Consumer Willingness to Pay for "Free-Range" and "Humanely Raised" Meats

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ABSTRACT

We use stated preference survey methods to deduce from the stated choices of a sample of consumers the premia people are likely to be willing to pay for meats that are raised to meet higher standards for animal welfare. Each subject is presented with six food shopping choice scenarios, each concerning alternative "brands" of chicken breasts, beef steak, or ground beef. For each type of meat, there is a choice among conventionally grown, free-range, or humanely raised products, or "none." Prices are randomly varied across choice scenarios and across individuals. Package sizes are randomly varied across choice sets, and the ordering of alternatives in the choice sets is also randomly varied across individuals. Preliminary results suggest that people may be willing to pay, on average, roughly $0.40 more per pound for free-range chicken and about $0.54 more per pound for humanely raised chicken. We also find that people may be willing to pay $0.68 more, on average, for humanely raised ground beef. Sample sizes appear to be still too small to allow us to discern statistically significant results for the different steak products. Further data collection is anticipated and may change both the estimated price premia and their significance levels.

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1. Introduction

According to a 2003 Gallup poll, a strong majority of Americans are in favor of laws requiring strict welfare standards for farm animals Moore (2003). However, federal law currently requires only that animals raised for meat be made unconscious before being slaughtered, as farm animals are exempt from other federal animal welfare laws (US Code: Humane Methods for Livestock Slaughter, Title 7, chapter 8). Conventional methods of raising food-animals that have proven cost-effective for farmers include maximizing the density of animals, using growth-inducing hormones, and using feed that includes animal by-products. Raising animals in high densities forces many farms to physically alter the animals (e.g. cutting tails, toes, beaks, etc. so that they cannot injure one another) and to regularly administer antibiotics to control diseases Lappe and Lappe (2002).

Currently, many grocery stores carry meat products labeled "free-range" that can command a substantial price premium (as much as four times the price of conventionally raised and labeled meat in some circumstances).[1] However, some portion of consumers' willingness to pay a premium for free-range meats has been attributed to concerns for human health and safety as well as ethical concerns—both for the environment and animal welfare. However, a "free-range" label has essentially no legal meaning or standard certifying body Lappe and Lappe (2002), so this designation does not amount to a well-defined product.

Existing price premia for free-range meats suggests that there may be a substantial unmet demand for some form of certification that would ensure that meat has been raised humanely. For example, Whole Foods Market recently created the Animal Compassion Fund. This non-profit organization has developed a strict code of animal husbandry standards. The intention is

[1] Source: author's informal survey of local grocery stores.

that the Fund will act as a third-party certifier for farms that want their products to carry the "Animal Compassion" label. These farms will also want to charge the attendant price premium. The Fund established preliminary standards in 2005, but has yet to put the label to use WholeFoodsMarket (2006). The USDA has mentioned demand for a similar labeling program, but because the Animal Compassion Program is better developed, we will use this "charitable organization" model, rather than a legislation/tax model, to motivate our study. In addition to consumers who might value a "humanely raised" labeling program and the farmers and grocery stores that might stand to profit from it, animal rights groups and other concerned individuals have suggested interest in the feasibility of humane husbandry (USDA, 2005).

To determine which types of consumers have positive willingness to pay (WTP) for improved farm animal welfare, and the magnitude of this WTP, we conduct a stated preference survey of a general population sample. The consumer choice scenario is cast in terms of background research concerning the viability of a novel meat-labeling program. Each consumer is posed a set of choice tasks concerning meat products raised according to different standards with randomized baseline prices for a "conventional" product and randomized price premia for "free-range" and "humanely raised" products.

Of course, WTP for humanely raised certification is just one side of the equation in assessing the viability of such a certification program. One would also need to consider the structure of costs in the poultry and livestock-growing industries to better understand whether the demand for humanely raised meat products makes specialization in these products profitable for at least some farms.

Related Literature

Other authors have identified several significant influences on meat purchasing behavior in general, and on attitudes toward more humanely raised meats more specifically. Meat consumption in general has been found to vary with consumer characteristics. Older consumers, females, those with higher incomes and those with higher education levels consume less meat Rimal (2002). Consumers have been shown to be price inelastic when it comes to meat in general and to perceive higher prices as indicators of higher quality meat West, et al. (2002, West, et al. (2002.)

Bennett and Blaney (2002), using a contingent valuation study of a more humane method of slaughtering pigs, demonstrated an increase in consumers' valuations if survey respondents perceived there to be a high level of social consensus that conventional methods of slaughter were unacceptable. Schröder and McEachern (2004), in a study of Scottish meat consumers found that individuals, in general, show more concern for animal welfare when they are acting as citizens influencing public policy than they do when they make actual purchases as consumers.

In studying consumer preferences for veal attributes, West et al. (2002) found it difficult to distinguish perceptions of quality from concern for animal welfare. Similarly, consumers indicated that they believe meat safety and healthfulness and animal welfare to be related Harper and Makatouni (2002). Pork consumers in Denmark, Sweden and the UK expect free-range pork to have a many positive characteristics, including: better taste and texture and more health benefits. They also expected free-range pigs to have improved welfare and to be more likely to be raised nearby, relative to conventionally raised pork. Because of this, it is concluded that free-range pork has the potential to become a profitable niche market Scholderer (2003). Among Brazilian consumers of free-range chicken, 49% agreed that animal welfare was one factor

motivating their purchases, while a strong majority cited environmental concerns and nearly all stated that their selection was due in part to health concerns, taste and the absence of antibiotics and growth hormones Farina and Almeida (2003). UK consumers indicated they would be inclined to buy organic, humanely raised pork, even at a 20% price premium over conventional pork, out of concerns for their health, the environment and animal welfare Grunert and Bech-Larsen (2005).

Others have come closer to isolating the value to consumers solely of increases in animal welfare. In a contingent valuation study of WTP for more humanely produced eggs, 86% of respondents said that they were "very" or "somewhat concerned" about the suffering of farm animals and 61% stated that these concerns altered their purchasing behavior Bennett (1997). Bennett found the corrected mean WTP for legislation that would increase the welfare of laying hens, via an increase in the price of eggs, to be £0.41 (about US $0.52) per dozen eggs (1997). Alm and Johansson (2005) suggest that Swedish food retailers could increase profits with private labels that ensure humane animal husbandry.

2. Original Survey Data

In order to determine the premium consumers might be willing to pay for meat labeled "humanely raised" before such a product is available, we conduct a stated preference survey. At this point, two pretests and an initial set of the final survey have yielded 122 responses, collected from a sample of jury pools at the Lane County Courthouse in Eugene, OR.

The jury pool population is made up of adults selected randomly from lists of registered voters and licensed drivers residing in Lane County (see LaneCounty (2001)). Portions of Lane County are relatively liberal, particularly in the city of Eugene, which is home to 43% of the county's population. (For example, countywide, Ralph Nader received 6% of the presidential vote in 1996,

while in Eugene he received 8% compared to 4% statewide and 1% nationwide AssociatedPress (2000).) However, the adjacent community of Springfield, which together with Eugene makes up the Eugene/Springfield metropolitan area, is considerably more conservative. Table 1 compares some relevant characteristics of survey respondents, the corresponding population of Lane County, the state of Oregon and the nation.

In a stated-preference consumer survey such as this, there are typically some incentives for respondents to overstate their willingness to pay (in an attempt to please the researchers and/or in hopes that the good will be provided and the respondent's option to buy the good in the future be preserved.) These tendencies must be considered and limited to the extent possible. To counteract these incentives, respondents were informed that a charitable organization funded by other concerned individuals would be established to certify meat as "humanely raised" if it was determined that a large enough share of the general population was willing to pay the necessary price premium in the hypothetical shopping scenarios presented in the survey. Respondents were reminded that, should these donations go to a meat-certifying program, they would not be available to fund other worthy causes the respondent might also care about. This framing of the choice task represents an effort to make these choices consequential. The survey instrument also asked respondents to rate their perception of the researchers' bias for of against the program so that this influence on WTP can be controlled for.

Respondents are presented with six choice scenarios in which they are asked to consider whether to purchase a given quantity and type of meat as though they were on a typical food shopping trip. Figure 1 contains a sample choice set for Choice Scenario #1, concerning a potential purchase of chicken breasts of different types, at different prices.

The second choice scenario is identical to the first, except that the per-pound prices for each type of chicken were different. The third and fourth choice scenarios considered top-sirloin beef and ground beef, respectively. In all scenarios, respondents were also given the option to choose "none." The fifth and sixth choice scenarios asked respondents to choose one of six types of meat, either chicken raised in one of the three manners or top-sirloin beef raised in one of the three manners and then again for chicken or ground beef. The right to left order of the types of meat labels (either conventional/free-range/humanely raised or humanely raised/free-range/conventional) was randomized across respondents. The left-to-right order of chicken/steak and chicken/ground beef in choice scenarios five and six was randomized as well.

Quantities of meat are varied randomly across choice sets (but kept constant within each choice set) in half-pound increments ranging from 1.5 to 3.0 pounds. For each choice, the per-pound price of conventional meat was varied randomly among eight possible values, as were the price premia for the free-range and humanely raised products (again, among eight possible values for each.) For each scenario, the premium on the humanely raised product was always higher than that of the free-range product. This strategy guards against strict dominance in the choice set, since the standards for humanely raised products were described as being much more stringent than for free-range products.

A common concern in stated preference surveys is that respondents are induced to "construct" their preferences on the spot during the choice exercises. If far more detailed information is provided in the survey than would be available in an actual future choice context, the implied demands may not accurately reflect the likely demand in future real markets. For this reason, both a long version of the survey (Appendix 1), and short version (Appendix 2) were used. The short version contained an abbreviated description of the animal husbandry standards

needed to gain "humanely raised" certification. With this difference, across split samples, we can estimate the effect on consumer choices of the level of information about the possible inhumane practices permitted under conventional standards.

Table 2 summarizes the randomized design of the survey, showing the marginal distributions of per-unit prices for each product used in our choice scenarios, as well as the package weights.

3. Theoretical Model and Estimating Specification

We will develop our model, initially, in the context of Choice Scenario #1, as shown in Figure 1. Indirect utility for each alternative in the choice set is considered a function of the quantity of meat purchased and the individual's income remaining after the purchase. (The "none" alternative, of course, incurs no cost.) The simple equations below consider only the cost, c_i^j, and quantity of the meat, q_i^j, described to subject i for each alternative (j = A, B, C, and N), ignoring the differences in utility that might come from different types of meat.

$$\begin{aligned} U_i^A &= \beta_0\left(Y_i - c_i^A\right) + \beta_1 q_i^A + \eta_i^A = V_i^A + \eta_i^A \\ U_i^B &= \beta_0\left(Y_i - c_i^B\right) + \beta_1 q_i^B + \eta_i^B = V_i^B + \eta_i^B \\ U_i^C &= \beta_0\left(Y_i - c_i^C\right) + \beta_1 q_i^C + \eta_i^C = V_i^C + \eta_i^C \\ V_i^N &= \beta_0\left(Y_i\right) + \eta_i^N \end{aligned} \qquad (1)$$

Net indirect utilities for the model, calculated using the "none" or status-quo option, then, are:

$$\begin{aligned} \Delta U_i^A &= \left(U_i^A - U_i^N\right) = \beta_0\left(-c_i^A\right) + \beta_1 q_i^A + \left(\eta_i^A - \eta_i^N\right) = \Delta V_i^A + \varepsilon_i^A \\ \Delta U_i^B &= \left(U_i^B - U_i^N\right) = \beta_0\left(-c_i^B\right) + \beta_1 q_i^B + \left(\eta_i^B - \eta_i^N\right) = \Delta V_i^B + \varepsilon_i^B \\ \Delta U_i^C &= \left(U_i^C - U_i^N\right) = \beta_0\left(-c_i^C\right) + \beta_1 q_i^C + \left(\eta_i^C - \eta_i^N\right) = \Delta V_i^C + \varepsilon_i^C \end{aligned} \qquad (2)$$

McFadden's conditional logit choice model (see Greene, 200X) assumes that subjects will prefer the alternative that conveys the highest possible indirect utility in the choice set. The stochastic structure of the conditional logit model (i.e. the assumed distributions for $\varepsilon_i^A, \varepsilon_i^B,$ and ε_i^C) leads to choice probabilities that can be expressed in terms of the observable portions of utility as:

$$
\begin{aligned}
P_i^A &= \frac{\exp\left(\Delta V_i^A\right)}{\exp\left(\Delta V_i^A\right)+\exp\left(\Delta V_i^B\right)+\exp\left(\Delta V_i^C\right)+1} \\
P_i^B &= \frac{\exp\left(\Delta V_i^B\right)}{\exp\left(\Delta V_i^A\right)+\exp\left(\Delta V_i^B\right)+\exp\left(\Delta V_i^C\right)+1} \\
P_i^C &= \frac{\exp\left(\Delta V_i^C\right)}{\exp\left(\Delta V_i^A\right)+\exp\left(\Delta V_i^B\right)+\exp\left(\Delta V_i^C\right)+1} \\
P_i^N &= \frac{1}{\exp\left(\Delta V_i^A\right)+\exp\left(\Delta V_i^B\right)+\exp\left(\Delta V_i^C\right)+1}
\end{aligned}
\qquad (3)
$$

In order to estimate the main unknown utility parameters β_0 (the marginal indirect utility for income) and β_1 (the marginal utility per generic pound of chicken, for example) the following log-likelihood function is maximized:

$$
L = \prod_{i=1}^{n} \left[P_i^A\right]^{A_i} \left[P_i^B\right]^{B_i} \left[P_i^C\right]^{C_i} \left[P_i^N\right]^{N_i} \qquad (4)
$$

Where A_i = 1 if person i chooses alternative A, and A_i =0 otherwise, and similarly for B_i, C_i and N_i.

Once the parameters of the indirect utility function are estimated, it is possible to solve for the individual's maximum WTP for the (generic) package of chicken. This maximum WTP is the price at which the individual would be just indifferent between paying for and consuming the product and not paying for or being able to consuming it. Because indifference implies identical utility between these two options, or a zero utility difference, we set the estimated

indirect utility-difference relative to the numeraire alternative equal to zero and solve for the package cost, c_i^{j*}, that satisfies this equality:

$$0 = \Delta V_i^j = \beta_0\left(-c_i^{j*}\right) + \beta_1 q_i^j + \varepsilon_i^j \text{ which implies that}$$
$$\beta_0\left(c_i^{j*}\right) = \beta_1 q_i^j + \varepsilon_i^j \qquad (5)$$
$$c_i^{j*} = \frac{\beta_1 q_i^j + \varepsilon_i^j}{\beta_0} = \frac{\beta_1}{\beta_0} q_i^j + \frac{\varepsilon_i^j}{\beta_0}$$

where $\varepsilon_i^j = \left(\eta_i^j - \eta_i^N\right)$. This estimated amount, c_i^{j*}, is interpreted as the maximum willingness to pay for q_i^j.

The error term in equation (55), $\varepsilon_i^j / \beta_0$, is symmetric around zero, so its expected value can be assumed to be zero. The expected value of maximum WTP for a package of generic chicken is thus (β_1/β_0) times the quantity (pounds) of chicken in the package, q_i^j. In other words, maximum WTP *per pound* of chicken is given by the ratio of the marginal utility per pound of chicken, β_1, to the marginal utility per dollar of income, β_0.

However, in this study, we will allow the marginal utility per pound of chicken to vary systematically with the type of chicken (conventional, free-range or humanely raised.) The baseline marginal utility, β_{10}, will be assigned to conventionally grown chicken, but the marginal utility per pound of chicken will be a systematic varying parameter that shifts by β_{11} if the chicken is free-range, and by β_{12} if the chicken is humanely raised. Thus the indirect utility-differences that drive the choices will be generalized to

$$\begin{aligned}\Delta U_i^j &= \beta_0\left(-c_i^j\right) + \left(\beta_{10} + \beta_{11} F_i^j + \beta_{12} H_i^j\right) q_i^j + \varepsilon_i^j \\ &= \beta_0\left(-c_i^j\right) + \beta_{10} q_i^j + \beta_{11} F_i^j q_i^j + \beta_{12} H_i^j q_i^j + \varepsilon_i^j\end{aligned} \qquad (6)$$

Solving for the maximum WTP for a package of chicken, we get

$$\text{Max WTP} \;=\; c_i^{j*} = \frac{\left(\beta_{10} + \beta_{11}F_i^{\,j} + \beta_{12}H_i^{\,j}\right)q_i^j}{\beta_0} + \frac{\varepsilon_i^j}{\beta_0} \tag{7}$$

Or, specifically for each type of chicken,

$$\begin{aligned}
\text{Max WTP} &= \frac{\beta_{10}}{\beta_0}q_i^j + \frac{\varepsilon_i^j}{\beta_0} \text{ for conventional} \\
\text{Max WTP} &= \frac{\left(\beta_{10} + \beta_{11}\right)}{\beta_0}q_i^j + \frac{\varepsilon_i^j}{\beta_0} \text{ for free-range} \\
\text{Max WTP} &= \frac{\left(\beta_{10} + \beta_{12}\right)}{\beta_0}q_i^j + \frac{\varepsilon_i^j}{\beta_0} \text{ for humanely raised}
\end{aligned} \tag{8}$$

A statistical test of the hypothesis that respondents are willing to pay no more for free-range meats than for conventional meats is a test of $H_0 : \beta_{11} = 0$. A test of the hypothesis that respondents are willing to pay no more for humanely raised meats than for conventional meats is a test of $H_0 : \beta_{12} = 0$. If either or both of these parameters prove to be positive and statistically significantly different from zero, then a point estimate of the per-pound premium willingly paid for free-range meat is β_{11}/β_0 and a point estimate of the per-pound premium willingly paid for humanely raised meat is β_{12}/β_0.

Indirect utility from a pound of meat can vary also with the kind of meat, as well as with the way it was raised. If we let $K_i^j = 1$ if the meat is chicken, $S_i^j = 1$ if the meat is beef steak and $G_{ij} = 1$ if the meat is ground beef (and zero otherwise in all three cases), then the indirect utility difference associated with any given alternative relative to the numeraire "none" alternative can be generalized to:

$$\begin{aligned}
\Delta U_i^j = \beta_0\left(-c_i^j\right) &+ \left(\beta_{10} + \beta_{11}F_i^{\,j} + \beta_{12}H_i^{\,j}\right)K_{ij}q_i^j \\
&+ \left(\beta_{10} + \beta_{11}F_i^{\,j} + \beta_{12}H_i^{\,j}\right)S_{ij}q_i^j \\
&+ \left(\beta_{30} + \beta_{31}F_i^{\,j} + \beta_{32}H_i^{\,j}\right)G_{ij}q_i^j + \varepsilon_i^j
\end{aligned} \tag{9}$$

The expected maximum WTP for each type of meat will then be given by the following functions of the estimated parameters:

Chicken	Conventional	β_{10}/β_0
	Free-Range	$(\beta_{10}+\beta_{11})/\beta_0$
	Humanely Raised	$(\beta_{10}+\beta_{12})/\beta_0$
Beef Steak	Conventional	β_{20}/β_0
	Free-Range	$(\beta_{20}+\beta_{21})/\beta_0$
	Humanely Raised	$(\beta_{20}+\beta_{22})/\beta_0$
Ground Beef	Conventional	β_{30}/β_0
	Free-Range	$(\beta_{30}+\beta_{31})/\beta_0$
	Humanely Raised	$(\beta_{30}+\beta_{32})/\beta_0$

This is a minimal, ten-parameter specification (nine marginal utilities per pound of product and one marginal utility of income). It presumes homogeneous preferences—that everyone in the sample has the same set of ten different marginal utilities. More general models will allow each of the ten fundamental parameters to depend systematically on characteristics of the individual. Eventually, we want to ascertain the observable characteristics of respondents that predispose them to be willing to pay a higher premium for humanely raised meats.

A final consideration concerning the structural model for utility concerns whether to include a "status quo" or "no purchase" alternative-specific dummy variable in our specifications. When a status quo dummy is used, the estimated marginal utility associated with it conveys the net utility difference between buying no product and buying at least some product, independent of the price, quantity, or other features of the products included in the choice scenario. Sometimes, out of a desire to appear cooperative, respondents sometimes feel compelled to select at least one of the "products" presented to them. In other cases, they may object to

something about the choice exercise, independent of the attributes of the alternative products, and may choose the "no purchase" option as a vote of protest. We are interested specifically in how differences in net income and differences in product attributes affect choices, and the key tradeoffs can be identified (sometimes more accurately) if these other confounding effects have been controlled-for, at least implicitly, via a status quo dummy variable.

4. Results and Discussion

Table 3 presents preliminary results from models that employ the usable data from our two pretest samples and the initial batch of returns from our first wave of the main survey. Only 122 respondents are represented in these preliminary data.

Chicken Breasts

The parameter estimates based on choices among different types of chicken breasts are the most precisely estimated because we can pool individuals' responses to the first and second choice scenarios, yielding a total of 241 usable choices from this sample. The utility parameter estimates in the first column of Table 3 reveal that package price is a statistically significant determinant of which alternative is chosen, as is package weight and the interaction terms that reveal individuals' average incremental marginal utility from the free-range product and the humanely raised product.

The estimated coefficient on the alternative-specific dummy variable associated with the "no purchase" alternative is not statistically significant in any of the preliminary models described in this paper. The coefficient on this dummy variable reveals the "lump" of utility associated with choosing none of the offered products. (The coefficient on this variable also reveals the complementary utility associated with choosing at least one of the chicken products). Since respondents were told in the pretest versions of the survey that they were to imagine they

had come to the supermarket to buy a certain size package of this product and that their only assignment was to decide which type they would choose, we expect these pretest data to reveal a negative marginal utility associated with the "no purchase" choice, since they would not buy any of the product they had come to the store to purchase. For chicken, however, while the point estimate on this coefficient is negative as expected, it is not statistically significantly different from zero. For the main version of the survey, the wording was changed to minimize the perception that the trip was specifically to purchase the product being described, in the quantity being described. This should minimize the disutility from "leaving empty-handed."

We convert the estimated marginal utilities into their corresponding WTP amounts to reveal that consumers' median WTP for conventionally grown chicken appears to be \$3.59/lb.[2] This WTP need not coincide with observed market prices, although if the consumer buys chicken regularly, we expect WTP to be at least as great as observed market prices. (The difference between the maximum price willingly paid and the market price represents consumer surplus.) The median premium willingly paid for free-range chicken appears to be only \$0.40, and the median premium willingly paid for the humanely raised product appears to average only \$0.54.

Undoubtedly, there will be considerable variation across different types of consumers in this willingness to pay. Some will be willing to pay nothing, while others will be willing to pay a substantial amount. When we have more data, we will be able to explore dimensions of heterogeneity in these premia willingly paid for the products that embody better treatment of farm animals.

[2] This willingness to pay estimate is merely a median because, technically, it is calculated by taking the ratio of two normally distributed variables. The theoretical mean for such a ratio is undefined, because zero is a feasible value for the denominator. We could use simulation methods to build up a sampling distribution from draws from the joint distribution of the relevant parameters. Or, we could estimate the log of the parameter in the denominator. When the estimated quantity is exponentiated, it will be strictly positive, rendering it possible to calculated a well-defined expected value. This strategy requires nonlinear optimization methods, however.

Ground Beef

We consider next our results for ground beef products, reserving discussion of the more complicated steak results for the next section. We have only half as may choices regarding only ground beef in our choice sets, because respondents receive only one such question, rather than two (as in the case of chicken).

The coefficient that reveals the baseline WTP for conventionally grown ground beef is statistically significantly different from zero, and our parameter estimates suggest that baseline WTP for conventional ground beef is about $2.71 per pound. With our limited sample size, the coefficient that implies the premium willingly paid for free-range ground beef is not statistically significantly different from zero. The coefficient that implies the premium for humanely raised beef is relatively more significant, but only at about the 16% level of significance. Its point estimate, however, implies about a $0.68 premium, per pound, for humanely raised ground beef (although we emphasize that this number is not very precisely estimated).

Top Sirloin Steaks

Estimation results for the simplest specification in the case of the steak products are given in the third column of Table 3. In this case, none of the parameter point estimates is statistically significantly different from zero and the point estimates for that suggest the price premia are both negative, which is troublesome. However, we consider three alternative specifications. The steak product is substantially more expensive than the chicken or the ground beef. We speculate that consumers may have a mental budget for the meat portion when they are purchasing the ingredients for a meal for their household. The price per pound for steak may be sufficiently high that they may be unwilling to pay extra for free-range or humanely raised products because this price premium more readily pushes them past the limit of their mental budget for meat. In

contrast, the baseline price of the conventional product in the case of chicken or ground beef may be sufficiently low that consumers feel they can afford to pay more for the free-range or humanely grown product.

In our first alternative model for the steak products (Steak-2 in Table 3), we allow the three parameters that imply WTP to vary with the weight of the package. These coefficients are not statistically significant either, but the point estimates suggest that WTP for all three types of steak may be decreasing with the size of the package. In the model labeled Steak-3 in Table 3, we allow these coefficients to shift, instead, with the package cost of the conventionally grown product in the choice set. Our sample size is not large enough to permit statistically significant estimates in this case either, but the point estimates suggest that the higher this baseline price of the conventional package, the lower the WTP or WTP premia for any of these products. In a final model, Steak-4 in Table 3, we allow only the parameters that reveal the WTP premia for free-range and humanely grown steak to shift with the weight of the package, and again find that the WTP premia for free-range or humanely grown steak is less, the larger the package involved.

If it proves to be true that WTP for the free-range or humanely grown product depends negatively on package size (or baseline cost of the conventional product), then perhaps these products should be offered in smaller packages and targeted towards consumers who tend to purchase smaller amounts on each shopping trip. Richer implications can be expected when our sample size grows to a more reasonable number of responses.

5. Caveats

The results presented above are the preliminary outcomes of a data gathering project that is still in the field. When data collection is complete, results will be based on a considerably larger number of responses.

Currently, we are only able to examine one product at a time (i.e. chicken, steak or ground beef). From a larger sample, however, a pooled choice model that constrains the marginal utility of income to be the same across all choices (and the implicit error variance) and one that allows for differing dispersions in the error terms associated with each choice (due to the differing levels of choice complexity between the three-product choice sets and the six-product choice sets should be conducted. Fixed-effect logit models may be used to examine common unobserved heterogeneity across respondents that would produce correlations in the error terms across the six choices made by each different respondent.

A pooled choice model was attempted with the current data set, but using any single choice set from the six choice sets posed to each respondent provides the most robust estimates of WTP. However, pooling the data from all six choice sets in an appropriate fashion vastly increases the number of choices brought to bear on the estimation of the full set of utility parameters in our models. Our data are designed to permit pooling. However, when pooling demand information from different choice contexts, it is important to be aware that the "noise" in these choices can differ systematically across different types of scenarios. It is common to allow the dispersion of the error term in the indirect utility differences, as in equation (9), to be normalized to unity for a numeraire choice set, but to differ across choice sets.

In principle, when all data are drawn from the same type of choice set, there is a single error dispersion parameter κ_m. Since utility is invariant to scale, we normalize the utility differences on this scale parameter, and estimate the normalized parameters, such as $\beta_0 / \kappa_m = \beta_0^*$:

$$\frac{\Delta U_i^j}{\kappa_m} = \frac{\beta_0}{\kappa_m}\left(-c_i^j\right) + \left(\frac{\beta_{10}}{\kappa_m} + \frac{\beta_{11}}{\kappa_m}F_i^j + \frac{\beta_{12}}{\kappa_m}H_i^j\right)K_i^j q_i^j + \left(\frac{\beta_{10}}{\kappa_m} + \frac{\beta_{11}}{\kappa_m}F_i^j + \frac{\beta_{12}}{\kappa_m}H_i^j\right)S_i^j q_i^j + \left(\frac{\beta_{30}}{\kappa_m} + \frac{\beta_{31}}{\kappa_m}F_i^j + \frac{\beta_{32}}{\kappa_m}H_i^j\right)G_i^j q_i^j + \frac{\varepsilon_i^j}{\kappa_m} \quad (10)$$

However, when there are different types of choice scenarios, and we wish to pool these data, it is plausible that the β utility parameters are identical across different choice scenarios, but the dispersion parameters differ (according to choice set complexity, for example). In these cases, we can choose one type of choice set as the numeraire, and estimate the dispersion parameters for other types of choice sets as multiples of this numeraire. These multiples can be constrained to be positive by specifying $\kappa_m = \exp(\kappa_m^*)$ and estimating κ_m^* as an unconstrained parameter. For the numeraire choice type, $\kappa_m^* = 0$, so that $\exp(\kappa_m^*) = 1$.

Heteroscedasticity of this type, according to choice set type, is relatively common in empirical choice data. If one fails to accommodate heteroscedasticity when pooling data across different types of choices, distortions to the estimated marginal utility parameters can result, and these will in turn distort any inferences about maximum WTP for different goods.[3] If one is to rely upon packaged software, the best strategy is to estimate preferences separately from each type of choice. This will produce a variety of different estimates of WTP for the same products, if the same products are represented in more than one choice set, so this estimation method is less efficient. However, it prevents biases in apparent WTP that can be present if the data are pooled without accommodating heteroscedasticity. In this paper, we limit our analysis to the types of models that can be estimated with packaged econometric software (Stata 9 in this case).

[3] Packaged maximum likelihood algorithms for utility-theoretic multiple choice models, however, do not allow for this type of heteroscedasticity. It is necessary to resort to original programming in generalized nonlinear optimization software, such as GAUSS or Matlab. This is a quantum increase in estimation difficulty.

6. Conclusions and Directions for Future Research

Preliminary results based on models that employ just three subsets of the data available indicate that consumers are willing to pay a premium for both free-range and humanely raised chicken breasts. The point estimates for these premia are in the neighborhood of $0.40 for free-range chicken (significantly different from zero at the five-percent level) and $0.54 for humanely raised chicken (based on utility parameters that are all significant at the ten-percent level.)

At the current sample size, we are not yet able to detect a statistically significant premium for free-range ground beef. However, a premium of roughly $0.68 for the humanely raised product approaches statistical significance, although only at about the sixteen-percent level.

For the much more expensive top-sirloin steak option, point estimates of the premia for free-range and humanely raised products are negative, although neither is remotely different from zero. We speculate that consumers have "mental budgets" for calculating the acceptable amount to pay for a meal that includes meat. Even at conventional prices, the steak option is likely to exhaust this mental food budget for many people, so there may be little room left to pay for the free-range or humanely raised alternatives. More research is needed to explore this possibility.

As sample size grows, our specifications can become correspondingly richer. In addition to testing for construct validity of the instrument (by exploring whether the price premium varies logically with membership in animal rights organizations and opinions about conventional husbandry and the ability of humane standards to improve the well being of farm animals) we plan to explore the following issues:

1. What is the impact of the provision of different levels of information on humanely raised meat in the long and short versions of the survey instrument? Any significant difference

in WTP for humanely raised meat that can be attributed to the amount of information provided to the consumer is likely to be very valuable information to suppliers of such products. These results will affect how these products are labeled and marketed.

2. Does the degree to which consumers seem to assume that *conventional* animal husbandry leads to the mistreatment of meat animals systematically affect WTP for alternative meats?
3. Do the price premia willingly paid for alternative meats vary systematically with individual characteristics, such as age, gender and education level? If so, this would allow for greater generality of our findings.
4. Does the premium willingly paid for alternative meat products decline with the size of the purchase (package)? I.e., is there a fixed, per- purchase component and a variable, per-pound component to each premium? This might suggest that small packages of free-range or humanely raised meats are more profitable for meat sellers than are large packages, as the preliminary steak findings may suggest.
5. Data gathered on respondents' shopping habits and the prices they believe they currently pay for conventional and free-range meat products and can be used in models that control for revealed preference information.
6. Questions A. 6 - A. 8 and C. 2 – C. 5 can be used to ascertain whether the premia willingly paid for humanely raised meats may be due to perceived attributes other than (or in addition to) changes in animal welfare, such as taste or healthfulness, and to what degree.

In addition to these pursuits, ancillary analyses will use other questions from our survey that help us to understand the nature of consumers' meat shopping experiences. The questions in

section A of the survey Also produce descriptive statistics that may be of interest in their own right.

Table 1

Descriptive Statistics for Survey Sample and Actual Population (2000 unless indicated)

	Survey sample	Lane County	Oregon	United States
2005 Population (Estimate)		335,180	3,641,056	296,410,404
Sample size	122			
Female	63.0%	50.8 %	50.4 %	50.9 %
Racial distribution				
White alone or in combination	97.1%	93.7 %	89.3%	77.1%
Black alone or in combination	0 %	1.3 %	2.1 %	12.9%
Asian alone or in combination	0.8%	2.8 %	3.7 %	4.2 %
Ethnicity -Hispanic or Latino	5.6%	4.6 %	8.0 %	12.5%
Age distribution (for 20 and above)				
20 to 24 years	4.9 %	11.6%	9.3%	9.4
25 to 34 years	21.3	17.7	19.0	19.9
35 to 44 years	16.4	19.7	21.3	22.5
45 to 54 years	20.5	20.8	20.5	18.8
55 to 59 years	14.8	7.0	7.0	6.7
60 to 64 years	10.7	5.3	5.3	5.4
65 to 74 years	7.4	8.9	8.9	9.2
75 to 84 years	0.0	6.8	6.5	6.2
85 years and over	4.1	2.3	2.3	2.1
Household income distribution				
<$10,000	4.0 %	11%	8.6 %	9.5 %
$10,000-$15,999	4.0	7.3	6.5	6.3
$15,000-$24,999	11.2	14.6	13.4	12.8
$25,000-$49,999	24.8	32.5	31.6	29.3
$50,000-$99,999	39.2	26.7	29.9	29.7
$100,000-$149,999	4.0	5.0	6.5	7.7
$150,000 - $199,999	3.2	1.3	1.7	2.2
$200,000+	1.6	1.5	1.8	2.4
Education, persons 25 and older				
Less than high-school	0%	12.5%	14.9%	19.6
High-school graduate	12.1	25.9	26.3	28.6
Some college, no degree	34.5	28.8	27.1	21.0
Associate degree	7.8	7.3	6.6	6.3
Bachelors degree	23.3	15.6	16.4	15.5
Graduate or prof. degree	16.4	9.9	8.7	8.9

Source: www.census.gov

Table 2

Randomized Design for Prices and weights

Meat	Type	Obs	Mean	Std. Dev.	Min	Max
chicken	- conventional	241	$ 2.45	$ 0.45	$ 1.79	$ 3.19
	- free-range	241	3.06	0.75	1.84	5.19
	- humanely raised	241	3.76	0.91	1.94	5.99
steak	- conventional	122	6.98	1.16	4.99	8.49
	- free-range	122	7.84	1.31	5.04	9.99
	- humanely raised	122	8.66	1.45	5.14	11.99
ground	- conventional	122	2.55	0.45	1.89	3.29
	- free-range	122	3.35	0.79	1.94	5.29
	- humanely raised	122	4.09	1.07	2.04	7.29
weight		485	2.20 lbs	0.59 lbs	1.50 lbs	3.00 lbs

Table 3
Parameter Estimates – Preliminary Models

	Chicken	Ground Beef	Steak	Steak-2	Steak-3	Steak-4
Total package price	-.452	-.35	-.0866	-.0914	-.0654	-.091
	(5.02)***	(3.46)***	(1.30)	(1.34)	(0.80)	(1.36)
Chicken*wt	1.62					
	(2.67)***					
Free-range*Chicken*wt	.179					
	(2.10)**					
Humane*Chicken*wt	.244					
	(1.89)*					
Steak*wt			.668	7.6	.826	.872
			(1.02)	(1.71)*	(0.81)	(1.25)
Free-range*Steak*wt			-.12	.0978	.0903	.149
			(1.00)	(0.18)	(0.25)	(0.28)
Humane*Steak*wt			-.0469	.385	.117	.43
			(0.31)	(0.71)	(0.31)	(0.81)
Ground*wt		.948				
		(1.99)**				
Free-range*Ground*wt		-.00871				
		(0.06)				
Humane*Ground*wt		.237				
		(1.39)				
Steak*wt*wt				-1.49		
				(1.53)		
Free-range*Steak*wt*wt				-.0858		-.106
				(0.41)		(0.52)
Humane*Steak*wt*wt				-.173		-.19
				(0.83)		(0.93)
Steak*wt*Conv_totalprice					-.00529	
					(0.18)	
Free-range*Steak*wt *Conv_totalprice					-.0117	
					(0.65)	
Humane*Steak*wt *Conv_totalprice					-.0101	
					(0.56)	
No purchase	-1.29	-.673	-.503	7	-.0269	-.0876
	(1.08)	(0.75)	(0.52)	(1.49)	(0.02)	(0.08)
Alternatives	964	488	488	488	488	488
Choices	241	122	122	122	122	122
Log L	-272.529	-156.001	-164.711	-163.048	-164.382	-164.262
Implied Willingness to pay:						
Conventional WTP/lb	$ 3.59	$ 2.71	$ 7.71			
Free-range premium/lb	0.40	-0.02	-1.39			
Humanely raised premium/lb	0.54	0.68	-0.54			

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Figure 1

Choice Scenario # 1 (Chicken Breasts)

Suppose you have come to your usual food store. You are considering whether to buy a «wt1»-pound package of chicken breasts. The store offers three brands of chicken breasts that look the same. The color, size and fat content of each brand are very similar. The only visible difference is that one brand is marked "«labela1»," one brand is marked "«labelb1»," and the third brand is marked "«labelc1»". The prices are also different.

Keeping in mind your household budget, which would you choose? (check ONE)

	A	B	C	None
Type	«labela1»	«labelb1»	«labelc1»	
Package size	«wt1» lbs	«wt1» lbs	«wt1» lbs	
Price	$ «dupa1»/lb	$ «dupb1»/lb	$ «dupc1»/lb	
Total cost	$ «dtpa1»	$ «dtpb1»	$ «dtpc1»	$ 0
I prefer:	☐	☐	☐	☐

Appendix: Survey Development

The survey was tested on sixteen individuals and revised several times before being fielded to a test sample of 50 respondents (42 of whom completed the questionnaire). Changes made following this preliminary analysis include:

1. Random variation of package sizes, rather than only presenting one pound packages of each type
2. A question asking the price the respondent currently pays for conventional chicken was expanded to include free-range chicken and conventional and free-range steak and ground beef to increase our ability to incorporate revealed preferences.
3. The first 50 surveys asked respondents if they thought the prices were realistic, too high or too low. The results of from this question led us to decrease the baseline price range of chicken and the question was eliminated thereafter.
4. Wording changes were also made in the introductory sections in an attempt to decrease the perception of researcher bias in favor of the humanely raised certification program.

The revised survey was fielded to a second test sample of 50 respondents. These results were pooled with the results from the first pre-test and subjected to preliminary analysis. The first two pre-tests framed the product choice in each Choice Scenario as essentially a "forced choice" by asking respondents to assume that they had come to their usual food store "to buy 1.5 pounds of chicken breasts." This framing appeared to create unexpectedly large disutility if the individual selected the "none" alternative. For example the indirect utility from paying the price of at least one brand of chicken would have to be low enough to exceed the disappointment of having to leave this store empty-handed. The revised wording of the survey states only that the individual should assume

that they have come to their usual food store and that they "are considering whether to buy 1.5 pounds of chicken breasts." Since the purchase in question is no longer being described as the purpose of the shopping trip, we anticipate that it should produce less disutility associated with the "none" alternative. This utility is the negative of the "lump" of utility associated with at least one of the products being purchased, independent of its attributes. We are interested in the marginal utilities of income and of each type of meat, not the total utility of a choice, which includes any disembodied utility associated with merely"some purchase" versus "no purchase."

The final version of the survey also explores two possible levels of information provision. The earlier pre-test surveys described the criteria for "humanely raised" certification in great detail. A side-effect of this level of detail is that consumers may become alarmed at learning (or imputing) that these possible mistreatments of animals are followed in all conventional farming operations. In the main survey, we are careful to debrief individuals about the extent to which they think this certification will merely confirm the good practices of some proportion of conventional farms. The more they think the humanely raised certification is superfluous, the less likely they are to be willing to pay a premium for meats with this certification.

Often, products labeled "free-range" are also certified organic and/or hormone-free. However, the label considered by this study targets animal welfare concerns only, and does not necessarily describe how pesticides, hormones or antibiotics are used in raising animals. This was also clarified in the final version.