $(\partial \Delta p_i^*/\partial h) > 0$. The extensive information treatment is postulated to affect ΔH_i only through changes in π_c^i, where consumers get to know that the product is certified from an international agency and are likely to assign a higher probability to delivery of good health (that is, H_h).

The sizes of the credibility gap and the health gap are crucial to consumer choice between certified and noncertified products. First, let us focus on the credibility gap. It depends on π_c^i and π_i^{nc} . How these posterior probabilities are formed (postinformation intervention) is critical to the effect that the intervention has on consumer choice between certified and noncertified grapes. With extensive and intensive information, we postulate a Bayesian update of the individual's prior belief that the product will contribute to better health. The specific form of Bayesian updating that we consider follows from Lybbert et al. (2007), who characterize the updating rules in the form given in equation (8) below.

In its most general form, Bayesian updating rules involve the ratio of a joint probability that two events occur and the unconditional probability that one of the events occurs. Below is a special case of the Bayesian updating rule. Let us denote the signals (from information treatment) that could lead to updating represented by $\pi_{cert}^k \; and \; \pi_{ncert}^k$ respectively. k denotes the type of signal emanating from extensive or intensive information. $k = E$ and $k = I$ imply extensive and intensive information, respectively.

$$\pi_i^c(k) = \delta_i^k \pi_i + (1 - \delta_i^k)\pi_{cert}^k. \tag{8}$$

Equation (8) can be rewritten as

$$\pi_i^c(k) = \pi_{cert}^k + \delta_i^k[\pi_i - \pi_{cert}^k]. \tag{8a}$$

A similar equation can be specified for the case of noncertified product as

$$\pi_i^{nc}(k) = \pi_{ncert}^k + \delta_i^k[\pi_i - \pi_{ncert}^k]. \tag{8b}$$

In equation (8), $\pi_i^c(k)$ is the posterior probability for consumer i about certified food delivering high health. $(1 - \delta_i^k)$ is the updating weight on the signal π_{cert}^k. Note that the updating weight depends on the individual. $(1 - \delta_i^k)$ is the updating weight and is a function of the credibility of the signal. In general, we postulate that the credibility of the signal is a function both of the type of signal and of individual characteristics. Thus,

$$\delta_i^k = \delta_i^k(k, X_i), \tag{9}$$

where X_i is a vector of characteristics for individual i. Equations (8a) and (8b) imply that the more "surprise" in the signal, the higher the updating. With the characterizations in (8a), (8b), and (9), heterogeneity is likely in the effect of different signals (label and information on availability of certified grapes) and documentation on consumers.

π_{ncert}^k denotes the signal under treatment k about noncertified product delivering high health. Further, note that without extensive or intensive information, the same prior probability for delivering high health exists for products of either type.

The posterior probability from extensive or intensive information treatment depends on the following points.

1. The consumer i has (δ_i) confidence in his prior beliefs. If (δ_i) equals 1, then the consumer has full faith in his prior belief and there is no updating from the signals provided regardless of the information given.
2. The greater the confidence in the signal (the certification label, information provided, or both), the greater the updating of the beliefs.
3. The bigger the surprise in the message (the difference between the prior belief and the signal), the greater the updating of the beliefs.

Extensive Information

The extensive information provided to consumers included banners and posters inside and outside the supermarkets. These informed consumers that a product certified by a third-party international agency was being sold at the supermarket. This information can be modeled as providing a positive signal about the certified product—and only the certified product. For simplicity, assume

$$\pi_{cert}^{E} = \pi + \theta. \tag{10}$$

Hence, under extensive information treatment, the following conditions hold (suppressing the i subscript from here on):

$$\pi_{cert}^{E} > \pi \Rightarrow \pi^{c} > \pi \qquad \text{Condition (A)}$$

$$\pi_{ncert}^{E} = \pi \Rightarrow \pi^{nc} = \pi$$

The credibility gap can then be written as

$$CC^{E} = (1 - \delta)\theta \tag{11}$$

The expected health gap under extensive information can be expressed as

$$\Delta H^{E} = (1 - \delta)\theta h, \tag{12}$$

where h denotes the health gap. Few straightforward points emerge from equation (12). Unless there is new positive information $(\theta > 0)$ and the consumer puts some weight on the new signal $(\delta < 1)$, no premium is possible (from equation 3), as the perceived improvement in health from the certified product equals zero.

In the first type of information intervention (with extensive information), the effect comes, if at all, from changes in π_c^i. Note that we are also keeping the health gap fixed in this scenario. Let us denote the credibility gap and health gap with the extensive information as CC_i^E and hh^E, respectively.

The following statement describes the characteristics of extensive information.

Statement 1: With extensive information, the health gap between certified and noncertified product is unaffected. The credibility gap is affected through changes in the probability of the certified product delivering a state of high health. The expected health gap that determines the size of maximum premium possible for any consumer is affected through this channel only.

Proof: This follows from the definition of extensive information above.

Intensive Information

Intensive information was in the form of fliers which explained what the certification entailed. This kind of information can have an effect not only on π_c^i but also on π_{nc}^i. Also, the economic value of high health

H_h and low health H_l can be revised with the provision of intensive information. The basis for this characterization of the intensive information treatment will become clear with the details regarding documentation provided in the next section. Hence, overall, the intensive information intervention via the provision of information on salient features of certification works on two fronts:

1. Changing the credibility gap between the certified and noncertified product ($\pi_c^i - \pi_{nc}^i$).
2. Changing the health gap ($H_h - H_l$) .

The credibility gap itself is impacted more because with intensive information, there can be Bayesian updating of the probability of food safety being delivered by the noncertified product as well. Further, it is possible that, following access to information, the state of low health is believed to be lower than H_l (high health could possibly be believed to be higher than H_h, but we rule out that possibility).

The counterpart of Condition (A) in this case is as follows:

$$\pi_{cert}^I > \pi_{cert}^E > \pi \Rightarrow \pi^c \gg \pi \qquad \text{Condition (B)}$$

$$\pi_{ncert}^I < \pi \Rightarrow \pi^{nc} < \pi$$

Let us denote the credibility gap under intensive information treatment as CC^I. Comparing Condition (A) and Condition (B) implies that $CC_i^I \geq CC_i^E \forall i$. Moreover, knowledge about the essential requirements of certification can lead consumers to assign a lower value to H_l. Denoting the health gap with intensive information as h^I implies that $h^I > h^E$ is possible. Combining the two implies

$$\Delta H^I \geq \Delta H^E \forall i, \tag{13}$$

which translates into

$$\Delta p_i^{*I} \geq \Delta p_i^{*E} \forall i, \tag{14}$$

where Δp_i^{*I} and Δp_i^{*E} denote the maximum premium possible for the certified product under extensive and intensive information, respectively.

It should be noted that there is an important difference in the size of the premium between the two information types. Δp_i^* depends not only on the expected health gap but also on the size of partial derivatives V_H and V_p, estimated at the point of indifference represented in equation (2). The arguments in the function on the right-hand side of equation (2) remain unchanged under extensive information. Under intensive information, the expected health variable on the right-hand side of equation (2) takes on a lower value. Thus, V_H would take a higher value if there is diminishing marginal value of health. From equation (3), Δp_i^* will be higher on account of this effect as well if $h^I > h^E$ holds.

2.3. Link to the Empirical Analysis

Empirically, what we observe is a binary decision by the consumer (that is, whether or not to buy the product labeled as certified). Based on the foregoing theoretical analysis, provision of information can lead consumers to choose the labeled product over the unlabeled product (believed to be noncertified) under certain conditions.

Assume that each consumer buys one unit of either labeled or unlabeled product. Facing an actual price premium Δp, the decision made by individuals is binary and can be represented by the following simple characterization.

Let $d_i = 1$ denote the outcome when the individual i buys the labeled product and $d_i = 0$ denote the outcome when the individual i does not buy labeled food. Then the outcomes for consumer i follow these simple rules:

$$d_i = 1 \; if \; \Delta H^I \geq \overline{\Delta H_i} \text{ and} \qquad (15)$$
$$d_i = 0 \; if \; \Delta H^I < \overline{\Delta H_i},$$

where $\overline{\Delta H_\iota}$ is the change in expected health from labels/certification, such that $\Delta p_i^* = \Delta p_i$.

Empirically, whether $d_i = 1$ or $d_i = 0$ depends on the following (which lead to the empirical analysis):

1. Type of information provided (extensive or intensive)
2. Effect of the information provided that depends on
    a. the signal relative to the prior beliefs of the consumers,
    b. the credibility of the signal from information provided, and
    c. updating based on the signal.

The effect of the information treatment does depend on the type of signals as well as on individual consumer characteristics. The reduced form of the decision to buy the product labeled as certified over the unlabeled product (a binary decision) is given as

$$C_i = \alpha + \beta * D_i + \gamma * X_i + \varepsilon_i, \tag{16}$$

where dependent variable C_i is binary and equals 1 if consumer i bought the labeled product and equals 0 otherwise, D_i is a binary variable that equals 1 if the consumer was provided intensive information and equals 0 if not, and X_i is a vector which includes not only the relative price of the labeled to the unlabeled product at the time of purchase but also consumer and household characteristics that have an effect on the decision to buy the labeled product.

3. THE MARKET EXPERIMENT

3.1. Components of the Experiment

This market experiment has three components that require detailed explanation. These include the food product of focus (grapes), the variation of the price, and the GlobalGAP certification.

3.1.1. Grapes

Grapes were deemed to be a suitable product for analysis of food safety issues for several reasons. Grapes are consumed raw and consequently carry several food safety risks, including biological and chemical contamination. The greatest risk of biological contamination occurs during the harvest and packing processes. Irrigation water, if of low quality, can be a source of pathogens and could result in biological contamination. Further risks are associated with chemical hazards (through the inappropriate use of fertilizers and pesticides) pertaining to the production of fresh grapes. Furthermore, fresh grapes are a fruit commonly consumed during the season in which the study was implemented (the end of February and entire month of March). Finally, the state of Maharashtra, where Mumbai is located, is an exporter of GlobalGAP-certified grapes to European supermarkets; therefore, we could procure GlobalGAP-certified grapes from nearby suppliers (within a 200 kilometers radius) for use in the market experiment presented here.

In this market experiment, we procured fresh grapes daily from the GlobalGAP exporters, transported them, and stored them in two Mumbai supermarkets (if the stock was not sold during that day) in accordance with the GlobalGAP standards. All of the grapes sold during the course of the experiment were GlobalGAP certified; however, only half were labeled as GlobalGAP certified and were placed on shelves that contained a banner indicating that they were certified grapes. The other half did not have any label and were placed on shelves without a banner; hence, to the customer, this second group was not GlobalGAP certified. Apart from the GlobalGAP certification label, the two groups of grapes were perfectly identical in their other attributes (color, variety, freshness, packaging, and texture). Because all of the grapes were sold in punnets, it was not possible for the consumer to check the taste (sweetness), as may be the case with grapes that are sold loose. During the course of the experiment, no other types of grapes were sold in the two supermarkets.

The perception of food safety is dependent on the information given to consumers. A product such as fresh grapes does not have search qualities with respect to food safety (meaning qualities that reveal the product's food safety attributes before purchase) nor does it have experience qualities (meaning those that reveal the product's food safety attributes immediately upon consumption). The critical role of credible information emerges because consumers can never fully evaluate food safety prior to purchase or even immediately after consumption. Thus, credible information gives the product food safety credence attributes. Credence attributes result in problems of adverse selection owing to asymmetric information between buyers and sellers, where the seller knows the quality and safety of the product but the buyer does not. In such a situation, a credible certification label signals higher food safety and can result in greater WTP for the labeled product.

3.1.2. Prices

As mentioned in the introduction, the prices of the labeled and unlabeled grapes were varied continuously to preclude the possibility that the results applied only to a particular set of absolute or relative prices of labeled and unlabeled grapes, respectively. Evidence shows that consumers often take price as a signal of better quality. If this effect works, then purchase behavior toward labeled grapes could be biased when the relative price is higher for labeled grapes. Hence, the incremental value of information could be more important when the relative price is low.

Prices of the labeled and unlabeled grapes were varied every two to three days, with the restriction that the labeled grapes were always offered at a premium. The prices were varied based on the

total sales in the previous two or three days (depending on whether the revision occurred after two days or after three days). A set menu of higher or lower prices (depending on the situation) was offered to the supermarkets. These set prices were such that price variation did not result in any losses to the participating supermarkets. The experiment presented here is a true market experiment as opposed to a field experiment; that is, prices were realistic and within a profitable margin for the supermarkets. The prices used in the intervention are presented in Table A.1 in the appendix.

3.1.3. Certification

In this study, we chose GlobalGAP as the third-party certification authority. Before September 2007, GlobalGAP was EurepGAP (European retailers' protocol for Good Agricultural Practice), which was founded in 1996 by a group of 11 British and Dutch retailers with the objective of creating a single private-sector standard for fresh fruits and vegetables. The GlobalGAP standard covers all aspects of production (summarized in Box 1) with a checklist of 49 major control points, 99 minor control points, and 66 recommendations. To obtain certification, the producer must obey all applicable major control points, 95 percent of the applicable minor control points at the time of the audit, and 100 percent of applicable minor control points within one month of completion of the audit (Chia-Hui Lee 2006).

GlobalGAP is deemed to be one of the most credible agencies currently existing in the world. This agency was chosen not only because of its extensive production and processing requirements but also because of our assumption that Indian consumers are more likely to trust an international third-party body, as opposed to a national body, for food safety standards and certification. This assumption is based on our review of the literature and on interviews with relevant stakeholders (consumers, traders, and farmers), which highlighted that food safety law and its enforcement are weak in India, as is also evident from the various recent food safety scandals (for example, contaminated bottled drinking water and soft drinks and high heavy-metal content in vegetables) (Marshall et al. 2003; Mathur et al. 2003; CSE 2004; Johnson et al. 2006).

Box 1. GlobalGAP production, postharvest, and handling requirements

- GlobalGAP is a private-sector body that sets voluntary standards for the certification of agricultural products around the globe.
- GlobalGAP requires that all products are traceable to the farms where they were produced.
- GlobalGAP requires that use of seed treatments is justified and approved.
- GlobalGAP requires that all fertilizer use be recorded. Fertilizers must be kept in a clean place to avoid contamination. Use of fertilizer over the limit of internationally accepted best practice is prohibited.
- GlobalGAP mandates that sewage is never used as manure.
- GlobalGAP requires strict maximum residue limits in pesticides. Pesticides can be sprayed only by technically qualified people. Farmers must keep records of all pesticide use.
- GlobalGAP requires that while harvesting, workers must have access to a clean toilet in the vicinity. Workers must be aware of hygiene requirements and diseases that make them unfit to handle harvests.
- GlobalGAP requires that packaging must be stored in a clean environment to avoid contamination by pests, rodents, birds, and chemicals. Reusable crates must be cleaned thoroughly to ensure that there is no contamination that may be detrimental to the product or consumer health.

Source: GlobalGAP, available at http://www.globalgap.org/cms.

3.2. Experimental Design and Protocol

During the implementation period, grapes were procured daily from GlobalGAP-certified producers in two districts (Pune and Sangli). The producers were paid the price they would have received in the export markets. In the two supermarkets, identical labeled and unlabeled grapes were shelved next to each other. Both groups of grapes were packaged in half-kilogram punnets, as is standard in Indian supermarkets. One group of grapes carried the GlobalGAP certification label; the other group (the placebo) contained identical grapes in identical packaging but without any labels. As explained previously, the prices of labeled and unlabeled grapes were varied consistently, with the restrictions that the labeled product always had a premium over the unlabeled one and that the prices were set within a profitable margin to cover all procurement, transportation, and storage costs.

All consumers who entered the supermarkets were provided with extensive information regarding the availability of GlobalGAP-certified grapes. This extensive information consisted of posters that were hung at both the outside and inside entrances, as well as above the shelves containing the GlobalGAP-certification labeled grapes. Further, every second customer (about one-half of the customers) who entered the supermarkets during the course of the experiment was randomly selected to be presented with the intensive information document. This document was a one-page, glossy documentation flier (see Figure A.1 in the appendix) explaining that GlobalGAP is a credible certification agency, as well as what this certification entails. The document was brief and highlighted only the main restrictions that GlobalGAP imposes on production, postharvest, and handling processes. The definition of GlobalGAP certification and what it entails was written based on interviews with farmers, supermarket managers, and food safety experts in India. Further, prior to the implementation of the experiment, focus group discussions were carried out with supermarket customers to keep the wording of the documentation as simple and approachable as possible. Given the multilingual context, the documentation was prepared in three languages—English, Hindi, and Marathi. Consumers were asked about their language preferences before being given the document.

Following checkout, customers who had purchased grapes were interviewed with a survey instrument, regardless of which kind of grapes they had purchased and whether or not they were given the intensive information document. In this experiment, customers who i) saw the extensive information (banners and posters), ii) received the intensive information document (the flier about GlobalGAP certification and what it entails), iii) bought grapes of either type, and iv) were interviewed with the survey instrument comprise the treatment group The control group consists of those customers who i) saw only the extensive information, ii) bought grapes of either type, and iii) were interviewed with the survey instrument. Every effort was made to interview all customers who purchased grapes during the course of the experiment. In total, 907 consumers were interviewed with a survey instrument that lasted about 30 minutes. The survey included questions on household- and respondent-level demographic, social, and economic characteristics, consumers' KAPP regarding food safety and quality, and a hypothetical choice experiment implemented to estimate the values consumers derive from various safety and quality attributes (taste, GlobalGAP certification, organic production, and local production) See Box A.1 in the appendix for details of the choice experiment study.

As explained in the introduction, the two supermarkets have different clientele (shop 1 catering to an upper-middle-income group and shop 2 to a lower-middle-income group). Additionally, both of these supermarkets are geographical monopolies within their neighborhoods (in the organized retail segment), as there are no other supermarkets in these neighborhoods and as it is too costly (in terms of cost of transportation and opportunity cost of time spent in Mumbai's traffic) for consumers to visit supermarkets in neighboring localities.

In total, 24 enumerators and two field supervisors were trained during a four-day workshop, which included two days of pretesting at the supermarkets. Enumerators were all postgraduate (Master's)-level marketing research students and the two field supervisors were their professors. Every workday was split into three shifts: morning to midday, midday to afternoon, and afternoon to evening. During the first two shifts, one enumerator was responsible for handing out the flier to every second customer that entered

the supermarkets, while two enumerators were responsible for interviewing those customers who had purchased grapes. Supermarket cashiers were responsible for informing every customer who had purchased grapes that there was a survey in which they could participate after checkout; in addition, enumerators were also responsible for stopping every customer after checkout to ask them if they had just purchased grapes and, if so, whether they would like to participate in a survey. During the last shift (afternoon to evening) and the weekend shifts, when the supermarkets were significantly more crowded, the number of enumerators at both ends was doubled.

The two field supervisors, as well as the manager of the experiment, monitored the enumerators daily to ensure that the enumerators i) continuously and randomly handed out the fliers to the customers as they entered the supermarkets, ii) did not talk customers into buying labeled grapes or in any way "market" the labeled grapes, iii) made every effort to interview as many of the grape purchasers as possible following checkout, and iv) checked the receipts of the respondents to record the quantity of grapes they purchased (by weight in kilograms) and the amount of money they spent on the grapes.

Eighty percent of the customers who bought grapes during the course of the experiment were interviewed with the survey instrument. The high response rate may be attributable to three factors. First, respondents seemed to value contributing to the study as it was part of students' vocational training in their marketing course. Second, we endeavored to create an environment conducive to onsite interviewing. Comfortable seats and cold soft drinks were provided and customers were given a small gift (an incense holder) at the end of the survey in appreciation of their time. Third, we conducted the survey with personal digital assistants (PDAs), which are handheld computers programmed to ensure efficiency and speed of data collection and to minimize any data collection and entry errors that may arise in conventional pen-and-paper interviews (see Caeyers et al. (2010) for a comparison of pen-and-paper interviewing to computer-assisted personal interviewing). Consumers were intrigued by this computer-assisted data collection method, which increased their willingness to participate in the survey.

4. RESULTS

4.1. Summary Statistics for the Control and Treatment Groups

Comparison of the social, economic, and demographic characteristics of the clientele of the two supermarkets revealed that, as expected, shop 1 customers have significantly higher income and education levels compared with their counterparts who patronize shop 2 (see Roy et al. 2010). Within each supermarket, the key social, economic, and demographic characteristics that we hypothesize to have significant impacts on consumer demand for safer and higher quality food were compared across treatment and control groups.

In shop 1, several of the key characteristics (age, education, and share of income spent on food) expected to affect demand for food safety are significantly different across the treatment and control groups. Though this difference might be a coincidence, it is also possible that there was self-selection among treatment group customers in regard to being interviewed, since customers with higher food safety consciousness might have better understood the document and been more likely to participate in the survey.

In shop 2, however, the randomization procedure worked, meaning the key characteristics were similar across the two groups. In the following sections, we present the results from the 336 grape-purchasing customers interviewed at shop 2. Table 1 presents the summary statistics for key household characteristics, including age, education, gender, income, expenditure on food, and distance to the supermarket. Even though every second customer (about one-half of the customers) was selected to receive the intensive information (the flier), the sample sizes of the two groups do not reflect this because not everyone who was presented with the flier purchased grapes and not everyone who had purchased grapes could be interviewed after checkout.

As can be seen from Table 1, the two groups (control and treatment) are similar in terms of important characteristics. Although they are located in the lower-middle-income neighborhood, consumers in our sample have higher incomes, have smaller families, and are more likely to hold at least a university degree compared with the Mumbai average (Census of India 2001). This profile of middle-income households is in line with the argument that middle-income households, which are increasing in number, are the likely clients of organized retail. The time it takes to get to the supermarket (less than half an hour on average and statistically insignificantly different across the two groups) reveals that the customers are located relatively near the supermarket (or at a convenient distance). This finding confirms our initial assertion that the supermarket may have a geographical monopoly within its locality.

Among the consumers who bought grapes and participated in the survey, 82.4 percent bought labeled grapes during the course of the experiment. According to the Pearson chi-square test results, consumers in the treatment group were significantly more likely to purchase grapes labeled with a food safety certification, compared with their counterparts in the control group at less than 1 percent significance level. Almost three-quarters of the control group consumers, however, bought labeled grapes, even though they were provided only with the extensive information on the banners and posters stating the availability of GlobalGAP-certified grapes in the store and not with the intensive information fliers.

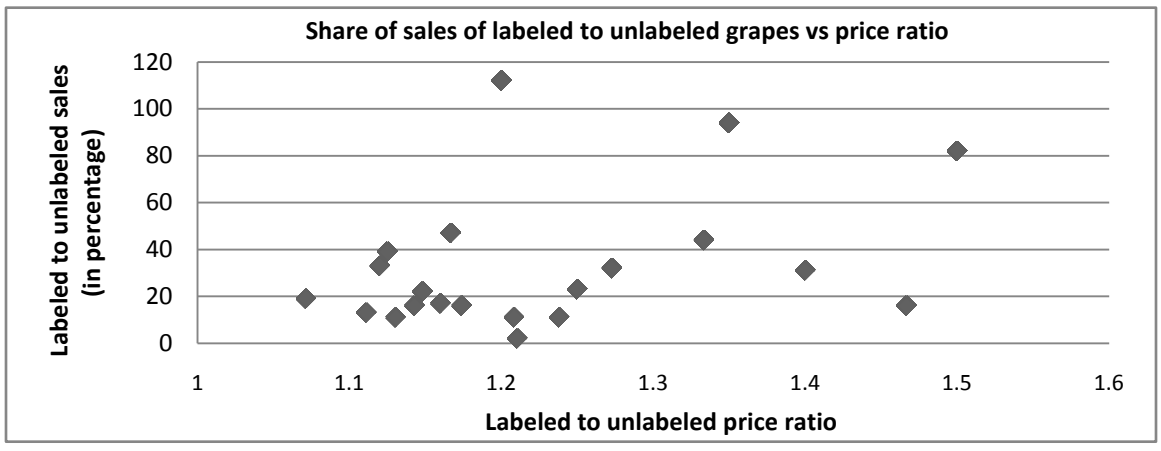
Table 1. Characteristics of control and treatment groups at shop 2

Characteristics	All consumers	Control group	Treatment group	Difference between two groups
	Mean (standard deviation)			
Age	46.07 (12.99)	47.03 (13.12)	45.67 (12.72)	NS[a]
Household size	3.77 (1.49)	3.86 (1.44)	3.66 (1.53)	NS
Share of food expenditure in monthly income	39.46 (18.3)	39.57 (17.15)	39.08 (17.84)	NS
Monthly income (in Rs)	25,302.11 (11,543.04)	24,520.55 (11,406.72)	26,054.72 (11,619.08)	NS
Distance to the supermarket (in minutes)	24.3 (22.9)	24.6 (26.2)	22.4 (17)	NS
	Percentage			
Gender = 1 if male, 0 otherwise	63.82%	65.07%	63.16%	NS
Education = 1 if university degree or above, 0 otherwise	70.59%	69.86%	71.05%	NS
Total number of consumers	336	146	190	NA[b]
Bought certified grapes = 1, 0 otherwise	82.35%	74.66%	88.95%	***

Source: Certification Market Experiment, Mumbai 2008.
Notes: [a]NS: nonsignificant; [b]NA: nonapplicable; *** pairwise Pearson chi-square test significantly different at 1% significance level.

Figure 1 shows the relationship between the share of sales of labeled to unlabeled grapes and the relative price of these two groups of grapes. As can be seen from this figure, there is no consistent pattern. Had the relationship been downward sloping, it could have implied that the relative price could play some role in revealing quality of, and hence demand for, labeled grapes.

Figure 1. Relative sales of labeled to unlabeled grapes and the relative price of labeled grapes



Source: Certification Market Experiment, Mumbai 2008.

4.2. Consumers' Knowledge, Attitudes, Perceptions, and Practices regarding Food Safety

As explained previously, consumers in the treatment group received detailed information regarding what the food safety certification entails. Through this randomized provision of intensive information, we tried to control for self-selection in seeking further information about the food safety-certified grapes sold in

the supermarket during the course of the experiment. The treatment (the provision of intensive information), however, is not expected to have a uniform effect on all consumers in the treatment group. We hypothesize that consumers will "digest" or perceive the information provided differently because of their prior KAPP about food safety.

To test this hypothesis, we constructed a consumer-specific index on food safety consciousness based on a factor analysis of consumers' answers to the 13 KAPP questions included in the survey instrument (Table 2). These questions were developed in consultation with supermarket managers and farmers and based on focus group discussions with supermarket customers. Twelve of these questions were coded according to a five-point Likert scale; one was a ranking question that was coded as binary options. The factor analysis was done using the principal factor extraction method. Factors with an eigenvalue above one were retained. Varimax rotation suggested the existence of one factor. Loadings above 0.40 were considered as factoring together. The factor was named Food Safety Consciousness on the basis of the variables that factored together as well as the relative magnitude of the factor loadings in absolute terms. The Food Safety Consciousness Index (FSCI) was calculated for each consumer based on his or her answers to the KAPP questions. Higher values of this index indicate a greater level of food safety consciousness prior to the experiment. One caveat that should be mentioned is that, even though this index is constructed from questions unrelated to the issues addressed in the certification document (Box 1), because the survey instrument was implemented after the treatment (that is, after the consumers had read the intensive information document), spillover effects could be possible for some consumers.

Table 2. Distribution and factor analysis of statements on food safety and quality KAPP

	Rotated factor loadings
Knowledge, attitude, perception, and practice statements	**Food safety consciousness index**
Statements coded according to the 5-point Likert scale: 1. Strongly disagree, 2. Disagree, 3. Neither agree nor disagree, 4. Agree, 5. Strongly agree	
1. All foodstuff should be organic.	0.4611
2. Of all the risks we face today, food safety is rather insignificant.	–0.1968
3. Producing safer food is costly.	–0.4242
4. I/we never purchase food from street vendors.	0.4768
5. I/we always purchase food from the supermarket.	0.4705
6. I/we look for nutrition information on processed food when shopping.	0.4718
7. I/we buy organic whenever that choice is possible.	0.6094
8. I look for organic certification if food is sold as organic.	0.4580
9. I buy brown bread.	0.3311
10. I buy bottled drinking water.	0.3913
11. I/we reduced consumption of cola products after the well-publicized episode of excess pesticide residues found in cola products.	–0.1118
12. I/we eat ready-to-eat meals.	–0.0502
Ranking most and second-most important food attributes	
13. The most important food characteristic is	
safety	0.1307
price	–0.2646
taste	–0.4427
nutrition	0.3540
Eigenvalues	2.3699

Source: Certification Market Experiment, Mumbai 2008.

4.3. Econometric Analysis of the Impact of Information on the Demand for Food Safety

In this section, we use a regression analysis to investigate the impact of the information given to the treatment group on consumers' purchase of food safety-certified grapes. In this analysis, we control for various consumer- and household-level characteristics which we hypothesize might affect consumer demand for safer food. We also control for the (relative) price of the labeled grapes, since this was varied during the course of the experiment. However, we do not need to control for product attributes such as variety, freshness, packaging, and taste since the labeled and unlabeled grapes were identical in these attributes. We also control for consumers' weekly frequency of grape purchase during the grape season, as well as the actual quantity of grapes bought during the supermarket visit. Both of these variables could have a bearing on consumers' choice between labeled and unlabeled grapes. Equation (16) is specified as a probit regression and two models were estimated: Model 1, which included all the consumer and household characteristics mentioned above, and Model 2, which in addition to the above-mentioned characteristics also included FSCI described in Section 4.2. The results of these models are presented in Table 3.

In both models, the results reveal that being in the treatment group did have a significant and positive impact on consumer demand for the labeled (food safety-certified) product, controlling for relative price and several consumer, household, and purchasing characteristics. Both income and years of education have a positive impact on consumers' likelihood of purchasing a safer product, although the coefficient on income is insignificant in both models. In addition, in both models, households that consume more grapes (both in quantity and in frequency) are more likely to prefer labeled grapes. All of these findings are similar to the findings of studies that investigated consumer demand for safer food in developed countries. These results are robust across the two models. The addition of FSCI in the second model reveals that consumers with higher FSCI are more likely to purchase labeled grapes, as expected.

It should be noted that these findings are robust to the choice of the model (the same regressions were also run using the linear probability model) and also inclusion of income in logarithmic form. Finally, the same regressions were also run with price per kilogram of grapes in absolute rather than relative terms. We found that absolute price was negative and significant, implying that, as expected, consumers are less likely to purchase grapes with higher prices, though this finding did not affect their demand for grapes with the food safety certification label if the consumers were in the treatment group. These results are presented in Tables A.2–A.7 in the appendix.

Table 3. Probit regression on factors that affect the purchase of labeled grapes[a]

Consumer and household characteristics	Model 1 without FSCI		Model 2 with FSCI	
	Coefficient (standard error)	Marginal effects	Coefficient (standard error)	Marginal effects
Treatment =1, 0 if control	0.589 (0.189)***	0.129 (0.043)***	0.398 (0.202)**	0.083 (0.043)**
Age	–0.004 (0.008)	–0.001 (0.002)	–0.006 (0.008)	–0.001 (0.002)
Gender =1 if male, 0 otherwise	0.078 (0.205)	0.017 (0.044)	–0.1 (0.209)	0.021 (0.044)
Share of food expenditure in monthly income	–0.006 (0.005)	–0.001 (0.001)	–0.0005 (0.006)	–0.0001 (0.001)
Monthly income (in Rs)	9.08×10^{-6} (9.39×10^{-6})	1.92×10^{-6} (0)	6.29×10^{-6} (9.73×10^{-6})	1.28×10^{-6} (0)
Vegetarian =1, 0 otherwise	–0.061 (0.196)	–0.013 (0.041)	–0.006 (0.2)	–0.001 (0.041)
Price ratio (price labeled/ price unlabeled)	0.822 (0.759)	0.174 (0.16)	0.273 (0.796)	0.056 (0.162)
Household size	–0.036 (0.059)	–0.008 (0.013)	–0.056 (0.061)	–0.011 (0.012)
Quantity of grapes bought in supermarket visit (in kg)	0.833 (0.6)*	0.176 (0.118)*	0.76 (0.609)	0.155 (0.116)*
Weekly frequency of grape purchase in season	0.156 (0.105)*	0.033 (0.022)*	0.24 (0.112)***	0.049 (0.023)**
Education (in years)	0.214 (0.109)**	0.045 (0.023)**	0.197 (0.111)*	0.04 (0.023)*
FSCI	—	—	0.14 (0.05)***	0.029 (0.01)***
Constant	–1.503 (1.281)		–2.184 (1.328)*	
Sample size	296		296	
Log likelihood	–117.453		–113.349	
Chi squared	30.77		38.96	
Degrees of freedom	11		12	
Significance level	0.0012		0.0001	
Correct predictions	87%		88%	
ρ^2	0.1158		0.1466	

Source: Certification Market Experiment, Mumbai 2008.
Notes: [a] Dependent variable is whether or not the consumer purchased certified grapes (bought certified grapes = 1, 0 otherwise); * significant at less than 10%, ** significant at less than 5%, *** significant at less than 1% with two-tailed or one-tailed tests.

4.4. Impacts of FSCI on Consumer Demand for Safer Food

The purpose of providing documentation to consumers was to inform them about the credibility of the GlobalGAP certification and about what this certification entails in terms of food safety. In all randomized experiments in which the marginal effect of provision of information is to be assessed, two problems are likely to be faced—i) the prior KAPP pertaining to the subject matter at hand and ii)) the disparity between the subjects' and researchers' capacity/propensity to process/absorb the information. The latter is often difficult to control for when there is only one-off interaction with the subject, as was the case in the market experiment presented here. If we had the opportunity to observe multiple purchases of the same consumers, we could have conducted a follow-up survey to ascertain the effects of information based on the actual absorption and processing of information.

To control for the first problem, we use the FSCI introduced in Section 4.2 to segment the customers into two groups—one with below-mean FSCI and another with mean and above-mean FSCI. Our hypothesis is that the marginal effect of the provision of information regarding credible certification on consumer demand for safer product would be higher for the consumers who have higher prior FSCI. This is because these customers already have preferences for safer food but may not have been presented with credible information and certification that would enable these preferences to materialize. The marginal effects of the probit models for customers with above- and below-mean FSCI are presented in Table 4. Results show that the marginal effect of credible information and certification is higher for customers who have a high FSCI—that is, those consumers who already have knowledge and awareness of food safety and perceive it to be important. The results are robust to the use of the median FSCI for this segmentation (results available from the authors upon request).

Table 4. Marginal effects from the probit regression on factors that affect the purchase labeled, stratified by FSCI below and above mean[a]

Consumer and household characteristics	FSCI mean and above	FSCI below mean
	Coefficient (standard error)	
Treatment =1, 0 if control	0.218 (0.088)**	0.112 (0.067)*
Age	0.002 (0.002)	–0.003 (0.003)
Gender =1 if male, 0 otherwise	0.047 (0.066)	–0.001 (0.074)
Share of food expenditure in monthly income	–0.002 (0.002)	0.0004 (0.002)
Monthly income (in Rs)	3.03×10^{-6} (0)	2.25×10^{-6} (0)
Vegetarian =1, 0 otherwise	0.043 (0.063)	–0.054 (0.065)
Price ratio (price labeled/ price unlabeled)	0.251 (0.214)	0.129 (0.29)
Household size	–0.013 (0.016)	–0.001 (0.023)
Quantity of grapes bought in supermarket visit (in kg)	—	0.107 (0.156)
Weekly frequency of grape purchase in season	0.059 (0.032)**	0.049 (0.039)
Education (in years)	0.066 (0.033)**	0.038 (0.036)
Sample size	114	159
Log likelihood	–37.186	–74.87
Chi squared	18.11	12.65
Degrees of freedom	10	11
Significance level	0.0532	0.3168
Correct predictions	91%	81.5%
ρ^2	0.1958	0.0779

Source: Certification Market Experiment, Mumbai 2008.
Notes: [a] Dependent variable is whether or not the consumer purchased certified grapes (bought certified grapes = 1, 0 otherwise); * significant at less than 10%, ** significant at less than 5%, *** significant at less than 1% with two-tailed tests

4.5. Caveats and Points for Further Consideration

Even though the randomization exercise was conducted successfully in shop 2, there are five potential caveats and other points about this experiment that should be mentioned. First, despite the random allocation of the intensive document, similarly to all information-focused interventions, provision of information need not imply uniform digestion of that information. As discussed previously, identification of the marginal effect of the treatment (intensive information regarding credible certification) is

challenging for this reason. We have adopted a novel way of controlling for prior knowledge and awareness about food safety through the KAPP data collected with the consumer survey instrument. This approach is, however, contingent upon the comprehensiveness of the KAPP questions and index presented here, and the shortcoming of either could bias the effect of the treatment on the outcome (purchase of the labeled product).

Second, in experiments such as the one presented in this paper, there is always the possibility of curiosity bias in consumer choices. A certified fresh fruit in Indian context is akin to a new product or brand in the market. Naturally, there could have been some bias in consumer choices because of this novelty, especially given the advertisement made with the posters and banners about GlobalGAP-certified grapes and the randomly distributed fliers. Had it been possible to implement this experiment over a longer period of time, we could have observed several repeat purchases by the same consumer and corrected for the issue of curiosity bias. Unfortunately, this was not feasible to the extent that we had hoped due to the fact that GlobalGAP-certified food products are limited to fresh fruits (for example, grapes and mangoes), which have very short seasons. Over the one-month period during which the experiment was implemented, field investigators could track only 68 repeat consumers, of which 79 percent opted for labeled grapes in their repeat visit.

Third, for the identification of the effect of information regarding credible certification on consumer demand for safer food, first-time choices are more suitable since through spillover (especially in a country such as India, which has strong social and information networks), the information would become available over time even without the provision of the documentation. To investigate whether a spillover of information indeed occurred through the course of the month, we plotted the share of sales of labeled grapes to unlabeled ones against time (Figure A.2 in the appendix). Had there been a spillover effect during the experiment, we would have seen an increasing trend, which is not evident in Figure A.2. Therefore, we can conjecture that there was not a significant spillover effect during the course of the experiment.

Fourth, in this experiment we chose GlobalGAP as the credible certification because we believed Indian consumers would have deeper trust in an international third-party certification due to previous food safety scandals and lax food safety standards and monitoring in India. However, through the consumer survey instrument, we found that when consumers were asked, “Who should certify foodstuff in India?” more consumers (39.5 percent) chose the government of India, followed by an international third-party certification agency (for example, GlobalGAP) with 30 percent. Therefore, it is likely that had we chosen the government of India as the certification authority, we could have observed a higher demand for the produce labeled as certified.

Related to this point, we also found that those who consume grapes more frequently and in higher quantities are more likely to prefer the labeled product. We can therefore deduct that had we chosen a product consumed more regularly (for example, flour), a higher demand for the safer product could have been observed. Finally, again related to the underestimation issue, in this market experiment we selected buyers without knowing whether they had visited the supermarket with the intention of buying grapes that day. If the consumer switched from not intending to buy grapes to buying grapes labeled as GlobalGAP certified, then it is likely that we are underestimating the impact of information and credible certification.

Finally, it needs to be recognized that the credibility of certification is enmeshed with the reputation of the retailer. Unless the consumers trust the supermarket to abide by the claims made (that is, that it shelves the true products), the credibility of the certification itself would be jeopardized. This justifies our choice of supermarket outlets to implement this experiment, since the fly-by-night nature of unorganized retail would not be perceived by the consumers as trustworthy in providing a truly certified product.

5. DISCUSSIONS AND CONCLUSIONS

In this paper, we presented the results of a randomized market experiment conducted in Mumbai, India, which hosts one of the world's fastest growing middle-income populations. The aim of this market experiment was to assess the role of credible information and certification on consumer demand for safer food in developing countries. Low or nonexistent demand for safer food among consumers in developing countries is often explained by consumers' low ability to pay, though there are few explanations as to why those consumers with consistently increasing incomes still exhibit a low demand for safer food. We hypothesize that this phenomenon can be explained by the lack of credible information and certification prevalent in developing countries; to capture these consumers' demand for safer food, credible information and certification should be provided.

To test this hypothesis we implemented a market experiment in which we sold grapes with credible food safety certification. We divided certified grapes into two groups—one labeled with a credible certification (GlobalGAP) and the other with no such label. We shelved these grapes side-by-side in two supermarkets located in two neighborhoods of Mumbai—an upper-middle-income neighborhood and a lower-middle-income one. During the course of the month in which the experiment took place, we provided the customers of these supermarkets with two types of information (extensive and intensive). The extensive information comprised banners and posters displayed visibly outside and inside the supermarkets and above the shelves of the labeled grapes; these banners informed consumers that GlobalGAP-certified fresh grapes were being sold at the supermarket during the grape season. Intensive information consisted of a brief document (a user-friendly flier) that introduced GlobalGAP and explained what the certification entails in terms of production, postharvest, and handling food safety standards. During the course of the experiment, every second customer that entered the supermarkets (about one-half of the customers) was selected and presented with the intensive information document. Following checkout, customers who purchased grapes of either kind were interviewed with a short survey instrument conducted with handheld computers. Those customers who received both the extensive information and the intensive information, purchased grapes of either kind, and participated in the interview comprise the treatment group in this market experiment; those who received only the extensive information, purchased grapes or either kind, and were interviewed made up the control group.

The comparison of the treatment group's key characteristics thought to affect demand for safer and higher quality food (age, income, and education) with those of the control group confirmed that the randomization was successfully implemented in only one of the shops (the one located in the lower-middle-income neighborhood). Consequently, we analyzed the data from the supermarket in which randomization was successful. Our findings revealed that consumers in the treatment group are more likely to purchase grapes that have food safety certification labels. Further, consumers' answers to various knowledge, attitude, perception and practices (KAPP) questions collected through the survey instrument were condensed into a consumer-specific food safety consciousness index (FSCI) with the use of the factor analysis method. Our aim in creating this index was to understand the impact of the treatment conditional on consumers' prior food safety KAPP. We used the mean FSCI value to stratify the sample into two segments—consumers with low FSCI (FSCI below mean) and those with high FSCI (FSCI mean and above). We found that the impact of the intensive information on those consumers with high FSCI was greater than the impact of the same on consumers with low FSCI. This result reinforces our argument that credible information and certification are the missing ingredients for capturing consumer demand for safer food in many developing countries.

APPENDIX

A.1. Derivation of the Indirect Utility Function

Let the ordinal utility function of a consumer be defined as

$$U = U(x, n, H), \tag{A.1}$$

where x and n denote the consumption of the non-numeriaire and the numeraire goods, respectively. Note that the expression in equation (A.1) implies that health is viewed as a well-defined "commodity" (see Johanson 1995). It also implies that a consumer is able to collapse different attributes of health into a single variable. Moreover, the health status of the consumer is treated as given. In this paper, the expected health status will be different across certified and noncertified product. The individual maximizes utility subject to a budget constraint. This gives the demand function for good x as

$$x = x(p, 1, H). \tag{A.2}$$

Substituting this into the direct utility function in equation (A.1), we get

$$V = V(p, 1, M, H) = U(x(p, 1, H), H). \tag{A.3}$$

The indirect utility function is specified as a function of prices, income, and expected health.

A.2. Choice of Certified over Noncertified Product

Consumer i prefers a certified product over the noncertified one if

$$V_i\left(H_c^i, p + \Delta p_i, s, M^i\right) > V_i\left(H_{nc}^i, p, s, M^i\right). \tag{A.4}$$

Taking a linear expansion around the point of indifference and using equation (3), we get

$$dV_i = -V_p(\Delta p_i^* - \Delta p_i). \tag{A.5}$$

Equation (A.5) implies that certified product is bought if $\Delta p_i^* > \Delta p_i$.

A.3. Change in Willingness to Pay a Premium as Income of an Individual Rises

Further, let us generically define a characteristic of the consumer (such as education or income) or product attribute other than food safety (such as price level) that could affect the maximum possible premium by k^i.

$$\frac{\partial \Delta p_i^*}{\partial k^i} = -\frac{[V_p V_{Hk^i} - V_H V_{pk^i}]}{(V_p{}^2)} \Delta H_i \tag{A.6}$$

Proposition 1: At the margin, the effect of increased income for individual i on the maximum premium that a consumer is willing to pay is ambiguous.

Proof: To see this, let us change k^iin equation (A.6) to M^i, the income of consumer i. Equation (A.6) in this case can be rewritten as

$$\frac{\partial \Delta p_i^*}{\partial M^i} = -\frac{[V_p V_{HM^i} - V_H V_{pM^i}]}{(V_p{}^2)} \Delta H_i. \tag{A.6'}$$

In equation (A.6') the sign of V_{HM^i} is unknown. The term is the change in marginal utility of health with income that could be signed atheoretically; that is, there is no theoretical basis for it to be

positive or negative. For the sign of V_{pM^i}: from Roy's identity, $V_p = -V_m x$ where x is the Marshallian demand. Thus,

$$V_{pm} = -[V_m \frac{\partial x}{\partial m} + x V_{mm}]. \quad \text{(A.7)}^3$$

Assuming normal good, the first expression within parentheses on the right-hand side of equation (A.7) is unambiguously positive. With diminishing returns to income, $V_{mm} < 0$. Hence, the sign of V_{pM^i} is ambiguous. Dahlby (1981) has shown that the expression in equation (A.7) can be rewritten as

$$\theta = s(r - \eta), \quad \text{(A.7')}$$

where θ is the elasticity of marginal utility of income with respect to price (note that the sign of the elasticity is the same as the sign of V_{pm}), s is the budget share of the commodity, η is the income elasticity of demand, and r is the coefficient of relative risk aversion (defined as the negative of the marginal utility of income with respect to income). Hence, whether the sign of V_{pm} is positive or negative depends on the relative magnitude of $r \; and \; \eta$.

Proposition 2: Assuming marginal utility of expected health varies positively with income, the consumer is willing to pay a higher premium for food safety only if $(r > \eta)$.

Proof: If $(r > \eta)$, based on the relationship in equation (A.7'), V_{pm} is positive. Plugging back into equation (A.6'), $\frac{\partial \Delta p_i^*}{\partial M^i}$ is greater than zero. If there is increasing relative risk aversion (r is larger for wealthier individuals), then small increases in income for wealthier consumers should result in greater maximum possible premium for certification from them. Hence, as incomes have risen in India, the WTP (willingness to pay) a higher premium for each individual will become more likely if the condition in proposition 2 is satisfied.

Note the role of credibility inherent in equation (A.6') as consumer income rises. As long as $\Delta H_i > 0$ and the condition in proposition 2 is satisfied, the maximum possible premium for certification will rise with income for each individual. However, the magnitude of ΔH_i determines the size of the premium, which is a function of credibility of certification.

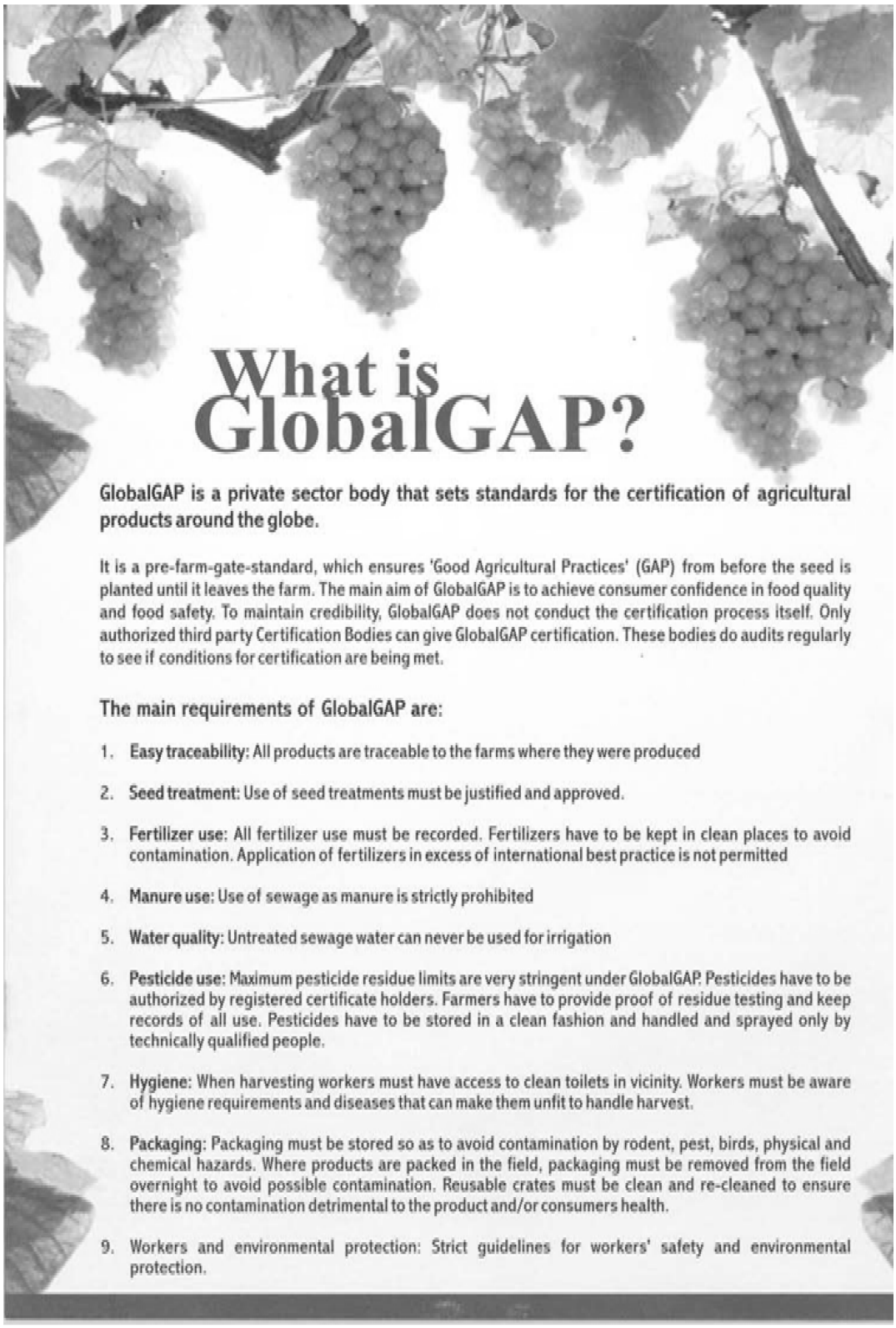
[3] V_{mp} (the change in marginal utility of income with price) was derived as in equation (A.7) in 1942 by Samuelson. By Young's theorem, $V_{mp} = V_{pm}$..

Table A.1. Prices (in rupees) of labeled and unlabeled grapes offered on different dates

Date	Shop 1		Shop 2	
	Labeled grapes (price Rs/kg)	Unlabeled grapes (price Rs/kg)	Labeled grapes (price Rs/kg)	Unlabeled grapes (price Rs/kg)
2/27/2008	60	40	60	50
2/28/2008	60	40	60	50
2/29/2008	54	40	50	40
3/1/2008	54	40	30	20
3/2/2008	54	40	40	30
3/3/2008	54	40	40	30
3/4/2008	54	40	44	30
3/5/2008	46	38	42	30
3/6/2008	46	38	44	30
3/8/2008	70	50	60	50
3/9//2008	70	60	60	50
3/10/2008	64	56	56	44
3/11/2008	64	56	56	44
3/12/2008	62	54	56	44
3/13/2008	62	54	52	42
3/14/2008	62	54	52	42
3/16/2008	60	50	56	48
3/17/2008	60	50	56	48
3/18/2008	58	50	54	48
3/19/2008	58	50	54	48
3/20/2008	58	48	54	46
3/21/2008	58	48	54	46
3/23/2008	60	56	56	50
3/25/2008	60	56	56	50
3/26/2008	60	54	54	48
3/27/2008	60	54	54	48
3/28/2008	56	50	52	46

Source: Compiled by authors.

Figure A.1. Short document on GlobalGAP certification (English version)



What is GlobalGAP?

GlobalGAP is a private sector body that sets standards for the certification of agricultural products around the globe.

It is a pre-farm-gate-standard, which ensures 'Good Agricultural Practices' (GAP) from before the seed is planted until it leaves the farm. The main aim of GlobalGAP is to achieve consumer confidence in food quality and food safety. To maintain credibility, GlobalGAP does not conduct the certification process itself. Only authorized third party Certification Bodies can give GlobalGAP certification. These bodies do audits regularly to see if conditions for certification are being met.

The main requirements of GlobalGAP are:

1. **Easy traceability:** All products are traceable to the farms where they were produced
2. **Seed treatment:** Use of seed treatments must be justified and approved.
3. **Fertilizer use:** All fertilizer use must be recorded. Fertilizers have to be kept in clean places to avoid contamination. Application of fertilizers in excess of international best practice is not permitted
4. **Manure use:** Use of sewage as manure is strictly prohibited
5. **Water quality:** Untreated sewage water can never be used for irrigation
6. **Pesticide use:** Maximum pesticide residue limits are very stringent under GlobalGAP. Pesticides have to be authorized by registered certificate holders. Farmers have to provide proof of residue testing and keep records of all use. Pesticides have to be stored in a clean fashion and handled and sprayed only by technically qualified people.
7. **Hygiene:** When harvesting workers must have access to clean toilets in vicinity. Workers must be aware of hygiene requirements and diseases that can make them unfit to handle harvest.
8. **Packaging:** Packaging must be stored so as to avoid contamination by rodent, pest, birds, physical and chemical hazards. Where products are packed in the field, packaging must be removed from the field overnight to avoid possible contamination. Reusable crates must be clean and re-cleaned to ensure there is no contamination detrimental to the product and/or consumers health.
9. Workers and environmental protection: Strict guidelines for workers' safety and environmental protection.

Source: Compiled by authors.

Box A.1. Results of the Roy et al. (2010) choice experiment study on consumer demand for safer and higher quality food in developing countries

In the Roy et al. (2010) study, the following safety and quality attributes pertaining to grapes were used:

Grape variety attribute	Attribute definition	Attribute levels
Taste	Level of sweetness of the grape at the time of purchase	Very sweet, sweet, and not so sweet
Production method	The level of use of synthetic fertilizers and pesticides and plant growth regulators	Organic production, semiorganic production, and nonorganic production
GlobalGAP certification	A Global certification of Good Agricultural Practices (GAP)	Certified vs. noncertified
Source of produce	Indicator of the length of supply chain and, hence, freshness	Direct from the farmer vs. not direct from the farmer
Price	Price of one kg of grapes in rupees	Rs 30–40, Rs 50, Rs 60–70

By using experimental design methods (see Louviere et al. 2000), these attributes and levels were grouped into 24 pairwise comparisons of grape profiles; each consumer was presented with six randomly selected choice sets, each of which contained two grape profiles and the decision to "opt out" by selecting neither of the grape profiles presented. Please see below for an example of these choice sets.

Assuming that the following two grapes were the ONLY choices you have, which one would you prefer to buy?

Grape Characteristics	Grape A	Grape B	
TASTE	Very sweet	Not so sweet	I like neither grape A nor grape B:
PRODUCTION METHOD	Organic	Non-organic	Given these two options, I will NOT purchase grapes in this supermarket visit
GLOBALGAP CERTIFICATION	Certified	Not certified	
SOURCE OF PRODUCE	Not direct from the farmer	Direct from the farmer	
PRICE PER KG	Rs. 40	Rs. 30	
I prefer to buy	Grape A……	Grape B…….	Neither……

Source: Compiled by authors.

Box A.1. Continued

Conditional logit model (CLM) regressions were estimated separately for the two shops since the clientele of the two supermarkets have different income and education levels; therefore, it is hypothesized that they have different preferences for grape attributes. In both models, the alternative specific constant (ASC) is positive and significant, implying that consumers are more likely to choose one of the grape alternatives presented to them rather than the status quo. Moreover, for the clientele of both stores, price is an insignificant determinant of grape choice, though the sign is negative as expected. This can be due to the small differences in the price level (maximum of 40 Rs) which might not be important for customers purchasing fresh grapes one month a year, especially in a hypothetical setting. The ranking of the attributes across the two stores is different in shop 1, where the most important determinant of grape choice is taste (sweetness), followed by whether or not the grape has GlobalGAP certification. In shop 2, on the other hand, the ranking of these two attributes is reversed. Surprisingly, the shop 2 customers, who have lower education levels and incomes than their counterparts in shop 1, reveal stronger preferences for certified grapes. One possible explanation for this is that given their lower income levels, households in this area might be more exposed to food safety risks and are therefore more wary of consequences from a lapse in food safety standards. Certification offers them an opportunity to access safer food, which, owing to their experiences, they might value more. Customers in shop 2 disclose strong preferences for organically produced grapes, as organic production ranks right below taste attributes; semiorganic production attribute is insignificant. Shop 1 consumers also rank organic production highly; this is followed by semiorganic grapes. These results are presented below.

Grape attributes	Shop 1	Shop 2
	Coefficient (standard error)	
ASC	1.607 (0.145)***	1.631 (0.190)***
Sweet taste	0.428 (0.032)***	0.342 (0.041)***
Very sweet taste	0.350 (0.036)***	0.286 (0.047)***
Semiorganic production	0.163 (0.037)***	0.054 (0.046)
Organic production	0.332 (0.037)***	0.227 (0.048)***
Direct from farmer	0.097 (0.039)***	0.124 (0.051)**
GlobalGAP certified	0.414 (0.035)***	0.414 (0.045)***
Price	–0.001 (0.003)	–0.0003 (0.004)
ρ^2	0.149	0.161
Log-likelihood	–3204.986	–1897.56
Sample size	3426	2058

Source: Compiled by authors.

Table A.2. Model 1 on Table 3 with income in logarithmic form*

Iteration 5: log likelihood = -117.44587
Probit regression:
Number of obs = 296
LR chi2(11) = 30.76
Prob > chi2 = 0.0012
Log likelihood = -117.44587
Pseudo R2 = 0.1158

certbuy	Coef	Std. Err.	z	P>|z|	[95% Conf. Interval]	
treatmt	.591243	.1884508	3.14	0.002	.2218862	.9605998
age	-.0045623	.0076824	-0.59	0.553	-.0196196	.010495
male	.0830222	.2052528	0.40	0.686	-.3192658	.4853102
ExpendShare	-.0060313	.0052103	-1.16	0.247	-.0162433	.0041808
ln_income	.1709042	.1740909	0.98	0.326	-.1703078	.5121161
Vegetarian	-.0531925	.1952711	-0.27	0.785	-.4359168	.3295317
priceratio	.8348537	.7598826	1.10	0.272	-.6544889	2.324196
hhsize	-.0353167	.059377	-0.59	0.552	-.1516935	.0810602
KgGrBought	.836662	.6004865	1.39	0.164	-.3402698	2.013594
HowOftenBu~r	.1557229	.1048455	1.49	0.137	-.0497705	.3612162
Education	.2132515	.108822	1.96	0.050	-.0000356	.4265387
cons	-3.009496	2.098503	-1.43	0.152	-7.122487	1.103495

Source: Compiled by authors.
Notes on abbreviations of variable names: Certbuy- binary variable equals 1 if buys certified product; Ln_income- log of income; HowOftenBu~r – How often in a week the consumer buys grapes during the grape season.

Table A.3. Model 2 on Table 3 with income in logarithmic form

Iteration 5: log likelihood = -113.23576						
Probit regression						
Number of obs = 296						
LR chi2(12) = 39.19						
Prob > chi2 = 0.0001						
Log likelihood = -113.23576						
Pseudo R2 = 0.1475						
certbuy	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
treatmt	.3948167	.2026558	1.95	0.051	-.0023815	.7920148
age	-.0062859	.0078011	-0.81	0.420	-.0215758	.009004
male	.1076777	.209967	0.51	0.608	-.3038501	.5192055
ExpendShare	-.0004688	.0056836	-0.08	0.934	-.0116085	.0106709
ln_income	.145669	.1805157	0.81	0.420	-.2081353	.4994734
Vegetarian	-.0002932	.1997478	-0.00	0.999	-.3917916	.3912052
priceratio	.2910675	.7958351	0.37	0.715	-1.268741	1.850876
hhsize	-.0562502	.0605349	-0.93	0.353	-.1748964	.0623959
KgGrBought	.7566634	.6071965	1.25	0.213	-.4334199	1.946747
HowOftenBu~r	.2423178	.1121575	2.16	0.031	.0224933	.4621424
Education	.1881153	.1119527	1.68	0.093	-.0313079	.4075385
fscinew	.1412662	.0495168	2.85	0.004	.044215	.2383174
cons	-3.487118	2.168074	-1.61	0.108	-7.736465	.7622299

Source: Compiled by authors.
Notes on abbreviations of variable names: Certbuy- binary variable equals 1 if buys certified product; Ln_income- log of income; HowOftenBu~r – How often in a week the consumer buys grapes during the grape season.

Table A.4. Model 1 on Table 3 estimated using linear probability model

Number of obs = 296
F(11, 284) = 2.78
Prob > F = 0.0019
R-squared = 0.0972
Adj R-squared = 0.0622
Root MSE = .36053

Source	SS	df	MS
Model	3.97280392	11	.361163993
Residual	36.9157096	284	.129984893
Total	40.8885135	295	.138605131

certbuy	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
treatmt	.1376676	.0429365	3.21	0.001	.0531534	.2221819
age	-.0010472	.0017669	-0.59	0.554	-.004525	.0024306
male	.0116418	.0456957	0.25	0.799	-.0783034	.101587
ExpendShare	-.0014805	.0011922	-1.24	0.215	-.0038271	.0008661
IncomeRp	2.34e-06	2.09e-06	1.12	0.264	-1.78e-06	6.47e-06
Vegetarian	-.011986	.0443487	-0.27	0.787	-.0992798	.0753078
priceratio	.137052	.168605	0.81	0.417	-.194822	.468926
hhsize	-.0112154	.0141039	-0.80	0.427	-.0389768	.0165461
KgGrBought	.0636691	.040772	1.56	0.119	-.0165845	.1439226
HowOftenBu~r	.0368637	.0237105	1.55	0.121	-.0098069	.0835343
Education	.0547607	.0255211	2.15	0.033	.0045261	.1049953
_cons	.3614129	.2876122	1.26	0.210	-.2047091	.927535

Source: Compiled by authors.
Notes on abbreviations of variable names: Certbuy- binary variable equals 1 if buys certified product; Ln_income- log of income; HowOftenBu~r – How often in a week the consumer buys grapes during the grape season.

Table A.5. Model 2 on Table 3 estimated using linear probability model

Number of obs	**= 296**
F(12, 283)	**= 3.34**
Prob > F	**= 0.0001**
R-squared	**= 0.1241**
Adj R-squared	**= 0.0870**
Root MSE	**= .35574**

Source	**SS**	**df**	**MS**
Model	5.07440957	12	.422867464
Residual	35.8141039	283	.126551604
Total	40.8885135	295	.138605131

certbuy	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
treatmt	.0921949	.0450821	2.05	0.042	.0034561	.1809337
age	-.0014978	.0017501	-0.86	0.393	-.0049426	.001947
male	.0213821	.0452089	0.47	0.637	-.0676062	.1103704
ExpendShare	-.0000593	.0012711	-0.05	0.963	-.0025614	.0024428
IncomeRp	1.69e-06	2.08e-06	0.81	0.418	-2.40e-06	5.78e-06
Vegetarian	-.0004193	.0439343	-0.01	0.992	-.0868989	.0860602
priceratio	.0273493	.1704679	0.16	0.873	-.3081967	.3628953
hhsize	-.0147716	.0139685	-1.06	0.291	-.042267	.0127237
KgGrBought	.0594441	.0402554	1.48	0.141	-.0197939	.138682
HowOftenBu~r	.0561466	.024291	2.31	0.022	.0083326	.1039606
Education	.0483568	.0252752	1.91	0.057	-.0013945	.0981081
fscinew	.032098	.0108792	2.95	0.003	.0106835	.0535125
_cons	.1725364	.2909194	0.59	0.554	-.4001041	.745177

Source: Compiled by authors.
Notes on abbreviations of variable names: Certbuy- binary variable equals 1 if buys certified product; Ln_income- log of income; HowOftenBu~r – How often in a week the consumer buys grapes during the grape season.

Table A.6. Model 1 on Table 3 with price of kg of grape in absolute form

Iteration 5: log likelihood = -111.70145
Probit regression
Number of obs = 298
LR chi2(11) = 49.38
Prob > chi2 = 0.0000
Log likelihood = -111.70145
Pseudo R2 = 0.1810

certbuy	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
treatmt	.6678787	.1948722	3.43	0.001	.2859363	1.049821
age	-.0079582	.0079886	-1.00	0.319	-.0236156	.0076991
male	-.01376	.2124725	-0.06	0.948	-.4301985	.4026785
ExpendShare	-.0073825	.0053967	-1.37	0.171	-.0179599	.0031948
IncomeRp	7.77e-07	9.57e-06	0.08	0.935	-.000018	.0000195
Vegetarian	.0376803	.2041262	0.18	0.854	-.3623997	.4377603
priceperkggr	-69.1907	17.17698	-4.03	0.000	-102.857	-35.52444
hhsize	-.0248377	.0615575	-0.40	0.687	-.1454881	.0958128
KgGrBought	3.625692	.908648	3.99	0.000	1.844775	5.40661
HowOftenBu~r	.0836107	.1090348	0.77	0.443	-.1300936	.2973151
Education	.1693664	.1124613	1.51	0.132	-.0510536	.3897864
cons	.1958565	.7580133	0.26	0.796	-1.289822	1.681535

Marginal effects after probit:
y = Pr(certbuy) (predict)
= .89494674

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
treatmt*	.1274085	.03954	3.22	0.001	.049916	.204901	.54698
age	-.0014476	.00144	-1.00	0.316	-.004278	.001383	46.5356
male*	-.0024969	.03847	-0.06	0.948	-.077898	.072904	.64094
Expend~e	-.0013429	.00098	-1.37	0.172	-.003268	.000583	39.4253
IncomeRp	1.41e-07	.00000	0.08	0.935	-3.3e-06	3.6e-06	25100.7
Vegetarian	.0068541	.03714	0.18	0.854	-.065933	.079641	1.3557
Price~gr	-12.58596	2.67767	-4.70	0.000	-17.8341	-7.33783	.024215
hhsize	-.004518	.01121	0.40	-0.687	-.026499	.017463	3.73826
KgGrBo~t	.6595224	.13459	4.90	0.000	.395722	.923323	.620805
HowOft~r	.015209	.02003	0.76	0.448	-.024053	.054471	2.21477
Educat~n	.0308082	.02064	1.49	0.136	-.009646	.071262	3.68456

Source: Compiled by authors.
Notes on abbreviations of variable names: Certbuy- binary variable equals 1 if buys certified product; Ln_income- log of income; HowOftenBu~r – How often in a week the consumer buys grapes during the grape season.
Note: 0 failures and 3 successes completely determined. (*) dy/dx is for discrete change of dummy variable from 0 to 1.

Table A.7. Model 2 on Table 3 with price of kg of grapes in absolute form

Iteration 5: log likelihood = -108.72156
Probit regression
Number of obs = 298
LR chi2(12) = 55.34
Prob > chi2 = 0.0000
Log likelihood = -108.72156
Pseudo R2 = 0.2029

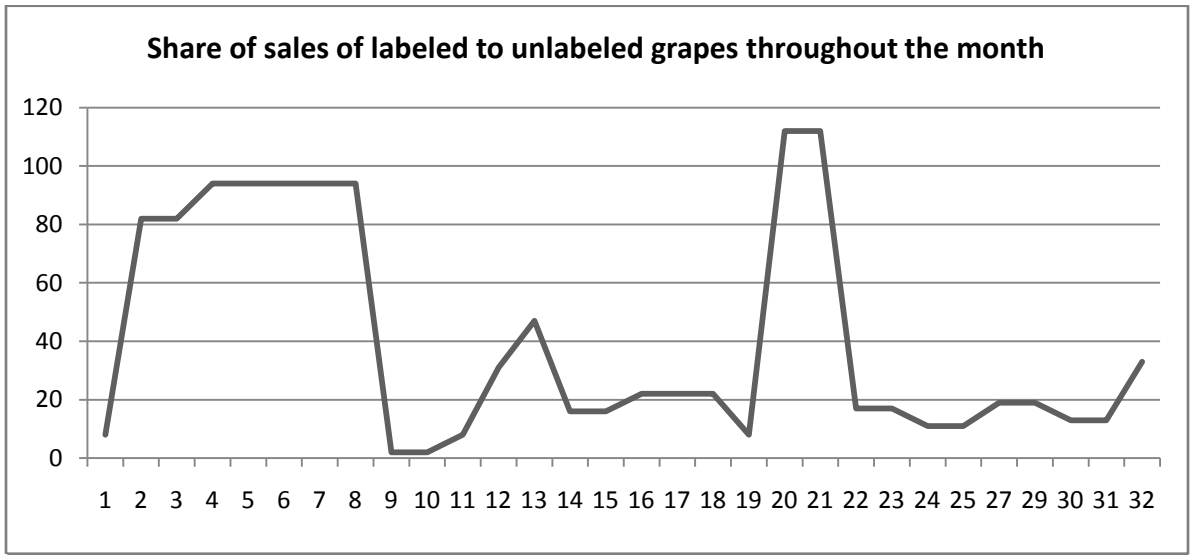
certbuy	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
treatmt	.5278182	.2047419	2.58	0.010	.1265314	.9291049
age	-.0095895	.0080816	-1.19	0.235	-.0254292	.0062501
male	.0174791	.2153597	0.08	0.935	-.4046182	.4395764
ExpendShare	-.0029942	.0057802	-0.52	0.604	-.0143232	.0083348
IncomeRp	-1.01e-06	9.76e-06	-0.10	0.918	-.0000201	.0000181
Vegetarian	.0760256	.2074489	0.37	0.714	-.3305669	.482618
priceperkggr	-69.50971	17.45437	-3.98	0.000	-103.7197	-35.29978
hhsize	-.0420182	.0622958	-0.67	0.500	-.1641156	.0800792
KgGrBought	3.597998	.9186062	3.92	0.000	1.797563	5.398433
HowOftenBu~r	.1549499	.1151742	1.35	0.179	-.0707874	.3806872
Education	.1567354	.1143644	1.37	0.171	-.0674146	.3808854
fscinew	.112263	.0464919	2.41	0.016	.0211407	.2033854
cons	-.9333452	.8934416	-1.04	0.296	-2.684459	.8177682

Marginal effects after probit:
y = Pr(certbuy) (predict)
= .89850169

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
treatmt*	.0972257	.03939	2.47	0.014	.020019	.174432	.54698
age	-.0017013	.00143	-1.19	0.233	-.004496	.001093	46.5356
male*	.0031108	.03844	0.08	0.935	-.072228	.07845	.64094
Expend~e	-.0005312	.00102	-0.52	0.603	-.002535	.001472	39.4253
IncomeRp	-1.79e-07	.00000	-0.10	0.918	-3.6e-06	3.2e-06	25100.7
Vegetarian	.0134879	.03684	0.37	0.714	-.05871	.085686	1.3557
Price~gr	-12.33187	2.67894	-4.60	0.000	-17.5825	-7.08124	.024215
hhsize	-.0074545	.01109	-0.67	0.501	-.029182	.014273	3.73826
KgGrBo~t	.6383284	.13454	4.74	0.000	.374643	.902014	.620805
HowOft~r	.02749	.02086	1.32	0.188	-.013403	.068383	2.21477
Educat~n	.0278068	.02046	1.36	0.174	-.012299	.067913	3.68456
fscinew	.0199168	.0085	2.34	0.019	.003256	.036577	9.61127

Source: Compiled by authors.
Notes on abbreviations of variable names: Certbuy- binary variable equals 1 if buys certified product; Ln_income- log of income; HowOftenBu~r – How often in a week the consumer buys grapes during the grape season.
Note: 0 failures and 3 successes completely determined. (*) dy/dx is for discrete change of dummy variable from 0 to 1.

Figure A.2. Share of sales of labeled to unlabeled grapes throughout the month



Source: Compiled by authors.

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