EFFECT OF INFORMATION DISPLAYS ON CAGE-FREE AND ORGANIC EGG SALES: EVIDENCE FROM TWO FIELD EXPERIMENTS

By

KATIE ROSE SMITHSON

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Oklahoma State University

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EFFECT OF INFORMATION DISPLAYS ON CAGE-FREE AND ORGANIC EGG SALES: EVIDENCE FROM TWO FIELD EXPERIMENTS

Thesis Approved:

Dr. Jayson L. Lusk

Thesis Adviser

Dr. Bailey Norwood

Dr. Rodney Holcomb

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Abstract: This research determines the effect of point-of-purchase informational displays on the difference in quantity and type of eggs purchased. Informative displays were introduced in two supermarkets and consumer purchasing behavior before, during, and after the introduction of the signage was analyzed. A random utility model was fit to the data, which described consumer choice as a function of price, egg type, day-of-the-week, promotional deals, and informative displays. Results indicate informative displays did not cause a large shift toward organic or cage-free eggs. The signs, however, did increase the total amount of eggs purchased, thus indicating the signs served as an overall demand enhancement mechanism.

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CHAPTER I

INTRODUCTION

Despite the rapid growth of organic food sales (Organic Trade Association, 2011), the market remains small with less than 1% of U.S. farmland estimated to be in organic production (USDA), and with fewer than 1% of egg sales being organic (Oberholzter et al., 2006). Eggs are a particularly interesting case study because of the implied animal welfare concerns, the recent elevation of such concerns in the egg industry as witnessed by Proposition 2 (Prop 2) in California in 2008, and the general lack of consumer knowledge about egg production.

Concerns for the welfare of laying hens has been enhancing for some time. In 1999 the European Union (EU) passed a law to phase out battery cages by 2012 (Appleby, 2003). American consumers appear increasingly concerned about the issue, as revealed by the success of animal advocacy organizations successfully pushing for laws to regulate animal living conditions. In the United States, Florida, Arizona, and recently California have responded to the concerns over animal welfare by passing constitutional amendments to prohibit certain agriculture practices (Lusk, 2010). The passage of Prop 2 in California outlawed the use of gestation crates for sows and battery cages for laying hens. Sows and laying hens must be kept in an area where they can lay down, stand up, turn around, and fully extended their limbs.

Partially in response to Prop 2, the Humane Society of the United States (HSUS) and the United Egg Producers (UEP) collaborated on an agreement, the Egg Products Inspection Act, which would have set a federal standard by requiring all laying hens in the U.S. be given a certain amount of space (Kopperud, 2013).

Requirements of the legislation included the phasing out of caged systems and replaced with enriched systems; requiring labeling on the type of housing method used on all egg cartons; and prohibiting all transport and sell of eggs that do not meet these standards (Feinstein, 2013; and Wyant, 2013). The Act failed to gain much traction in Congress and appears to be going nowhere at the moment, but the developments highlight changes that may be coming for the egg market.

Beyond regulatory efforts, there are a host of private market initiatives aimed at promoting cage-free and organic egg sales. Restaurants and food retailers, like McDonald's and Burger King, have responded to consumers' concerns for animal welfare by sourcing a certain percentage of their food from providers that have improved animal welfare standards (Prickett, 2010; Lusk and Norwood, 2010). Cage-free eggs are now marketed in almost every major grocery chain, and estimates suggest that about eight percent of eggs produced in the U.S. come from cage-free farms (Charles, 2013).

Though the cage-free egg market is growing, marketers of cage-free eggs face many obstacles. One problem faced by participants in the market is inconsistent information about the variety of options they face. In today's egg market there are a wealth of choices including, pasteurized, fertilized, "natural", free range, Omega 3, organic, cage-free, and caged eggs (Chang et al., 2011). Preferences for these options depend on advertising and information disseminated to the consumer. For example, Lusk (2010) studied how demand for eggs in California was affected by the media attention surrounding the vote of Prop 2. He found elevated demand for organic and cage-free eggs as a result of the information surrounding Prop 2. Lusk (2010) conjectured that the demand shift occurred because consumers are unaware and/or misinformed about modern

practices of agriculture. Supporting that claim, Appleby (2003) argued that with fewer people in agriculture today, more consumers are disconnected with their food sources, which leads to criticism of modern agricultural production. In an experimental setting, Richards et al., (2011) examined how media advertising like that surrounding the Prop 2 vote in California affected egg demand. Richards et al., (2011) concluded that advertising that was in support for cage-free eggs was more effective in increasing consumers' willingness to pay for cage-free eggs compared to advertising that was against cage-free eggs..

Consumer research reveals a lack of knowledge about production of eggs in the U.S. Consumers believe that 37% of all eggs produced in the U.S. are from caged systems when, in actuality more than 90% are produced in caged systems (Norwood and Lusk, 2011). Consumers also tend to falsely believe that brown eggs are more nutritious and healthier than white eggs, and that brown eggs only come from hens fed organic ingredients (Johnson et al., 2011). Organic and cage-free eggs are perceived to be healthier and provide better welfare to the hen. However, research reveals little nutritional benefit to organic and animal welfare differences are intensely debated (Anderson, 2011; and Singh et al., 2009). Animal welfare studies suggest that animals raised organically experience a higher quality of life as the animal are able to exhibit natural behaviors, however, death rates are often higher in organic and cage-free systems (Hidalog et al., 2008; Savory, 2004; and Wall, Tauson, and Sorgjerd, 2008).

Could misinformation partially explain the low market share for organic and cage-free eggs? This research will determine how informative displays at the point-of-purchase influence cage-free and organic egg sales, market share, revenue, and gross margin. We implement an experimental design in which colored-coordinated aisle displays and shelf labels were introduced in the egg case in two supermarkets. Scanner data was collected before, during, and after the introduction of the signage to determine the effects on sales of cage-free, organic, and caged eggs. This research will provide insight to farmers, retailers, and animal advocacy organizations on factors influencing preferences for hen living conditions.

Objectives:

The overall objective of this research is to determine the effect of point-of-purchase informational displays on organic and cage-free egg sales. The specific objectives of this research are to estimate a consumer demand model for eggs using grocery store scanner data to determine whether informative displays: 1) affects total egg sales, 2) alters the market shares for organic, cage-free, and caged hen eggs; and 3) affects revenues and gross margins from the egg case.

CHAPTER II

REVIEW OF LITERATURE

There are various opinions on the effects of egg housing systems on animal welfare and egg quality. For example, a common opinion about battery caged systems is that it lowers the hen's welfare due to their lack of movement and inability to exhibit natural behaviors such as dust bathing and laying eggs in nests. However, Savory (2004) argues that battery cages were developed to improve hen's welfare by reducing the spread of diseases. In terms of nutritional effects of housing systems, Hidalgo et al. (2008) examined the differences in physical and chemical egg features from four different housing systems and found there was no clear difference in eggs from the different housing systems. However, organic eggs exhibited the highest whipping and foaming capacity but freshness ranked last whereas caged eggs had the strongest resistance to shell breakage. Similarly, Singh, Cheng, and Silversides (2009), observed the effect of egg quality from four different breeds of hens in two different housing systems (caged and floor pens) and found eggs from floor pens produced larger eggs, stronger shells, and good yolk color whereas hens in caged systems exhibited lower mortality rates and eggs had less contamination.

Cage-free and organic systems are more costly than caged systems. The change from caged systems to barn systems (cage-free) increases producers' cost by 40% to 70% (Sumner et al., 2011). The increase in cost can be attributed to increases in prices of pullets, feeds, labor and housing for non-caged systems (Sumner et al., 2011). In addition, non-caged systems have caused an increase in labor costs and higher ammonia emissions (Singh, Cheng, and Silversides, 2009).

Although producers experience greater expense in producing hens in cage-free and organic systems, consumers are willing to pay more for eggs from these types of systems (Norwood and Lusk, 2011). Consumers who exhibit stronger preferences for organic and other specialty eggs are consumers who believe these specialty eggs are a healthier option, taste better, and support the local economy (Hughner et al., 2007; and Padel and Foster, 2005). Plus, organic consumers are usually environmentally conscientious, aware of food safety, and concerned about animal welfare (Hughner et al., 2007; and Padel and Foster, 2005). In addition, consumers are attracted to organic foods because eating foods that are purely organic provides them personal satisfaction (Zanoli and Naspetti, 2002; and Lusk, 2011).

Deterrents of growth for the organic food market are high price premiums, lack of availability, skepticism of organic labels, lack of information, and satisfaction of current food choices (Hughner et al., 2007). Padel and Foster (2005) found that a majority of consumers associate organic foods with healthy eating and fresh produce. Schuldt and Schwarz (2010) suggest that consumers overestimate the benefits of organic. Consumers have perceived organic as healthier and low in calories and that this halo-effect leads people to form erroneous beliefs (like eating organic will lead to more effective weight loss) (Schuldt and Schwarz, 2010). Padel and Foster (2005) revealed that consumers who did not understand the meaning of organic had a hard time justifying paying a high premium.

Price is also a reason why people do not buy organic. In surveys, 56% of consumers say that price is the reason why they do not buy organic foods (McEachern and Willock, 2004). Price premiums also affect the market demand for cage-free eggs. Sumner et al., (2008) estimated that

due to new regulations from Prop 2, prices for cage-free eggs in California will rise by 20% due to higher production costs. Allender and Richards (2010) observed that with the 20% increase in California 2007-2008 egg prices, that 79.37% of their sample would not be willing to buy cage-free eggs. However, there are obviously consumers willing to pay the high premiums. Baltzer's (2004) estimated that consumers were "willing to pay 43% more for barn eggs, 15% more for free range eggs, 58% more for organic eggs and 28% more for pasteurized eggs" when compared to eggs from a battery cage (caged system)(p.85). Similarly, Allender and Richards (2010) found that only 20.63% of their sample in California would buy cage-free eggs and within this sample the willingness to pay for cage-free eggs was $0.524 / dozen. In a different study, Chang, Lusk, and Norwood (2011) found that consumers who bought cage-free eggs only had a willingness to pay a premium of $0.95 / dozen for cage-free eggs. Similarly, Asselin (2005) observed that the most health conscious consumers were only willing to pay a premium of $0.72 / dozen for omega-3 eggs.

There has been some prior research on the effects of in-store displays on organic food sales. Reicks, Splett, and Fishman (1999) placed point-of-purchase (POP) signage in front of 14 different organic food products in upscale and discount grocery stores. This particular study had three treatments: no signage, moderate level of signage, and high level of signage. The moderate level of signage placed shelf labels and 3 by 5-inch card that defined organic, by 10 of the organic items with the Midwest Organic Alliance logo. In addition, a brochure on organic foods was placed in the front of the store in a plastic brochure box. High level of signage had shelf labels for all organic products, 3 by 5-inch organic definition cards were placed by 14 organic items, 4 by 8-inch Earth Friendly Organic logo signs were placed around the stores, and there were 5 to 7 organic brochure boxes placed throughout the store. The signage was displayed for a total of six weeks. The study revealed that stores that had organic signs reported having more sales in organic foods than stores that had no signs (Reicks, Splett, and Fishman, 1999). In addition, signs were the most effective with skim milk, butter, eggs, and carrots (Reicks, Splett, and Fishman, 1999).

CHAPTER III

CONCEPTUAL FRAMEWORK

The first hypothesis is that the total egg sales will increase when the signs are introduced. One reason why total egg sales are hypothesized to increase is that the displayed signs will garner attention and serve as a reminder to buy eggs.

The second hypothesis is there will be an increase in market share for organic and cage-free eggs as a result of signs being displayed. The signs inform consumers about egg options by stating the difference in hen housing between caged, cage-free, and organic eggs, which prior research suggests many people do not understand. The use of organic informative signs can simplify the decision making process for those who are aware and provide knowledge for those who are unaware (Reicks, Splett, and Fishman, 1999). In addition, previous literature suggests the signs will attract more consumers who are concerned with food safety, have children, and are less cost conscious (Hughner et al., 2007; Reicks, Splett, and Fishman, 1999; and Loureiro, McCluskey, and Mittelhammer, 2001). By providing such informative knowledge about eggs, it is believed that it will have the same effect thus increasing market share in organic and cage-free eggs.

The third hypothesis is the overall revenues and gross margins in eggs will increase as a result of the introduction of signage. Logically, when there is an increase in sales of eggs, then there will be an increase in revenues. Assuming eggs are not sold as loss-leaders, gross margins and profit may increase too, particularly if consumers substitute toward higher-priced, higher margin egg options.

CHAPTER IV

STUDY 1

Methods and Procedures:

The first study was conducted in Store 1, an independently owned grocery store in Stillwater Oklahoma. Stillwater's population is about 46,000 however the actual population is larger due to the 23,000 students at Oklahoma State University. Consumer's IGA is located in close proximity to the University and is centrally located in Stillwater. The median household income of the area is $30,133. In addition to Store 1 there are three other supermarkets in town.

The experiment design consisted of two weeks of no signage (control 1), two weeks of signage (treatment), and two weeks of no signage (control 2), totaling six weeks. During the six weeks, daily prices and quantities sold of all the eggs were collected. There were a total of 15 different types of eggs available, two of those were cage-free and one was organic. An outline of this study can be seen in figure 1.

During the control 1 phase, signs were not displayed for two weeks and prices were recorded daily to compare against the stores weekly price sheets to control for undisclosed sales. Store 1 was asked to hold prices constant throughout the study period and to have no promotions, but they did not completely comply with the request. As a result, scanner data was augmented with our daily observations to note the occurrence of promotions.

Then by using the econometric model discussed later in this section, we controlled for promotions and price changes.

During the treatment phase the signs were displayed in the egg aisle. There was both a stick out display and shelf labels identifying the type of eggs (see figures 2 and 3). The stick out display revealed detailed information about the difference in housing methods between organic, cage-free, and caged eggs. Specifically, organic eggs are laid by hens that have access to the outdoors, are free to move, and have the ability to express natural behaviors. Cage-free hens are typically housed in barns with about a 200 square inch area per bird, do not have outdoor access but do have the ability to move and express natural behaviors. Caged hens are typically housed in systems with about 67 square inch per bird in wire cages where they do not have access to the outdoors, their movement is limited, and are unable exhibit natural behaviors. Thus, organic eggs were labeled green with the statements “Hens have access to the outdoors and are free to move and stretch their wings”. Cage-Free eggs were labeled yellow with the statement “Free to move and stretch their wings”. Caged eggs were labeled white with the statements “Hens have little room to move and are not able to stretch their wings”. In addition, the shelf labels were colored accordingly and identified the type of egg.

In the control 2 phase, displays were taken down and personal daily recording of prices were conducted for two additional weeks

Finally, an in store survey was conducted. The survey consisted of 13 questions and was administered to 50 Store 1 customers over a five day period. The purpose of the survey was to obtain stated preferences for egg characteristics and to determine whether consumers noticed the displays. To identify whether the customer really saw the sign that was displayed, the survey posed a quiz. Respondents were asked which of 3 versions of the signs were actually displayed. Two of the options were decoys and one was the actual sign displayed (see figure 4).

In addition to reporting summary statistics, demand models are estimated to control for fluctuating prices, promotions, and day-of-the-week. To model demand for different egg types, we followed the random utility approach as in Besanko (1998). Each individual *i* chooses between *n* egg types or decides not to purchase. Let the utility derived from option *j* and person *i* on day *t* be:

$$(1)\quad U_{ijt} = \beta_{0j} + \beta_{1j}W_{jt} + \beta_{2j}S_{jt} + \alpha P_{jt} + \mathcal{E}_{jt} + \epsilon_{ijt}$$

Where W_{jt} and S_{jt} are dummy variables taking the value of 1 if time *t* is a weekend or a period in which signs are displayed, respectively, β_{1j} and β_{2j} are coefficients indicating the effects of weekends and signs on egg type *j*, P_{jt} is the price of option *j* at time *t*, α is the marginal utility of price, β_{0j} is an alternative specific constant that indicates the preference for egg type *j*; $\mathcal{E}_{jt}$ is an mean utility that consumers receives from unobservable attributes, which is assumed to be normally distributed, and ϵ_{ijt} is the overall error term. Consumers are assumed to choose the egg type *j* that generates the highest utility.

If the ϵ_{ijt} are distributed type I extreme value, then the multinomial logit model results. In particular, the share of purchases attributable to egg type *j*, is given by:

$$(2)\quad S_{jt} = \frac{e^{(\beta_{0j} + \beta_{1j}W_{jt} + \beta_{2j}S_{jt} + \alpha P_{jt} + \varepsilon_{jt})}}{\sum_{k=1}^{n} e^{(\beta_{0k} + \beta_{1k}W_{kt} + \beta_{2k}S_{kt} + \alpha P_{kt} + \varepsilon_{kt})} + 1}, \; j=1,\ldots I.$$

In this equation, the utility of the outside "no purchase" option has been normalized to zero for identification purposes.[1] Because of the existence of the random term, $\mathcal{E}_{jt}$, in the above probability equation, the parameters cannot be estimated via conventional maximum likelihood techniques. Fortunately, equation (2) can be manipulated to produce a much more convenient form for estimation. In particular, taking the natural log of equation (2) produces the following:

[1] The outside share is not directly observed. We calculated the value by finding the daily maximum number of eggs bought in any day during our sample period and increased the amount by 20%. The quantity of outside "no purchase" choices were calculated as the difference between this "20% more than the maximum observed value" and the actual quantity of sales observed. A somewhat related approach was taken by Besanko (1998), Nevo (2001), and others who have used related modeling approaches.

(3) $\ln(S_{jt}) = \beta_{0j} + \beta_{1j}W_{jt} + \beta_{2j}S_{jt} + \alpha P_{jt} + \varepsilon_{jt} - ln(\sum_{k=1}^{n} e^{(\beta_{0k} + \beta_{1k}W_{kt} + \beta_{2k}S_{kt} + \alpha P_{kt} + \varepsilon_{kt})} + 1)$.

Given the preceding normalization, the expression for the outside option is:

(4) $\ln(S_{0t}) = \ln(1) - ln(\sum_{i=1}^{n} e^{(\beta_{0j} + \beta_{1j}W_{jt} + \beta_{2j}S_{jt} + \alpha P_{jt} + \varepsilon_{jt})} + 1)$.

Thus, taking the difference in these two expressions yields a series of linear equations. Noting that ln(1)=0, the difference in share between an egg option *j* and the outside option is:

(5) $\ln(S_{jt}) - \ln(S_{0t}) = \beta_{0j} + \beta_{1j}W_{jt} + \beta_{2j}S_{jt} + \alpha P_{jt} + \varepsilon_{jt}$, .

This conversion produces a system of *n* linear equations that can be estimated by seemingly-unrelated regression procedures.

To determine the effect of signage on market share for organic, cage-free, and caged hen eggs, one can analyze simple summary statistics; however, these will not control for variations in prices and promotion in the treatment and control periods. To address these issues, the estimates from equation (5) can be used to estimate the market share of when the signs were displayed and when the signs were not displayed were compared. This was done by plugging the estimated coefficients back into equation (2).

The average revenue per day was found by multiplying the weighted average price of each egg type by the predicted daily quantity of each type sold. The gross margin per day was found by multiplying the predicted daily quantity sold by the difference in the weighted average price of each type by the weighted average wholesale cost of each type.

Results

Summary Statistics

Forty-five days of data were collected from Store 1. Due to software failures at Store 1, five days of scanner data were missing. Additionally, the store stopped providing us data after 6 days of control 2. Therefore, the analysis relies on forty days of data: control 1 phase represents

22 days, the treatment phase represents 12 days, and the control 2 phase represents 6 days. The additional days in control 1 were added to compensate for the data loss during the treatment phase and control 2 phase.

Table 1 reports the average daily quantity sold the percent change in quantities between the treatment and controls, and total sales. There were only 3 egg types that decreased quantity sold during the treatment phase relative to control 1: Best Choice dozen jumbo eggs, Eggland extra-large eggs, and Clearly Organic eggs. Similarly, there were only 3 eggs that increased in quantity sold moving from the treatment to the control 2 phase: Best Choice dozen medium eggs, Eggland extra-large eggs, and Clearly Organic eggs. The egg types that had the highest percent change in quantity between control 1 and the treatment phase was Land-O-Lakes large omega-3 eggs with an 188% increase, Best Choice extra-large cage-free egg with 122% change, and Land-O-Lakes brown eggs with an 83% change. The largest percent change between control 2 and the treatment phase was Eggland large brown cage-free eggs with a 200% increase, Eggland large eggs 1.5 dozen with 188% increase, and Land-O-Lakes large omega-3 eggs with a 120% increase, all increases due to introduction of signage. The only percent change that was statistically significant was for Land-O-Lakes large omega-3 eggs and Best Choice extra-large cage-free egg. When solely observing the two cage-free varieties there was an increase in the average daily quantities from the control 1 phase to the treatment phase and a decrease in average daily quantities from the treatment phase to the control 2 phase. In other words, when signs were displayed, the average daily quantity sold of cage-free eggs increased and when signs were taken down the average daily quantity sold decreased. However, organic eggs responded in the opposite way.

The sales data in table 1 were aggregated into three types of eggs and using the raw data the raw market share was calculated (see table 2). The vast majority of eggs sold at Store 1 are caged eggs. Cage-free market share increased from 3.4% to 4.6%, a 66.7% increase when signs were displayed. Interestingly, however, market share for organic eggs fell by .08% when signs

were displayed. Between the two varieties of cage-free eggs, the lower priced cage-free variety (Best Choice extra-large cage-free) had the largest increase in market share.

Although these summary statistics are useful, they are potentially misleading because they do not account for the fact that grocery store managers decided to lower the prices of several alternatives during the treatment phase period and that the data in the above table do not control for the fact that there are more weekends in the first control period than in the treatment period.

Model Results

For the econometric model, instead of using all 15 different egg options, for parsimony, the eggs types were aggregated into six categories (see full list of the 15 different egg options see table 3).

Table 4 reports the estimation results. The price effect was significant and negative as expected. Weekends had a statistically significant positive effect on demand for all egg types besides cage-free. Weekends had the greatest effect on organic and caged larger than a dozen categories. The introduction of signage (relative to control 1 and control 2) had a statistically significant effect on caged half-dozen, cage-free, and brown categories. Organic egg sales were not significantly affected by signs.

The estimates in table 4 can be used to calculate market shares by plugging the coefficients values back into the equation (2). In the calculations, we assigned the weekend variable a value of .29 (because 2/7=0.29 days of the week are weekends on average) and used the sample average weighted price for each category. The market shares were first calculated assuming with the “signs displayed” variable equal to 1 and then 0. Table 5 reports the estimates. All of the caged, cage-free and brown categories are estimates that increased in market share when the signs were displayed. Organic categories market share remained virtually unchanged. In addition to the egg categories a “no purchase” category was added to represent the estimated frequency of customers who did not buy eggs. As it can be seen, when the signs were displayed

the market share of customers who did not buy eggs decreased (i.e., the signs caused an increase in egg sales).

The market shares calculated in table 5 can be used to simulate revenue and gross margins (see table 6). Average revenues per day increased for all varieties accept organic. Caged larger than a dozen, caged dozen, and brown varieties experienced the largest increase in average revenue per day when the signs were displayed. Average per day gross margins summed across all egg types without the signs was $8.95 and increased to $10.71 when signs were displayed. Organic variety and caged larger than dozen varieties experienced a loss in gross margin when the signs were displayed.

Survey Results

An in-person survey was distributed at Store 1 for a period of 5 days and 50 responses were obtained. Fifty-two percent of respondents were male and 60% were between 18 and 35 years of age. Fifty percent of the respondents obtained a high school degree and the other 50% of respondents had a bachelor's degree or higher. Forty-eight percent of respondents were university students and the other 52% were non-students.

When asked what was the first thing respondents considered when shopping for eggs, 32% of respondents considered carton size, 30% considered price, 16% considered egg size, 10% considered type of hen housing, 8% considered the brand, and 4% considered the color. Of the respondents, 68% said they bought caged eggs, 22% said they bought cage-free eggs, and 12% said they bought organic. Clearly, the percentage of people who said they bought cage-free and organic drastically exceeds the actual market shares (see table 2), suggesting consumers either do not know what they buy, misrepresented what they bought, or that our survey sample is not representative of egg shoppers in the store. Seventy-two percent of customers said they bought a dozen (12 eggs), 14% bought 1.5 dozen (18 eggs), 12% bought half-dozen (6 eggs), and 2% bought 2.5 dozen (30 eggs).

When asked what the highest premium respondents were willing to pay for a dozen cage-free eggs, 26% of the respondents picked the highest price range, $1.26 to $1.50. The next highest premium respondents were willing to pay was between $0.51 to $1.00 and zero dollars. Respondents answered that when buying eggs the consideration of the welfare of the hens was somewhat important to them. In addition, respondents rated themselves higher in caring for the welfare of the hen when compared to other shoppers.

The egg displays were not memorable to the customers. When customers were asked to pick out which sign was displayed in the egg aisle only 1 person out of 50 answered correctly. Eighty-six percent of respondents answered the question by indicating that they did not see a sign.

CHAPTER V

STUDY 2

To determine the extent to which the results from study 1 were robust and generalizable, we moved to a different store in a different city and repeated the experiment.

Methods and Procedures

For study 2, informative displays were set up in Store 2 in Sand Springs Oklahoma. Sand Springs' population is about 19,000 and has a median household income of $52,791. Store 2's location is in a suburb of Tulsa, Oklahoma. Store 2 was newer and relatively more "high end" than Store 1. In addition to Store 2, there are 4 other grocery supermarkets closely located around Store 2.

Store 2 had a total of 19 different types of eggs available, of those two were cage-free and two were organic. The experiment design for study 2 was similar to that of study 1 (see figure 1). Store 2 collected much more detailed scanner data including promotional items and price discounts, eliminating the need for the authors to make daily price observations. An important difference in Store 2 is that eggs in this location were displayed in refrigerator cases with glass doors. Thus, instead of the stick out displays being attached to the aisle shelves, the signs were affixed to the glass doors (see figure 5) and the shelf labels identifying the type of eggs were used the same way as in study 1 (see figure 6). The data was analyzed in the same way as in study 1.

Results

Summary Statistics

Forty-two days of data were collected from Store 2. Control 1, treatment, and control 2 phases represent 14 days of data each. During the 42 days, Store 2 had 99,848 shoppers and 10% of those shoppers bought eggs.

Table 7 reports the average daily quantity sold and the percent change in quantities between the treatment and controls. Seven out of 19 egg varieties decreased in quantity sold during the treatment phase relative to control 1, including one cage-free and organic variety. In comparison, eight of the 19 egg varieties decreased in quantity sold, including both organic and one cage-free variety, when moving from the treatment to the control 2 phase. The only statistically significant change between the treatment and control 1 was Best Choice dozen medium eggs with a 38.86% change and Best Choice extra-large cage-free eggs with a 3.57% change. In addition, these two varieties also had the highest percent change in quantity between control 1 and treatment phase with a 629% change and 143% change (respectively). However, the only statistically significant change between the treatment and control 2 phase was Best Choice large eggs with a 22.43% change and Best Choice extra-large cage-free eggs with a 2.34% change. Also, these two varieties where in the top three of the highest percentage changes in quantity with a 70% change, and a 63% change (respectively). When solely looking at the 2 cage-free and 2 organic varieties the average daily quantities from the control 1 phase to the treatment phase increased for the cheaper option of cage-free eggs (Best Choice extra-large cage-free) and the more expensive option of organic eggs (Clearly Organic). Table 8 shows the change in aggregated market share between organic, cage-free, and caged eggs. The majority of eggs sold at Store 2 are caged eggs, however the market share of organic eggs is higher than store 1. The data reveals minimal change as a result of signage.

Model Results

Table 10 reports the logit demand estimates. These estimates include an additional variable added to control for a promotional deal offered by store 2 for 7 days of the experiment. This promotional deal was called 10 for 10 which meant that there were a handful items that were preselected, including option 3, and when you bought 10 of any of these marked down items each item was a $1.00 (even at this discount store 2 was still had a 12% gross margin on option 3). Instead of using all 19 different egg options, sales were aggregated into six categories (see full list of the 19 different egg options see table 9).

Estimates indicate that demand for most egg types (except caged larger than a dozen) was significantly higher on weekends (see table 10). The cage-free and organic categories were positively impacted the most by weekends. When the signs were displayed, it had negative impact on demand for half-dozen caged eggs, larger than a dozen caged eggs, and brown eggs. However, signage had a positive effect on dozen caged eggs, cage-free, and organic categories. When the promotional deal was present it had a positive effect on the caged dozen and brown categories.

Similarly, to study 1, the market shares were calculated by plugging the coefficient values back into the utility equation (2). Table 11 shows the change in market share from when the signs were not displayed and were displayed. Only the caged dozen categories saw a substantive increase in market share while the signs were displayed. The rest of the caged and brown categories saw a slight decrease in market share. The cage-free and organic categories market share remained relatively constant when signs were introduced. When the signs were displayed the market share of customers who did not buy eggs decreased. Like study 1, when the signs were displayed the market share of customers who did not buy eggs decreased (i.e., the signs caused an increased in egg sales).

Average revenue per day and gross margins per day were found the same way as in Study 1 (see table 12). Revenues per day increased for only caged dozen varieties and the cage-free

variety when the signs were displayed. Total per day gross margins increased from a total of $94.92 to $97.80 per day when signs were displayed.

Survey Results

A survey was administered in Store 2 after the study period. Sixty-three complete responses were obtained. Fifty-six percent of the respondents were female and 38% were between 45 and 54 years of age. Fifty-four percent of respondents had a bachelor's degree or higher and the other 46% had as their highest education level obtained a high school degree.

When asked what was the first thing respondents considered when shopping for eggs; 32% of respondents considered egg size, 17% considered price, 16% considered color, 13% considered type of hen housing, 11% considered brand, and 11% considered carton size. Of the respondents, 57% bought caged eggs, 35% bought cage-free eggs, and 8% bought organic. Seventy-five percent of customers bought a dozen (12 eggs), 22% bought 1.5 dozen (18 eggs), and 3% bought a half-a-dozen (6 eggs). Thus, the most common purchase for customers were a dozen caged eggs.

When asked what the highest premium respondents were willing to pay for a dozen cage-free eggs, 41% of the respondents picked the highest premium price range, $1.26 to $1.50. Seventy percent of the customers had a stated willingness to pay premium that was between $0.51 and $1.50 and the other 30% of the customers only had a willingness to pay premium between $0 and $0.50. Thus, a majority of customers at Store 2 said they placed a higher value on the welfare of the hen. When buying eggs respondents answered that the consideration of the welfare of hens was very important to them. Also, most respondents rated other customer's importance of hen welfare lower than their own.

The egg displays did not seem to be memorable to the customers. Only 8% of respondents picked the correct sign when asked to pick out which sign was displayed in the egg aisle. Ninety percent of respondents did not remember seeing a sign displayed and 2% answered incorrectly.

CHAPTER V

DISCUSSION

Results from both studies suggest that the introduction of signage about hen laying conditions had a small overall positive effect on egg sales and increased revenue and gross margin to the egg case. However, the signs had only a modest or null effect in terms of shifting demand toward cage-free egg sales. Neither study found that organic egg sales were significantly increased by the signage. Thus, it appears that the signs primarily served to attract attention to the egg cases and served as a generic reminder for customers to buy eggs.

In Study 1, the signs had significant positive effects on the caged half-a-dozen category. The high population of limited-income college students in this location might partially explain this result. An interesting finding was that sales of brown eggs in study 1 positively responded to signage. Although signs clearly indicated which options were caged and which were not, it is possible that consumers were confused about this issue and thought that all brown eggs were cage-free. Anecdotally, conversations with survey takers revealed significant lack of knowledge about which egg types were cage-free and which were not.

Surprisingly, organic egg sales were only slightly affected by the signage and not at a level that reached statistical significance. One reason may be that organic eggs were priced significantly higher than competing alternatives.

At this price point, organic eggs may only appeal to a small segment of shoppers, and signage information may have been insufficient to overcome the much higher price. Further support for this interpretation can be found by looking at detailed data from study 1.

Of the two types of cage-free eggs available, signage had the largest effect on the lowest-priced cage-free egg option. One cage-free egg type was priced at $2.25/carton and the other was priced at $3.25/carton; raw summary statistics show that signage increased the sales of the former by 183% but the later by only 18%. Thus, signage appears to be most effective at increasing sales of the lowest-priced cage-free or organic alternative. Overall, these findings suggest an important interplay between the effectiveness of point-of-purchase signage and the prices of cage-free and organic alternatives relative to conventional cage eggs.

Similarly, in study 2, cage-free had a larger increase in demand compared to organic when the signs were displayed, signifying consumers may want to support good welfare for the hen without it being a large expense to them.

Overall, these findings suggest an important interplay between the effectiveness of point-of-purchase signage and the prices of cage-free and organic alternatives relative to conventional caged eggs. The fact that post-experiment surveys revealed that only a tiny fraction of shoppers correctly recalled seeing the signage suggests that even if signage can cause a short bump in egg sales, they appear unlikely to have lasting demand effects.

REFERENCES

Allender, W.J., and T.J. Richards. 2010. "Consumer Impact of Animal Welfare Regulation in the California Poultry Industry." Journal of Agricultural and Resource Economics. 35.3: 424-442.

Anderson, K.E. 2011. "Comparison of fatty acid, cholesterol, and vitamin A and E composition in eggs from hens housed in conventional cage and range production facilities." Poultry Science 90.7: 1600-1608.

Appleby, M.C. 2003. "The European Union ban on conventional cages for laying hens: History and prospects." Journal of Applied Animal Welfare Science 6.2: 103-121.

Asselin, A.M. 2005. “Eggcentric Behavior—Consumer Characteristics That Demonstrate Greater Willingness to Pay for Functionality”. American Journal of Agricultural Economics. 87.5:1339-1344.

Baltzer, K. 2004.“Consumers’ willingness to pay for food quality–the case of eggs”.. Food Economics-Acta Agriculturae Scandinavica, Section C, 1.2:78-90.

Berning,J.P., H.H. Chouinard, and J.J. McCluskey.2008. “Consumer preferences for detailed versus summary formats of nutrition information on grocery store shelf labels”. Journal of Agricultural & Food Industrial Organization. 6.1:1-20

Besanko, D., S. Gupta, and D. Jain. 1998. "Logit demand estimation under competitive pricing behavior: An equilibrium framework." Management Science 44.11.1: 1533-1547.

Chang, J.B., J.L. Lusk, and F.B. Norwood. 2011. “The price of happy hens: A hedonic analysis of retail egg prices.” Journal of Agricultural and Resource Economics. 35.3:406-423.

Charles, D. “What The Rise Of Cage-Free Eggs Means For Chickens” 2013. Online. Available at. http://www.npr.org/blogs/thesalt/2013/06/27/195639341/what-the-rise-of-cage-free-eggs-means-for-chickens [Last accessed November 20, 2013.]

Debry, B.M. and A.S. Levy. 2001. “Do food labels work?”. In Bloom, P.N., Gundlach, G.T. Handbook of Marketing and Society.Sage, Thousands Oak, CA, pp.372-398

Dimitri, C. and C.Green. 2000. “Recent growth patterns in the US organic foods market”. USDA economic Research Service Agriculture information bulletin. 777:1-21

Feinstein,D. “Feinstein Bill Sets National Standard for Egg Industry” 2013. Online. Available at http://www.feinstein.senate.gov/public/index.cfm/press-releases?ID=fdf4f2eb-5ff2-467a-a4c8-b9e1fd63880e [Last accessed October 24, 2013].

Hidalog, A., M.Rossi, F.Clerici, and S. Ratti. 2008. “A market study on quality characteristics of eggs from different housing systems.” Food chemistry. 106.3:1031-1038

Hughner, R.S., P. McDonagh, A. Prothero, C.J. Shultz II, and J. Stanton. 2007. "Who are organic food consumers? A compilation and review of why people purchase organic food." Journal of Consumer Behavior. 94-110

Johnston, N.P., L.K. Jefferies, B. Rodriguez, and D.E Johnston. 2011. “Acceptance of brown-shelled eggs in a white-shelled egg market”. Poultry Science. 90.5:1074-1079.

Kopperud, S. “A not-too-rosy outlook for the UEP-HSUS egg bill” 2013. Online. Available at http://brownfieldagnews.com/2013/05/10/a-not-too-rosy-outlook-for-the-uep-hsus-egg-bill/. [Last accessed October 23, 2013].

Loureiro,M.L., J.J.McCluskey and R.C. Mittelhammer. 2001. “Assessing consumer preferences for organic, eco-labeled, and regular apples”. Journal of Agricultural and Resource Economics. 404-416.

Lu,Y., and J.Cranfield. 2013. "Consumer Preference for Eggs from Enhanced Animal Welfare Production System: A Stated Choice Analysis." Paper presented at AAEA and CAES joint annual meeting, Washington, DC, 4-6 August

Lusk, J. L. 2010. "The effect of proposition 2 on the demand for eggs in California." Journal of Agricultural & Food Industrial Organization. 8.1.

Lusk, J. L. 2011. "External validity of the food values scale”. Food Quality and Preference 22.5 452-462.

Lusk,J.L. 2013. “Consumer Information and Labeling” In Armbruster, W.J. and R.D. Knutson, eds. Us Programs Affecting Food and Agricultural Marketing. pp. 349-373.

Lusk, J.L., and F.B.Norwood. 2010. "Direct versus indirect questioning: an application to the well-being of farm animals." Social indicators research 96.3: 551-565.

McEachern, M.G., and J.Willock. 2004. “Producers and consumers of organic meat: A focus on attitudes and motivations”. British Food Journal. 106.7:534-552.

Nevo, A. 2001."Measuring market power in the ready-to-eat cereal industry."Econometrica 69.2: 307-342.

Norwood, F.B., and J.L. Lusk. 2011. “A calibrated auction-conjoint valuation method: Valuing pork and eggs produced under differing animal welfare conditions.” Journal of Environmental Economics and Management. 62:80-94

Oberholtzer, L., C. Greene, and E. Lopez. “Organic Poultry and Eggs Capture High Price Premiums and Growing Share of Specialty Markets.” USDA/Economic Research Service Outlook Report No. LDP-M-150-01, Washington, DC, 2006. Available at http://usda01.library.cornell.edu/usda/ers/LDP-M/2000s/2006/LDP-M-12-27-2006_Special_Report.pdf [Last accessed February 25,2013]

Organic Trade Association “Organic Agriculture and Production,” 2013. Online. Available at. http://www.organicnewsroom.com/2012/04/us_consumerdriven_organic_mark.html [Last accessed March 12, 2013.]

Organic Trade Association “U.S. Organic Industry Overview” 2013. Online. Available at http://www.ota.com/pics/documents/2011OrganicIndustrySurvey.pdf. [Last accessed February 25, 2013.]

Padel, S. and C. Foster. 2005. “Exploring the gap between attiduted and behavior: Understanding the why cosnumers buy or do not buy organic food”. British Food Journal. 107.8:606-625

Patterson, P.H., K.W. Koelkebeck, D.D. Bell, J.B. Carey, K.E. Anderson, and M.J. Darre. 2001. “Egg marketing in national supermarkets: specialty egg—part 2.” Poultry Science. 80.4:390-395

Prickett, R.W., F.B Norwood, and J.L. Lusk. 2010 "Consumer preferences for farm animal welfare: results from a telephone survey of US households." Animal Welfare 19.3: 335-347.

Reicks, M., P. Splett, and A. Fishman. 1999. “Shelf labeling of organic foods: customer response in Minnesota grocery stores.” Journal of Food Distribution Research. 30:11-23

Richards, T.J., W.J. Allender, D.Fang, and M.Doyon. (2011) "Media Advertising and Ballot Initiatives: An Experimental Analysis." Paper presented at the AAEA and NAREA joint annual meeting, Pittsburgh PA, 24-26 July.

Savory, C. J. 2004. "Laying hen welfare standards: a classic case of power to the people." Animal Welfare. 13:153-158.

Schuldt, J.P., and N. Schwarz. 2010. "The “organic” path to obesity? Organic claims influence calorie judgments and exercise recommendations." Judgment and Decision Making 5.3 : 144-150.

Singh,R., K.M. Cheng, and F.G. Silversides. 2009. “Production performance and egg quality of four strains of laying hens kept in conventional cages and floor pens.” Poultry Science. 88.2:256-264.

Sumner, D.A., H. Gow, D. Hayes, W. Matthew, B. Norwood, J.T. Rosen-Molina, and W. Thurman. 2011. “Economic and market issues on the sustainability of egg production in the United States: Analysis of alternative production systems”. Poultry Science. 90.1:241-250.

Sumner, D.A., J.T. Rosen-Molina, W.A. Matthews, J.A. Mench, and K.R. Richter. 2008. “Economic effects of proposed restrictions on egg-laying hen housing in California.” University of California Agricultural Issues Center.

Wall, H., R. Tauson, and S. Sorgjerd. 2008. "Bacterial contamination of eggshells in furnished and conventional cages." The Journal of Applied Poultry Research. 17.1:11-16.

Wyant, S. “Livestock groups equate HSUS/UEP bill to government takeover of farms.” 2013. Online Available at http://www.agripulse.com/HSUS_UEP_legislation_012312.asp.[Last accessed October 24, 2013]

Zanoli, R., and S, Naspetti. 2002. “Consumer motivations in the purchase of organic food: a means-end approach”. British Food Journal. 104.8:643-653.

APPENDICES

Tables

Table 1: Changes in Average Daily Quantity Sold

	Average Daily Quantity during Control 1	Average Daily Quantity during Treatment	Average Daily Quantity during Control 2	Change between Treatment and Control 1	Change between Treatment and Control 2	Percent Change between Control 1 and Treatment	Percent Change between Control 2 and Treatment
Best Choice							
Grade A Large egg 0.5 doz	5.36	7.67	5.33	2.30	2.33	0.43	0.44
Grade A Large egg	24.77	27.58	18.00	2.81	9.58*	0.11	0.53
Grade A Jumbo egg	4.59	4.50	4.50	-0.09	0.00	-0.02	0.00
Grade A Extra-Large egg	8.32	9.33	6.00	1.02	3.33	0.12	0.56
Grade A Medium egg	8.73	10.17	12.50	1.44	-2.33	0.16	-0.19
Grade A egg 1.5 doz	23.14	26.50	25.67	3.36	0.83	0.15	0.03
Grade A Large Brown egg	3.91	4.92	3.33	1.01	1.58	0.26	0.48
Grade A Large egg 2.5 doz	4.18	7.42	6.17	3.23*	1.25	0.77	0.20
Extra-Large cage-free egg	1.50	3.33	1.67	1.83*	1.67	1.22	1.00
Clearly Organic							
Organic Extra-Large egg	2.45	2.00	2.50	-0.45	-0.50	-0.19	-0.20
Eggland							
Large egg 1.5 doz	1.64	1.92	0.67	0.28	1.25	0.17	1.88
Large Brown cage-free egg	1.82	2.00	0.67	0.18	1.33	0.10	2.00
Extra-Large Egg	3.86	2.58	3.17	-1.28*	-0.58	-0.33	-0.18
Land-O-Lakes							
Large Omega-3 egg	0.64	1.83	0.83	1.20*	1.00*	1.88	1.20
National Large brown egg	1.95	3.58	2.67	1.63	0.92	0.83	0.34
Total Sales	96.86	115.33	93.67				
	n=22	*n=12*	*n=6*				

Doz-Dozen

**= Change is significant at a %5 level*

Table 2: Total Quantity Market Share by Type

	Caged	Cage-free	Organic
Control 1	0.934	0.034	0.025
Treatment	0.921	0.046	0.017
Control 2	0.940	0.025	0.027
Total	0.930	0.037	0.023

Table 3: List of all varieties at Store 1

Option	Brand	Egg per Carton	Size	Color	Hen Housing
1	Best Choice	6	Large	White	Cage
2	Best Choice	12	Large	White	Cage
3	Best Choice	12	Jumbo	White	Cage
4	Best Choice	12	Extra-Large	White	Cage
5	Best Choice	12	Medium	White	Cage
6	Best Choice	18	Large	White	Cage
7	Best Choice	12	Large	Brown	Cage
8	Best Choice	30	Large	White	Cage
9	Best Choice	12	Extra-Large	White	Cage-free
10	Eggland	18	Large	White	Cage
11	Eggland	12	Large	Brown	Cage-free
12	Eggland	12	Extra-Large	White	Cage
13	Land-O-Lakes	12	Large	White	Cage
14	Land-O-Lakes	12	Large	Brown	Cage
15	Clearly Organic	12	Extra-Large	White	Organic

The categories included: caged half-a-dozen (option1), caged dozen (option 2, 3, 4, 5, and 12), caged larger than a dozen (option 6, 8, and10), brown (option 7 and 14), cage-free (option 9 and 11), and organic (option 15)

Table 4: Logit Demand Estimates (Seemingly Unrelated Regression)

Parameters	**Alternative Specific Constant** Estimate (Standard Error)	**Weekend** Estimate (Standard Error)	**Signs Displayed** Estimate (Standard Error)	**Price** Estimate (Standard Error)
Caged Half-dozen	-2.723* (0.199)	0.413*** (0.215)	0.517** (0.220)	-0.422** (0.138)
Caged Dozen	-0.116 (0.260)	0.341** (0.156)	0.200 (0.163)	-0.422** (0.138)
Caged Larger than a Dozen	-0.248 (0.393)	0.446** (0.185)	0.203 (0.194)	-0.422** (0.138)
Brown	-2.177* (0.335)	0.407*** (0.234)	0.463*** (0.242)	-0.422** (0.138)
Cage-free	-2.303* (0.418)	-0.037 (0.252)	0.481*** (0.258)	-0.422** (0.138)
Organic	-2.351** (0.561)	0.446*** (0.256)	0.099 (0.262)	-0.422** (0.138)

*Is significant at 0.01 level ** Is significant at 0.05 level *** Is significant at a 0.1 level

The R-Square values for the parameter are as follows: caged half-dozen 0.2127, caged dozen 0.1269, caged larger than a dozen 0.2325, brown 0.1593, cage-free 0.1542, and organic 0.0800.

Table 5: Market Share Predictions from demand model

	Market Share	
	Without Signs	**With Signs**
Caged Half-a-dozen	2.5%	3.8%
Caged Dozen	25.7%	27.6%
Caged Larger than a Dozen	16.0%	17.3%
Brown	2.8%	3.9%
Cage-free	1.7%	2.4%
Organic	1.3%	1.2%
No Purchase	50.0%	43.9%

Table 6: Average Revenue and Gross Margin per Day

	Without Signs		With Signs	
	Average Revenue per day ($)	**Gross Margin per day ($)**	**Average Revenue per day ($)**	**Gross Margin per day ($)**
Caged Half-a-dozen	3.57	0.97	5.26	1.44
Caged Dozen	62.81	8.40	67.41	9.02
Caged Larger than a Dozen	61.56	-3.16	66.23	-3.40
Brown	8.70	0.96	12.14	1.34
Cage-free	6.85	1.31	9.73	1.86
Organic	6.95	0.48	6.74	0.46
No Purchase	0.00	0.00	0.00	0.00
Total		8.95		10.71

Table 7: Changes in Average Daily Quantity Sold

	Average Quantity during Control 1	Average Quantity during Treatment	Average Quantity during Control 2	Change between Treatment and Control 1	Change between Treatment and Control 2	Percent Change between Control 1 and Treatment	Percent Change between Control 2 and Treatment
Best Choice							
Grade A Large egg 5 doz	0.36	0.50	0.57	0.14	-0.07	0.40	-0.13
Grade A Large egg 0.5 doz	6.00	6.71	6.64	0.71	0.07	0.12	0.01
Grade A Medium egg	5.86	42.71	20.64	36.86*	22.07	6.29	1.07
Grade A Jumbo egg	13.57	16.00	17.71	2.43	-1.71	0.18	-0.10
Grade A Large Brown egg	6.07	5.21	5.29	-0.86	-0.07	-0.14	-0.01
Grade A Medium egg 1.5 doz	3.36	3.21	4.79	-0.14	-1.57	-0.04	-0.33
Large eggs 2.5 doz	3.14	3.79	4.43	0.64	-0.64	0.20	-0.15
Extra-Large Cage-free egg	2.50	6.07	3.71	3.57*	2.36*	1.43	0.63
Grade A Large egg	44.14	54.50	31.50	10.36	23.00*	0.23	0.73
Grade A Large egg 1.5 doz	18.43	19.93	21.71	1.50	-1.79	0.08	-0.08
Grade A Extra-Large	5.29	5.21	4.50	-0.07	0.71	-0.01	0.16
Clearly Organic							
Organic Extra-Large egg	3.85	3.86	3.50	0.01	0.36	0.00	0.10
Eggland							
Large egg 1.5 doz	5.86	6.14	4.93	0.29	1.21	0.05	0.25
Large Brown Organic	2.07	1.79	1.71	-0.29	0.07	-0.14	0.04
Large Brown cage-free	3.86	2.93	3.00	-0.93	-0.07	-0.24	-0.02
Large eggs	6.29	7.29	8.14	1.00	-0.86	0.16	-0.11
Extra-Large egg	8.07	7.79	7.86	-0.29	-0.07	-0.04	-0.01
Land-O-Lakes							
Large Omega 3 egg	1.36	1.29	1.43	-0.07	-0.14	-0.05	-0.10
Large Brown egg	5.00	6.00	4.21	1.00	1.79*	0.20	0.42
Total Sales	145.06	200.93	156.29				
	n=14	*n=14*	*n=14*				

Doz-Dozen

**= Change is significant at a 5% level*

Table 8: Total quantity market share by type

	Caged	Cage-free	Organic
Control 1	0.917	0.044	0.039
Treatment	0.927	0.045	0.028
Control 2	0.924	0.043	0.033
Total	0.923	0.044	0.041

Table 9: List of all varieties at Reasor's

Option	Brand	Egg Per Carton	Size	color	Hen Housing
1	Best Choice	60	Large	White	Cage
2	Best Choice	6	Large	White	Cage
3	Best Choice	12	Medium	White	Cage
4	Best Choice	12	Jumbo	White	Cage
5	Best Choice	12	Large	Brown	Cage
6	Best Choice	18	Medium	White	Cage
7	Best Choice	30	Large	White	Cage
8	Best Choice	12	Extra-Large	White	Cage-free
9	Best Choice	12	Large	White	Cage
10	Best Choice	18	Large	White	Cage
11	Best Choice	12	Extra-Large	White	Cage
12	Clearly Organic	12	Large	White	Organic
13	Eggland	18	Large	White	Cage
14	Eggland	12	Large	Brown	Organic
15	Eggland	12	Large	Brown	Cage-free
16	Eggland	12	Large	White	Cage
17	Eggland	12	Extra-Large	White	Cage
18	Land-O-Lakes	12	Large	White	Cage
19	Land-O-Lakes	12	Large	Large	Cage

The categories included: caged half-a-dozen (option 2), caged dozen (option 3,4,9,11,16,17, and 18), caged larger than a dozen (option 6,7,10, and 13), brown (option 5 and 19), cage-free (option 8 and 15), and organic (option 12 and 14). Option 1 (Best Choice large 5 dozen) was dropped from the model to keep the two studies similar in egg options.

Table 10: Logit Demand Estimates (Seemingly Unrelated Regression)

Parameters	**Alternative Specific Constant** Estimate (Standard Error)	**Signs Displayed** Estimate (Standard Error)	**Weekend** Estimate (Standard Error)	**Promotional Deal** Estimate (Standard Error)	**Price** Estimate (Standard Error)
Caged Half-a-dozen	-3.326*	-0.029	0.401*	-0.024	-0.463*
	(0.157)	(0.173)	(0.151)	(0.202)	(0.136)
Caged Dozen	-0.202	0.161***	0.336*	0.253**	-0.463*
	(0.276)	(0.085)	(0.070)	(0.112)	(0.136)
Caged Larger than a Dozen	-0.684***	-0.059	-0.412*	0.033	-0.463*
	(0.411)	(0.107)	(0.093)	(0.125)	(0.136)
Brown	-2.124*	-0.039	0.330*	0.200	-0.463*
	(0.339)	(0.762)	(0.111)	(0.150)	(0.136)
Cage-free	-2.335*	0.114	0.437*	-0.086	-0.463*
	(0.424)	(0.171)	(0.147)	(0.197)	(0.136)
Organic	-1.824*	0.0003	0.513*	-0.107	-0.463*
	(0.646)	(0.199)	(0.173)	(0.232)	(0.136)

*Is significant at 0.01 level ** Is significant at 0.05 level *** Is significant at a 0.1 level

The R-Square values for the parameter are as follows: caged half-dozen 0.1724, caged dozen 0.7229, caged larger than a dozen 0.3855, brown 0.1324, cage-free 0.2086, and organic 0.2417.

Table 11: Market Share Prediction from Demand Model

	Market Share	
	Without Signs	**With Signs**
Caged Half-a-dozen	1.6%	1.5%
Caged Dozen	23.3%	26.5%
Caged Larger than a Dozen	8.5%	7.7%
Brown	2.6%	2.4%
Cage-free	1.7%	1.8%
Organic	1.3%	1.3%
No purchase	61.0%	58.9%

Table 12: Average Revenue and Gross Margin per Day

	Without Signs		With Signs	
	Average Revenue per day ($)	**Gross Margin per day ($)**	**Average Revenue per day ($)**	**Gross Margin per day ($)**
Caged Half-a-dozen	4.43	1.78	4.15	1.66
Caged Dozen	128.06	44.87	145.12	50.84
Caged Larger than a Dozen	76.63	30.12	69.68	27.38
Brown	18.75	6.61	17.40	6.14
Cage-free	14.89	5.41	16.10	5.85
Organic	18.15	6.13	17.51	5.92
No Purchase	0.00	0.00	0.00	0.00
Total		94.92		97.80

Figures

Figure 1: Experiment Outline of Study

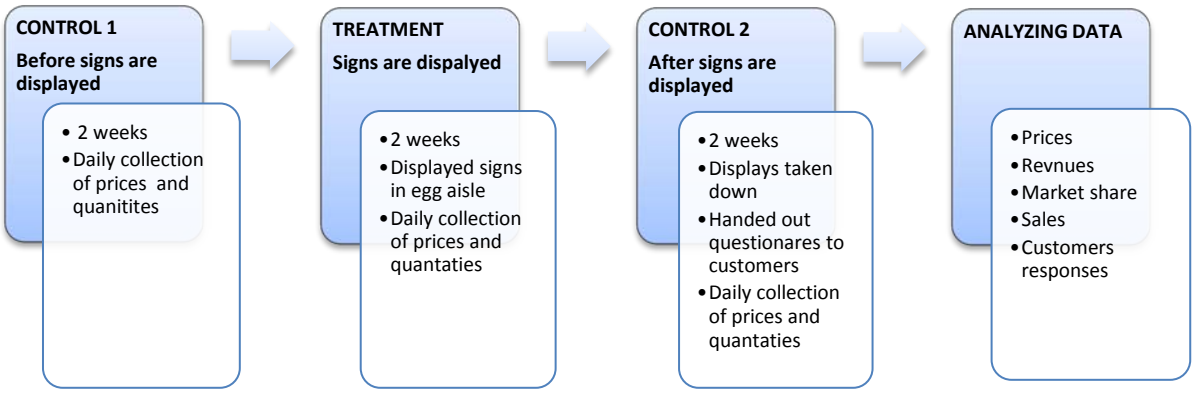

Figure 2: Stick out display

Figure 3: Shelf labels

Figure 4. Different sign choices

Sign A

Sign B

Sign C

Figure 5: Display

Figure 6**:** Display and Shelf labels

Oklahoma State University Institutional Review Board

Date:	Monday, March 11, 2013
IRB Application No	AG1317
Proposal Title:	Egg Perception
Reviewed and Processed as:	Exempt

Status Recommended by Reviewer(s): Approved Protocol Expires: 3/10/2014

Principal Investigator(s):

Katie Rose Smithson
415 Ag Hall
Stillwater, OK 74078

Jayson Lusk
411 Ag Hall
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

X The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval. Protocol modifications requiring approval may include changes to the title, PI, advisor, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Dawnett Watkins 219 Cordell North (phone: 405-744-5700, dawnett.watkins@okstate.edu).

Sincerely,

Shelia H. Kennison

Shelia Kennison, Chair
Institutional Review Board

Oklahoma State University Institutional Review Board

Date:	Thursday, July 18, 2013	**Protocol Expires:**	3/10/2014
IRB Application No:	AG1317		
Proposal Title:	Egg Perception		
Reviewed and Processed as:	Exempt **Modification**		

Status Recommended by Reviewer(s) **Approved**

Principal Investigator(s):

Katie Rose Smithson
415 Ag Hall
Stillwater, OK 74078

Jayson Lusk
411 Ag Hall
Stillwater, OK 74078

The requested modification to this IRB protocol has been approved. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is complete. All approved projects are subject to monitoring by the IRB.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

Mod to recruit participants at Reasor's in Sand Springs, OK

Signature :

Shelia H. Kennison

Shelia Kennison, Chair, Institutional Review Board

Thursday, July 18, 2013
Date

VITA

Katie Smithson

Candidate for the Degree of

Master of Science

Thesis: EFFECT OF INFOMRATION DISPLAYES ON CAGE-FREE AND ORGANIC EGG CONSUMPTION: EVIDENCE FROM TWO FIELD EXPERIMENTS

Major Field: Agricultural Economics

Biographical:

Education:

Completed the requirements for the Master of Science in Agricultural Economics at Oklahoma State University, Stillwater, Oklahoma in May, 2014.

Completed the requirements for the Bachelor of Science in Agricultural Business at Oklahoma State University, Stillwater, Oklahoma in May, 2012.

Experience:

Professional Memberships: